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Manual on Metric Building Drawing Practice

PREPARED BY
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MEMBERS OF THE WORKING GROUP,
SUBCOMMITTEE ON DESIGN AND CONSTRUCTION,
INTERDEPARTMENTAL COMMITTEE FOR METRIC CONVERSION

National Research Council of Canada

Conseil national de recherches du Canada

M A N U A L O N M E T R I C
B U I L D I N G D R A W I N G P R A C T I C E

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The Metric Commission has granted use of the National Symbol for Metric Conversion

PREFACE

The Canadian construction industry is preparing for conversion to the metric system beginning in January 1978. This manual, prepared by the Working Group of the Subcommittee on Design and Construction of the Interdepartmental Committee for Metric Conversion, has been developed to assist in the preparation of proper construction drawings that are so essential to a smooth transition.

This Manual is a basic tool for metric conversion. The first three Parts explain what is involved in this conversion. Part 4 gives a step-by-step procedure for the production of metric drawings; the following Parts will assist, it is hoped, in design decisions and offer help with the actual act of "translating" a design approach to metric.

One of the main responsibilities of the Division of Building Research is to serve the Canadian construction industry. The Division was pleased, therefore, to have one of its members serve on the Working Group responsible for preparing this Manual and to arrange for its publication.

It is hoped that this Manual will be of assistance to those in the construction industry who are concerned with the conversion to metric. Comments on the Manual will be welcomed.

C.B. Crawford
Director
Division of Building Research
National Research Council of Canada

Ottawa
April 1976

ACKNOWLEDGEMENTS AND REFERENCES

In the preparation of this Manual the Working Group consulted many texts, not only Canadian but also those issued by other countries that have recently converted to SI. Although these have not been cited in the text, the authors wish to acknowledge the information gained from the following references:

Metric Conversion in Building and Construction, 1972, Standards Association of Australia.

Metric Data for Building Designers, 1975, Standards Association of Australia.

AJ Metric Handbook, 1969, The Architectural Press, London.

CAN-3-Z234.1-76, Metric Practice Guide.

CAN-3-Z234.2-76, The International System of Units (SI).

CAN-3-A31.M-75, Series of Standards for Metric Dimensional Co-ordination in Building.

CSA B78.3 (draft) Building Drawings.

CGSB 88-GP-20M, Standard for Scales (Ratios) for Charts, Maps, and Plans in Metric (SI) System.

Metric Monitor and various booklets published by the Metric Commission, Ottawa.

The Working Group also wishes to credit the source of the following tables that are reproduced in this Manual:

Tables Nos. 8.1 to 8.4 and 8.6 to 8.14 from Metric Conversion in Building and Construction, 1972, Standards Association of Australia;

Tables Nos. 6.1 to 6.4 from Metric Data for Building Designers, 1975, Standards Association of Australia.

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PART 1. INTRODUCTION

1.1 GENERAL

In the White Paper on Metric Conversion, released in January 1970, the Government of Canada responded to numerous representations from widely diverse segments of the nation (Canadian Construction Association, Engineering Institute of Canada, Canadian Council of Professional Engineers, Canadian Chamber of Commerce, Royal Architectural Institute of Canada, and Canadian Teachers' Federation to name only a few of the organizations that presented briefs on this matter). All these groups realized the desirability and inevitability of Canada's "going metric" in conformity with the world-wide trend exhibited in the 1960's and 70's by which time almost all nations were committed to this international system of weights and measures. General policy, set out in the White Paper, adopted the International System of Units (SI) as the basis for metric conversion in Canada. At the same time the Weights and Measures Act was revised to include the SI units, thus making them legal in Canada.

1.2 METRIC COMMISSION

To achieve one orderly change to the metric system of measurement, the Federal Government, by Order in Council in June 1971, established the Metric Commission to co-ordinate and stimulate metric conversion throughout the nation's economy. The Commission, in turn, established eleven Steering Committees, each responsible for co-ordinating a group of economic sectors with related interests. A chart of the distribution of the various engineering industries sectors in the Steering Committee is shown on Fig. 1.1. From this chart it is obvious that although the building industry as such comes under Steering Committee 5, the complexity of the industry necessitates co-operation with other sectors. Therefore, aside from the regular Sector Committee work in Steering Committee 5, intersectoral links were established to serve the interests of the building industry. To further co-ordination of metric conversion in the public service sector, two other committees were established: an Interdepartmental Committee for Metric Conversion (ICMC) Subcommittee on Design and Construction, and the Intergovernmental Design and Construction Committee on Metric Conversion (IDCC) (provincial level). (Names and addresses of members of Committees concerned with metric conversion in Canada's construction industry are included in Appendix A.)

1.3 M-DAY

By consensus of the representatives of the Canadian construction industry, 1 January 1978 has been selected as "M-Day" for construction. This is the first day of Metric Construction Year -- the year in which the Canadian construction industry will work mainly in the SI system. Following M-day, drawings and specifications will be prepared in metric terms and materials or components that are required in metric sizes will become available.

A timetable bar chart for metric conversion prepared by Sector 5.01, Construction, is shown on Fig. 1.2.

Metric Commission Canada / Commission du système métrique Canada

STEERING & SECTOR COMMITTEE STRUCTURE

DATE ISSUED: MARCH 31, 1977

BY: RESEARCH & PLANNING DIRECTORATE

SECTOR NO.	SECTOR PLAN MANAGER	PLANNING MANAGER	SECTOR TITLE
STEERING COMMITTEE # 1			
1.01	8	C	AIR TRANSPORT
1.02	8	C	RAILWAY TRANSPORT
1.03	8	C	WATER TRANSPORT
1.04	8	C	ROAD & URBAN TRANSPORT
1.07	8	C	METEOROLOGY
1.20	8	C	WORKING GROUP ON TARIFFS
STEERING COMMITTEE # 2			
2.04	6	B	MOTOR VEHICLE & PARTS MANUFACTURERS
2.05	6	B	TRUCK BODY & TRAILER MANUFACTURERS
2.06	6	B	RAILROAD ROLLING STOCK
2.07	6	B	SHIPBUILDING & BOATBUILDING
2.08	14	B	HEATING,VENTILATING,AIR COND.& FOOD SERVICE EQUIP.
	14	B	2.09 PLUMBING & HYDRONIC HEATING
2.10	15	B	IRON & STEEL MILLS & FOUNDARIES
	15	B	2.11 FASTENERS INDUSTRY
2.21	15	B	METAL STAMPING, FORMING, PRESSING, COATING
2.22	14	B	CAN MANUFACTURERS
2.23	14	B	COOKWARE & HOUSEWARES
2.24	14	B	TOOLS & MEASURING DEVICES
2.25	15	B	BUILDERS & HOME HARDWARE
2.27	6	B	FIRE FIGHTING EQUIPMENT - SMALL ARMS - AMMUNITION
			MISCELLANEOUS MACHINERY -
2.31	6	B	AGRICULTURAL & CONSTRUCTION EQUIPMENT
2.32	15	B	MACHINERY & FLUID POWER
2.33	15	B	METAL WORKING MACHINES - MACHINE SHOPS
			TOOL & DIE SHOPS - CUTTING TOOLS
STEERING COMMITTEE # 3			
3.01	13	C	ELECTRICAL MANUFACTURERS
3.02	13	F	RADIO, TELEVISION, COMMUNICATION, ELECTRONIC EQUIPMENT & PARTS
3.03	13	C	AIRCRAFT & AIRCRAFT PARTS MANUFACTURERS
3.04	13	F	BUSINESS MACHINES, SCIENTIFIC & PROFESSIONAL EQUIPMENT
3.05	13	C	COMMUNICATIONS
3.06	11	C	ELECTRIC POWER
3.07	16	E	RUBBER PRODUCTS
3.08	16	E	CHEMICALS & CHEMICAL PRODUCTS
3.09	16	E	PLASTICS INDUSTRY
3.10	14	F	WORKING GROUP ON SCALES IN THE RETAIL FOOD INDUSTRY
STEERING COMMITTEE # 4			
4.01	3	E	MINES
4.02	3	E	PETROLEUM & NATURAL GAS INDUSTRY & SERVICES
4.03	3	E	PETROLEUM REFINERIES, WHOLESALERS & GASOLINE SERVICE STATIONS
4.04	3	E	NATURAL GAS DISTRIBUTION & TRANSPORT
4.05	3	E	NON-FERROUS METALS

SECTOR NO.	SECTOR PLAN MANAGER	PLANNING MANAGER	SECTOR TITLE
STEERING COMMITTEE # 5			
5.01	10	E	CONSTRUCTION
5.02	10	E	NON-METALLIC MINERAL PRODUCTS
5.03	10	E	STRUCTURAL & ARCHITECTURAL METALS
5.05	10	E	REAL ESTATE, LAND SURVEYORS & TOWN PLANNERS
5.06	10	E	ROAD DESIGN, CONSTRUCTION & OPERATIONS
STEERING COMMITTEE #61 - AGRICULTURE, FISHING, TRAPPING			
61.01	4	F	BULK GRAIN HANDLING INDUSTRY
61.02	4	F	FEED INDUSTRY
61.03	4	F	POULTRY
61.04	4	F	LIVESTOCK
61.05	4	F	HORTICULTURE
61.06	4	F	FISHING & FISH PRODUCTS
61.07	4	F	DAIRY FARMERS
61.08	4	F	SEED
61.09	4	F	TOBACCO FARMERS
61.10	4	F	TOBACCO PRODUCTS
STEERING COMMITTEE #62 - FOOD			
62.02	12	F	CONFECTIONERY
62.03	12	F	MEAT PACKERS
62.04	12	F	DAIRY PROCESSORS
62.05	12	F	FOOD PROCESSORS
62.06	12	F	PET FOODS
62.07	12	F	BISCUITS
62.08	12	F	EDIBLE OILS
62.09	12	F	SUGAR
62.10	12	F	BAKERS
62.11	12	F	TEA & COFFEE
62.13	12	F	MILLERS
62.21	12	F	COLD CEREALS
62.22	12	F	HOT CEREALS
62.23	12	F	SPICES,EXTRACTS & FOOD COLOURING
62.24	12	F	COLD BEVERAGES,MIXES & DRY DESSERT MIXES
62.25	12	F	CHOCOLATE DRINKS & COCOA POWDER
62.26	12	F	PASTA PRODUCTS
62.27	12	F	BAKING MIXES
62.28	12	F	SNACK FOODS
62.29	12	F	RICE
62.50	12	F	WORKING GROUP ON PACKAGING
STEERING COMMITTEE #63 - BEVERAGES			
63.01	12	F	DISTILLED SPIRITS
63.02	12	F	BREWERIES
63.03	12	F	SOFT DRINKS
63.04	12	F	WINE
63.05	12	F	LIQUOR COMMISSIONERS
63.06	12	F	MINERAL WATER PRODUCERS
63.07	12	F	FRUIT JUICE INDUSTRY
63.08	12	F	CIDER

SECTOR NO.	SECTOR PLAN MANAGER	PLANNING MANAGER	SECTOR TITLE
STEERING COMMITTEE # 7			
7.10	1	A	TEXTILES
7.20	1	A	CLOTHING
7.30	1	A	LEATHER (FOOTWEAR)
7.41	1	A	JEWELRY
7.42	1	A	SPORTING GOODS
7.43	1	A	TOYS
7.45	1	A	BRUSH, BROOM & MOP
7.49	1	A	LUGGAGE & LEATHER GOODS
STEERING COMMITTEE # 8			
8.10	9	A	FORESTRY
	9	A	8.17 URBAN FORESTRY ARBORICULTURE
8.20	9	A	WOOD (INCL. SUB-COMMITTEE)
	9	A	8.21 SOFT WOOD LUMBER
	9	A	8.22 HARDWOOD LUMBER & FLOORING
	9	A	8.23 PANEL PRODUCTS
	9	A	8.24 SASH, DOORS & MILLWORK
	9	A	8.25 LAMINATING
	9	A	8.26 PALLETS
	9	A	8.27 PRESERVATION
	9	A	8.28 POLES & PILING
	9	A	8.29 SHINGLES
8.30	9	A	FURNITURE & FIXTURES
8.45	9	A	PAPER & ALLIED IND. PRINTING & PUBLISHING
STEERING COMMITTEE # 9			
9.10	2	D	HEALTH & WELFARE
9.21	2	D	AMUSEMENT & RECREATION
9.22	2	D	ARTS & CULTURE
9.30	5	D	SERVICES TO BUSINESS MANAGEMENT
9.40	5	D	ACCOMMODATION & FOOD SERVICES
9.50	2	D	RETAIL, HOME ECONOMICS & CONSUMERS
9.60	5	D	LABOUR ORGANIZATIONS
9.70	5	D	PERSONAL SERVICES
STEERING COMMITTEE # 10			
10.01	7	A	ELEMENTARY & SECONDARY SCHOOLS
10.03	7	A	POST SECONDARY NON-UNIVERSITY EDUCATION
10.04	7	A	UNIVERSITIES & COLLEGES

SECTOR STRUCTURE APPROVED BY THE METRIC COMMISSION SEPT.15, 1976
REV. DEC.15/1976

ASSIGNMENTS OF SECTORS

TO SECTOR PLAN MANAGERS		TO PLANNING MANAGERS
1 - ALPERS P.	9 - EARLE J.	A - BERRY J.
2 - BENNETT J.	10 - FRIEDMAN I.	B - BOISVERT C.
3 - ROCKBURNE C.A.	11 - GANAPATHY N.	C - DREYER B.
4 - CRAIG B.	12 - GULAS G.M.	D - ECCLESTONE G.
5 - DEACHMAN R.J.	13 - SWAIN G.	E - SPARKES E.
6 - MANSOUR E.	14 - WASSINK B.	F - TALWAAR K.
7 - DESBARATS G.	15 - BRIGHT R.	
8 - DOW H.	16 - TROTTIER J.	

THIS TABLE IS BEING UPDATED EVERY TWO MONTHS AS NECESSARY

FIG. 1.1 ORGANIZATION CHART OF STEERING COMMITTEES, METRIC COMMISSION, CANADA

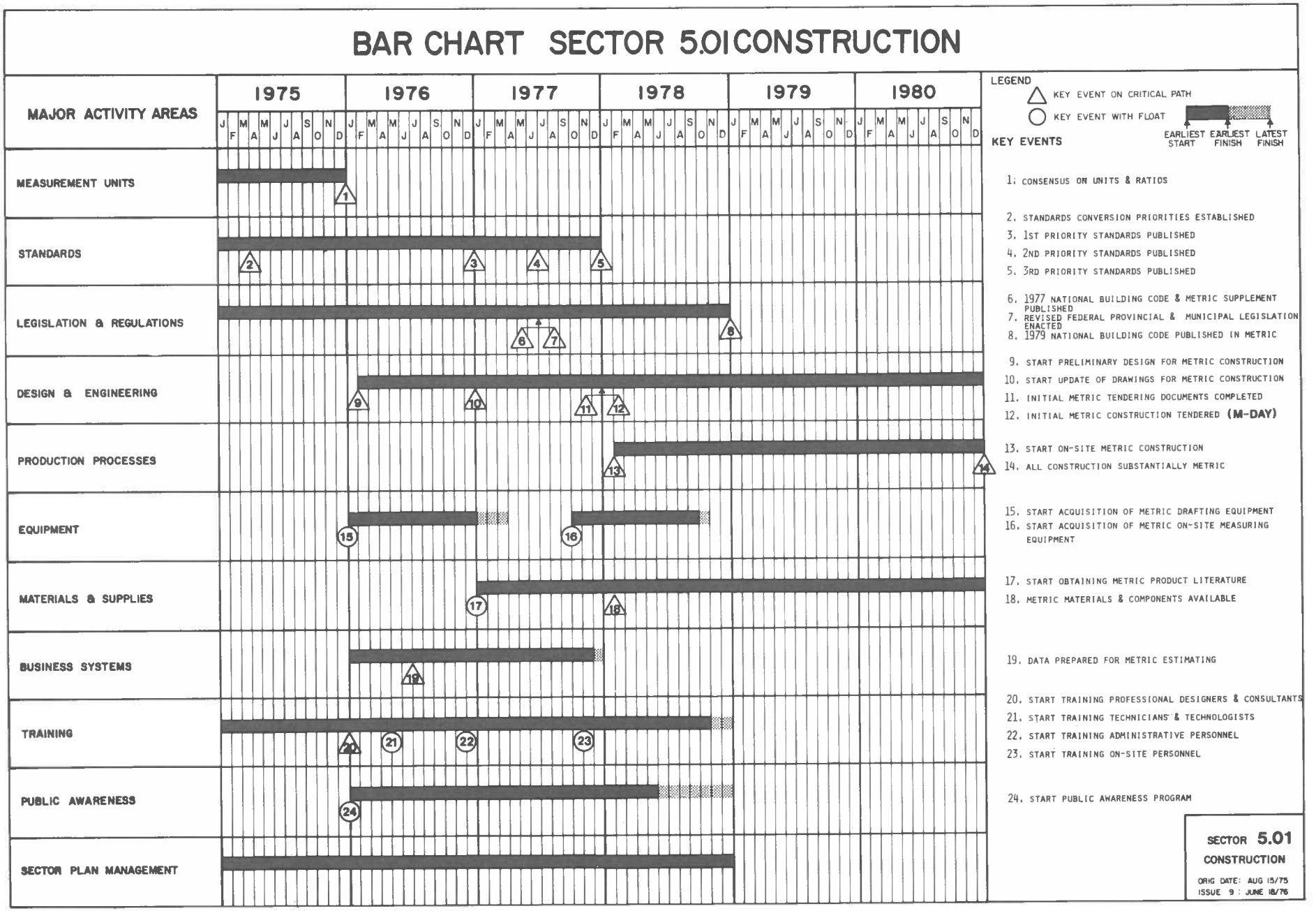


FIG. 1.2 TIMETABLE FOR METRIC CONVERSION IN CONSTRUCTION INDUSTRY (SUBJECT TO REVISION)

PART 2. METRIC CONVERSION

2.1 GENERAL

The actual 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."

2.2 SOFT CONVERSION

In "soft conversion" the actual dimensions of a product (or, for example, of a set-back distance, floor area, etc.) are not changed but are only expressed in appropriate SI units. (Necessary conversion factors are in Part 8 of this Manual.) Inevitably in most practical cases, when a workable number is required a certain rounding off of the calculated figure will be involved. Here commonsense, practice and technical knowledge will come into play. The intention is to convey the degree 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 let us assume that by exact calculation using conversion factors from Part 8 the resulting figure has more digits than required. Then the procedure is as follows:

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

    7.151 426 rounded to 4 digits -- 7.151;

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, e.g.,

    3.416 72 rounded to 4 digits -- 3.417
    2.213 501 rounded to 4 digits -- 2.214;

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, e.g.,

    2.35 rounded to 2 digits -- 2.4
    2.45 rounded to 2 digits -- 2.4

It must again be stressed that the most accurate equivalents in conversion are obtained by multiplying the quantity to be converted by the conversion factor given in the Tables in Part 8, 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 most probably not be accurate.

2.3 HARD CONVERSION

With very few exceptions, hard conversion to metric, as defined, involves a physical change (as may happen in the case of products originally manufactured to metric dimensions and up to now described in imperial units of measurement only for convenience). 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 indistry 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.

These changes of course will not occur by a mere wish or by an isolated decision. Canadian standards-writing organizations, e.g., CSA and CGSB, are at present involved in the standards conversion program. Many standards written in SI units will be prepared before M-Day; the rest will be converted as quickly as possible and as required.

It is expected that various professional organizations and industrial sectors will make available design tools specifically for their field of work. (This Manual is but one example.) The Intergovernmental Committee on Design and Construction has begun to issue bulletins indicating preferred dimensions of building components.

2.4 METRIC CONVERSION OF THE 1977 EDITION OF THE NATIONAL BUILDING CODE

The next (7th) edition of the National Building Code will be published in July 1977. It will be issued as an all-imperial Code accompanied by a pamphlet giving either hard or soft metric conversions depending on available standards and product information. This pamphlet will be in tabular form. In addition, Metric Product Bulletins will be published at intervals to accommodate subsequent introduction of metric products. Other documents associated with the 1977 Code will be changed to metric by the use of supplementary metric pamphlets where appropriate.

PART 3. SI METRIC

3.1 GENERAL

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 CAN 3-Z.234.2-76, the International System of Units (SI) and CAN 3-Z.234.1-76, Metric Practice Guide. Recommended applications of multiples and submultiples, conversion factors relating SI and imperial systems and a table of "working units" applicable to various sectors of design and construction are shown in Part 9 of this Manual.

3.2 RULES FOR WRITING SI UNITS AND SYMBOLS

One of the main advantages of the SI is that there is a unique symbol for each unit. Throughout this text, the word "symbol" is used to refer to the signs used to represent the various units, for that is what they are: symbols, not abbreviations; and they remain the same in all languages. The word "symbol," not "abbreviation," should always be used. This makes for greater clarity and reduces the chance of error. The following are the basic rules for the use of these symbols.

3.2.1 Symbols are always printed in upright (roman) type. When according to ISO Standard 1000, "SI Units," 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 until now, therefore, has been to use the script ell (ℓ), as shown in several places in this Manual. It should be noted, however, that the CSA Committee on Metric Practice Guide has recently recommended that a capital ell (L) be used as the symbol for litre in all applications. (This decision has recently also been taken by standards-writing organizations in the U.S.A.).

3.2.2 Symbols do not change in the plural: e.g., 1 kg, 45 kg (not 45 kgs).

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

3.2.4 When symbols consist of letters, there is always a full space between the quantity and the symbols: e.g., 45 kg (not 45kg). However, when the first character of a symbol is not a letter, no space is left: e.g., 32°C (not 32 °C or 32° C), and 45°12'45" (not 42 ° 12 ' 45 ").

3.2.5 Symbols are written in lower case, except when the unit is derived from a proper name. Examples: m for metre, s for second; but A for ampere, Wb for weber, N for newton, W for watt. Prefixes are printed in upright type without spacing between the prefix and the unit symbol: e.g., km is the symbol for kilometre.

3.2.6 When associated with a number, symbols for SI units should always be used and unit names not written out, e.g., 16 mm^2 and not 16 square millimetres; however, when no number is involved, the unit should be spelled out in full. Abbreviations such as "sq.mm" are not acceptable.

3.2.7 Where a decimal fraction of a unit is used, a zero should always be placed before the decimal marker: e.g., 0.45 kg (not .45 kg). This practice draws attention to the decimal marker, and helps avoid errors of scale.

3.2.8 Beware of the confusion which 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".

3.2.9 Names and symbols should not be mixed, e.g., N•m or newton metre but NOT N metre or newton m. Note that a multiplier dot is used between symbols in a compound unit but no dot is required when that unit is written out, e.g., $W/(m^2 \cdot °C)$ is written as "watt per square metre degree Celsius."

3.2.10 Compound units formed by division employ an oblique stroke (solidus) when symbols are used, e.g., km/h, not kph or km per hr. When the units are written out, the word "per" is used, e.g., kilonewtons per square metre NOT kilonewtons/square metre.

3.2.11 In text, a symbol should not be used to start a sentence.

3.3 RULES FOR WRITING NUMBERS

3.3.1 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.

3.3.2 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, e.g., 32 453.246 072 5. 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, i.e., 1 234 or 1234.

TABLE 3.1 SI BASE UNITS

Physical Quantity	Unit	Symbol
length	metre	m
mass	kilogram	kg
time*	second	s
electric current*	ampere	A
thermodynamic temperature	kelvin	K
luminous intensity*	candela	cd
amount of substance†	mole	mol

* Three of these units (the second, ampere and candela) are already in use with the imperial system.

† The mole, which has recently been added to SI, will have no application in the building construction industry.

TABLE 3.2 SI SUPPLEMENTARY UNITS

Physical Quantity	Unit	Symbol
plane angle	radian	rad
solid angle	steradian	sr

TABLE 3.3 DERIVED UNITS WITH SPECIAL NAMES

Physical Quantity	Unit	Symbol	Derivation
frequency	hertz	Hz	s^{-1}
force	newton	N	$kg \cdot m/s^2$
pressure, stress	pascal	Pa	N/m^2
work, energy, quantity of heat	joule	J	$N \cdot m$
power	watt	W	J/s
electric charge	coulomb	C	$A \cdot s$
electric potential	volt	V	W/A
electric capacitance	farad	F	C/V
electric resistance	ohm	Ω	V/A
electric conductance	siemens	S	Ω^{-1}
magnetic flux	weber	Wb	$V \cdot s$
magnetic flux density	tesla	T	Wb/m^2
inductance	henry	H	$V \cdot s/A$
temperature (for temperature interval 1°C = 1K)	degree Celsius	°C	K-273.15
luminous flux	lumen	lm	$cd \cdot sr$
illumination	lux	lx	lm/m^2

TABLE 3.4 SI DERIVED UNITS

(expressed in terms of other units and base units)

Physical Quantity	Unit	Symbol
area	square metre	m^2
volume	cubic metre	m^3
density	kilogram per cubic metre	kg/m^3
velocity	metre per second	m/s
angular velocity	radian per second	rad/s
acceleration	metre per second squared	m/s^2
angular acceleration	radian per second squared	rad/s^2
volume rate of flow	cubic metre per second	m^3/s
moment of inertia	kilogram metre squared	$kg \cdot m^2$
moment of force	newton metre	$N \cdot m$
surface tension	newton per metre	N/m
dynamic viscosity	pascal second	$Pa \cdot s$
kinematic viscosity	metre squared per second	m^2/s
calorific value	joule per cubic metre	J/m^3
intensity of heat flow	watt per square metre	W/m^2
thermal conductivity	watt per metre kelvin	$W/(m \cdot K)$
electric field strength	volt per metre	V/m
magnetic field strength	ampere per metre	A/m
luminance	candela per square metre	cd/m^2

TABLE 3.5 PREFERRED MULTIPLES AND SUBMULTIPLES

Prefix	Symbol	Factor	Magnitude
exa	E	10^{18}	1 000 000 000 000 000 000
peta	P	10^{15}	1 000 000 000 000 000
tera	T	10^{12}	1 000 000 000 000
giga	G	10^{9}	1 000 000 000
mega	M	10^{6}	1 000 000
kilo	k	10^{3}	1 000
milli	m	10^{-3}	0.001
micro	μ	10^{-6}	0.000 001
nano	n	10^{-9}	0.000 000 001
pico	p	10^{-12}	0.000 000 000 001
femto	f	10^{-15}	0.000 000 000 000 001
atto	a	10^{-18}	0.000 000 000 000 000 001

PART 4. DRAWING PRACTICE

4.1 DRAWING PAPER SIZES

In the absence of a Canadian national standard for drawing paper sizes, it is recommended that the ISO 'A' series, as described in CGSB 9-GP-100, be adopted.

4.1.1 *Basic Principles*

The 'A' series of paper sizes is a rationally designed system based on a sheet having an area of 1 m^2 (841 × 1189 mm) from which all other sizes are derived by successively dividing it into two equal parts parallel to the shorter side (Figure 4.1). Consequently, the ratio of the areas of any two successive sheets is 2:1 and the ratio between the short side x and the long side y, of any sheet, is $1:\sqrt{2}$, i.e., the ratio between a side and the diagonal of a square (Figure 4.1).

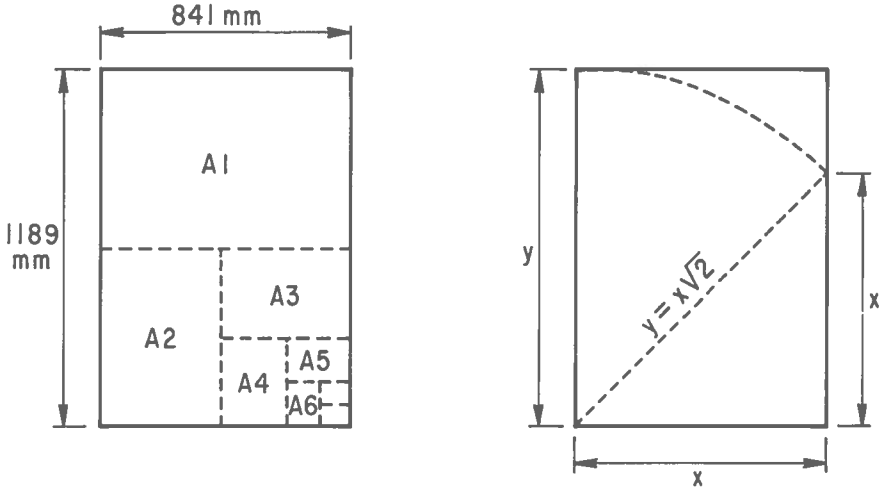


FIG. 4.1 SHEET SIZES

4.1.2 *ISO Series 'A'*

Trimmed sheet sizes are designated in Table 4.1 by 'A' followed by a number indicating the number of divisions that have been made. For example, sheet size A4 is produced from the basic A0 sheet by four successive divisions. Sizes larger than A0 may be designated by a prefix. Size 2A0 is a sheet 1189 × 1682 mm and size 4A0 is a sheet 1682 × 2378 mm.

4.1.3 *Tolerances*

The tolerances on the above dimensions will vary depending on the sheet size and the end use. Unless otherwise specified in the product standards, the following tolerances shall apply:

Sizes A0 to A3 - -0; +2 mm
Sizes A4 to A10 - -0; +1 mm

TABLE 4.1 ISO SERIES 'A' PAPER SIZES

Designation	Dimensions, mm
A0	841 × 1189
A1	594 × 841
A2	420 × 594
A3	297 × 420
A4	210 × 297
A5	148 × 210
A6	105 × 148
A7	74 × 105
A8	52 × 74
A9	37 × 52
A10	26 × 37

TABLE 4.2 DIMENSIONS OF OVERSIZE SHEETS

Designation		
Ordering Purposes Only	Standard	Cut Sheet Dimensions, mm
RA0	A0	860 × 1220
RA1	A1	610 × 860
RA2	A2	430 × 610
RA3	A3	305 × 430
RA4	A4	215 × 305

Note: Until a final decision or standard sheet sizes in Canada is taken by the appropriate CGSB Standard Committee drawing sheets in inch sizes can be used.

4.1.4 *Oversize Drawing Sheets*

To provide added protection or to permit edge binding and subsequent print trimming to regular sizes, the over-all paper sizes listed in Table 4.2 are recommended.

4.1.5 *Supplementary Size B1*

For drawing offices that cannot conveniently accommodate the ISO-A0 size drawing sheet, but require a size larger than A1, an intermediate sheet size ISO-B1 (707 mm × 1000 mm) is recommended as an interim measure.

4.2 LAYOUT AND IDENTIFICATION OF DRAWING SHEETS

4.2.1 *General*

All drawing sheets require certain basic information, such as title and scale, but additional information is generally desirable. The use of preprinted sheets enables 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:

a) Border lines

b) Binding margin

c) Title block

d) Information panel.

Sheets may also contain:

e) Sheet grid reference systems

f) Camera alignment marks for microfilming

g) Marks to facilitate folding.

4.2.2 *Borders*

All drawing sheets should have a border on all four edges, that on the left-hand side being 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 the print damaged in use. Recommended border widths are shown in Table 4.3.

TABLE 4.3 DIMENSIONS OF DRAWING FRAME: WITH BINDING MARGIN

Drawing Sheet Size Designation	Nominal Width of Borders, mm			Dimensions of Rectangular Drawing Frame, mm
	On Top and Bottom	On LHS	On RHS	
A0	20	40	16	801 × 1133
A1	14	28	12	566 × 801
A2	10	20	8	400 × 566
A3	7	20	6	283 × 394
A4	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.

4.2.3 *Print Trimming Line*

Where ISO-RA series (oversize) drawing sheets are used, a method of indicating the trimming line should be marked on the sheets. This may be by means of broken lines forming a frame, dimensioned to the cut sheet dimensions of regular size sheets specified in Table 4.1, or by other suitable methods of indication.

4.3 MICROFILMING

4.3.1 *Relationship of Microfilm and Paper Sizes*

The ISO-A series drawing sheets are particularly well suited to reduction on a 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.

4.3.2 *Camera Alignment Marks*

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 outwards and should be placed outside the drawing frame.

4.3.3 *Graphic Scale*

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 300 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.

4.4 SHEET SIZE DESIGNATION

The sheet size designation number should be indicated on the drawing, preferably in the left-hand bottom corner outside the drawing frame.

4.5 ORIENTATION OF PLANS

A North point should be shown on every location plan, adjacent to the title panel.

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

The North point should preferably face the top of the drawing sheet.

4.6 KEY DIAGRAMS

Where a particular plan occupies more than one sheet, a key diagram may be included to relate graphically the particular block to the over-all 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.

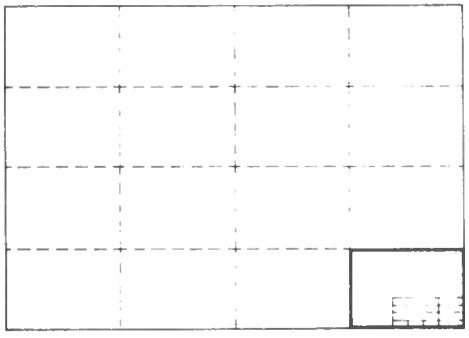
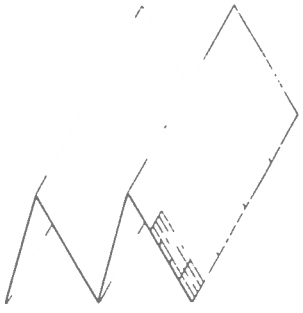
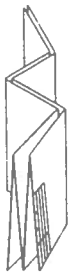
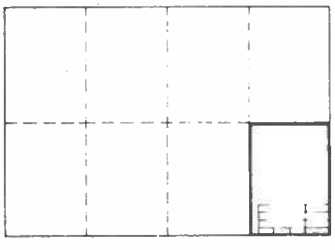
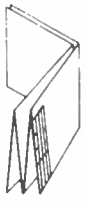
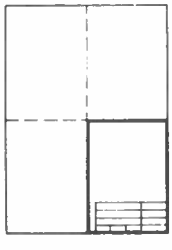
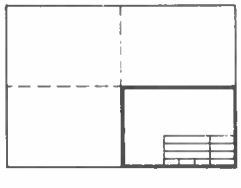
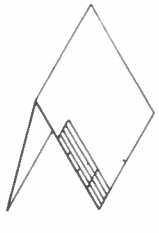
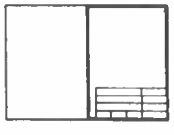
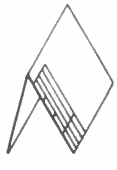
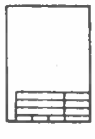
Sheet size	Fold lines	Intermediate	Final
A0 **841 × 1189**			
A1 **594 × 841**			
A2 **420 × 594**			
A2 **420 × 594**			
A3 **297 × 420**			

FIG. 4.2 SIMPLE FOLDING OF SHEETS

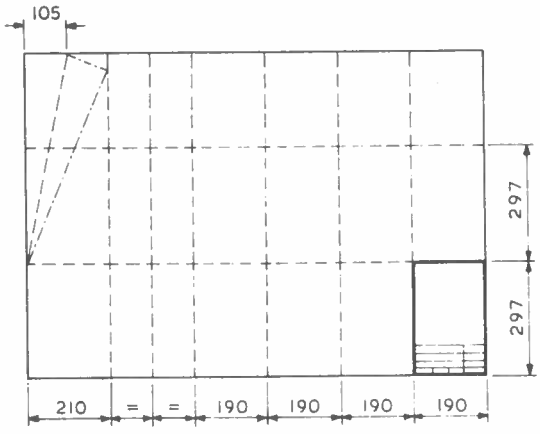
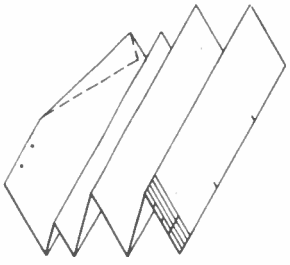
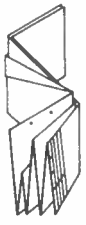
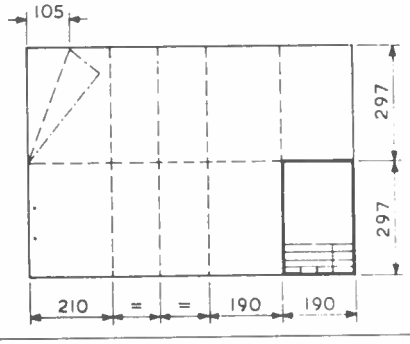
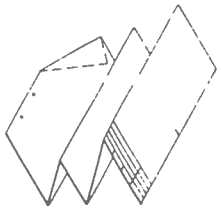
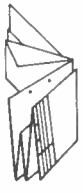
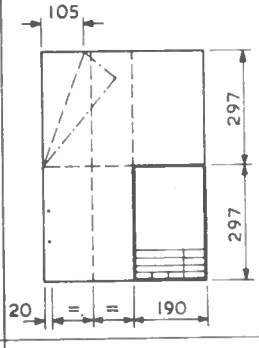
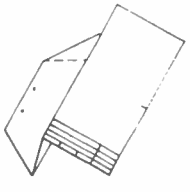
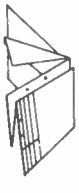
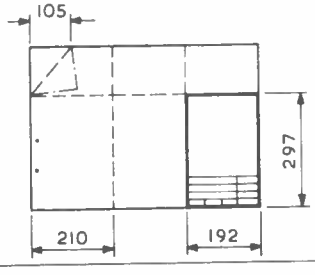
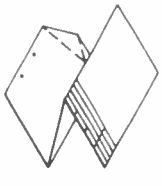
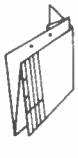
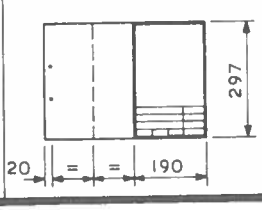
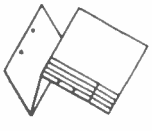
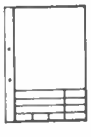
Sheet size	Fold lines	Intermediate	Final
A0 **841 × 1189**			
A1 **594 × 841**			
A2 **420 × 594**			
A2 **420 × 594**			
A3 **297 × 420**			

FIG. 4.3 FOLDING OF SHEETS FOR FILING

4.7 DRAWING SHEET REFERENCE

Drawings may be classified according to the source of production, e.g., architectural, structural, mechanical and electrical.

Drawings within these categories should then be numbered sequentially.

4.8 FOLD LINES

Fold lines should be indicated on drawings irrespective of whether prints are intended to be folded or rolled for storing. Methods of folding are shown in Figures 4.2 and 4.3. The number and position of fold lines should be specified by the user, but generally drawings should be folded to A4 size. Drawings preferably should be file folded.

4.9 INFORMATION PANEL

All notes and general information should be located in an information panel. This information panel should combine with the title panel to form a block on the drawing sheet, in a vertical or horizontal arrangement as shown in Figures 4.4 and 4.5.

The panel may contain the following information:

a) Revision details (each of which is indexed to the revision suffix, dated and initialled

b) Notes (general or specific which are better consolidated under this heading rather than loosely placed on the drawing)

c) Key to symbols and abbreviations. (The application of these by rubber stamp or transfer will save labour and also assist in standardization.)

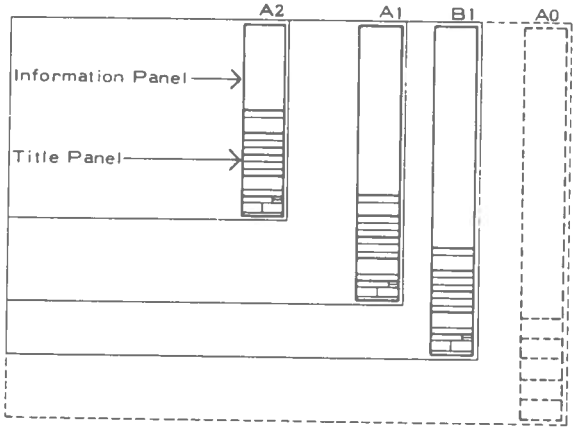


FIG. 4.4 VERTICAL ARRANGEMENT OF INFORMATION AND TITLE PANELS

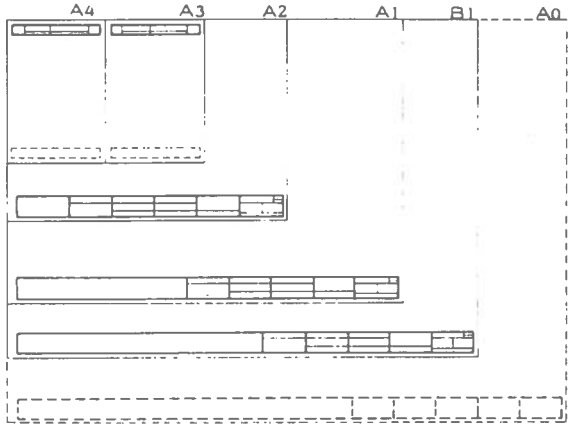


FIG. 4.5 HORIZONTAL ARRANGEMENT OF INFORMATION AND TITLE PANELS

4.10 TITLE PANEL

To facilitate reference when prints are simple or file folded, the title panel should be in either the vertical or horizontal format, located in the position shown in Figures 4.4 and 4.5.

It should include the following information as applicable:

a) Job title (usually made up of nature of project, name of proprietor and site address)

b) Subject of the drawing

c) Scale

d) Date of drawing

e) Job number

f) Drawing number and revision suffix

g) Drawing reference, where a classification system has been adopted

h) Name of architect (and associated architect where required) together with address and telephone number.

It may also include names or initials of the person(s) drawing or checking the drawing, and the name of the architect in charge of the job.

Title panels may be preprinted on the drawing sheet or on adhesive plastic film to avoid repetition of work.

Examples of title panels are given in Figures 4.6 and 4.7.

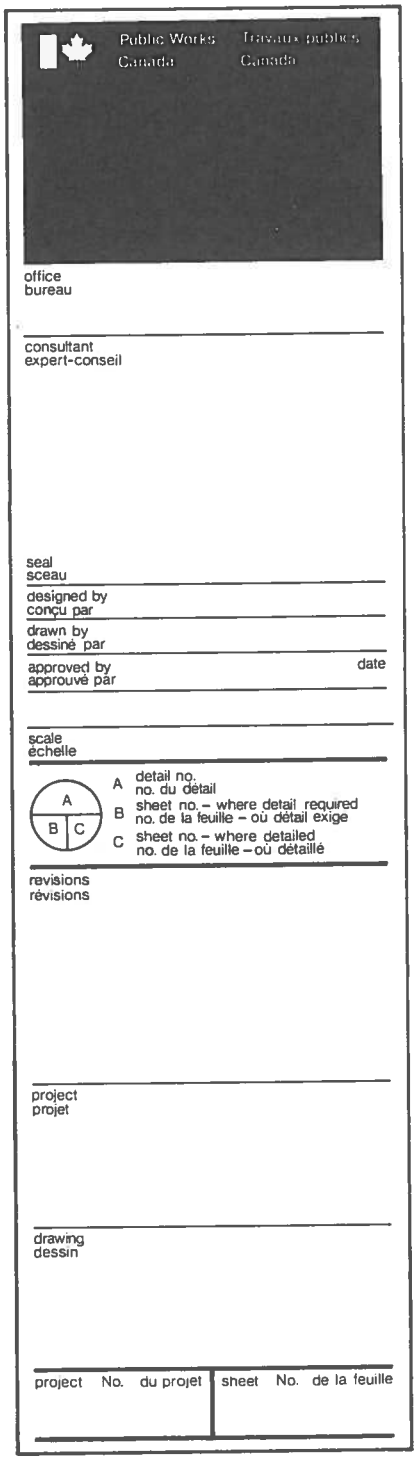
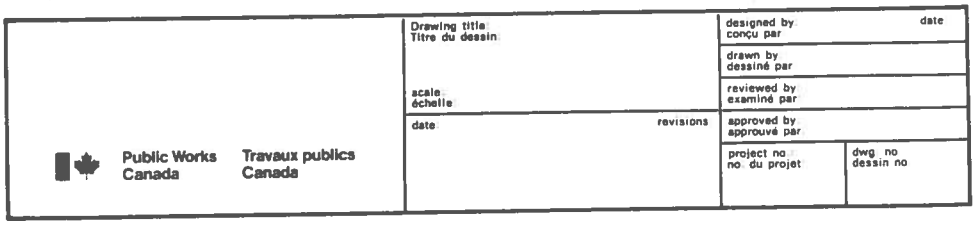


FIG 4.7 VERTICAL TITLE PANEL

FIG. 4.6 HORIZONTAL TITLE PANEL



4.11 SCALES

4.11.1 *Standard Scales*

The Canadian Government Specifications Board (CGSB) Standard 88-GP-20M sets out scales and ratios recommended for use in charts, maps and plans in metric SI. The standard includes a comprehensive list ranging from 1:1 000 000 reduction ratio to 100:1 enlargement based on the 1.2.5 series for use in architecture, engineering, construction and surveying and mapping. For convenience, the preferred scales for building drawings are reproduced in Table 4.4.

4.11.2 *Choice of Scale*

The scale selected for a particular drawing should be determined by consideration of:

a) The type of information to be communicated;

b) The need for the drawing to communicate adequately and accurately the information necessary for the particular work to be carried out;

c) The need for economy in time and effort in drawing production.

4.11.3 *Indication of Scales*

The drawing scale should be stated in the title panel of each drawing sheet.

e.g., Scale 1:100

or Scale: Not To Scale (NTS)

Where two or more scales are used on the same sheet, the particular scales should be clearly indicated.

In addition to the statement in the title panel, it may be advisable to indicate the scale graphically, e.g.,

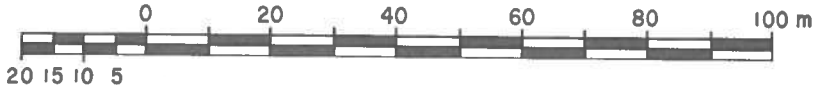


FIG. 4.8 GRAPHIC SCALE

4.11.4 *Metric Scales (Instruments)*

The simplicity of the metric system is reflected in the ease with which metric ratios can be operated (see Figure 4.9). The decimal subdivision of the scale 1:1 and 1:100 allows for almost all drawings to be done with one metric scaling instrument. However, to acquire metric knowledge quickly, it is suggested that the recommended ratios of the metric scales, as listed in Table 4.4, should be used.

TABLE 4.4 PREFERRED SCALES FOR BUILDING DRAWINGS

Drawing	Recommended Scales	Use	Former Scales (Ratios)
Block Plan	1:2000 1:1000 1:500	To locate the site within the general district	1"=200' (1:2400) 1"=100' (1:1200) 1"=40' (1:480)
Site Plan	1:500 1:200	To locate building work, including services and site works, on the site.	1"=40' (1:480) 1/16"=1' (1:192)
Sketch Plans General Location Drawings	1:200 1:100 1:50	To show the over-all design of the building. To indicate the juxtaposition of rooms and spaces, and to locate the position of components and assemblies.	1/16"=1' (1:192) 1/8"=1' (1:96) 1/4"=1' (1:48)
Special Area Location Drawings	1:50 1:20	To show the detailed location of components and assemblies in complex areas.	1/4"=1' (1:48) 1/2"=1' (1:24)
Construction Details	1:20 1:10 1:5 1:1	To show the interface of two or more components or assemblies for construction purposes.	1/2"=1' (1:24) 1"=1' (1:12) 3"=1' (1:4) Full size (1:1)
Range Drawings	1:100 1:50 1:20	To show in schedule form, the range of specific components and assemblies to be used in the project.	1/8"=1' (1:96) 1/4"=1' (1:48) 1/2"=1' (1:24)
Component and Assembly Details	1:10 1:5 1:1	To show precise information of components and assemblies for workshop manufacture.	1"=1' (1:12) 3"=1' (1:4) Full size (1:1)

THIS DRAWING MAY BE USED TO CHECK THE CORRECT INTERPRETATION OF A SCALE.

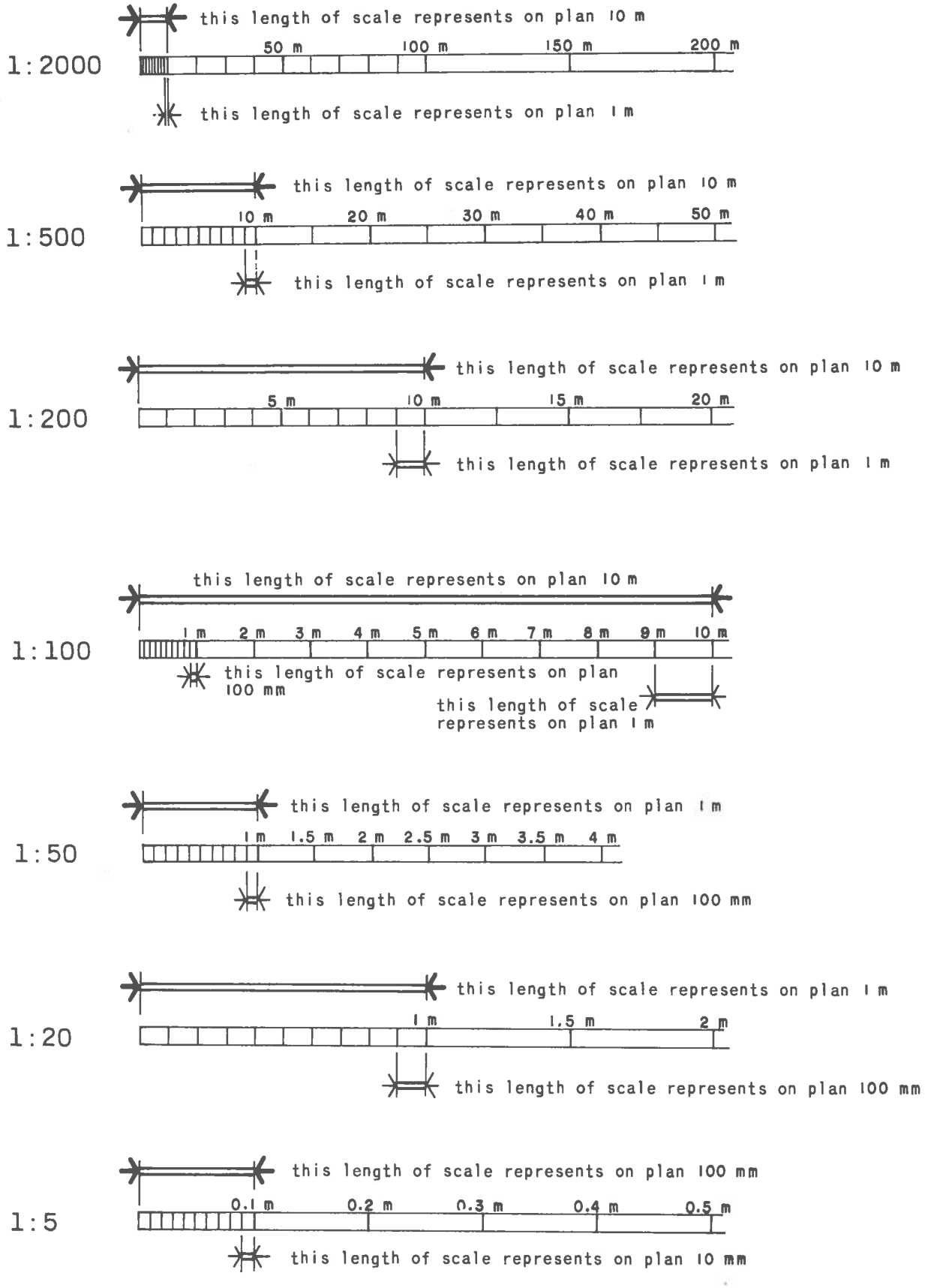


FIG. 4.9 REPRESENTATION OF METRIC LENGTHS (TO SCALE)

4.12 LINES

4.12.1 *General*

Lines of differing thicknesses should be used to facilitate the reading of a drawing. The actual thickness of lines used will depend on the purpose of the drawing, its size, scale, whether the lines are in ink or pencil, the proposed method of reproduction and if to be microfilmed. The range of line thicknesses on each drawing should be kept to a minimum and once determined, they should be used consistently for the same type of drawing throughout a project.

4.12.2 *Minimum Thickness*

The minimum thickness of line to be used is largely dependent on the proposed method of reproduction. The minimum ink line thickness recommended for 1:1 dyeline reproduction is 0.18 mm. Where drawings are made for reproduction at a reduced scale, either by microfilming or other method, the minimum line thickness used in the original drawing shall be such that in the smallest print to be made, the line will have a thickness of not less than 0.18 mm.

4.12.3 *Range of thicknesses*

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 which follows a $\sqrt{2}$ progression in accordance with the sizes of drawing sheets given in clause 4.1 of this Manual. One great advantage in the use of this series is that when drawings are microfilmed and re-enlarged to a different scale, using standard reduction and enlargement ratios, the resulting line thicknesses are still standard and any necessary modification can be made using standard drawing pens and lettering stencils.

4.12.4 *Thickness Grouping*

It is not necessary, or desirable, that all of the line thicknesses given in clause 4.12.3 be used together. For any one drawing it is recommended that lines from only one of the groups given in Table 4.5 be adopted. For general office use Group C is recommended.

TABLE 4.5 LINE THICKNESS GROUPINGS, mm

Size	A	B	C	D
Thick	1.0	0.7	0.5	0.35
Medium	0.7	0.5	0.35	0.25
Thin	0.5	0.35	0.25	0.18

4.12.5 *Thicknesses for Specific Purposes*

A guide to the relative thicknesses of lines for specific purposes is given in Table 4.6.

TABLE 4.6 LINES FOR SPECIFIC PURPOSES

Drawing	Line	Thickness
Block Plans	Outline of new building and site boundaries.	Thick
	Outline of existing buildings.	Medium
	Reference and dimension lines and hatching.	Thin
Site Plans	Outline of site and new building.	Thick
	General building works and landscaping.	Medium
	Reference grid, dimension lines and hatching.	Thin
Location Drawings	Primary elements in horizontal or vertical section, outlines requiring emphasis.	Thick
	Components and assemblies in plan, section and elevation.	Medium
	Reference grids, dimension lines and hatching.	Thin
Construction Details	Primary components and assemblies in horizontal or vertical section.	Thick
	Components and assemblies in plan, section and elevation.	Medium
	Reference grids, dimension lines and hatching.	Thin
Range Drawings	Outlines requiring emphasis.	Thick
	Components and assemblies in elevation.	Medium
	Reference lines, dimension lines and hatching.	Thin
Component and Assembly Details	Profiles in horizontal or vertical section.	Thick
	Profiles in elevation.	Medium
	Reference grids, dimension lines and hatching.	Thin

4.13 LETTERING AND NOTES

4.13.1 *General*

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.

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. It is recommended that all drawings be made to conform to these requirements, and that particular attention be paid to the avoidance of the following common faults:

a) Unnecessary fine detail,

b) Poor spacing of details,

c) Carelessly drawn figures and letters,

d) Inconsistent delineation,

e) Incomplete erasures, leaving ghosted images,

f) Use of differing densities, such as pencil, ink and typescript on the same drawing,

g) Use of heavy guidelines for lettering.

4.13.2 *Notes on Drawings*

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

a) Generalized notes, i.e., those 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, Notes 1 and 2, etc.

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.

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

d) The underlining of lettering or notes is not recommended. If special attention is required 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.

4.13.3 *Lettering*

The requirements and principles listed in clauses 4.13.1 and 4.13.2 are best met by the style of lettering known as standard upper case roman (simple block without serif or scroll) which should be used exclusively, except for metric symbols requiring lower case letters, e.g., millimetres (mm) and centimetres (cm). Condensed or extended styles are not recommended.

Decimal points should be heavier than the lettering and should be shown on the lower line, e.g., 53.4 kg.

4.13.4 *Size of Lettering*

The line thickness for letters and figures should be in the same range as the line thicknesses used on the particular drawing, as described in clause 4.12.2. These bear the same $\sqrt{2}$ relationship to one another as do paper sizes. It is expected that pens in the full range of sizes recommended will be available commercially.

The height of lettering should be in accordance with Table 4.7 consistent with line thickness used.

TABLE 4.7 RECOMMENDED HEIGHT OF LETTERING

	Height of Letters, mm	
Thickness of Lines, mm	For Contact Printing (Ratio 1:10)	For Microfilming (Ratio 1:14)
0.18	1.8	2.5
0.25	2.5	3.5
0.35	3.5	5.0
0.5	5.0	7.0
0.7	7.0	10.0
1.0	10.0	14.0

For microfilming, letters and figures should be drawn so that in the smallest print to be made from the film, they will have a height of not less than 1.3 mm.

The use of the recommended line thickness of 0.25 mm for lettering on the A1 sheet, using a thickness/height ratio of 1:10 (and therefore a height of 2.5 mm) will, when reduced to A2, give a height of 1.8 mm and when reduced to A3 a height of 1.3 mm, which is still legible to most people. Further reduction to 0.9 mm is not advisable.

Where microfilming, rather than contact printing, is the major consideration, a thickness/height ratio of 1:14 is recommended.

Fine lines and miniature lettering should not be used because they are unsuitable for reproduction either by contact printing or microfilming.

The size of the figures denoting the project and drawing numbers should be not less than 7 mm high, so that the microfilm will be readily identifiable at low magnitudes.

Symbols, such as signs for power outlets and telephones, should be at least as large as the lettering.

4.13.5 *Spacing*

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.

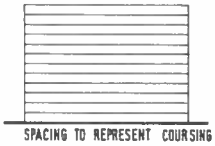
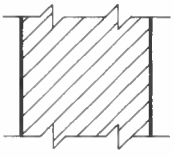
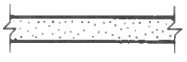
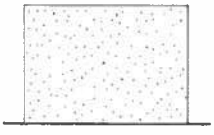
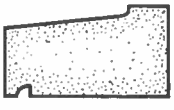
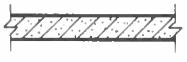
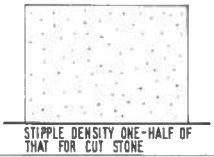
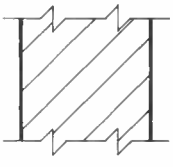
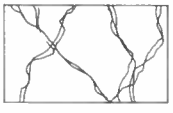
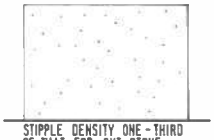
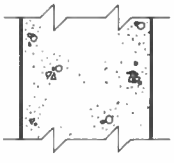
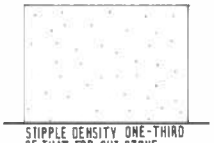
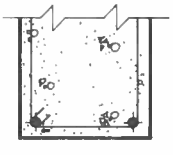
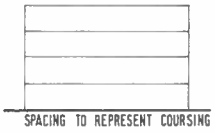
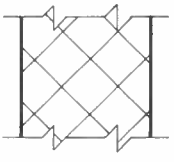
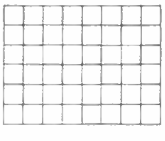
4.13.6 *Typewriting*

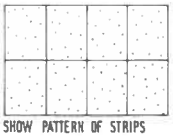
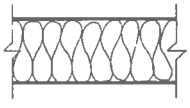
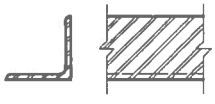
Where variable typeface typewriters are used, the previously recommended relationships between height and thickness of letters should be maintained, particularly if reduction of the drawing is planned.

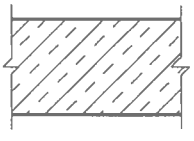
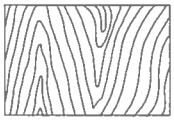
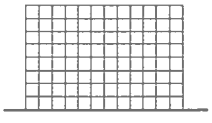
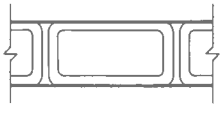
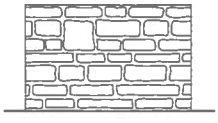
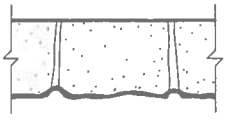
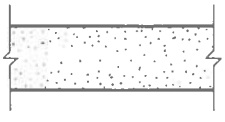
Where typewriting is used, the type face, size and density should be selected or controlled to conform as nearly as possible with the line work previously recommended and to that used on the drawing. A typeface without serifs is preferred.

4.14 SYMBOLS

MATERIALS

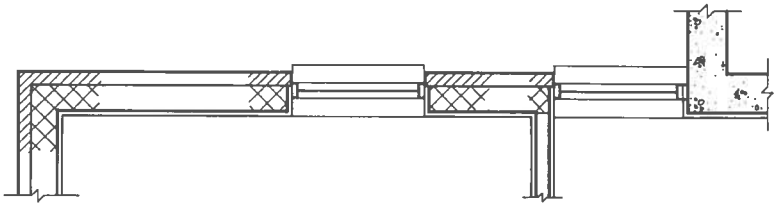
	GENERAL LOCATION DRAWINGS SCALE 1:50 OR SMALLER		ASSEMBLY DRAWINGS SCALE 1:10 OR LARGER
	PLAN & SECTION	ELEVATION	PLAN & SECTION
BRICK MASONRY		 SPACING TO REPRESENT COURSING	
CUT STONE MASONRY			
ARTIFICIAL STONE MASONRY	 LINE SPACING TWICE AS WIDE AS FOR BRICK	 STIPPLE DENSITY ONE-HALF OF THAT FOR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

	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		 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			
BRONZE, BRASS, COPPER, & ASSOCIATED ALLOYS	AS FOR STRUCTURAL STEEL		
ALUMINUM	AS FOR STRUCTURAL STEEL		

	GENERAL LOCATION DRAWINGS SCALE 1:50 OR SMALLER		ASSEMBLY DRAWINGS SCALE 1:10 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 & CEMENT			

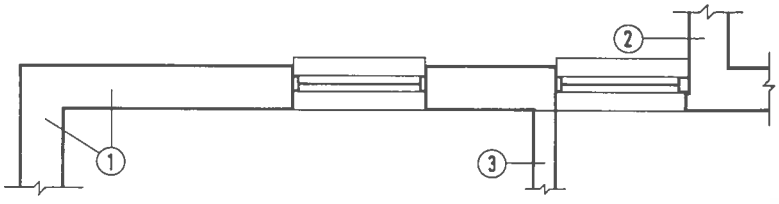
WALLS

WALL MATERIAL SYMBOLS ARE SHOWN ONLY WHERE MATERIAL OR CONSTRUCTION CHANGES OR TERMINATES



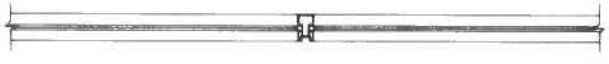
WALL MATERIAL SYMBOLS NEED NOT BE USED WHEN WALL CONSTRUCTION DETAILS ARE SHOWN IN A WALL TYPE SCHEDULE

ESPECIALLY APPLICABLE TO SMALL SCALE DRAWING



NOTE: IN RENOVATION WORK MATERIAL SYMBOLS ARE NOT USED FOR EXISTING WALLS; MATERIAL SYMBOLS ARE USED ONLY TO DIFFERENTIATE NEW WORK FROM EXISTING; WALLS OR PARTITIONS TO BE REMOVED ARE SHOWN BY BROKEN LINES

WALL OF SHEET GLASS OR OTHER TRANSPARENT OR TRANSLUCENT SHEETS IN WOOD OR METAL FRAME; E.G. STORE WINDOW



WALL OF GLASS BLOCK OR OTHER TRANSPARENT OR TRANSLUCENT MASONRY

A WINDOW BUILT INTO A TRANSPARENT OR TRANSLUCENT MASONRY WALL

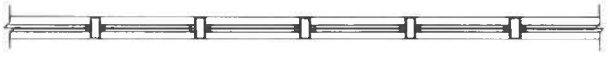
PANEL TYPE CURTAIN WALL, WITHOUT WINDOWS

PANEL TYPE CURTAIN WALL, WITH WINDOWS

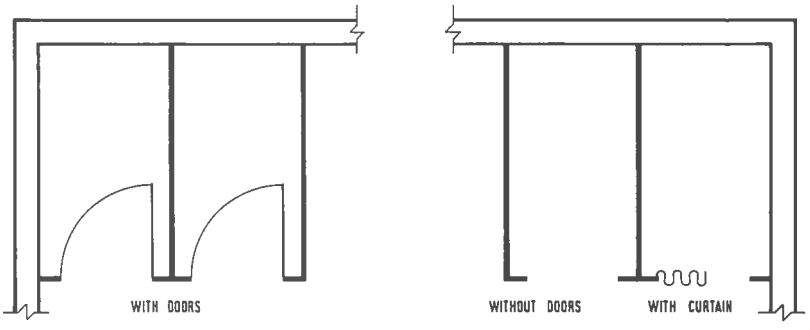
PARTITIONS

FRAME PARTITION
IN NEW WORK MATERIAL SYMBOLS ARE NOT SHOWN

GLAZED PARTITION - ANY TRANSPARENT OR TRANSLUCENT SHEET MATERIAL, EITHER FLAT, CORRUGATED, OR TEXTURED IN ANY WAY



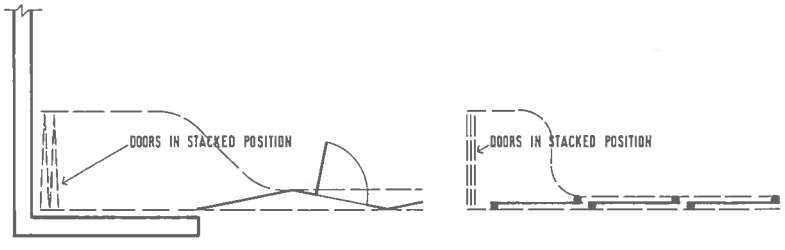
TOILET PARTITIONS
THE SAME PARTITION SYMBOL IS TO BE USED FOR ALL TYPES OF TOILET PARTITION CONSTRUCTION AT SCALES OF 1:50 & 1:100



MOVABLE PARTITIONS

WIRE PARTITIONS

TWO-TRACK ACCORDION PARTITIONS



DOORS ARE HUNG ON TWO TRACKS AND STACK WHEN OPEN; PILOT OR PASS DOORS ARE SHOWN IN USUAL WAY

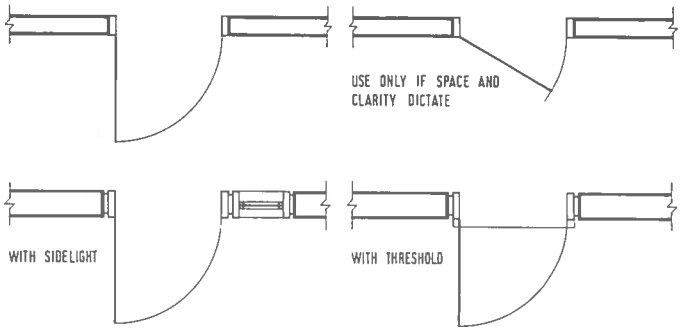
ARCHWAY - AN OPENING IN A WALL OR PARTITION, WITHOUT DOORS

OPENING EXTENDS UP TO A LINTEL, ARCH OR VALENCE

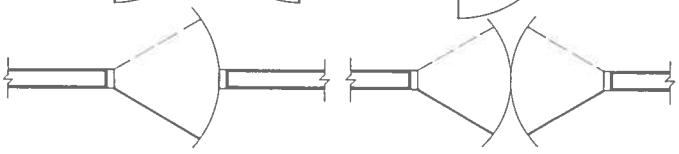
DOORS

SINGLE SWING DOORS

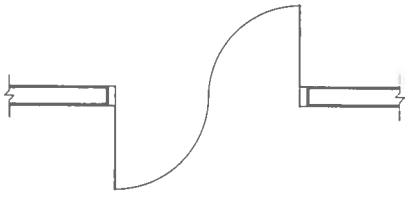
NOTE - SIZE AND TYPE OF DOOR IS SHOWN WHEN A DOOR SCHEDULE IS NOT USED



DOUBLE ACTING DOORS



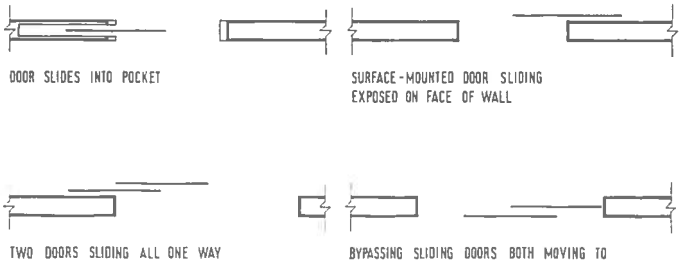
IN-AND-OUT DOORS



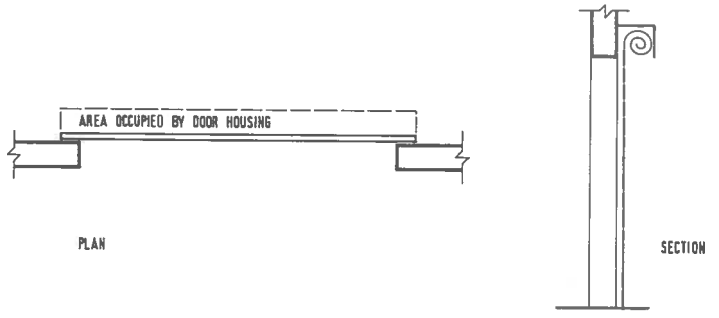
FOLDING DOORS

ACCORDION DOORS

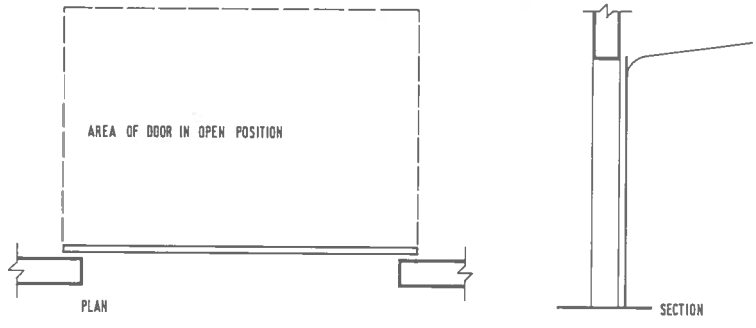
SLIDING DOORS



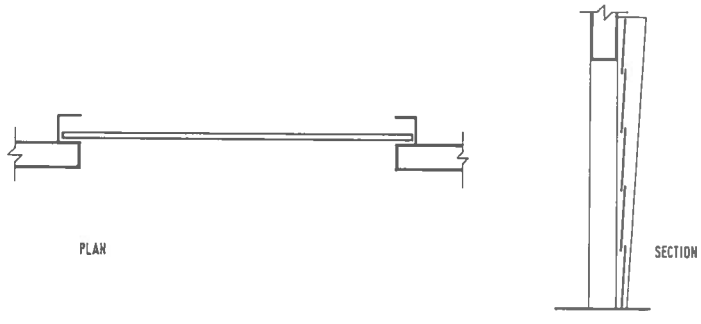
ROLL-UP DOORS



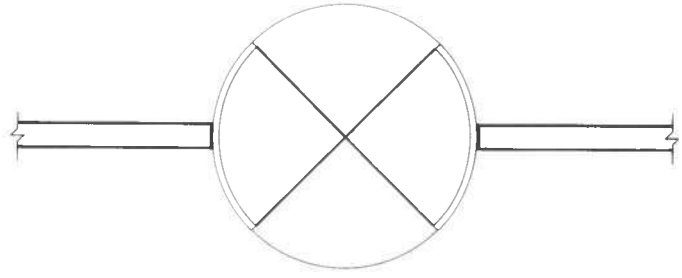
OVERHEAD DOORS



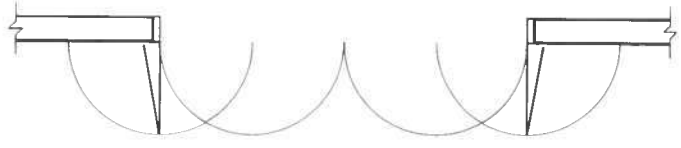
VERTICAL LIFT DOORS



REVOLVING DOORS

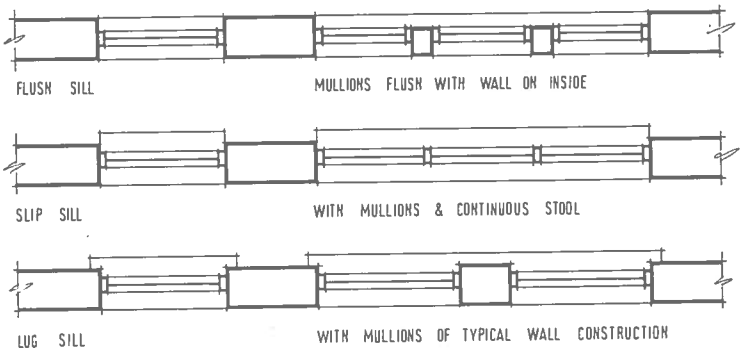


DOUBLE-LEAF SWINGING DOORS



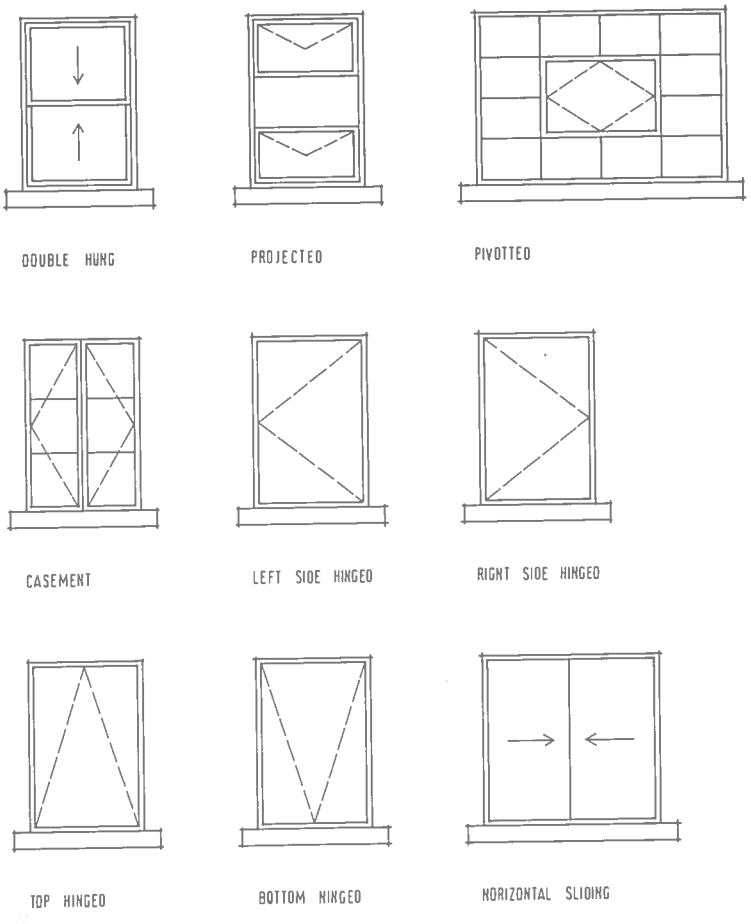
WINDOWS

IN PLAN, FOR ALL TYPES OF SASH



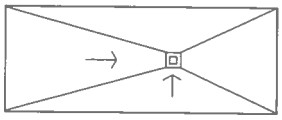
IN ELEVATION

SYMBOLS APPLY REGARDLESS OF MATERIAL USED IN MANUFACTURE OF SASH.



MISCELLANEOUS

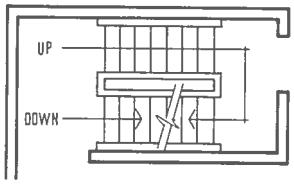
SURFACE SLOPE



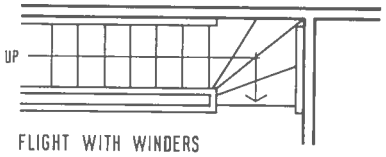
TO INDICATE FLOOR OR ROOF CONDITIONS OR OTHER SLOPING SURFACES IN PLAN; ARROWS INDICATE DIRECTION OF SLOPE

STAIRS

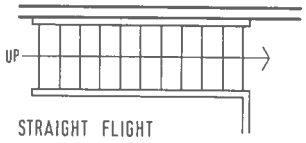
NOTE : ALL ARROWS SHOWING A SLOPE OR STEPS SHOULD BE PRECEDED BY THE INFORMATION 'UP' OR 'DOWN'; THIS MAY BE FOLLOWED BY AN INDICATION OF THE NO. OF RISERS FROM FLOOR TO FLOOR; EG 'UP 12 RISERS'



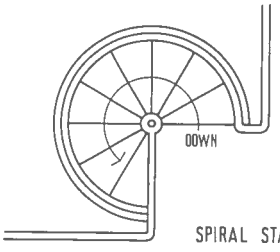
OPEN WELL



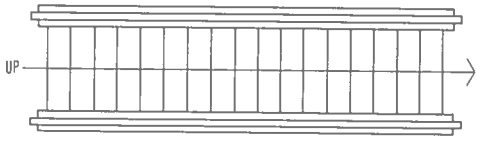
FLIGHT WITH WINDERS



STRAIGHT FLIGHT

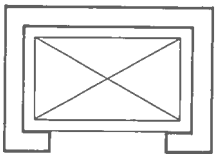


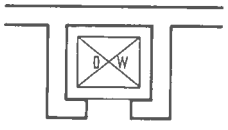
SPIRAL STAIRS



ESCALATOR

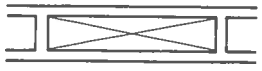
ELEVATORS





DUMBWAITER

DUCTS



CHIMNEY FLUE

AT FLOOR WHERE HEATING UNIT IS CONNECTED TO FLUE

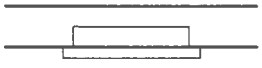
ACCESS HATCH

LOCATED IN CEILING

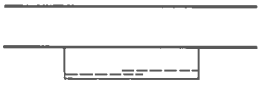
LOCATED IN FLOOR

SKYLIGHTS

CABINETS

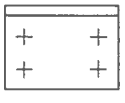


RECESSED



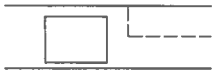
SURFACE MOUNTED

FURNITURE & APPLIANCES



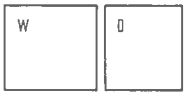
RANGE

REFRIGERATOR

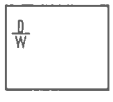


SINK IN COUNTER & WALL CABINETS

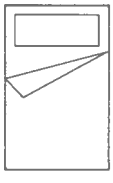
DISHWASHER

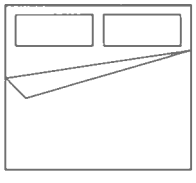


WASHER & DRYER

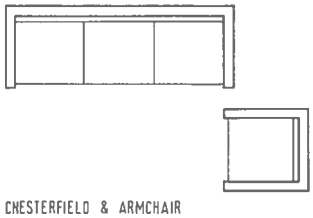


COMBINED WASHER & DRYER





SINGLE & DOUBLE BED



CHESTERFIELD & ARMCHAIR

STRUCTURAL

THE DESIGNATION OF ROLLED STEEL SHAPES ARE TO BE IN ACCORDANCE WITH THOSE PUBLISHED IN THE C.I.S.C. HANDBOOK OF STEEL CONSTRUCTION.
SYMBOLS USED IN CONJUNCTION WITH ABOVE DESIGNATIONS TO INDICATE THE MAKE-UP OF STRUCTURAL MEMBERS.

BEAM WITH WEB IN VERTICAL PLANE

BEAM WITH WEB NORMAL TO VERTICAL PLANE

CHANNEL WITH WEB IN VERTICAL PLANE

CHANNEL WITH WEB NORMAL TO VERTICAL PLANE, TOES DOWN

CHANNEL WITH WEB NORMAL TO VERTICAL PLANE, TOES UP

2 ANGLES, BACK TO BACK

2 ANGLES, STARRED

UNEQUAL ANGLE, O.S.L. IS THE SHORT LEG

2 UNEQUAL ANGLES, LONG LEGS BACK TO BACK

2 UNEQUAL ANGLES, SHORT LEGS BACK TO BACK

2 UNEQUAL ANGLES, SHORT LEGS IN VERTICAL PLANE TOED TOWARDS EACH OTHER AND BATTENED OR LACED

2 CHANNELS, WEBS IN VERTICAL PLANE, TOED OUT, BATTENED OR LACED

2 CHANNELS, WEBS IN VERTICAL PLANE, TOED IN AND 2 PLATES, BOXED

4 ANGLES, BATTENS OR LACING ON ALL FOUR SIDES

STRUCTURAL ABBREVIATIONS

TOS	TOP OF STEEL
BM	BEAM
COL	COLUMN
U/N	UNLESS OTHERWISE NOTED
U/S	UNDERSIDE
MIN	MINIMUM
MAX	MAXIMUM
NF	NEAR FACE
FF	FAR FACE
EL OR ELEV	ELEVATION
CL	CENTRE-LINE
OPNG	OPENING
ARCH.	ARCHITECTURAL
MECH.	MECHANICAL
ELEC.	ELECTRICAL
STRUCT.	STRUCTURAL
DWG (S)	DRAWING (S)
PL	PLATE
BPL	BASE (BEARING) PLATE
FL	FLAT
LLV	LONG LEG VERTICAL
LLH	LONG LEG HORIZONTAL
NO.	NUMBER
CAP.	CAPACITY
@	AT
o/c or c c	CENTER TO CENTER
REINF	REINFORCING
CONC	CONCRETE
T	TOP
BOT	BOTTOM
BRDG	BRIDGING
OWSJ	OPEN WEB STEEL JOIST
OWSSJ	OPEN WEB SHORT SPAN JOIST
OWLSJ	OPEN WEB LONG SPAN JOIST

EW	EACH WAY
EF	EACH FACE
ES	EACH SIDE
EE	EACH END
IF	INSIDE FACE
OF	OUTSIDE FACE
UL	UPPER LAYER
LL	LOWER LAYER
VERT	VERTICAL
HORZ	HORIZONTAL
DWLS	DOWELS
FTG	FOOTING
INT	INTERIOR
EXT	EXTERIOR
WWM	WELDED WIRE MESH
TEMP STL	TEMPERATURE STEEL
DIAG	DIAGONAL
R	RADIUS
∅	DIAMETER
EXIST	EXISTING
WWF	WELDED WIDE FLANGE

ELECTRICAL

CEILING	WALL	
○	—○	OUTLET
Ⓑ	—Ⓑ	BLANKED OUTLET
ⓓ		DROP CORD
Ⓔ	—Ⓔ	ELECTRIC OUTLET IF CONFUSION WITH OTHER SYMBOLS POSSIBLE
Ⓕ	—Ⓕ	FAN OUTLET
Ⓙ	—Ⓙ	JUNCTION BOX
Ⓛ	—Ⓛ	LAMPHOLDER
$Ⓛ_{PS}$	$—Ⓛ_{PS}$	LAMPHOLDER WITH PULL SWITCH
Ⓢ	—Ⓢ	PULL SWITCH
Ⓥ	—Ⓥ	OUTLET FOR VAPOUR DISCHARGE LAMP
Ⓧ	—Ⓧ	EXIT LIGHT OUTLET
Ⓒ	—Ⓒ	CLOCK OUTLET
		DUPLEX RECEPTACLE
		SINGLE , TRIPLEX RECEPTACLE
		SPLIT - SWITCHED - DUPLEX RECEPTACLE
		THREE - CONDUCTOR SPLIT - DUPLEX RECEPTACLE
		THREE - CONDUCTOR SPLIT - SWITCHED - DUPLEX RECEPTACLE
		WEATHERPROOF RECEPTACLE
		RANGE RECEPTACLE
		SWITCH & RECEPTACLE
		RADIO & RECEPTACLE
		SPECIAL PURPOSE OUTLET , UNDESIGNATED
		FLOOR RECEPTACLE
		DESIGNATED SPECIAL PURPOSE OUTLET
		DESIGNATED SPECIAL PURPOSE RECEPTACLE
		FLUORESCENT FIXTURE

S	SINGLE POLE SWITCH
S_2	DOUBLE POLE SWITCH
S_3	THREE WAY SWITCH
S_4	FOUR WAY SWITCH
S_D	AUTOMATIC DOOR SWITCH
S_E	ELECTROLIER SWITCH
S_K	KEY OPERATED SWITCH
S_P	SWITCH & PILOT LAMP
S_{CB}	CIRCUIT BREAKER
S_{WCB}	WEATHERPROOF CIRCUIT BREAKER
S_{MC}	MOMENTARY CONTACT SWITCH
S_{RC}	REMOTE CONTROL SWITCH
S_{WP}	WEATHERPROOF SWITCH
S_F	FUSED SWITCH
S_{WF}	WEATHERPROOF FUSED SWITCH
$S_{a,b,c,\text{etc.}}$	SPECIAL SWITCH OR CIRCUIT BREAKER
	LIGHTING PANEL
	POWER PANEL
	BRANCH CIRCUIT IN CEILING OR WALL
	BRANCH CIRCUIT IN FLOOR
	EXPOSED BRANCH CIRCUIT
	HOME RUN TO PANELBOARD NUMBER OF CIRCUITS INDICATED BY NUMBER OF ARROWS
	UNDERFLOOR DUCT & JUNCTION BOX
	GENERATOR
	MOTOR
	INSTRUMENT
	POWER TRANSFORMER
	CONTROLLER
	ISOLATING SWITCH

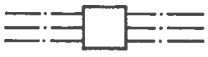
	PUSHBUTTON
	BUZZER
	BELL
	ANNUNCIATOR
	INTERCONNECTING TELEPHONE
	TELEPHONE SWITCHBOARD
	BELL-RINGING TRANSFORMER
	ELECTRIC DOOR OPENER
	FIRE ALARM
	FIRE ALARM STATION
	CITY FIRE ALARM STATION
	FIRE ALARM CENTRAL STATION
	AUTOMATIC FIRE ALARM DEVICE
	WATCHMAN'S STATION
	WATCHMAN'S CENTRAL STATION
	HORN
	NURSE'S SIGNAL PLUG
	MAID'S SIGNAL PLUG
	RADIO OUTLET
	SIGNAL CENTRAL STATION
	INTERCONNECTION BOX
	BATTERY
	AUXILIARY SYSTEM CIRCUITS
	SPECIAL AUXILIARY OUTLETS

TELEPHONE

CABLE EXPOSED

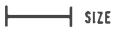
CONDUIT

CONDUIT, HOME RUN



UNDERFLOOR DUCT &
JUNCTION BOX

CONDUIT RISER



RISER SLEEVE

FLOOR OUTLET BOX

CEILING OUTLET BOX

WALL OUTLET BOX

PRIMARY ENTRANCE LOCATION

UTILITY COLUMN

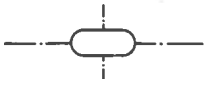
BACKBOARD

METAL WALL CABINET

SWITCHBOARD

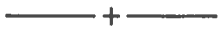
PULL BOX

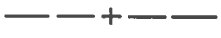
TRENCH HEADER FEED ON
UNDERFLOOR DUCT SYSTEM



HEADER DUCT WITH ACCESS UNIT ON
UNDERFLOOR DUCT SYSTEM

PLUMBING


SOIL & WASTE


SOIL, WASTE OR LEADER BELOW GRADE


VENT

COLD WATER

HOT WATER

FLOOR OR ROOF DRAIN

RAINWATER LEADER


SOIL STACK

GREASE INTERCEPTER

SERVICE SINK

URINALS

WATER CLOSET WITH TANK

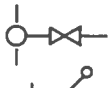
WATER CLOSET, FLUSH VALVE TYPE

BIDET

BATH TUB

SHOWER


COLUMN SHOWER

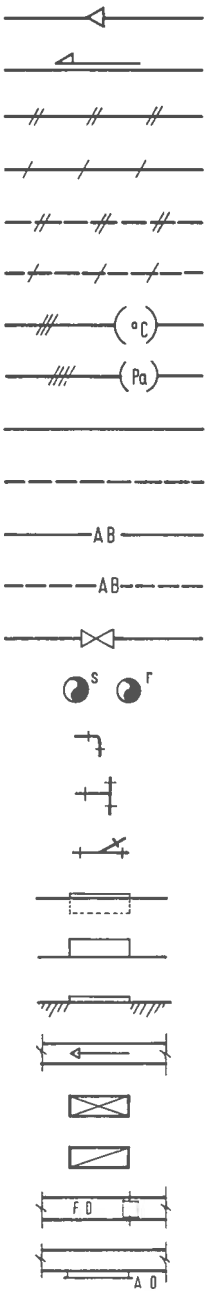

FIRE HYDRANT


SIAMESE CONNECTION

HOSE BIB

SMOKE DETECTOR

HEATING, VENTILATING, AIR CONDITIONING



DIRECTION OF FLOW

DIRECTION OF PIPE SLOPE

HIGH PRESSURE STEAM

LOW PRESSURE STEAM

HIGH PRESSURE RETURN

LOW PRESSURE RETURN

SUPER HEATED STEAM

UNTREATED STEAM

HOT WATER HEATING SUPPLY

HOT WATER HEATING RETURN

ANYTYPE OF SUPPLY

ANY RETURN

GATE VALVE

RISER, SUPPLY & RETURN

ELBOW

TEE

Y CONNECTION

RECESSED CONVECTOR RADIATOR

SURFACE MOUNTED CONVECTOR

CONVECTOR

DUCT & DIRECTION OF FLOW

SUPPLY DUCT IN SECTION

RETURN DUCT IN SECTION

FIRE DAMPER

ACCESS DOOR

4.15 ABBREVIATIONS FOR USE IN BUILDING DRAWING PRACTICE

Abbreviations used in building drawings should be those recommended in CSA Standard Z-85 (new Standard now (1977) being prepared). When using abbreviations, care should be taken that an abbreviation cannot be mistaken for an SI symbol; in typewritten text, use of italic type is recommended for abbreviations, e.g., *A* for area, A for ampere.

4.16 DRAWING EXAMPLES

4.16.1 *General*

The following examples are given solely to show certain of the drawing conventions previously described and the appearance of drawings at three of the commonly used scales.

The examples are not only deliberately simplified but also incorporate a number of assumptions, necessitated by lack of information at the time of publication. These assumptions concern the dimensions of materials and spaces which cannot be confirmed until the relevant codes and standards are established and the manufacturing industry has made decisions about product sizes. The examples, therefore, must not be considered as guides to design or construction practice.

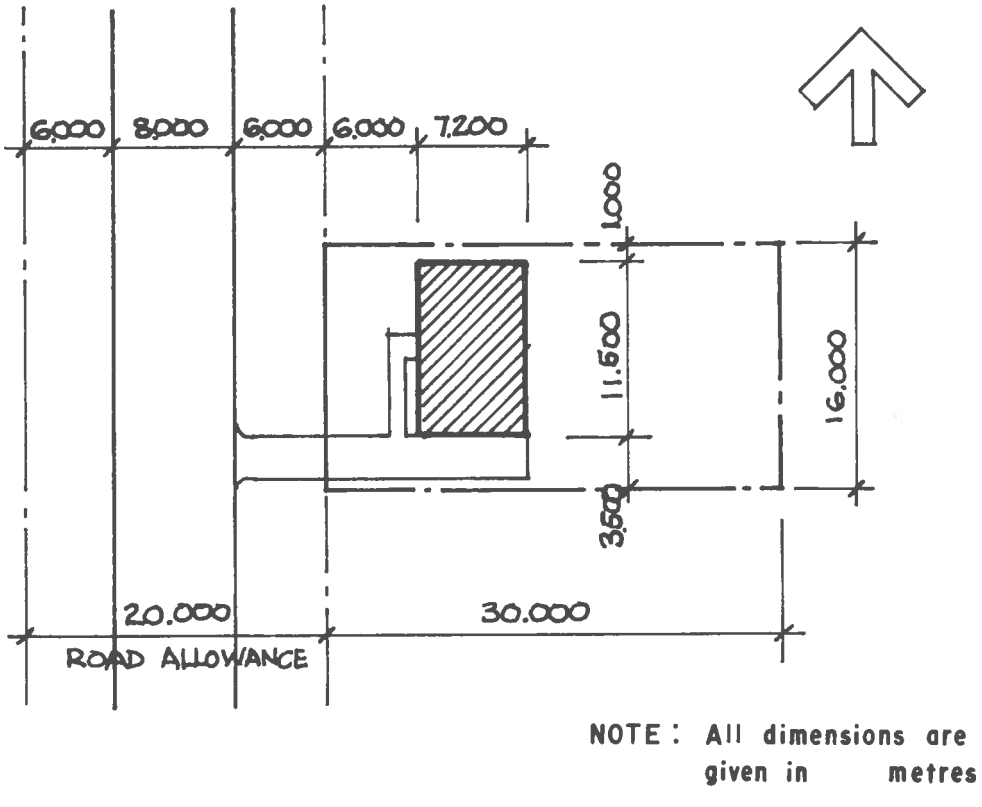


FIG. 4.10 EXAMPLE OF PLOT PLAN 1:500

4.16.2 *Preferred Units in Dimensioning*

Units for linear measurement in building and construction should normally be restricted to the metre (m) and the millimetre (mm). The kilometre (km) may also be used where necessary. However, the centimetre (cm) should be avoided, as should the hectometre (hm), the decimetre (dm) and the decametre (dam). These recommendations are made for the following reasons:

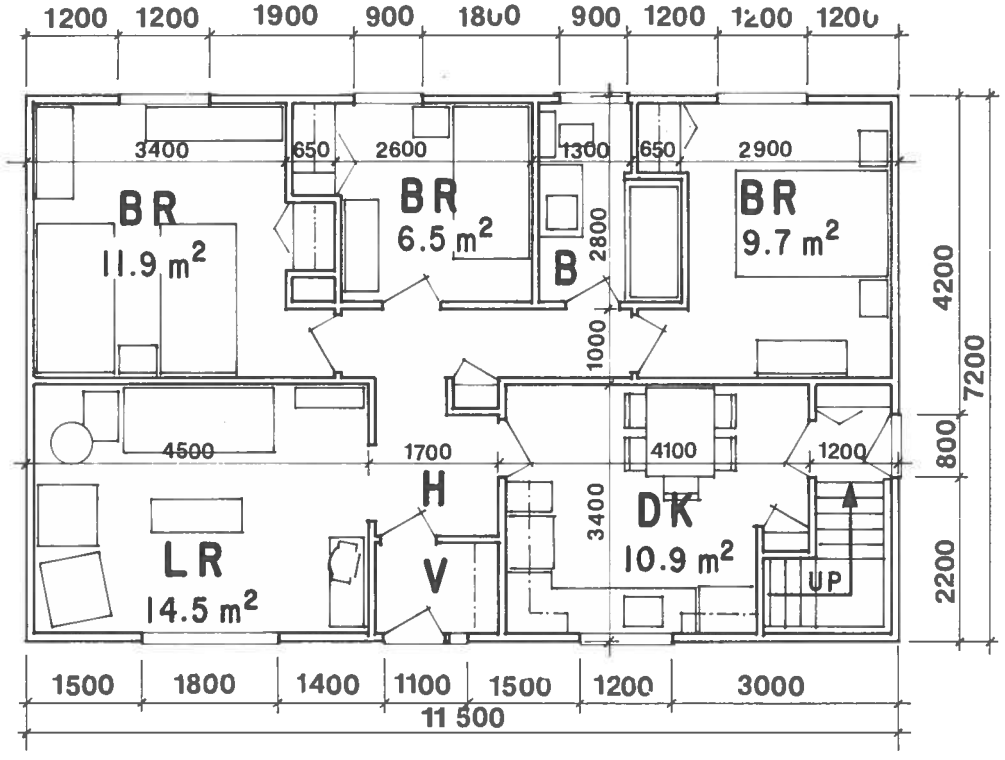
a) The preferred multiples and submultiples in SI are those that are related to the base unit by a factor of 1000.

b) Not using the centimetre, etc., means unit symbols are not required after dimensions. Whole numbers will always indicate millimetres, and decimalized expressions (which must be taken to three decimal places) will indicate metres. For example, the dimensions 600, 1200, 25 000 are all in millimetres and 1.200 and 25.000 are in metres.

c) The use of units other than the metre and the millimetre would introduce an unnecessary degree of complexity and ambiguity into drawings, and would increase the likelihood of errors in calculating and checking of dimensions.

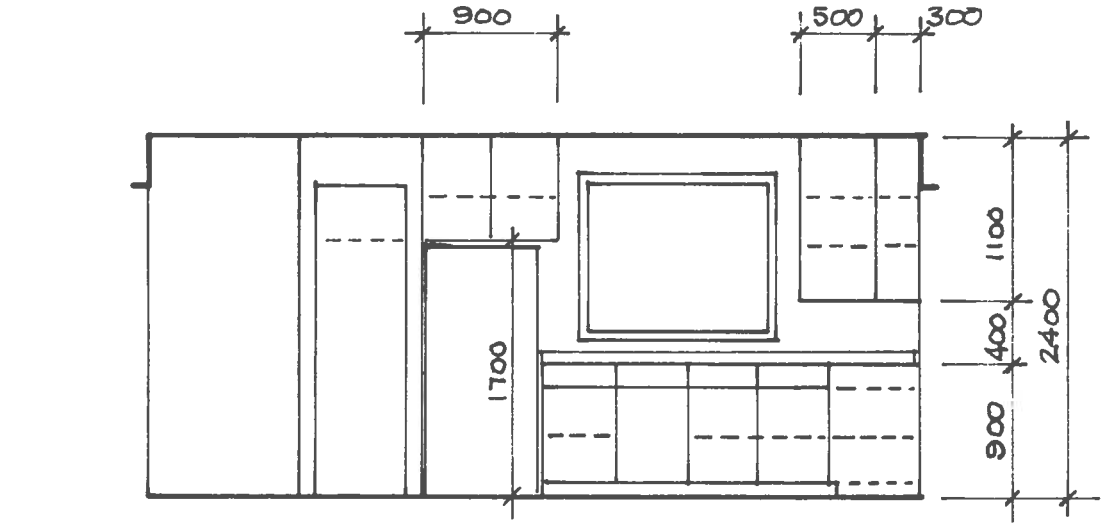
Until metric usage is completely familiar it may be useful to add to drawings a note such as "All dimensions are in millimetres."

To avoid the need of using numbers with an excessive number of digits, particularly in the dimensioning of areas or volumes, it is recommended that mathematical notation be used: e.g., 2 160 000 mm^2 (1200 × 1800) may be written as 2.16×10^6 mm^2 or more simply, 2.16 m^2. For room and other spaces in buildings it is sufficient to give areas to the nearest one tenth of a square metre.

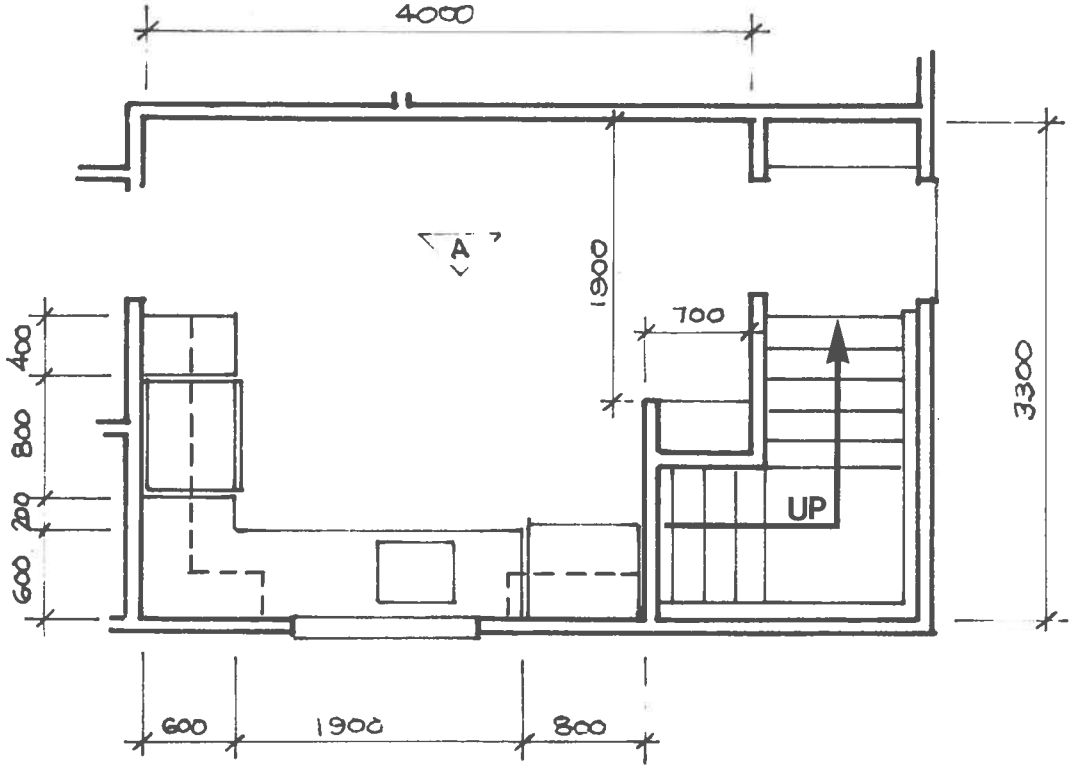


NOTE: All dimensions are given in millimetres unless otherwise indicated

FIG. 4.11 EXAMPLE OF FLOOR PLAN 1:100



ELEVATION A



PLAN

NOTE: All dimensions are given in millimetres

FIG. 4.12 EXAMPLE OF DETAILED PLAN & ELEVATION 1:50

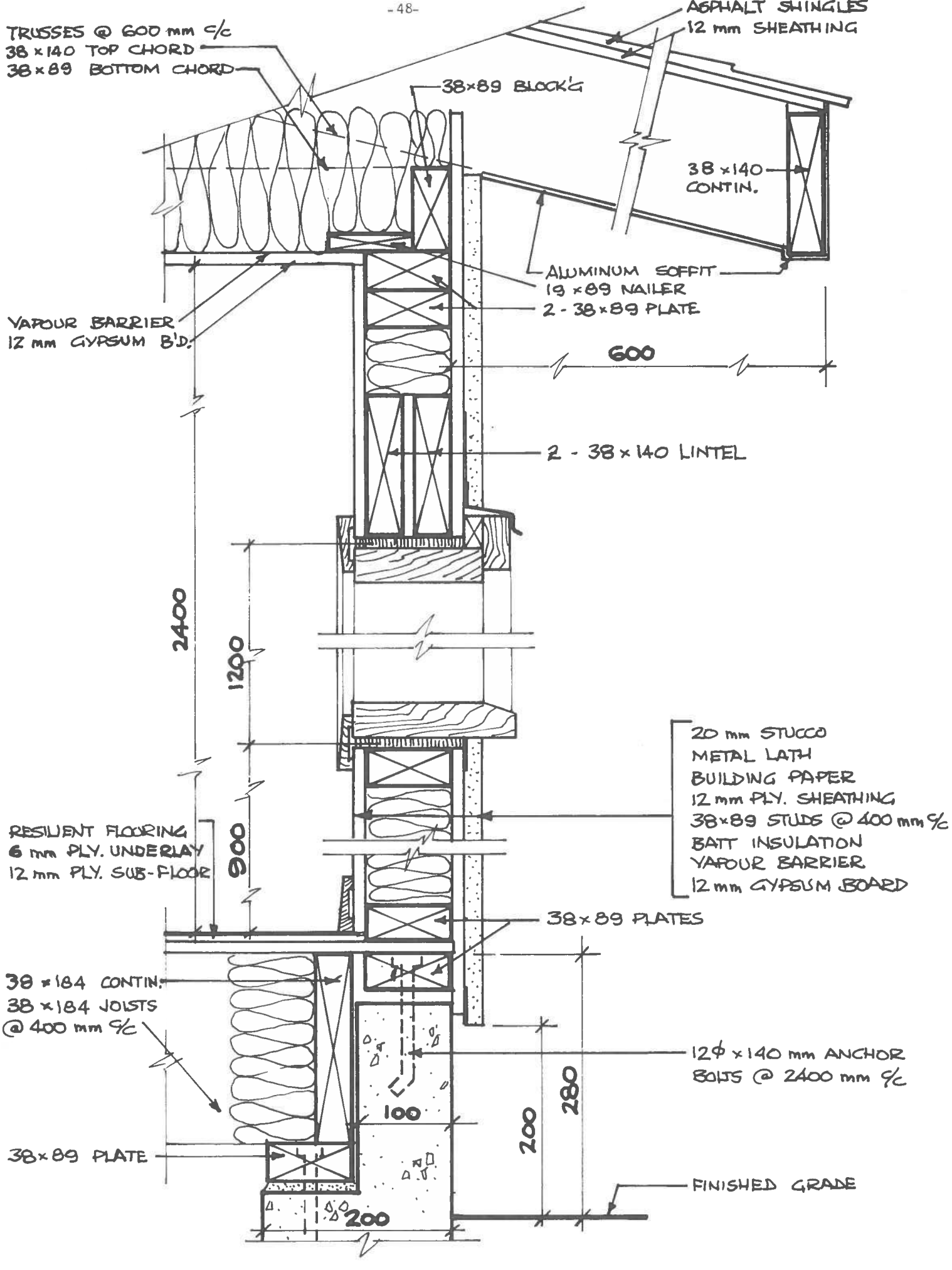


FIG. 4.13 EXAMPLE OF SECTION 1:5

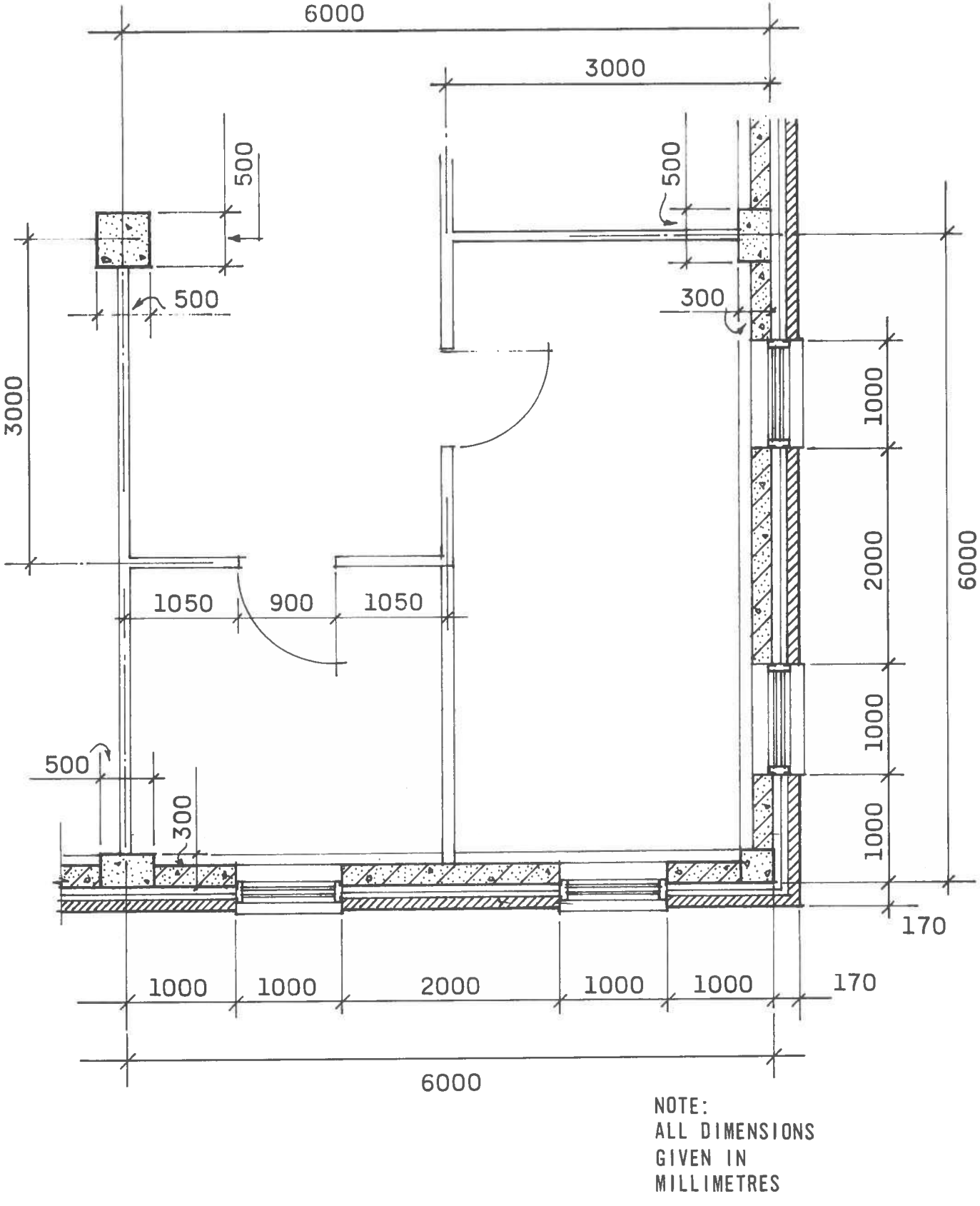


FIG. 4.14 EXAMPLE OF OFFICE FLOOR PLAN 1:50

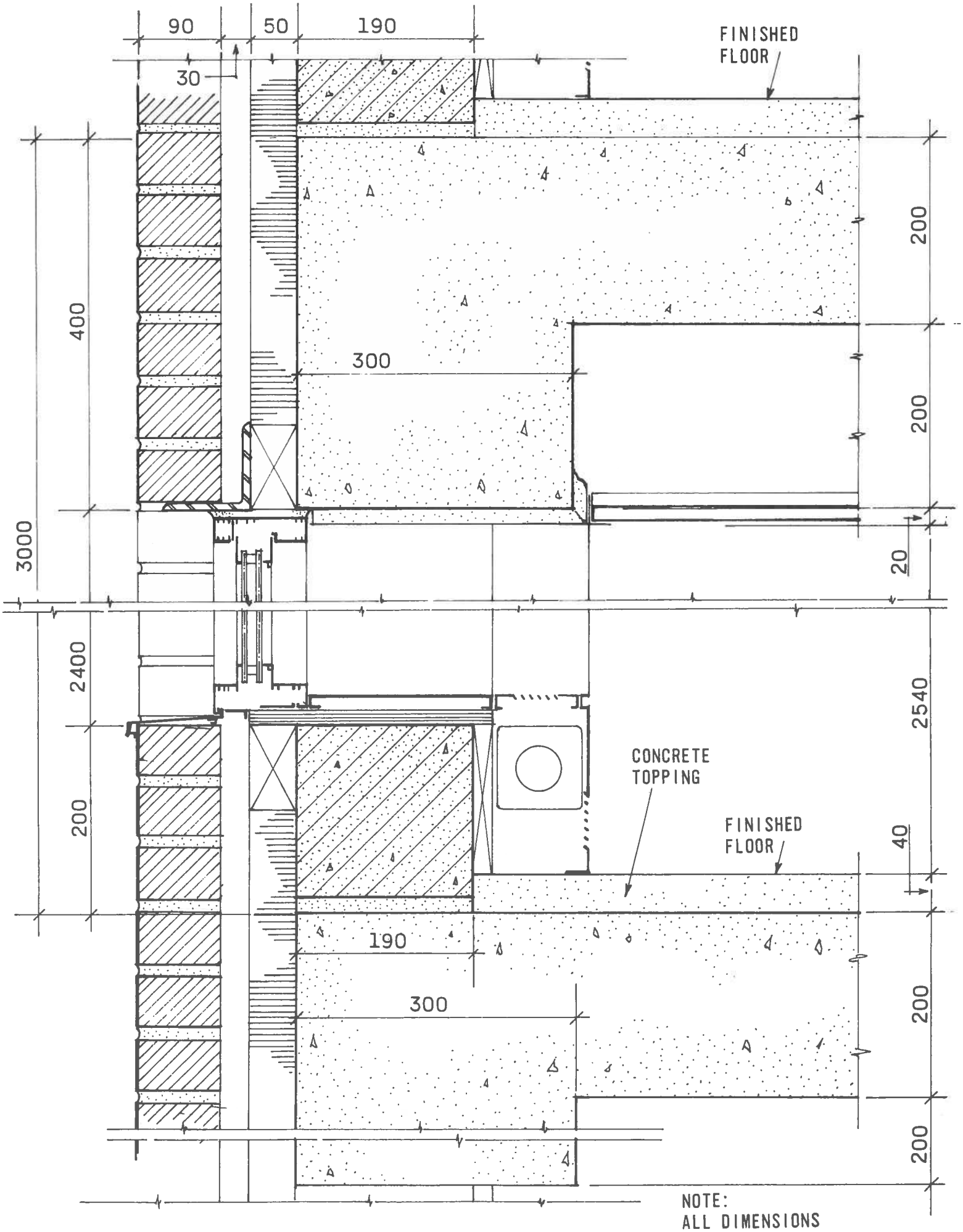


FIG. 4.15 EXAMPLE OF SECTION 1:5

PART 5. DIMENSIONAL CO-ORDINATION

5.1 PRODUCT SIZES

The sizes of products and the ways of putting them together to make a building have seldom been guided by a common dimensional framework understood by all. Traditionally, each major participant in the building process, the manufacturer, the designer, and the builder, has been obliged to make compromises that take account of individual dimensional constraints. Dimensional co-ordination is simply a means of ensuring that everyone concerned with building is using the same dimensional language, and that manufactured components will fit together in the spaces allocated to them in a building.

The change to the metric SI system will oblige many manufacturers to change the actual physical size of their products. If these new sizes are chosen with reference to a common dimensional framework the entire building process, from manufacturing to on-site construction, will be simplified. This is particularly true in view of the trend in the industry toward the increasing use of pre-manufactured components which cannot be easily modified on site. The use of dimensional co-ordination means that the manufacturer will be able to standardize his products and reduce their variety, the designer will be able to use off-the-shelf components with the assurance that they will fit together without complex detailing, and the builder will have no need to cut and fit on site or resort to makeshift and wasteful building techniques.

5.2 DIMENSIONAL CO-ORDINATION IN DESIGN

5.2.1 *Modular Grid*

Dimensional co-ordination relies on the establishment of rectangular and three-dimensional grids of basic modules into which components can be introduced in an inter-related pattern of sizes. The modular grid delineates the space into which a component fits. This is the most important characteristic of dimensional co-ordination: the component must always be under-sized in relation to the grid. just as a piston must be of smaller diameter than that of the cylinder in which it moves. The grid therefore is made up of spaces which permit the insertion of a component plus a joint.

5.2.2 *Basic Module*

The modular grid is based on a basic module of 100 mm, an internationally accepted module. The basic module is used to generate a practical and acceptable range of preferred multiples of 100 mm which at the same time gives sufficient flexibility to the designer and an economic range of product sizes to the manufacturer. The preferred multiples (and sub-multiples) of the basic module for vertical and horizontal use are fully described in the CSA A31.M-75 series of Standards.

5.2.3 *Multimodule*

The multimodule for horizontal controlling dimensions is 600 mm. Horizontal controlling dimensions are dimensions between vertical controlling planes, i.e., planes generated by the modular grid. Horizontal controlling dimensions should be in increments of:

a) 600 mm up to 9600 mm

b) 1200 mm above 9600 mm.

Below 600 mm, increments of 300 mm (1st preference) and 200 mm (2nd preference) may be used.

5.2.4 *Vertical Controlling Planes*

Vertical controlling planes may be placed either on the axis of structural members or on their boundaries. When boundary controlling planes are used, the width of the zone for the structure (columns or loadbearing walls) should be in multiples of 100 mm.

The multimodules for vertical controlling dimensions are 300 mm and 600 mm. Vertical controlling dimensions are dimensions between horizontal controlling planes.

5.2.5 *Floor Heights*

For floor-to-floor (storey) heights, vertical controlling dimensions should be in increments of:

a) 100 mm from 2400 mm up to 3000 mm
b) 300 mm from over 3000 mm up to 4800 mm.

For floor-to-ceiling (room) heights, vertical controlling dimensions should be in increments of:

a) 100 mm from 2100 mm up to 2700 mm
b) 300 mm from over 2700 mm up to 3600 mm
c) 600 mm above 3600 mm.

It is recommended that floor-to-ceiling heights of 2200 mm or less be restricted to multi-storey carparks, unfinished basements, agricultural buildings and residential bathrooms, utility rooms, passages and halls.

For changes in levels of floors and roofs, vertical controlling dimensions should be in increments of:

a) 100 mm up to 2400 mm
b) 300 mm above 2400 mm.

The height of the zones for floors and roofs which contain structural elements, and which may also include floor and ceiling finishes and services, should be in increments of:

a) 100 mm up to 1200 mm
b) 300 mm over 1200 mm.

5.2.6 *Door Heights*

Height of door head, taken from controlling plane at the surface of the finished floor to the underside of rough opening, should be 2100 mm or 2200 mm.

5.2.7 *Window Heights*

Height of windows taken from the controlling plane at the surface of the finished floor:

a) to the underside of the rough opening at the head should be:
2100, 2200, 2400, or 2700 mm.

b) to the top of the rough opening at the sill should be:
300, 600, 900 or 1200 mm (1st preference)
400, 800 or 1000 mm (2nd preference).

It should be noted that a sill height of 800 mm may be appropriate for a window above a desk, and 1000 mm for a window above a kitchen counter or laboratory bench.

PART 6. ANTHROPOMETRIC DATA AND INTERNAL CIRCULATION

6.1 GENERAL

The body and reach characteristics of persons have a direct influence on design. Average (mean) dimensions of some of the more important of these characteristics for men and women between the ages of 18 and 40 are shown in Figures 6.1 and 6.2.

6.2 AVERAGES

It must be emphasized that averages should be treated with caution as only about half the population will be included in the "average" group. It is seldom economic or practicable to consider 100 per cent of the population in design calculations. The dimensions shown in the Figures in this Part are thus only guidelines for general design purposes.

6.3 STATISTICAL DATA AVAILABLE

As the only statistical data available for Canadian adults are for heights and weights,* the dimensions shown in the following Figures are from United Kingdom data. The heights shown include an allowance for footwear. The average Canadian man between the ages of 18 and 40 is 1739 mm tall (barefoot) and has a mass of 72.8 kg. The figures for Canadian women are 1604 mm and 58.5 kg.

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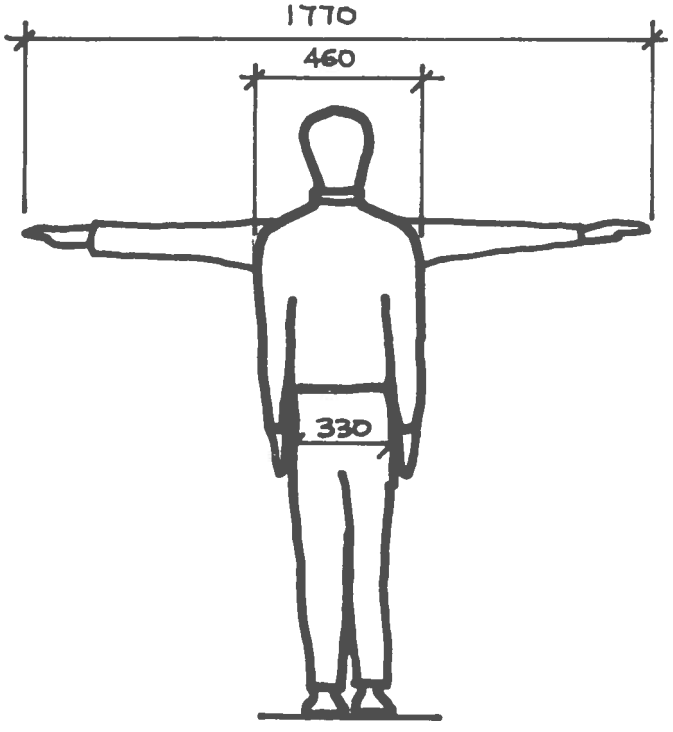
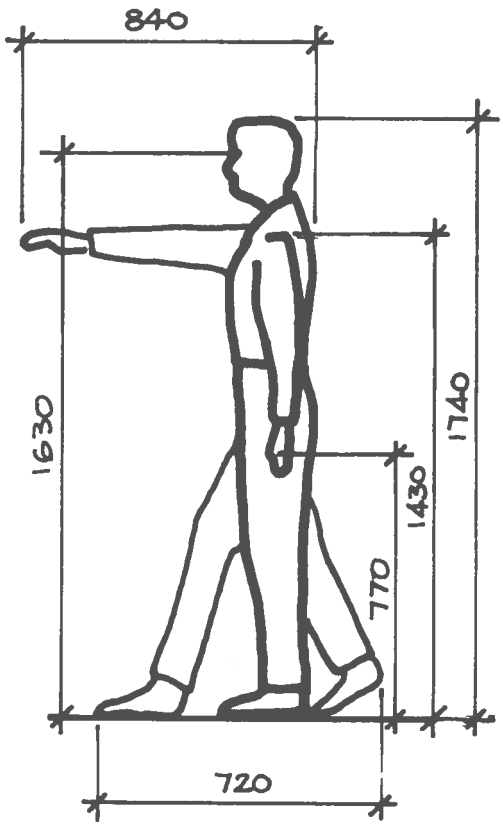
* "Tables of Heights and Weights of Canadians," Health and Welfare Canada 1975, a report on a national survey taken in 1970-72 for Nutrition Canada.





NOTE: All dimensions are given in millimetres

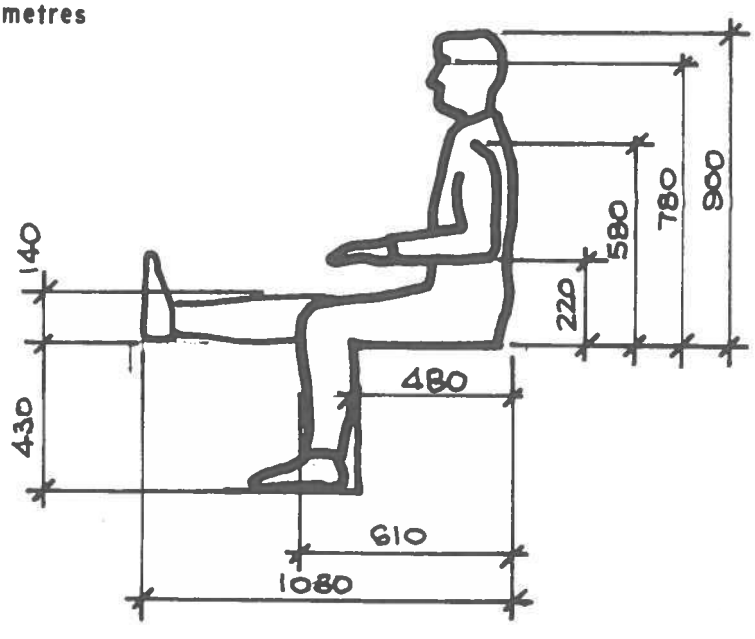
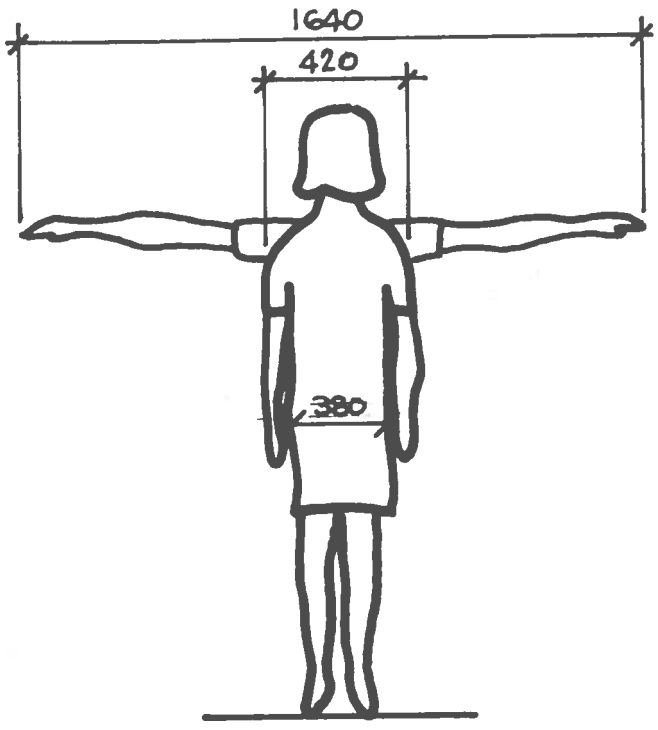
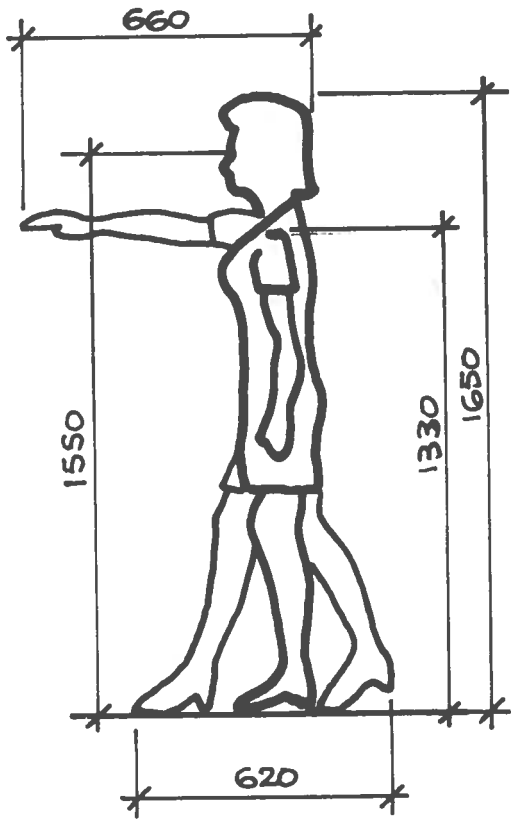


FIG. 6.1 AVERAGE MAN





NOTE: All dimensions are given in millimetres

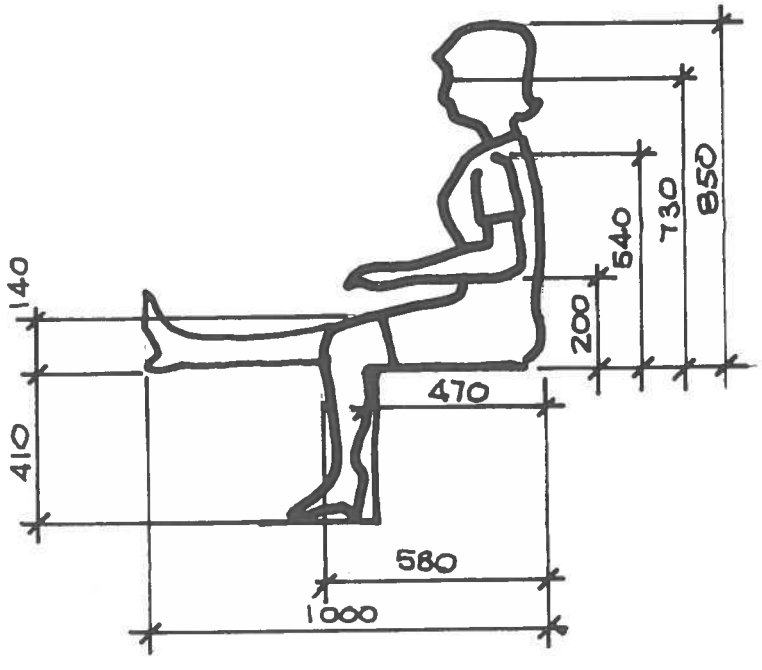
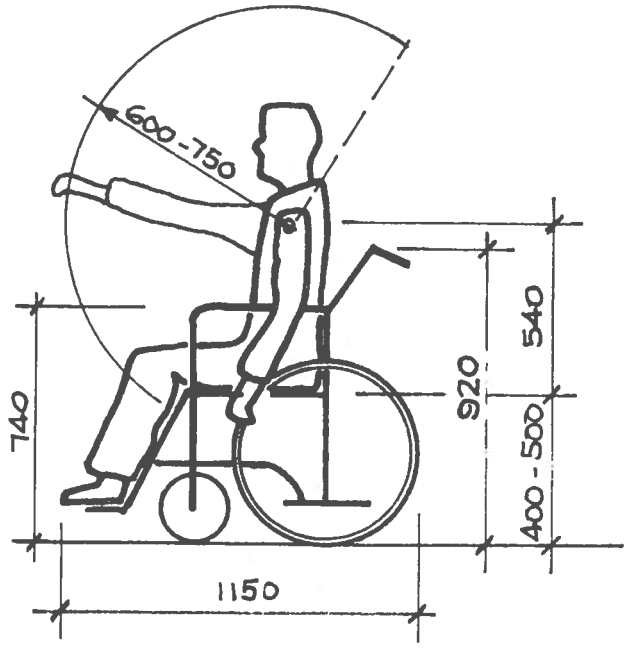
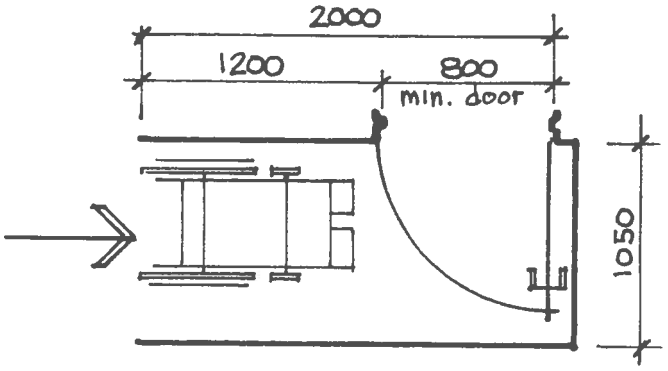
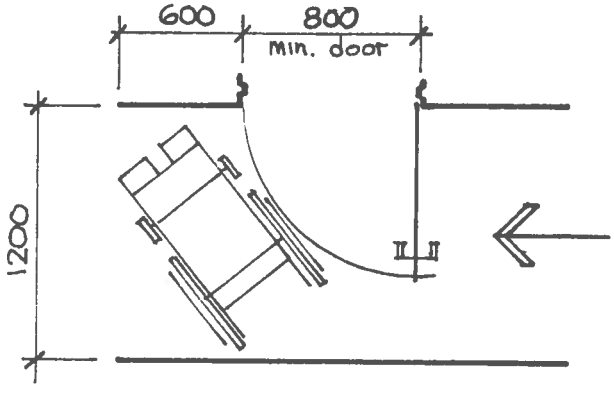


FIG. 6.2 AVERAGE WOMAN

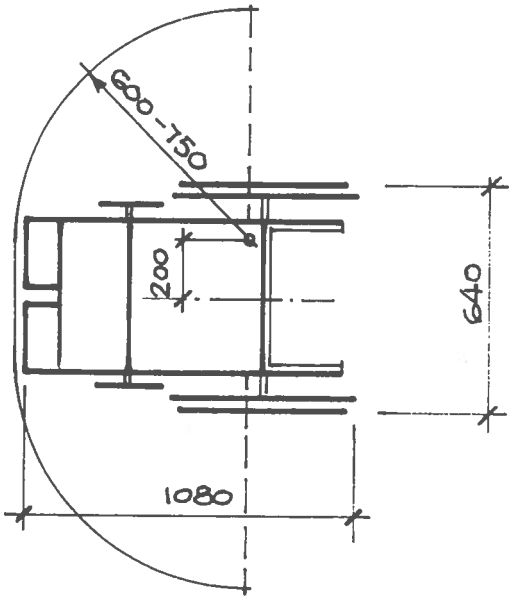




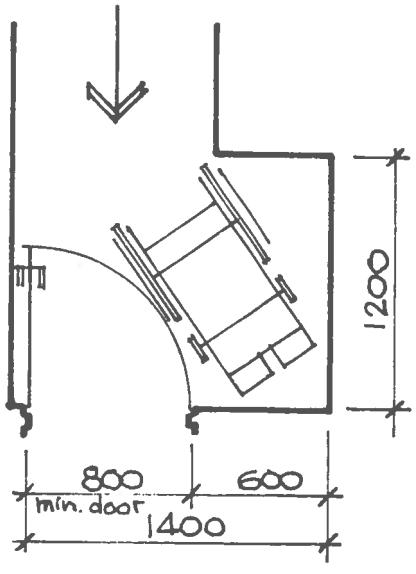
from handle side



from hinge side



NOTE: All dimensions are given in millimetres



approach to out-swinging doors

FIG. 6.3 DISABLED PERSON IN WHEELCHAIR

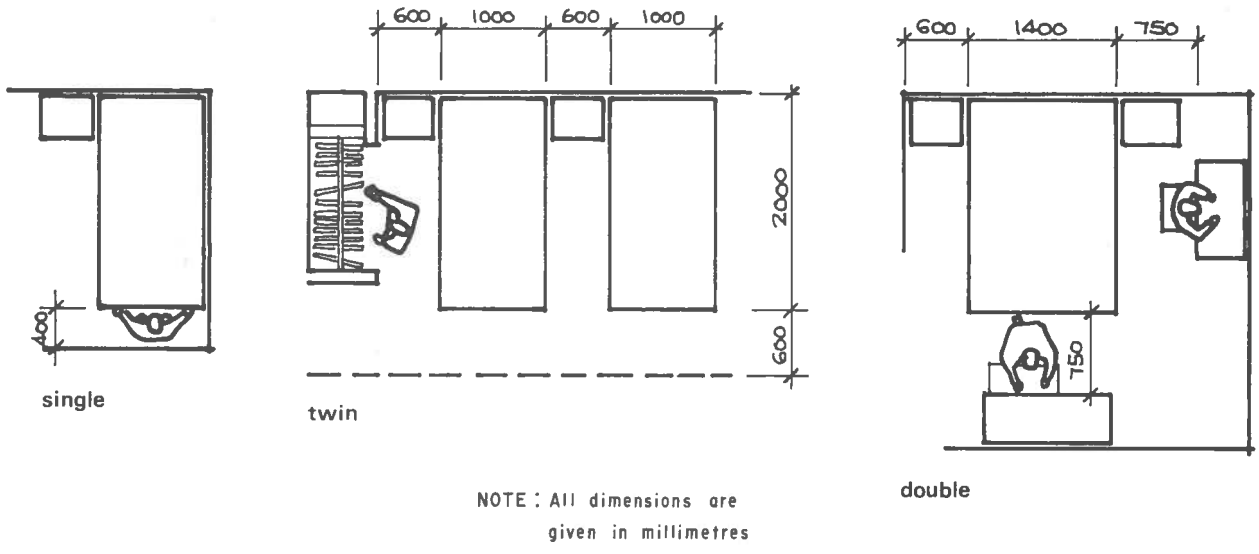


FIG. 6.4 INTERNAL CIRCULATION SCHEMES - SLEEPING SPACES

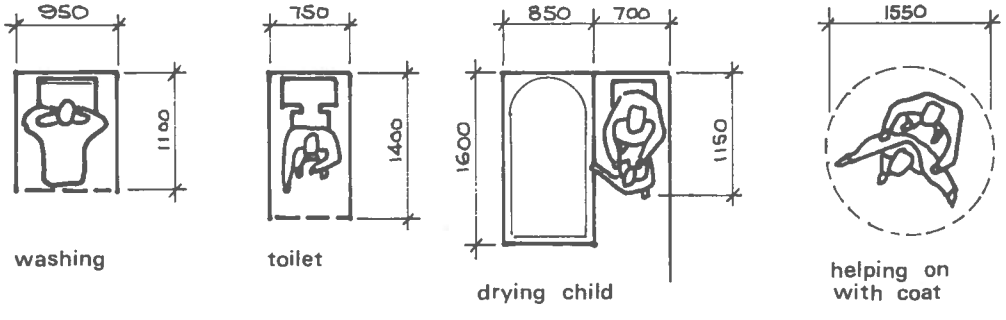


FIG. 6.5 INTERNAL CIRCULATION SCHEMES - PERSONAL CARE

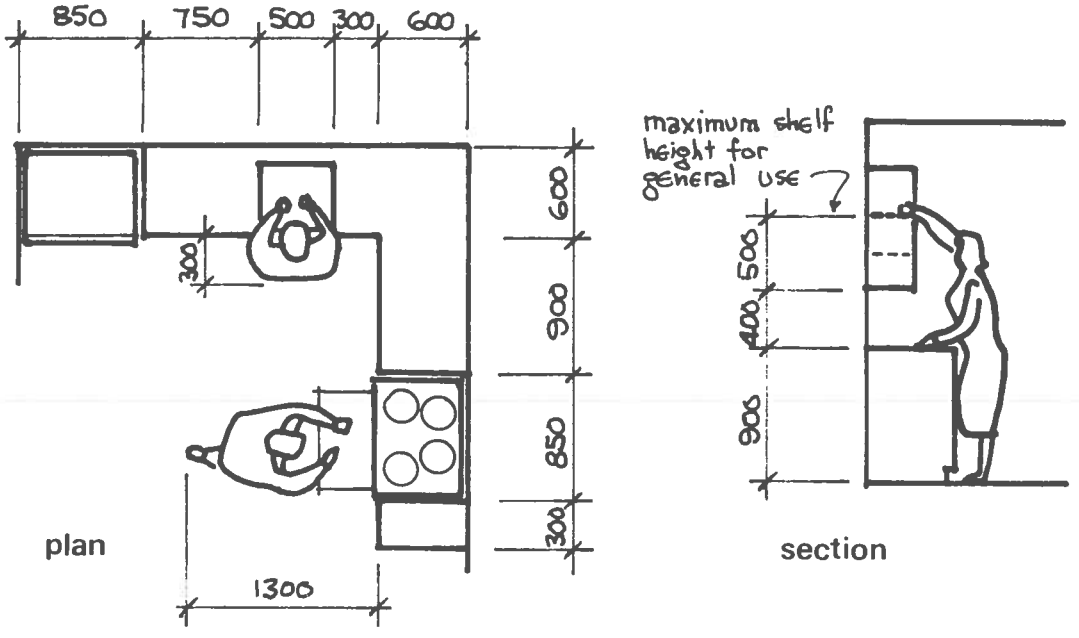


FIG. 6.6 KITCHEN SPACE

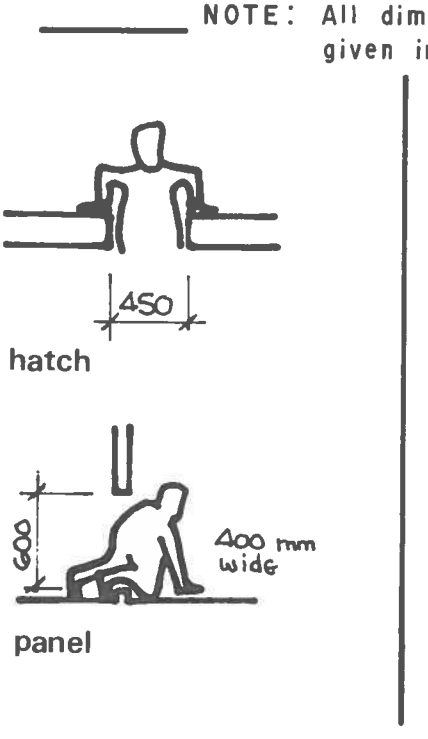


FIG. 6.7 ACCESS

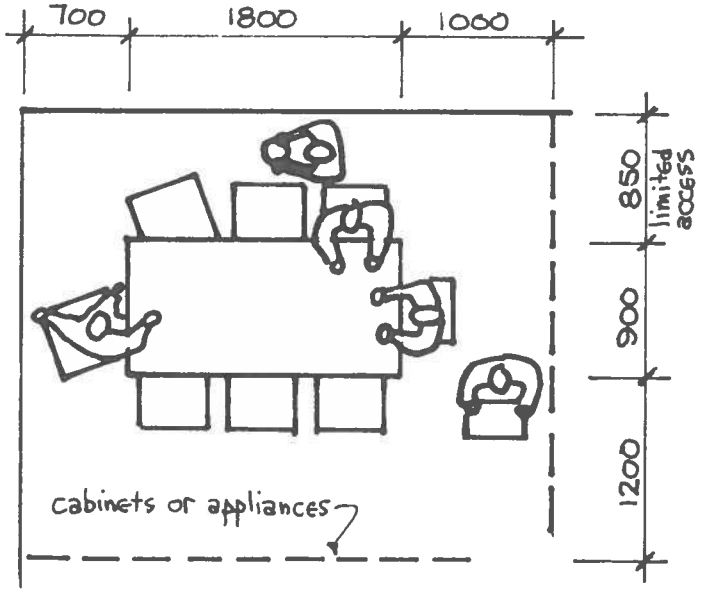
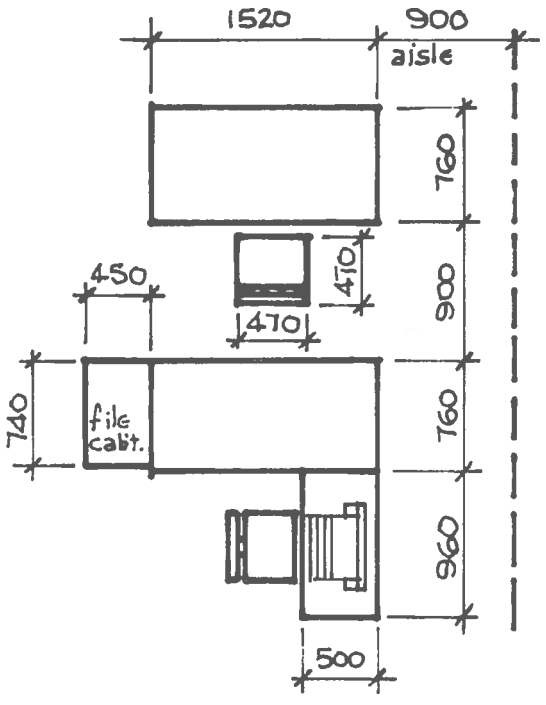
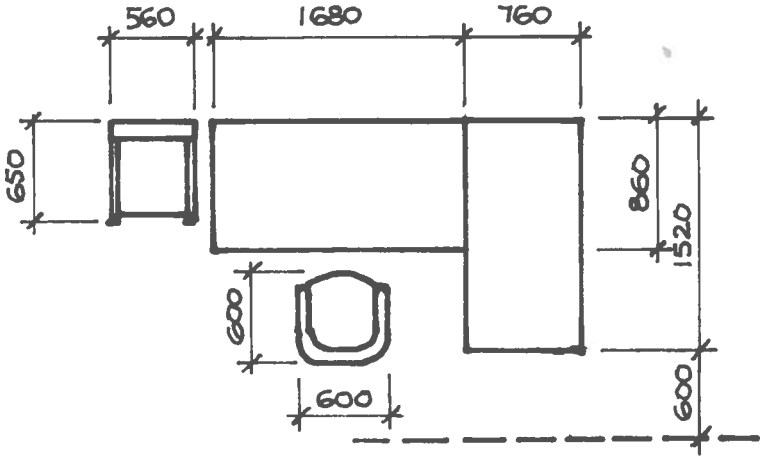


FIG. 6.8 EATING SPACE

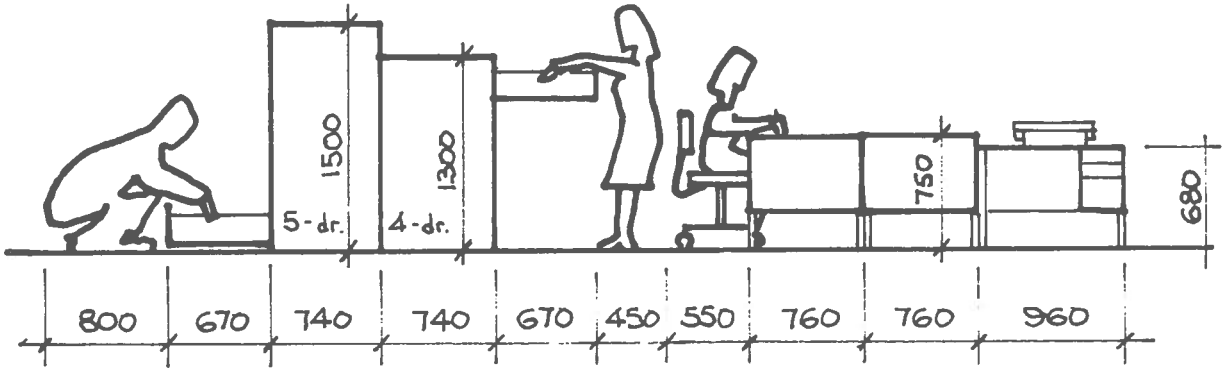


secretarial/clerical



executive

NOTE: All dimensions are given in millimetres



typical requirements

FIG. 6.9 OFFICE SPACES

6.4 INTERNAL CIRCULATION

6.4.1 Tables 6.1 to 6.4 can be used to estimate areas, e.g., floor areas. The dimensions of the area to be determined are given in millimetres at the edge of the table; the area is given in square metres and square feet (square feet in italics). From these tables one can determine:

- areas, given the dimensions of the area; or
- possible lengths and widths of the area (in preferred dimensions), given a specific area.

6.4.2 *Example in the Use of Area Tables*

Problem: Determine the preferred metric dimensions for an office with an area of approximately 150 ft^2.

From Table 6.2, alternative possible dimensions are:

5400 × 2600 mm = 14.04 m^2 = 151 ft^2

*5100 × 2700 mm = 13.77 m^2 = 148 ft^2

4800 × 2900 mm = 13.92 m^2 = 150 ft^2

4500 × 3100 mm = 13.95 m^2 = 150 ft^2

*4200 × 3300 mm = 13.86 m^2 = 149 ft^2

*3900 × 3600 mm = 14.04 m^2 = 151 ft^2

Although there are other dimensions that are close to 150 ft^2, those listed above were selected because the first figure is a multiple of 300 mm. In this range a multiple of 600 mm is the most preferred. It will be found, however, that on this basis the obtainable area nearest to 150 ft^2 is 4800 × 3000 mm, 14.40 m^2 or 155 ft^2. By resorting to the second preference of 300 mm increments, those marked * are valid alternatives. When the third preference of 100 mm increment is considered, all the above examples, and others, become valid.

Note: Examples of the utilization of various spaces in home and office are shown in Figs. 6.4 to 6.9 (pages 57 to 59).

Table 6.1 100 × 100 mm to 2400 × 4800 mm

	100	200	300	400	500	600	700	800	900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	2400
100	0.01 *0.1*	0.02 *0.2*	0.03 *0.3*	0.04 *0.4*	0.05 *0.5*	0.06 *0.6*	0.07 *0.8*	0.08 *0.9*	0.09 *1.0*	0.10 *1.1*	0.11 *1.2*	0.12 *1.3*	0.13 *1.4*	0.14 *1.5*	0.15 *1.6*	0.16 *1.7*	0.17 *1.8*	0.18 *1.9*	0.19 *2.0*	0.20 *2.2*	0.21 *2.3*	0.22 *2.4*	0.23 *2.5*	0.24 *2.6*
200	0.02 *0.2*	0.04 *0.4*	0.06 *0.6*	0.08 *0.9*	0.10 *1.1*	0.12 *1.3*	0.14 *1.5*	0.16 *1.7*	0.18 *1.9*	0.20 *2.2*	0.22 *2.4*	0.24 *2.6*	0.26 *2.8*	0.28 *3.0*	0.30 *3.2*	0.32 *3.4*	0.34 *3.7*	0.36 *3.9*	0.38 *4.1*	0.40 *4.3*	0.42 *4.5*	0.44 *4.7*	0.46 *5.0*	0.48 *5.2*
300	0.03 *0.3*	0.06 *0.6*	0.09 *1.0*	0.12 *1.3*	0.15 *1.6*	0.18 *1.9*	0.21 *2.3*	0.24 *2.6*	0.27 *2.9*	0.30 *3.2*	0.33 *3.6*	0.36 *3.9*	0.39 *4.2*	0.42 *4.5*	0.45 *4.8*	0.48 *5.2*	0.51 *5.5*	0.54 *5.8*	0.57 *6.1*	0.60 *6.5*	0.63 *6.8*	0.66 *7.1*	0.69 *7.4*	0.72 *7.8*
400	0.04 *0.4*	0.08 *0.9*	0.12 *1.3*	0.16 *1.7*	0.20 *2.2*	0.24 *2.6*	0.28 *3.0*	0.32 *3.4*	0.36 *3.9*	0.40 *4.3*	0.44 *4.7*	0.48 *5.2*	0.52 *5.6*	0.56 *6.0*	0.60 *6.5*	0.64 *6.9*	0.68 *7.3*	0.72 *7.8*	0.76 *8.2*	0.80 *8.6*	0.84 *9.0*	0.88 *9.5*	0.92 *9.9*	0.96 *10.3*
500	0.05 *0.5*	0.10 *1.1*	0.15 *1.6*	0.20 *2.2*	0.25 *2.7*	0.30 *3.2*	0.35 *3.8*	0.40 *4.3*	0.45 *4.8*	0.50 *5.4*	0.55 *5.9*	0.60 *6.5*	0.65 *7.0*	0.70 *7.5*	0.75 *8.1*	0.80 *8.6*	0.85 *9.1*	0.90 *9.7*	0.95 *10.2*	1.00 *10.8*	1.05 *11.3*	1.10 *11.8*	1.15 *12.4*	1.20 *12.9*
600	0.06 *0.6*	0.12 *1.3*	0.18 *1.9*	0.24 *2.6*	0.30 *3.2*	0.36 *3.9*	0.42 *4.5*	0.48 *5.2*	0.54 *5.8*	0.60 *6.5*	0.66 *7.1*	0.72 *7.8*	0.78 *8.4*	0.84 *9.0*	0.90 *9.7*	0.96 *10.3*	1.02 *11.0*	1.08 *11.6*	1.14 *12.3*	1.20 *12.9*	1.26 *13.6*	1.32 *14.2*	1.38 *14.9*	1.44 *15.5*
700	0.07 *0.8*	0.14 *1.5*	0.21 *2.3*	0.28 *3.0*	0.35 *3.8*	0.42 *4.5*	0.49 *5.3*	0.56 *6.0*	0.63 *6.8*	0.70 *7.5*	0.77 *8.3*	0.84 *9.0*	0.91 *9.8*	0.98 *10.5*	1.05 *11.3*	1.12 *12.1*	1.19 *12.8*	1.26 *13.6*	1.33 *14.3*	1.40 *15.1*	1.47 *15.8*	1.54 *16.6*	1.61 *17.3*	1.68 *18.1*
800	0.08 *0.9*	0.16 *1.7*	0.24 *2.6*	0.32 *3.4*	0.40 *4.3*	0.48 *5.2*	0.56 *6.0*	0.64 *6.9*	0.72 *7.8*	0.80 *8.6*	0.88 *9.5*	0.96 *10.3*	1.04 *11.2*	1.12 *12.1*	1.20 *12.9*	1.28 *13.8*	1.36 *14.6*	1.44 *15.5*	1.52 *16.4*	1.60 *17.2*	1.68 *18.1*	1.76 *18.9*	1.84 *19.8*	1.92 *20.7*
900	0.09 *1.0*	0.18 *1.9*	0.27 *2.9*	0.36 *3.9*	0.45 *4.8*	0.54 *5.8*	0.63 *6.8*	0.72 *7.8*	0.81 *8.7*	0.90 *9.7*	0.99 *10.7*	1.08 *11.6*	1.17 *12.6*	1.26 *13.6*	1.35 *14.5*	1.44 *15.5*	1.53 *16.5*	1.62 *17.4*	1.71 *18.4*	1.80 *19.4*	1.89 *20.3*	1.98 *21.3*	2.07 *22.3*	2.16 *23.3*
1000	0.10 *1.1*	0.20 *2.2*	0.30 *3.2*	0.40 *4.3*	0.50 *5.4*	0.60 *6.5*	0.70 *7.5*	0.80 *8.6*	0.90 *9.7*	1.00 *10.8*	1.10 *11.8*	1.20 *12.9*	1.30 *14.0*	1.40 *15.1*	1.50 *16.1*	1.60 *17.2*	1.70 *18.3*	1.80 *19.4*	1.90 *20.5*	2.00 *21.5*	2.10 *22.6*	2.20 *23.7*	2.30 *24.8*	2.40 *25.8*
1100	0.11 *1.2*	0.22 *2.4*	0.33 *3.6*	0.44 *4.7*	0.55 *5.9*	0.66 *7.1*	0.77 *8.3*	0.88 *9.5*	0.99 *10.7*	1.10 *11.8*	1.21 *13.0*	1.32 *14.2*	1.43 *15.4*	1.54 *16.6*	1.65 *17.8*	1.76 *18.9*	1.87 *20.1*	1.98 *21.3*	2.09 *22.5*	2.20 *23.7*	2.31 *24.9*	2.42 *26.0*	2.53 *27.2*	2.64 *28.4*
1200	0.12 *1.3*	0.24 *2.6*	0.36 *3.9*	0.48 *5.2*	0.60 *6.5*	0.72 *7.8*	0.84 *9.0*	0.96 *10.3*	1.08 *11.6*	1.20 *12.9*	1.32 *14.2*	1.44 *15.5*	1.56 *16.8*	1.68 *18.1*	1.80 *19.4*	1.92 *20.7*	2.04 *22.0*	2.16 *23.3*	2.28 *24.5*	2.40 *25.8*	2.52 *27.1*	2.64 *28.4*	2.76 *29.7*	2.88 *31.0*
1300	0.13 *1.4*	0.26 *2.8*	0.39 *4.2*	0.52 *5.6*	0.65 *7.0*	0.78 *8.4*	0.91 *9.8*	1.04 *11.2*	1.17 *12.6*	1.30 *14.0*	1.43 *15.4*	1.56 *16.8*	1.69 *18.2*	1.82 *19.6*	1.95 *21.0*	2.08 *22.4*	2.21 *23.8*	2.34 *25.2*	2.47 *26.6*	2.60 *28.0*	2.73 *29.4*	2.86 *30.8*	2.99 *32.2*	3.12 *33.6*
1400	0.14 *1.5*	0.28 *3.0*	0.42 *4.5*	0.56 *6.0*	0.70 *7.5*	0.84 *9.0*	0.98 *10.5*	1.12 *12.1*	1.26 *13.6*	1.40 *15.1*	1.54 *16.6*	1.68 *18.1*	1.82 *19.6*	1.96 *21.1*	2.10 *22.6*	2.24 *24.1*	2.38 *25.6*	2.52 *27.1*	2.66 *28.6*	2.80 *30.1*	2.94 *31.6*	3.08 *33.2*	3.22 *34.7*	3.36 *36.2*
1500	0.15 *1.6*	0.30 *3.2*	0.45 *4.8*	0.60 *6.5*	0.75 *8.1*	0.90 *9.7*	1.05 *11.3*	1.20 *12.9*	1.35 *14.5*	1.50 *16.1*	1.65 *17.8*	1.80 *19.4*	1.95 *21.0*	2.10 *22.6*	2.25 *24.2*	2.40 *25.8*	2.55 *27.4*	2.70 *29.1*	2.85 *30.7*	3.00 *32.3*	3.15 *33.9*	3.30 *35.5*	3.45 *37.1*	3.60 *38.8*
1600	0.16 *1.7*	0.32 *3.4*	0.48 *5.2*	0.64 *6.9*	0.80 *8.6*	0.96 *10.3*	1.12 *12.1*	1.28 *13.8*	1.44 *15.5*	1.60 *17.2*	1.76 *18.9*	1.92 *20.7*	2.08 *22.4*	2.24 *24.1*	2.40 *25.8*	2.56 *27.6*	2.72 *29.3*	2.88 *31.0*	3.04 *32.7*	3.20 *34.4*	3.36 *36.2*	3.52 *37.9*	3.68 *39.6*	3.84 *41.3*
1700	0.17 *1.8*	0.34 *3.7*	0.51 *5.5*	0.68 *7.3*	0.85 *9.1*	1.02 *11.0*	1.19 *12.8*	1.36 *14.6*	1.53 *16.5*	1.70 *18.3*	1.87 *20.1*	2.04 *22.0*	2.21 *23.8*	2.38 *25.6*	2.55 *27.4*	2.72 *29.3*	2.89 *31.1*	3.06 *32.9*	3.23 *34.8*	3.40 *36.6*	3.57 *38.4*	3.74 *40.3*	3.91 *42.1*	4.08 *43.9*
1800	0.18 *1.9*	0.36 *3.9*	0.54 *5.8*	0.72 *7.8*	0.90 *9.7*	1.08 *11.6*	1.26 *13.6*	1.44 *15.5*	1.62 *17.4*	1.80 *18.4*	1.98 *21.3*	2.16 *23.3*	2.34 *25.2*	2.52 *27.1*	2.70 *29.1*	2.88 *31.0*	3.06 *32.9*	3.24 *34.9*	3.42 *36.8*	3.60 *38.8*	3.78 *40.7*	3.96 *42.6*	4.14 *44.6*	4.32 *46.5*
1900	0.19 *2.0*	0.38 *4.1*	0.57 *6.1*	0.76 *8.2*	0.95 *10.2*	1.14 *12.3*	1.33 *14.3*	1.52 *16.4*	1.71 *18.4*	1.90 *20.5*	2.09 *22.5*	2.28 *24.5*	2.47 *26.6*	2.66 *28.6*	2.85 *30.7*	3.04 *32.7*	3.23 *34.8*	3.42 *36.8*	3.61 *38.9*	3.80 *40.9*	3.99 *42.9*	4.18 *45.0*	4.37 *47.0*	4.56 *49.1*
2000	0.20 *2.2*	0.40 *4.3*	0.60 *6.5*	0.80 *8.6*	1.00 *10.8*	1.20 *12.9*	1.40 *15.1*	1.60 *17.2*	1.80 *19.4*	2.00 *21.5*	2.20 *23.7*	2.40 *25.8*	2.60 *28.0*	2.80 *30.1*	3.00 *32.3*	3.20 *34.4*	3.40 *36.6*	3.60 *38.8*	3.80 *40.9*	4.00 *43.1*	4.20 *45.2*	4.40 *47.4*	4.60 *49.5*	4.80 *51.7*
2100	0.21 *2.3*	0.42 *4.5*	0.63 *6.8*	0.84 *9.0*	1.05 *11.3*	1.26 *13.6*	1.47 *15.8*	1.68 *18.1*	1.89 *20.3*	2.10 *22.6*	2.31 *24.9*	2.52 *27.1*	2.73 *29.4*	2.94 *31.6*	3.15 *33.9*	3.36 *36.2*	3.57 *38.4*	3.78 *40.7*	3.99 *42.9*	4.20 *45.2*	4.41 *47.5*	4.62 *49.7*	4.83 *52.0*	5.04 *54.3*
2200	0.22 *2.4*	0.44 *4.7*	0.66 *7.1*	0.88 *9.5*	1.10 *11.8*	1.32 *14.2*	1.54 *16.6*	1.76 *18.9*	1.98 *21.3*	2.20 *23.7*	2.42 *26.0*	2.64 *28.4*	2.86 *30.8*	3.08 *33.2*	3.30 *35.5*	3.52 *37.9*	3.74 *40.3*	3.96 *42.6*	4.18 *45.0*	4.40 *47.4*	4.62 *49.7*	4.84 *52.1*	5.06 *54.5*	5.28 *56.8*
2300	0.23 *2.5*	0.46 *5.0*	0.69 *7.4*	0.92 *9.9*	1.15 *12.4*	1.38 *14.9*	1.61 *17.3*	1.84 *19.8*	2.07 *22.3*	2.30 *24.8*	2.53 *27.2*	2.76 *29.7*	2.99 *32.2*	3.22 *34.7*	3.45 *37.1*	3.68 *39.6*	3.91 *42.1*	4.14 *44.6*	4.37 *47.0*	4.60 *49.5*	4.83 *52.0*	5.06 *54.5*	5.29 *56.9*	5.52 *59.4*
2400	0.24 *2.6*	0.48 *5.2*	0.72 *7.8*	0.96 *10.3*	1.20 *12.9*	1.44 *15.5*	1.68 *18.1*	1.92 *20.7*	2.16 *23.3*	2.40 *25.8*	2.64 *28.4*	2.88 *31.0*	3.12 *33.6*	3.36 *36.2*	3.60 *38.8*	3.84 *41.3*	4.08 *43.9*	4.32 *46.5*	4.56 *49.1*	4.80 *51.7*	5.04 *54.3*	5.28 *56.8*	5.52 *59.4*	5.76 *62.0*
2500	0.25 *2.7*	0.50 *5.4*	0.75 *8.1*	1.00 *10.8*	1.25 *13.5*	1.50 *16.1*	1.75 *18.8*	2.00 *21.5*	2.25 *24.2*	2.50 *26.9*	2.75 *29.6*	3.00 *32.3*	3.25 *35.0*	3.50 *37.7*	3.75 *40.4*	4.00 *43.1*	4.25 *45.7*	4.50 *48.4*	4.75 *51.1*	5.00 *53.8*	5.25 *56.5*	5.50 *59.2*	5.75 *61.9*	6.00 *64.6*
2600	0.26 *2.8*	0.52 *5.6*	0.78 *8.4*	1.04 *11.2*	1.30 *14.0*	1.56 *16.8*	1.82 *19.6*	2.08 *22.4*	2.34 *25.2*	2.60 *28.0*	2.86 *30.8*	3.12 *33.6*	3.38 *36.4*	3.64 *39.2*	3.90 *42.0*	4.16 *44.8*	4.42 *47.6*	4.68 *50.4*	4.94 *53.2*	5.20 *56.0*	5.46 *58.8*	5.72 *61.6*	5.98 *64.4*	6.24 *67.2*
2700	0.27 *2.9*	0.54 *5.8*	0.81 *8.7*	1.08 *11.6*	1.35 *14.5*	1.62 *17.4*	1.89 *20.3*	2.16 *23.3*	2.43 *26.2*	2.70 *29.1*	2.97 *32.0*	3.24 *34.9*	3.51 *37.8*	3.78 *40.7*	4.05 *43.6*	4.32 *46.5*	4.59 *49.4*	4.86 *52.3*	5.13 *55.2*	5.40 *58.1*	5.67 *61.0*	5.94 *63.9*	6.21 *66.8*	6.48 *69.8*
2800	0.28 *3.0*	0.56 *6.0*	0.84 *9.0*	1.12 *12.1*	1.40 *15.1*	1.68 *18.1*	1.96 *21.1*	2.24 *24.1*	2.52 *27.1*	2.80 *30.1*	3.08 *33.2*	3.36 *36.2*	3.64 *39.2*	3.92 *42.2*	4.20 *45.2*	4.48 *48.2*	4.76 *51.2*	5.04 *54.3*	5.32 *57.3*	5.60 *60.3*	5.88 *63.3*	6.16 *66.3*	6.44 *69.3*	6.72 *72.3*
2900	0.29 *3.1*	0.58 *6.2*	0.87 *9.4*	1.16 *12.5*	1.45 *15.6*	1.74 *18.7*	2.03 *21.9*	2.32 *25.0*	2.61 *28.1*	2.90 *31.2*	3.19 *34.3*	3.48 *37.5*	3.77 *40.6*	4.06 *43.7*	4.35 *46.8*	4.64 *49.9*	4.93 *53.1*	5.22 *56.2*	5.51 *59.3*	5.80 *62.4*	6.09 *65.6*	6.38 *68.7*	6.67 *71.8*	6.96 *74.9*
3000	0.30 *3.2*	0.60 *6.5*	0.90 *9.7*	1.20 *12.9*	1.50 *16.1*	1.80 *19.4*	2.10 *22.6*	2.40 *25.8*	2.70 *29.1*	3.00 *32.3*	3.30 *35.5*	3.60 *38.8*	3.90 *42.0*	4.20 *45.2*	4.50 *48.4*	4.80 *51.7*	5.10 *54.9*	5.40 *58.1*	5.70 *61.4*	6.00 *64.6*	6.30 *67.8*	6.60 *71.0*	6.90 *74.3*	7.20 *77.5*
3100	0.31 *3.3*	0.62 *6.7*	0.93 *10.0*	1.24 *13.3*	1.55 *16.7*	1.86 *20.0*	2.17 *23.4*	2.48 *26.7*	2.79 *30.0*	3.10 *33.4*	3.41 *36.7*	3.72 *40.0*	4.03 *43.4*	4.34 *46.7*	4.65 *50.1*	4.96 *53.4*	5.27 *56.7*	5.58 *60.1*	5.89 *63.4*	6.20 *66.7*	6.51 *70.1*	6.82 *73.4*	7.13 *76.7*	7.44 *80.1*
3200	0.32 *3.4*	0.64 *6.9*	0.96 *10.3*	1.28 *13.8*	1.60 *17.2*	1.92 *20.7*	2.24 *24.1*	2.56 *27.6*	2.88 *31.0*	3.20 *34.4*	3.52 *37.9*	3.84 *41.3*	4.16 *44.8*	4.48 *48.2*	4.80 *51.7*	5.12 *55.1*	5.44 *58.6*	5.76 *62.0*	6.08 *65.4*	6.40 *68.9*	6.72 *72.3*	7.04 *75.8*	7.36 *79.2*	7.68 *82.7*
3300	0.33 *3.6*	0.66 *7.1*	0.99 *10.7*	1.32 *14.2*	1.65 *17.8*	1.98 *21.3*	2.31 *24.9*	2.64 *28.4*	2.97 *32.0*	3.30 *35.5*	3.63 *39.1*	3.96 *42.6*	4.29 *46.2*	4.62 *49.7*	4.95 *53.3*	5.28 *56.8*	5.61 *60.4*	5.94 *63.9*	6.27 *67.5*	6.60 *70.0*	6.93 *74.6*	7.26 *78.1*	7.59 *81.7*	7.92 *85.3*
3400	0.34 *3.7*	0.68 *7.3*	1.02 *11.0*	1.36 *14.6*	1.70 *18.3*	2.04 *22.0*	2.38 *25.6*	2.72 *29.3*	3.06 *32.9*	3.40 *36.6*	3.74 *40.3*	4.08 *43.9*	4.42 *47.6*	4.76 *51.2*	5.10 *54.9*	5.44 *58.6*	5.78 *62.2*	6.12 *65.9*	6.46 *69.5*	6.80 *73.2*	7.14 *76.9*	7.48 *80.5*	7.82 *84.2*	8.16 *87.8*
3500	0.35 *3.8*	0.70 *7.5*	1.05 *11.3*	1.40 *15.1*	1.75 *18.8*	2.10 *22.6*	2.45 *26.4*	2.80 *30.1*	3.15 *33.9*	3.50 *37.7*	3.85 *41.4*	4.20 *45.2*	4.55 *49.0*	4.90 *52.7*	5.25 *56.5*	5.60 *60.3*	5.95 *64.0*	6.30 *67.8*	6.65 *71.6*	7.00 *75.3*	7.35 *79.1*	7.70 *82.9*	8.05 *86.6*	8.40 *90.4*
3600	0.36 *3.9*	0.72 *7.8*	1.08 *11.6*	1.44 *15.5*	1.80 *19.4*	2.16 *23.3*	2.52 *27.1*	2.88 *31.0*	3.24 *34.9*	3.60 *38.8*	3.96 *42.6*	4.32 *46.5*	4.68 *50.4*	5.04 *54.3*	5.40 *58.1*	5.76 *62.0*	6.12 *65.9*	6.48 *69.8*	6.84 *73.6*	7.20 *77.5*	7.56 *81.4*	7.92 *85.3*	8.28 *89.1*	8.64 *93.0*
3700	0.37 *4.0*	0.74 *8.0*	1.11 *11.9*	1.48 *15.9*	1.85 *19.9*	2.22 *23.9*	2.59 *27.9*	2.96 *31.9*	3.33 *35.8*	3.70 *39.8*	4.07 *43.8*	4.44 *47.8*	4.81 *51.8*	5.18 *55.8*	5.55 *59.7*	5.92 *63.7*	6.29 *67.7*	6.66 *71.7*	7.03 *75.7*	7.40 *79.7*	7.77 *83.6*	8.14 *87.6*	8.51 *91.6*	8.88 *95.6*
3800	0.38 *4.1*	0.76 *8.2*	1.14 *12.3*	1.52 *16.4*	1.90 *20.5*	2.28 *24.5*	2.66 *28.6*	3.04 *32.7*	3.42 *36.8*	3.80 *40.9*	4.18 *45.0*	4.56 *49.1*	4.94 *53.2*	5.32 *57.3*	5.70 *61.4*	6.08 *65.4*	6.46 *69.5*	6.84 *73.6*	7.22 *77.7*	7.60 *81.8*	7.98 *85.9*	8.36 *90.0*	8.74 *94.1*	9.12 *98.2*
3900	0.39 *4.2*	0.78 *8.4*	1.17 *12.6*	1.56 *16.8*	1.95 *21.0*	2.34 *25.2*	2.73 *29.4*	3.12 *33.6*	3.51 *37.8*	3.90 *42.0*	4.29 *46.2*	4.68 *50.4*	5.07 *54.6*	5.46 *58.8*	5.85 *63.0*	6.24 *67.2*	6.63 *71.4*	7.02 *75.6*	7.41 *79.8*	7.80 *84.0*	8.19 *88.2*	8.58 *92.4*	8.97 *96.6*	9.36 *100.8*
4000	0.40 *4.3*	0.80 *8.6*	1.20 *12.9*	1.60 *17.2*	2.00 *21.5*	2.40 *25.8*	2.80 *30.1*	3.20 *34.4*	3.60 *38.8*	4.00 *43.1*	4.40 *47.4*	4.80 *51.7*	5.20 *56.0*	5.60 *60.3*	6.00 *64.6*	6.40 *68.9*	6.80 *73.2*	7.20 *77.5*	7.60 *81.8*	8.00 *86.1*	8.40 *90.4*	8.80 *94.7*	9.20 *99.0*	9.60 *103.3*
4100	0.41 *4.4*	0.82 *8.8*	1.23 *13.2*	1.64 *17.7*	2.05 *22.1*	2.46 *26.5*	2.87 *30.9*	3.28 *35.3*	3.69 *39.7*	4.10 *44.1*	4.51 *48.5*	4.92 *53.0*	5.33 *57.4*	5.74 *61.8*	6.15 *66.2*	6.56 *70.6*	6.97 *75.0*	7.38 *79.4*	7.79 *83.9*	8.20 *88.3*	8.61 *92.7*	9.02 *97.1*	9.43 *101.5*	9.84 *105.9*
4200	0.42 *4.5*	0.84 *9.0*	1.26 *13.6*	1.68 *18.1*	2.10 *22.6*	2.52 *27.1*	2.94 *31.6*	3.36 *36.2*	3.78 *40.7*	4.20 *45.2*	4.62 *49.7*	5.04 *54.3*	5.46 *58.8*	5.88 *63.3*	6.30 *67.8*	6.72 *72.3*	7.14 *76.9*	7.56 *81.4*	7.98 *85.9*	8.40 *90.4*	8.82 *94.9*	9.24 *99.5*	9.66 *104.0*	10.08 *108.5*
4300	0.43 *4.6*	0.86 *9.3*	1.29 *13.9*	1.72 *18.5*	2.15 *23.1*	2.58 *27.8*	3.01 *32.4*	3.44 *37.0*	3.87 *41.7*	4.30 *46.3*	4.73 *50.9*	5.16 *55.5*	5.59 *60.2*	6.02 *64.8*	6.45 *69.4*	6.88 *74.1*	7.31 *78.7*	7.74 *83.3*	8.17 *87.9*	8.60 *92.6*	9.03 *97.2*	9.46 *101.8*	9.89 *106.5*	10.32 *111.1*
4400	0.44 *4.7*	0.88 *9.5*	1.32 *14.2*	1.76 *18.9*	2.20 *23.7*	2.64 *28.4*	3.08 *33.2*	3.52 *37.9*	3.96 *42.6*	4.40 *47.4*	4.84 *52.1*	5.28 *56.8*	5.72 *61.6*	6.16 *66.3*	6.60 *71.0*	7.04 *75.8*	7.48 *80.5*	7.92 *85.3*	8.36 *90.0*	8.80 *94.7*	9.24 *99.5*	9.68 *104.2*	10.12 *108.9*	10.56 *113.7*
4500	0.45 *4.8*	0.90 *9.7*	1.35 *14.5*	1.80 *19.4*	2.25 *24.2*	2.70 *29.1*	3.15 *33.9*	3.60 *38.8*	4.05 *43.6*	4.50 *48.4*	4.95 *53.3*	5.40 *58.1*	5.85 *63.0*	6.30 *67.8*	6.75 *72.7*	7.20 *77.5*	7.65 *82.3*	8.10 *87.2*	8.55 *92.0*	9.00 *96.9*	9.45 *101.7*	9.90 *106.6*	10.35 *111.4*	10.80 *116.3*
4600	0.46 *5.0*	0.92 *9.9*	1.38 *14.9*	1.84 *19.8*	2.30 *24.8*	2.76 *29.7*	3.22 *34.7*	3.68 *39.6*	4.14 *44.6*	4.60 *49.5*	5.06 *54.5*	5.52 *59.4*	5.98 *64.4*	6.44 *69.3*	6.90 *74.3*	7.36 *79.2*	7.82 *84.2*	8.28 *89.1*	8.74 *94.1*	9.20 *99.0*	9.66 *104.0*	10.12 *108.9*	10.58 *113.9*	11.04 *118.8*
4700	0.47 *5.1*	0.94 *10.1*	1.41 *15.2*	1.88 *20.2*	2.35 *25.3*	2.82 *30.4*	3.29 *35.4*	3.76 *40.5*	4.23 *45.5*	4.70 *50.6*	5.17 *55.6*	5.64 *60.7*	6.11 *65.8*	6.58 *70.8*	7.05 *75.9*	7.52 *80.9*	7.99 *86.0*	8.46 *91.1*	8.93 *96.1*	9.40 *101.2*	9.87 *106.2*	10.34 *111.3*	10.81 *116.4*	11.28 *121.4*
4800	0.48 *5.2*	0.96 *10.3*	1.44 *15.5*	1.92 *20.7*	2.40 *25.8*	2.88 *31.0*	3.36 *36.2*	3.84 *41.3*	4.32 *46.5*	4.80 *51.7*	5.28 *56.8*	5.76 *62.0*	6.24 *67.2*	6.72 *72.3*	7.20 *77.5*	7.68 *82.7*	8.16 *87.8*	8.64 *93.0*	9.12 *98.2*	9.60 *103.3*	10.08 *108.5*	10.56 *113.7*	11.04 *118.8*	11.52 *124.0*

Table 6.2 2400 × 2400 mm to 4800 × 7200 mm

	2400	2500	2600	2700	2800	2900	3000	3100	3200	3300	3400	3500	3600	3700	3800	3900	4000	4100	4200	4300	4400	4500	4600	4700	4800
2400	5.76 62.0	6.00 64.5	6.24 67.0	6.48 70.0	6.72 72.9	6.96 75.0	7.20 77.5	7.44 80.0	7.68 82.5	7.92 85.5	8.16 88.0	8.40 90.5	8.64 93.0	8.88 95.5	9.12 98.0	9.36 101	9.60 103	9.84 106	10.08 109	10.32 111	10.56 114	10.80 116	11.04 119	11.28 121	11.52 124
2500	6.00 64.5	6.25 67.5	6.50 70.0	6.75 72.5	7.00 75.5	7.25 78.0	7.50 80.5	7.75 83.5	8.00 86.0	8.25 89.0	8.50 91.5	8.75 94.0	9.00 97.0	9.25 99.5	9.50 102	9.75 105	10.00 108	10.25 110	10.50 113	10.75 116	11.00 118	11.25 121	11.50 124	11.75 126	12.00 129
2600	6.24 67.0	6.50 70.0	6.76 73.0	7.02 75.5	7.28 78.5	7.54 81.0	7.80 84.0	8.06 87.0	8.32 89.5	8.58 92.5	8.84 95.0	9.10 98.0	9.36 101	9.62 104	9.88 106	10.14 109	10.40 112	10.66 115	10.92 118	11.18 120	11.44 123	11.70 126	11.96 129	12.22 132	12.48 134
2700	6.48 70.0	6.75 72.5	7.02 75.5	7.29 78.5	7.56 81.5	7.83 84.5	8.10 87.0	8.37 90.0	8.64 93.0	8.91 96.0	9.18 99.0	9.45 102	9.72 105	9.99 108	10.26 110	10.53 113	10.80 116	11.07 119	11.34 122	11.61 125	11.88 128	12.15 131	12.42 134	12.69 137	12.96 140
2800	6.72 72.5	7.00 75.5	7.28 78.5	7.56 81.5	7.84 84.5	8.12 87.5	8.40 90.5	8.68 93.5	8.96 96.5	9.24 99.5	9.52 102	9.80 105	10.08 109	10.36 112	10.64 115	10.92 118	11.20 121	11.48 124	11.76 127	12.04 130	12.32 133	12.60 136	12.88 139	13.16 142	13.44 145
2900	6.96 75.0	7.25 78.0	7.54 81.0	7.83 84.5	8.12 87.5	8.41 90.5	8.70 93.5	8.99 97.0	9.28 100	9.57 103	9.86 106	10.15 109	10.44 112	10.73 115	11.02 119	11.31 122	11.60 125	11.89 128	12.18 131	12.47 134	12.76 137	13.05 140	13.34 144	13.63 147	13.92 150
3000	7.20 77.5	7.50 80.5	7.80 84.0	8.10 87.0	8.40 90.5	8.70 93.5	9.00 97.0	9.30 100	9.60 103	9.90 107	10.20 110	10.50 113	10.80 116	11.10 119	11.40 123	11.70 126	12.00 129	12.30 232	12.60 136	12.90 139	13.20 142	13.50 145	13.80 149	14.10 152	14.40 155
3100	7.44 80.0	7.75 83.5	8.06 87.0	8.37 90.0	8.68 93.5	8.99 97.0	9.30 100	9.61 103	9.92 107	10.23 110	10.54 113	10.85 117	11.16 120	11.47 123	11.78 127	12.09 130	12.40 133	12.71 137	13.02 140	13.33 143	13.64 147	13.95 150	14.26 153	14.57 157	14.88 160
3200	7.68 82.5	8.00 86.0	8.32 89.5	8.64 93.0	8.96 96.5	9.28 100	9.60 103	9.92 107	10.24 110	10.56 114	10.88 117	11.20 121	11.52 124	11.84 127	12.16 131	12.48 134	12.80 138	13.12 141	13.44 145	13.76 148	14.08 152	14.40 155	14.72 158	15.04 162	15.36 165
3300	7.92 85.5	8.25 89.0	8.58 92.5	8.91 96.0	9.24 99.5	9.57 103	9.90 107	10.23 110	10.56 114	10.89 117	11.22 121	11.55 124	11.88 128	12.21 131	12.54 135	12.87 139	13.20 142	13.53 146	13.86 149	14.19 153	14.52 156	14.85 160	15.18 163	15.51 167	15.84 171
3400	8.16 88.0	8.50 91.5	8.84 95.0	9.18 99.0	9.52 102	9.86 106	10.20 110	10.54 113	10.88 117	11.22 121	11.56 124	11.90 128	12.24 132	12.58 135	12.92 139	13.26 143	13.60 146	13.94 150	14.28 154	14.62 157	14.96 161	15.30 165	15.64 168	15.98 172	16.32 176
3500	8.40 90.5	8.75 94.0	9.10 98.0	9.45 102	9.80 105	10.15 109	10.50 113	10.85 117	11.20 121	11.55 124	11.90 128	12.25 132	12.60 136	12.95 139	13.30 143	13.65 147	14.00 151	14.35 154	14.70 158	15.05 162	15.40 166	15.75 170	16.10 173	16.45 177	16.80 181
3600	8.64 93.0	9.00 97.0	9.36 101	9.72 105	10.08 109	10.44 112	10.80 116	11.16 120	11.52 124	11.88 128	12.24 132	12.60 136	12.96 140	13.32 143	13.68 147	14.04 151	14.40 155	14.76 159	15.12 163	15.48 167	15.84 171	16.20 174	16.56 178	16.92 182	17.28 186
3700	8.88 95.5	9.25 99.5	9.62 104	9.99 108	10.36 112	10.73 115	11.10 119	11.47 123	11.84 127	12.21 131	12.58 135	12.95 139	13.32 143	13.69 147	14.06 151	14.43 155	14.80 159	15.17 163	15.54 167	15.91 171	16.28 175	16.65 179	17.02 183	17.39 187	17.76 191
3800	9.12 98.0	9.50 102	9.88 106	10.26 110	10.64 115	11.02 119	11.40 123	11.78 127	12.16 131	12.54 135	12.92 139	13.30 143	13.68 147	14.06 151	14.44 155	14.82 160	15.20 164	15.58 168	15.96 172	16.34 176	16.72 180	17.10 184	17.48 188	17.86 192	18.24 196
3900	9.36 101	9.75 105	10.14 109	10.53 113	10.92 118	11.31 122	11.70 126	12.09 130	12.48 134	12.87 139	13.26 143	13.65 147	14.04 151	14.43 155	14.82 160	15.21 164	15.60 168	15.99 172	16.38 176	16.77 181	17.16 185	17.55 189	17.94 193	18.33 197	18.72 202
4000	9.60 103	10.00 108	10.40 112	10.80 116	11.20 121	11.60 125	12.00 129	12.40 133	12.80 138	13.20 142	13.60 146	14.00 151	14.40 155	14.80 159	15.20 164	15.60 168	16.00 172	16.40 177	16.80 181	17.20 185	17.60 189	18.00 194	18.40 198	18.80 202	19.20 207
4100	9.84 106	10.25 110	10.66 115	11.07 119	11.48 124	11.89 128	12.30 132	12.71 137	13.12 141	13.53 146	13.94 150	14.35 154	14.76 159	15.17 163	15.58 168	15.99 172	16.40 177	16.81 181	17.22 185	17.63 190	18.04 194	18.45 199	18.86 203	19.27 207	19.68 212
4200	10.08 109	10.50 113	10.92 118	11.34 122	11.76 127	12.18 131	12.60 136	13.02 140	13.44 145	13.86 149	14.28 154	14.70 158	15.12 163	15.54 167	15.96 172	16.38 176	16.80 181	17.22 185	17.64 190	18.06 194	18.48 199	18.90 203	19.32 208	19.74 212	20.16 217
4300	10.32 111	10.75 116	11.18 120	11.61 125	12.04 130	12.47 134	12.90 139	13.33 143	13.76 148	14.19 153	14.62 157	15.05 162	15.48 167	15.91 171	16.34 176	16.77 181	17.20 185	17.63 190	18.06 194	18.49 199	18.92 204	19.35 208	19.78 213	20.21 218	20.64 222
4400	10.56 114	11.00 118	11.44 123	11.88 128	12.32 133	12.76 137	13.20 142	13.64 147	14.08 152	14.52 156	14.96 161	15.40 166	15.84 171	16.28 175	16.72 180	17.16 185	17.60 189	18.04 194	18.48 199	18.92 204	19.36 208	19.80 213	20.24 218	20.68 223	21.12 227
4500	10.80 116	11.25 121	11.70 126	12.15 131	12.60 136	13.05 140	13.50 145	13.95 150	14.40 155	14.85 160	15.30 165	15.75 170	16.20 174	16.65 179	17.10 184	17.55 189	18.00 194	18.45 199	18.90 203	19.35 208	19.80 213	20.25 218	20.70 223	21.15 228	21.60 233
4600	11.04 119	11.50 124	11.96 129	12.42 134	12.88 139	13.34 144	13.80 149	14.26 153	14.72 158	15.18 163	15.64 168	16.10 173	16.56 178	17.02 183	17.48 188	17.94 193	18.40 198	18.86 203	19.32 208	19.78 213	20.24 218	20.70 223	21.16 228	21.62 233	22.08 238
4700	11.28 121	11.75 126	12.22 132	12.69 137	13.16 142	13.63 147	14.10 152	14.57 157	15.04 162	15.51 167	15.98 172	16.45 177	16.92 182	17.39 187	17.86 192	18.33 197	18.80 202	19.27 207	19.74 212	20.21 218	20.68 223	21.15 228	21.62 233	22.09 238	22.56 243
4800	11.52 124	12.00 129	12.48 134	12.96 140	13.44 145	13.92 150	14.40 155	14.88 160	15.36 165	15.84 171	16.32 176	16.80 181	17.28 186	17.76 191	18.24 196	18.72 202	19.20 207	19.68 212	20.16 217	20.64 222	21.12 227	21.60 233	22.08 238	22.56 243	23.04 248
4900	11.76 127	12.25 132	12.74 137	13.23 142	13.72 148	14.21 153	14.70 158	15.19 164	15.68 169	16.17 174	16.66 179	17.15 185	17.64 190	18.13 195	18.62 200	19.11 206	19.60 211	20.09 216	20.58 222	21.07 227	21.56 232	22.05 237	22.54 243	23.03 248	23.52 253
5000	12.00 129	12.50 135	13.00 140	13.50 145	14.00 151	14.50 156	15.00 161	15.50 167	16.00 172	16.50 178	17.00 183	17.50 188	18.00 194	18.50 199	19.00 205	19.50 210	20.00 215	20.50 221	21.00 226	21.50 231	22.00 237	22.50 242	23.00 248	23.50 253	24.00 258
5100	12.24 132	12.75 137	13.26 143	13.77 148	14.28 154	14.79 159	15.30 165	15.81 170	16.32 176	16.83 181	17.34 187	17.85 192	18.36 198	18.87 203	19.38 209	19.89 214	20.40 220	20.91 225	21.42 231	21.93 236	22.44 242	22.95 247	23.46 253	23.97 258	24.48 264
5200	12.48 134	13.00 140	13.52 146	14.04 151	14.56 157	15.08 162	15.60 168	16.12 174	16.64 179	17.16 185	17.68 190	18.20 196	18.72 202	19.24 207	19.76 213	20.28 218	20.80 224	21.32 229	21.84 235	22.36 241	22.88 246	23.40 252	23.92 257	24.44 263	24.96 269
5300	12.72 137	13.25 143	13.78 148	14.31 154	14.84 160	15.37 165	15.90 171	16.43 177	16.96 183	17.49 188	18.02 194	18.55 200	19.08 205	19.61 211	20.14 217	20.67 222	21.20 228	21.73 234	22.26 240	22.79 245	23.32 251	23.85 257	24.38 262	24.91 268	25.44 274
5400	12.96 140	13.51 145	14.04 151	14.58 157	15.12 163	15.66 169	16.20 174	16.74 180	17.28 186	17.82 192	18.36 198	18.90 203	19.44 209	19.98 215	20.52 221	21.06 227	21.60 233	22.14 238	22.68 244	23.22 250	23.76 256	24.30 262	24.84 267	25.38 273	25.92 279
5500	13.20 142	13.75 148	14.30 154	14.85 160	15.40 166	15.95 172	16.50 178	17.05 184	17.60 189	18.15 195	18.70 201	19.25 207	19.80 213	20.35 219	20.90 225	21.45 231	22.00 237	22.55 243	23.10 249	23.65 255	24.20 260	24.75 266	25.30 272	25.85 278	26.40 284
5600	13.44 145	14.00 151	14.56 157	15.12 163	15.68 169	16.24 175	16.80 181	17.36 187	17.92 193	18.48 199	19.04 205	19.60 211	20.16 217	20.72 223	21.28 229	21.84 235	22.40 241	22.96 247	23.52 253	24.08 259	24.64 265	25.20 271	25.76 277	26.32 283	26.88 289
5700	13.68 147	14.25 153	14.82 160	15.39 166	15.96 172	16.53 178	17.10 184	17.67 190	18.24 196	18.81 202	19.38 209	19.95 215	20.52 221	21.09 227	21.66 233	22.23 239	22.80 245	23.37 252	23.94 258	24.51 264	25.08 270	25.65 276	26.22 282	26.79 288	27.36 295
5800	13.92 150	14.50 156	15.08 162	15.66 169	16.24 175	16.82 181	17.40 187	17.98 194	18.56 200	19.14 206	19.72 212	20.30 219	20.88 225	21.46 231	22.04 237	22.62 243	23.20 250	23.78 256	24.36 262	24.94 268	25.52 275	26.10 281	26.68 287	27.26 293	27.84 300
5900	14.16 152	14.75 159	15.34 165	15.93 171	16.52 178	17.11 184	17.70 191	18.29 197	18.88 203	19.47 210	20.06 216	20.65 222	21.24 229	21.83 235	22.42 241	23.01 248	23.60 254	24.19 260	24.78 267	25.37 273	25.96 279	26.55 286	27.14 292	27.73 298	28.32 305
6000	14.40 155	15.00 161	15.60 168	16.20 174	16.80 181	17.40 187	18.00 194	18.60 200	19.20 207	19.80 213	20.40 220	21.00 226	21.60 233	22.20 239	22.80 245	23.40 252	24.00 258	24.60 265	25.20 271	25.80 278	26.40 284	27.00 291	27.60 297	28.20 304	28.80 310
6100	14.64 158	15.25 164	15.86 171	16.47 177	17.08 184	17.69 190	18.30 197	18.91 204	19.52 210	20.13 217	20.74 223	21.35 230	21.96 236	22.57 243	23.18 250	23.79 256	24.40 263	25.01 269	25.62 276	26.23 282	26.84 289	27.45 295	28.06 302	28.67 309	29.28 315
6200	14.88 160	15.50 167	16.12 174	16.74 180	17.36 187	17.98 194	18.60 200	19.22 207	19.84 214	20.46 220	21.08 227	21.70 234	22.32 240	22.94 247	23.56 254	24.18 260	24.80 267	25.42 274	26.04 280	26.66 287	27.28 294	27.90 300	28.52 307	29.14 314	29.76 320
6300	15.12 163	15.75 170	16.38 176	17.01 183	17.64 190	18.27 197	18.90 203	19.53 210	20.16 217	20.79 224	21.42 231	22.05 237	22.68 244	23.31 251	23.94 258	24.57 264	25.20 271	25.83 278	26.46 285	27.09 292	27.72 298	28.35 305	28.98 312	29.61 319	30.24 326
6400	15.36 165	16.00 172	16.64 179	17.28 186	17.92 193	18.56 200	19.20 207	19.84 214	20.48 220	21.12 227	21.76 234	22.40 241	23.04 248	23.68 255	24.32 262	24.96 269	25.60 276	26.24 282	26.88 289	27.52 296	28.16 303	28.80 310	29.44 317	30.08 324	30.72 331
6500	15.60 168	16.25 175	16.90 182	17.55 189	18.20 196	18.85 203	19.50 210	20.15 217	20.80 224	21.45 231	22.10 238	22.75 245	23.40 252	24.05 259	24.70 266	25.35 273	26.00 280	26.65 287	27.30 294	27.95 301	28.60 308	29.25 315	29.90 322	30.55 329	31.20 336
6600	15.84 171	16.50 178	17.16 185	17.82 192	18.48 199	19.14 206	19.80 213	20.46 220	21.12 227	21.17 234	22.44 242	23.10 249	23.76 256	24.42 263	25.08 270	25.74 277	26.40 284	27.06 291	27.72 298	28.38 305	29.04 313	29.70 320	30.36 327	31.02 334	31.68 341
6700	16.08 173	16.75 180	17.42 188	18.09 195	18.76 202	19.43 209	20.10 216	20.77 224	21.44 231	22.11 238	22.78 245	23.45 252	24.12 260	24.79 267	25.46 274	26.13 281	26.80 288	27.47 296	28.14 303	28.81 310	29.48 317	30.15 325	30.82 332	31.49 339	32.16 346
6800	16.32 176	17.00 183	17.68 190	18.36 198	19.04 205	19.72 212	20.40 220	21.08 227	21.76 234	22.44 242	23.12 249	23.80 256	24.48 264	25.16 271	25.84 278	26.52 285	27.20 293	27.88 300	28.56 307	29.24 315	29.92 322	30.60 329	31.28 337	31.96 344	32.64 351
6900	16.56 178	17.25 186	17.94 193	18.63 201	19.32 208	20.01 215	20.70 223	21.39 230	22.08 238	22.77 245	23.46 253	24.15 260	24.84 267	25.53 275	26.22 282	26.91 290	27.60 297	28.29 305	28.98 312	29.67 319	30.36 327	31.05 334	31.74 342	32.43 349	33.12 357
7000	16.80 181	17.50 188	18.20 196	18.90 203	19.60 211	20.30 219	21.00 226	21.70 234	22.40 241	23.10 249	23.80 256	24.50 264	25.20 271	25.90 279	26.60 286	27.30 294	28.00 301	28.70 309	29.40 316	30.10 324	30.80 332	31.50 339	32.20 347	32.90 354	33.60 362
7100	17.04 183	17.75 191	18.46 199	19.17 206	19.88 214	20.59 222	21.30 229	22.01 237	22.72 245	23.43 252	24.14 260	24.85 267	25.56 275	26.27 283	26.98 290	27.69 298	28.40 306	29.11 313	29.82 321	30.53 329	31.24 336	31.95 344	32.66 352	33.37 359	34.08 367
7200	17.28 186	18.00 194	18.72 202	19.44 209	20.16 217	20.88 225	21.60 233	22.32 240	23.04 248	23.76 256	24.48 264	25.20 271	25.92 279	26.64 287	27.36 295	28.08 302	28.80 310	29.52 318	30.24 326	30.96 333	31.68 341	32.40 349	33.12 357	33.84 364	34.56 372

Table 6.3 4800 × 4800 mm to 12 000 × 18 000 mm

	4 800	5 100	5 400	5 700	6 000	6 300	6 600	6 900	7 200	7 500	7 800	8 100	8 400	8 700	9 000	9 300	9 600	9 900	10 200	10 500	10 800	11 100	11 400	11 700	12 000
4 800	23.0 248	24.5 264	25.9 279	27.4 295	28.8 310	30.2 326	31.7 341	33.1 357	34.6 372	36.0 388	37.4 403	38.9 419	40.3 434	41.8 450	43.2 465	44.6 481	46.1 496	47.5 512	49.0 527	50.4 543	51.8 558	53.3 574	54.7 589	56.2 605	57.6 620
5 100	24.5 264	26.0 280	27.5 296	29.1 313	30.6 329	32.1 346	33.7 362	35.2 379	36.7 395	38.2 412	39.8 428	41.3 445	42.8 461	44.4 478	45.9 494	47.4 511	49.0 527	50.5 543	52.0 560	53.5 576	55.1 593	56.6 609	58.1 626	59.7 642	61.2 659
5 400	25.9 279	27.5 296	29.2 314	30.8 331	32.4 349	34.0 366	35.6 384	37.3 401	38.9 419	40.5 436	42.1 453	43.7 471	45.4 488	47.0 506	48.6 523	50.2 541	51.8 558	53.5 575	55.1 593	56.7 610	58.3 628	59.9 645	61.6 663	63.2 680	64.8 698
5 700	27.4 295	29.1 313	30.8 331	32.5 350	34.2 368	35.9 387	37.6 405	39.3 423	41.0 442	42.7 460	44.5 479	46.2 497	47.9 515	49.6 534	51.3 552	53.0 571	54.7 589	56.4 607	58.1 626	59.8 644	61.6 663	63.3 681	65.0 699	66.7 718	68.4 736
6 000	28.8 310	30.6 329	32.4 349	34.2 368	36.0 388	37.8 407	39.6 426	41.4 446	43.2 465	45.0 484	46.8 504	48.6 523	50.4 543	52.2 562	54.0 581	55.8 601	57.6 620	59.4 639	61.2 659	63.0 678	64.8 698	66.6 717	68.4 736	70.2 756	72.0 775
6 300	30.2 326	32.1 346	34.0 366	35.9 387	37.8 407	39.7 427	41.6 448	43.5 468	45.4 488	47.2 509	49.1 529	51.0 549	52.9 570	54.8 590	56.7 610	58.6 631	60.5 651	62.4 671	64.3 692	66.1 712	68.0 732	69.9 753	71.8 773	73.7 793	75.6 814
6 600	31.7 341	33.7 362	35.6 384	37.6 405	39.6 426	41.6 448	43.6 469	45.5 490	47.5 512	49.5 533	51.5 554	53.5 575	55.4 597	57.4 618	59.4 639	61.4 661	63.4 682	65.3 703	67.3 725	69.3 746	71.3 767	73.3 789	75.2 810	77.2 831	79.2 853
6 900	33.1 357	35.2 379	37.3 401	39.3 423	41.4 446	43.5 468	45.5 490	47.6 512	49.7 535	51.7 557	53.8 579	55.9 602	58.0 624	60.0 646	62.1 668	64.2 691	66.2 713	68.3 735	70.4 758	72.4 780	74.5 802	76.6 824	78.7 847	80.7 869	82.8 891
7 200	34.6 372	36.7 395	38.9 419	41.0 442	43.2 465	45.4 488	47.5 512	49.7 535	51.8 558	54.0 581	56.2 605	58.3 628	60.5 651	62.6 674	64.8 698	67.0 721	69.1 744	71.3 767	73.4 791	75.6 814	77.8 837	79.9 860	82.1 884	84.2 907	86.4 930
7 500	36.0 388	38.2 412	40.5 436	42.7 460	45.0 484	47.2 509	49.5 533	51.7 557	54.0 581	56.2 605	58.5 630	60.7 654	63.0 678	65.2 702	67.5 727	69.7 751	72.0 775	74.2 799	76.5 823	78.7 848	81.0 872	83.2 896	85.5 920	87.7 945	90.0 969
7 800	37.4 403	39.8 428	42.1 453	44.5 479	46.8 504	49.1 529	51.5 554	53.8 579	56.2 605	58.5 630	60.8 655	63.2 680	65.5 705	67.9 730	70.2 756	72.5 781	74.9 806	77.2 831	79.6 856	81.9 882	84.2 907	86.6 932	88.9 957	91.3 982	93.6 1008
8 100	38.9 419	41.3 445	43.7 471	46.2 497	48.6 523	51.0 549	53.5 575	55.9 602	58.3 628	60.7 654	63.2 680	65.6 706	68.0 732	70.5 759	72.9 785	75.3 811	77.8 837	80.2 863	82.6 889	85.0 915	87.5 942	89.9 968	92.3 994	94.8 1020	97.2 1046
8 400	40.3 434	42.8 461	45.4 488	47.9 515	50.4 543	52.9 570	55.4 597	58.0 624	60.5 651	63.0 678	65.5 705	68.0 732	70.6 760	73.1 787	75.6 814	78.1 841	80.6 868	83.2 895	85.7 922	88.2 949	90.7 977	93.2 1004	95.8 1031	98.3 1058	100.8 1085
8 700	41.8 450	44.4 478	47.0 506	49.6 534	52.2 562	54.8 590	57.4 618	60.0 646	62.6 674	65.2 702	67.9 730	70.5 759	73.1 787	75.7 815	78.3 843	80.9 871	83.5 899	86.1 927	88.7 955	91.3 983	94.0 1011	96.6 1039	99.2 1068	101.8 1096	104.4 1124
9 000	43.2 465	45.9 494	48.6 523	51.3 552	54.0 581	56.7 610	59.4 639	62.1 668	64.8 698	67.5 727	70.2 756	72.9 785	75.6 814	78.3 843	81.0 872	83.7 901	86.4 930	89.1 959	91.8 988	94.5 1017	97.2 1046	99.9 1075	102.6 1104	105.3 1133	108.0 1163
9 300	44.6 481	47.4 511	50.2 541	53.0 571	55.8 601	58.6 631	61.4 661	64.2 691	67.0 721	69.7 751	72.5 781	75.3 811	78.1 841	80.9 871	83.7 901	86.5 931	89.3 961	92.1 991	94.9 1021	97.6 1051	100.4 1081	103.2 1111	106.0 1141	108.8 1171	111.6 1201
9 600	46.1 496	49.0 527	51.8 558	54.7 589	57.6 620	60.5 651	63.4 682	66.2 713	69.1 744	72.0 775	74.9 806	77.8 837	80.6 868	83.5 899	86.4 930	89.3 961	92.2 992	95.0 1023	97.9 1054	100.8 1085	103.7 1116	106.6 1147	109.4 1178	112.3 1209	115.2 1240
9 900	47.5 512	50.5 543	53.5 575	56.4 607	59.4 639	62.4 671	65.3 703	68.3 735	71.3 767	74.2 799	77.2 831	80.2 863	83.2 895	86.1 927	89.1 959	92.1 991	95.0 1023	98.0 1055	101.0 1087	103.9 1119	106.9 1151	109.9 1183	112.9 1215	115.8 1247	118.8 1279
10 200	49.0 527	52.0 560	55.1 593	58.1 626	61.2 659	64.3 692	67.3 725	70.4 758	73.4 791	76.5 823	79.6 856	82.6 889	85.7 922	88.7 955	91.8 988	94.9 1021	97.9 1054	101.0 1087	104.0 1120	107.1 1153	110.2 1186	113.2 1219	116.3 1252	119.3 1285	122.4 1318
10 500	50.4 543	53.5 576	56.7 610	59.8 644	63.0 678	66.1 712	69.3 746	72.4 780	75.6 814	78.7 848	81.9 882	85.0 915	88.2 949	91.3 983	94.5 1017	97.6 1051	100.8 1085	103.9 1119	107.1 1153	110.2 1187	113.4 1221	116.5 1255	119.7 1288	122.8 1322	126.0 1356
10 800	51.8 558	55.1 593	58.3 628	61.6 663	64.8 698	68.0 732	71.3 767	74.5 802	77.8 837	81.0 872	84.2 907	87.5 942	90.7 977	94.0 1011	97.2 1046	100.4 1081	103.7 1116	106.9 1151	110.2 1186	113.4 1221	116.6 1256	119.9 1290	123.1 1325	126.4 1360	129.6 1395
11 100	53.3 574	56.6 609	59.9 645	63.3 681	66.6 717	69.9 753	73.3 789	76.6 824	79.9 860	83.2 896	86.6 932	89.9 968	93.2 1004	96.6 1039	99.9 1075	103.2 1111	106.6 1147	109.9 1183	113.2 1219	116.5 1255	119.9 1290	123.2 1326	126.5 1362	129.9 1398	133.2 1434
11 400	54.7 589	58.1 626	61.6 663	65.0 699	68.4 736	71.8 773	75.2 810	78.7 847	82.1 884	85.5 920	88.9 957	92.3 994	95.8 1031	99.2 1068	102.6 1104	106.0 1141	109.4 1178	112.9 1215	116.3 1252	119.7 1288	123.1 1325	126.5 1362	130.0 1399	133.4 1436	136.8 1473
11 700	56.2 605	59.7 642	63.2 680	66.7 718	70.2 756	73.7 793	77.2 831	80.7 869	84.2 907	87.7 945	91.3 982	94.8 1020	98.3 1058	101.8 1096	105.3 1133	108.8 1171	112.3 1209	115.8 1247	119.3 1205	122.8 1322	126.4 1360	129.9 1398	133.4 1436	136.9 1473	140.4 1511
12 000	57.6 620	61.2 659	64.8 698	68.4 736	72.0 775	75.6 814	79.2 853	82.8 891	86.4 930	90.0 969	93.6 1008	97.2 1046	100.8 1085	104.4 1124	108.0 1163	111.6 1201	115.2 1240	118.8 1279	122.4 1318	126.0 1356	129.6 1395	133.2 1434	136.8 1473	140.4 1511	144.0 1550
12 300	59.0 636	62.7 675	66.4 715	70.1 755	73.8 794	77.5 834	81.2 874	84.9 914	88.6 953	92.2 993	95.9 1033	99.6 1072	103.3 1112	107.0 1152	110.7 1192	114.4 1231	118.1 1271	121.8 1311	125.5 1350	129.1 1390	132.8 1430	136.5 1470	140.2 1509	143.9 1549	147.6 1589
12 600	60.5 651	64.3 692	68.0 732	71.8 773	75.6 814	79.4 854	83.2 895	86.9 936	90.7 977	94.5 1017	98.3 1058	102.1 1099	105.8 1139	109.6 1180	113.4 1221	117.2 1261	121.0 1302	124.7 1343	128.5 1383	132.3 1424	136.1 1465	139.9 1505	143.6 1546	147.4 1587	151.2 1628
12 900	61.9 667	65.8 708	69.7 750	73.5 791	77.4 833	81.3 875	85.1 916	89.0 958	92.9 1000	96.7 1041	100.6 1083	104.5 1125	108.4 1166	112.2 1208	116.1 1250	120.0 1291	123.8 1333	127.7 1375	131.6 1416	135.4 1458	139.3 1500	143.2 1541	147.1 1583	150.9 1625	154.8 1666
13 200	63.4 682	67.3 725	71.3 767	75.2 810	79.2 853	83.2 895	87.1 938	91.1 980	95.0 1023	99.0 1066	103.0 1108	106.9 1151	110.9 1194	114.8 1236	118.8 1279	122.8 1321	126.7 1364	130.7 1407	134.6 1449	138.6 1492	142.6 1535	146.5 1577	150.5 1620	154.4 1662	158.4 1705
13 500	64.8 698	68.8 741	72.9 785	76.9 828	81.0 872	85.0 915	89.1 959	93.1 1003	97.2 1046	101.2 1090	105.3 1133	109.3 1177	113.4 1221	117.4 1264	121.5 1308	125.5 1351	129.6 1395	133.6 1439	137.7 1482	141.8 1526	145.8 1569	149.8 1613	153.9 1657	157.9 1700	162.0 1744
13 800	66.2 713	70.4 758	74.5 802	78.7 847	82.8 891	86.9 936	91.1 980	95.2 1025	99.4 1070	103.5 1114	107.6 1159	111.8 1203	115.9 1248	120.1 1292	124.2 1337	128.3 1381	132.5 1426	136.6 1471	140.8 1515	144.9 1560	149.0 1604	153.2 1649	157.3 1693	161.5 1738	165.6 1783
14 100	67.7 729	71.9 774	76.1 820	80.4 865	84.6 911	88.8 956	93.1 1002	97.3 1047	101.5 1093	105.7 1138	110.0 1184	114.2 1229	118.4 1275	122.7 1320	126.9 1366	131.1 1411	135.4 1457	139.6 1503	143.8 1548	148.0 1594	152.3 1639	156.5 1685	160.7 1730	165.0 1776	169.2 1821
14 400	69.1 744	73.4 791	77.8 837	82.1 884	86.4 930	90.7 977	95.0 1023	99.4 1070	103.7 1116	108.0 1163	112.3 1209	116.6 1256	121.0 1302	125.3 1349	129.6 1395	133.9 1442	138.2 1488	142.6 1535	146.9 1581	151.2 1628	155.5 1674	159.8 1721	164.2 1767	168.5 1814	172.8 1860
14 700	70.6 760	75.0 807	79.4 854	83.8 902	88.2 949	92.6 997	97.0 1044	101.4 1092	105.8 1139	110.2 1187	114.7 1234	119.1 1282	123.5 1329	127.9 1377	132.3 1424	136.7 1472	141.1 1519	145.5 1566	149.9 1614	154.3 1661	158.8 1709	163.2 1756	167.6 1804	172.0 1851	176.4 1899
15 000	72.0 775	76.5 823	81.0 872	85.5 920	90.0 969	94.5 1017	99.0 1066	103.5 1114	108.0 1163	112.5 1211	117.0 1259	121.5 1308	126.0 1356	130.5 1405	135.0 1453	139.5 1502	144.0 1550	148.5 1598	153.0 1647	157.5 1695	162.0 1744	166.5 1792	171.0 1841	175.5 1889	180.0 1938
15 300	73.4 792	78.0 840	82.6 889	87.2 939	91.8 988	96.4 1038	101.0 1087	105.6 1136	110.2 1186	114.7 1235	119.3 1285	123.9 1334	128.5 1383	133.1 1433	137.7 1482	142.3 1532	146.9 1581	151.5 1630	156.1 1680	160.6 1729	165.2 1779	169.8 1828	174.4 1877	179.0 1927	183.6 1976
15 600	74.9 806	79.6 856	84.2 907	88.9 957	93.6 1008	98.3 1058	103.0 1108	107.6 1159	112.3 1209	117.0 1259	121.7 1310	126.4 1360	131.0 1411	135.7 1461	140.4 1511	145.1 1562	149.8 1612	154.4 1662	159.1 1713	163.8 1763	168.5 1814	173.2 1864	177.8 1914	182.5 1965	187.2 2015
15 900	76.3 822	81.1 873	85.9 924	90.6 976	95.4 1027	100.2 1078	104.9 1130	109.7 1181	114.5 1232	119.2 1284	124.0 1335	128.8 1386	133.6 1438	138.3 1489	143.1 1540	147.9 1592	152.6 1643	157.4 1694	162.2 1746	166.9 1797	171.7 1848	176.5 1900	181.3 1951	186.0 2002	190.8 2054
16 200	77.8 837	82.6 889	87.5 942	92.3 994	97.2 1046	102.1 1099	106.9 1151	111.8 1203	116.6 1256	121.5 1308	126.4 1360	131.2 1412	136.1 1465	140.9 1517	145.8 1569	150.7 1622	155.5 1674	160.4 1726	165.2 1779	170.1 1831	175.0 1883	179.8 1936	184.7 1988	189.5 2040	194.4 2093
16 500	79.2 853	84.1 906	89.1 959	94.0 1012	99.0 1066	103.9 1119	108.9 1172	113.8 1225	118.8 1279	123.7 1332	128.7 1385	133.6 1439	138.6 1492	143.6 1545	148.5 1598	153.4 1652	158.4 1705	163.3 1758	168.3 1812	173.2 1865	178.2 1918	183.2 1971	188.1 2025	193.0 2078	198.0 2131
16 800	80.6 868	85.7 922	90.7 977	95.8 1031	100.8 1085	105.8 1139	110.9 1194	115.9 1248	121.0 1302	126.0 1356	131.0 1411	136.1 1465	141.1 1519	146.2 1573	151.2 1628	156.2 1682	161.3 1736	166.3 1790	171.4 1845	176.4 1899	181.4 1953	186.5 2007	191.5 2062	196.6 2116	201.6 2170
17 100	82.1 884	87.2 939	92.3 994	97.5 1049	102.6 1104	107.7 1160	112.9 1215	118.0 1270	123.1 1325	128.2 1380	133.4 1436	138.5 1491	143.6 1546	148.8 1601	153.9 1657	159.0 1712	164.2 1767	169.3 1822	174.4 1877	179.5 1933	184.7 1988	189.8 2043	194.9 2098	200.1 2154	205.2 2209
17 400	83.5 899	88.7 955	94.0 1011	99.2 1068	104.4 1124	109.6 1180	114.8 1236	120.1 1292	125.3 1349	130.5 1405	135.7 1461	140.9 1517	146.2 1573	151.4 1629	156.6 1686	161.8 1742	167.0 1798	172.3 1854	177.5 1910	182.7 1967	187.9 2023	193.1 2079	198.4 2135	203.6 2191	208.8 2248
17 700	85.0 915	90.3 972	95.6 1029	100.9 1086	106.2 1143	111.5 1200	116.8 1257	122.1 1315	127.4 1372	132.7 1429	138.1 1486	143.4 1543	148.7 1600	154.0 1658	159.3 1715	164.6 1772	169.9 1829	175.2 1886	180.5 1943	185.8 2000	191.2 2058	196.5 2115	201.8 2172	207.1 2229	212.4 2286
18 000	86.4 930	91.8 988	97.2 1046	102.6 1104	108.0 1163	113.4 1221	118.8 1279	124.2 1337	129.6 1395	135.0 1453	140.4 1511	145.8 1569	151.2 1628	156.6 1686	162.0 1744	167.4 1802	172.8 1860	178.2 1918	183.6 1976	189.0 2034	194.4 2093	199.8 2151	205.2 2209	210.6 2267	216.0 2325

Table 6.4 12 000 × 12 000 mm to 24 000 × 36 000 mm

	12 000	12 600	13 200	13 800	14 400	15 000	15 600	16 200	16 800	17 400	18 000	18 600	19 200	19 800	20 400	21 000	21 600	22 200	22 800	23 400	24 000
12 000	144.0 *1550*	151.2 *1628*	158.4 *1705*	165.6 *1783*	172.8 *1860*	180.0 *1938*	187.2 *2015*	194.4 *2093*	201.6 *2170*	208.8 *2248*	216.0 *2325*	223.2 *2403*	230.4 *2480*	237.6 *2558*	244.8 *2635*	252.0 *2713*	259.2 *2790*	266.4 *2868*	273.6 *2945*	280.8 *3023*	288.0 *3100*
12 600	151.2 *1628*	158.8 *1709*	166.3 *1790*	173.9 *1872*	181.4 *1953*	189.0 *2034*	196.6 *2116*	204.1 *2197*	211.7 *2279*	219.2 *2360*	226.8 *2441*	234.4 *2523*	241.9 *2604*	249.5 *2685*	257.9 *2767*	264.6 *2848*	272.2 *2930*	279.7 *3011*	287.3 *3092*	294.8 *3174*	302.4 *3255*
13 200	158.4 *1705*	166.3 *1790*	174.2 *1876*	182.2 *1961*	190.1 *2046*	198.0 *2131*	205.9 *2217*	213.8 *2302*	221.8 *2387*	229.7 *2472*	237.6 *2558*	245.5 *2643*	253.4 *2728*	261.4 *2813*	269.3 *2899*	277.2 *2984*	285.1 *3069*	293.0 *3154*	301.0 *3240*	308.9 *3325*	316.8 *3410*
13 800	165.6 *1783*	173.9 *1872*	182.2 *1961*	190.4 *2050*	198.7 *2139*	207.0 *2228*	215.3 *2317*	223.6 *2406*	231.8 *2496*	240.1 *2585*	248.4 *2674*	256.7 *2763*	265.0 *2852*	273.2 *2941*	281.5 *3030*	289.8 *3119*	298.1 *3209*	306.4 *3298*	314.6 *3387*	322.9 *3476*	331.2 *3565*
14 400	172.8 *1860*	181.4 *1953*	190.1 *2046*	198.7 *2139*	207.4 *2232*	216.0 *2325*	224.6 *2418*	233.3 *2511*	241.9 *2604*	250.6 *2697*	259.2 *2790*	267.8 *2883*	276.5 *2976*	285.1 *3069*	293.8 *3162*	302.4 *3255*	311.0 *3348*	319.7 *3441*	328.3 *3534*	337.0 *3627*	345.6 *3720*
15 000	180.0 *1938*	189.0 *2034*	198.0 *2131*	207.0 *2228*	216.0 *2325*	225.0 *2422*	234.0 *2519*	243.0 *2616*	252.0 *2713*	261.0 *2809*	270.0 *2906*	279.0 *3003*	288.0 *3100*	297.0 *3197*	306.0 *3294*	315.0 *3391*	324.0 *3488*	333.0 *3584*	342.0 *3681*	351.0 *3778*	360.0 *3875*
15 600	187.2 *2015*	196.6 *2116*	205.9 *2217*	215.3 *2317*	224.6 *2418*	234.0 *2519*	243.4 *2620*	252.7 *2720*	262.1 *2821*	271.4 *2922*	280.8 *3023*	290.2 *3123*	299.5 *3224*	308.9 *3325*	318.2 *3426*	327.6 *3526*	337.0 *3627*	346.3 *3728*	355.7 *3829*	365.0 *3929*	374.4 *4030*
16 200	194.4 *2093*	204.1 *2197*	213.8 *2302*	223.6 *2406*	233.3 *2511*	243.0 *2616*	252.7 *2720*	262.4 *2825*	272.2 *2930*	281.9 *3034*	291.6 *3139*	301.3 *3243*	311.0 *3348*	320.8 *3453*	330.5 *3557*	340.2 *3662*	349.9 *3767*	359.6 *3871*	369.0 *3976*	379.1 *4080*	388.8 *4185*
16 800	201.6 *2170*	211.7 *2279*	221.8 *2387*	231.8 *2496*	241.9 *2604*	252.0 *2713*	262.1 *2821*	272.2 *2930*	282.2 *3038*	292.3 *3147*	302.4 *3255*	312.5 *3364*	322.6 *3472*	332.6 *3581*	342.7 *3689*	352.8 *3798*	362.9 *3906*	373.0 *4015*	383.0 *4123*	393.1 *4232*	403.2 *4340*
17 400	208.8 *2248*	219.2 *2360*	229.7 *2472*	240.1 *2585*	250.6 *2697*	261.0 *2809*	271.4 *2922*	281.9 *3034*	292.3 *3147*	302.8 *3259*	313.2 *3371*	323.6 *3484*	334.1 *3596*	344.5 *3708*	355.0 *3821*	365.4 *3933*	375.8 *4046*	386.3 *4158*	396.7 *4270*	407.2 *4383*	417.6 *4495*
18 000	216.0 *2325*	226.8 *2441*	237.6 *2558*	248.4 *2674*	259.2 *2790*	270.0 *2906*	280.8 *3023*	291.6 *3139*	302.4 *3255*	313.2 *3371*	324.0 *3488*	334.8 *3604*	345.6 *3720*	356.4 *3836*	367.2 *3953*	378.0 *4069*	388.8 *4185*	399.6 *4302*	410.4 *4418*	421.2 *4534*	432.0 *4650*
18 600	223.2 *2403*	234.4 *2523*	245.5 *2643*	256.7 *2763*	267.8 *2883*	279.0 *3003*	290.2 *3123*	301.3 *3243*	312.5 *3364*	323.6 *3484*	334.8 *3604*	346.0 *3724*	357.1 *3844*	368.3 *3964*	379.4 *4084*	390.6 *4204*	401.8 *4325*	412.9 *4445*	424.1 *4565*	435.2 *4685*	446.4 *4805*
19 200	230.4 *2480*	241.9 *2604*	253.4 *2728*	265.0 *2852*	276.5 *2976*	288.0 *3100*	299.5 *3224*	311.0 *3348*	322.6 *3472*	334.1 *3596*	345.6 *3720*	357.1 *3844*	368.6 *3968*	380.2 *4092*	391.7 *4216*	403.2 *4340*	414.7 *4464*	426.2 *4588*	437.8 *4712*	449.3 *4836*	460.8 *4960*
19 800	237.6 *2558*	249.5 *2685*	261.4 *2813*	273.2 *2941*	285.1 *3069*	297.0 *3197*	308.9 *3325*	320.8 *3453*	332.6 *3581*	344.5 *3708*	356.4 *3836*	368.3 *3964*	380.2 *4092*	392.0 *4220*	403.9 *4349*	415.8 *4476*	427.7 *4604*	439.6 *4731*	451.4 *4859*	463.3 *4987*	475.2 *5115*
20 400	244.8 *2635*	257.0 *2767*	269.3 *2899*	281.5 *3030*	293.8 *3162*	306.0 *3294*	318.2 *3426*	330.5 *3557*	342.7 *3689*	355.0 *3821*	367.2 *3953*	379.4 *4084*	391.7 *4216*	403.9 *4348*	416.2 *4480*	428.4 *4611*	440.6 *4743*	452.9 *4875*	465.1 *5007*	477.4 *5138*	489.6 *5270*
21 000	252.0 *2713*	264.6 *2848*	277.2 *2984*	289.8 *3119*	302.4 *3255*	315.0 *3391*	327.6 *3526*	340.2 *3662*	352.8 *3798*	365.4 *3933*	378.0 *4069*	390.6 *4204*	403.2 *4340*	415.8 *4476*	428.4 *4611*	441.0 *4747*	453.6 *4883*	466.2 *5018*	478.8 *5154*	491.4 *5289*	504.0 *5425*
21 600	259.2 *2790*	272.2 *2930*	285.1 *3069*	298.1 *3209*	311.0 *3348*	324.0 *3488*	337.0 *3627*	349.9 *3767*	362.9 *3906*	375.8 *4046*	388.8 *4185*	401.8 *4325*	414.7 *4464*	427.7 *4604*	440.6 *4743*	453.6 *4883*	466.6 *5022*	479.5 *5162*	492.5 *5301*	505.4 *5441*	518.4 *5580*
22 200	266.4 *2868*	279.7 *3011*	293.0 *3154*	306.4 *3298*	319.7 *3441*	333.0 *3584*	346.3 *3728*	359.6 *3871*	373.0 *4015*	386.3 *4158*	399.6 *4302*	412.9 *4445*	426.2 *4588*	439.6 *4731*	452.9 *4875*	466.2 *5018*	479.5 *5162*	492.8 *5305*	506.2 *5448*	519.5 *5592*	532.8 *5735*
22 800	273.6 *2945*	287.3 *3092*	301.0 *3240*	314.6 *3387*	328.3 *3534*	342.0 *3681*	355.7 *3829*	369.4 *3976*	383.0 *4123*	396.7 *4270*	410.4 *4418*	424.1 *4565*	437.8 *4712*	451.4 *4859*	465.1 *5007*	478.8 *5154*	492.5 *5301*	506.2 *5448*	519.8 *5596*	533.5 *5742*	547.2 *5890*
23 400	280.8 *3023*	294.8 *3174*	308.9 *3325*	322.9 *3476*	337.0 *3627*	351.0 *3778*	365.0 *3929*	379.1 *4080*	393.1 *4232*	407.2 *4383*	421.2 *4534*	435.2 *4685*	449.3 *4836*	463.3 *4987*	477.4 *5138*	491.4 *5289*	505.4 *5441*	519.5 *5592*	533.5 *5743*	547.6 *5894*	561.6 *6045*
24 000	288.0 *3100*	302.4 *3255*	316.8 *3410*	331.2 *3565*	345.6 *3720*	360.0 *3875*	374.4 *4030*	388.8 *4185*	403.2 *4340*	417.6 *4495*	432.0 *4650*	446.4 *4805*	460.8 *4960*	475.2 *5115*	489.6 *5270*	504.0 *5425*	518.4 *5580*	532.8 *5735*	547.2 *5890*	561.6 *6045*	576.0 *6200*
24 600	295.2 *3178*	310.0 *3336*	324.7 *3495*	339.5 *3654*	354.2 *3813*	369.0 *3972*	383.8 *4131*	398.5 *4290*	413.3 *4449*	428.0 *4607*	442.8 *4766*	457.6 *4925*	472.3 *5084*	487.1 *5243*	501.8 *5402*	516.8 *5561*	531.4 *5720*	546.1 *5878*	560.9 *6037*	575.6 *6196*	590.4 *6355*
25 200	302.4 *3255*	317.5 *3418*	332.6 *3581*	347.8 *3743*	362.9 *3906*	378.0 *4069*	393.1 *4232*	408.2 *4394*	423.4 *4557*	438.5 *4720*	453.6 *4883*	468.7 *5045*	483.8 *5208*	499.0 *5371*	514.1 *5534*	529.2 *5696*	544.3 *5859*	559.4 *6022*	574.6 *6185*	589.7 *6347*	604.8 *6510*
25 800	309.6 *3333*	325.1 *3499*	340.6 *3666*	356.0 *3832*	371.5 *3999*	387.0 *4166*	402.5 *4332*	418.0 *4499*	433.4 *4666*	448.9 *4832*	464.4 *4999*	479.9 *5165*	495.4 *5332*	510.8 *5499*	526.3 *5665*	541.8 *5832*	557.3 *5999*	572.8 *6165*	588.2 *6332*	603.7 *6498*	619.2 *6665*
26 400	316.8 *3410*	332.6 *3581*	348.5 *3751*	364.3 *3922*	380.2 *4092*	396.0 *4263*	411.8 *4433*	427.7 *4604*	443.5 *4774*	459.4 *4945*	475.2 *5115*	491.0 *5286*	506.9 *5456*	522.7 *5627*	538.6 *5797*	554.4 *5968*	570.2 *6138*	586.1 *6309*	601.9 *6479*	617.8 *6650*	633.6 *6820*
27 000	324.0 *3488*	340.2 *3662*	356.4 *3836*	372.6 *4011*	388.8 *4185*	405.0 *4359*	421.2 *4534*	437.4 *4708*	453.6 *4883*	469.8 *5057*	486.0 *5231*	502.2 *5406*	518.4 *5580*	534.6 *5754*	550.8 *5929*	567.0 *6103*	583.2 *6278*	599.4 *6452*	615.6 *6626*	631.8 *6801*	648.0 *6975*
27 600	331.2 *3565*	347.8 *3743*	364.3 *3922*	380.9 *4100*	397.4 *4278*	414.0 *4456*	430.6 *4635*	447.1 *4813*	463.7 *4991*	480.2 *5169*	496.8 *5348*	513.4 *5526*	529.9 *5704*	546.5 *5882*	563.0 *6061*	579.6 *6239*	596.2 *6417*	612.7 *6595*	629.3 *6774*	645.8 *6952*	662.4 *7130*
28 200	338.4 *3643*	355.3 *3825*	372.2 *4007*	389.2 *4189*	406.1 *4371*	423.0 *4553*	439.9 *4735*	456.8 *4917*	473.8 *5100*	490.7 *5282*	507.6 *5464*	524.5 *5646*	541.4 *5828*	558.4 *6010*	575.3 *6192*	592.2 *6374*	609.1 *6557*	626.0 *6739*	643.0 *6921*	659.9 *7103*	676.8 *7285*
28 800	345.6 *3720*	362.9 *3906*	380.2 *4092*	397.4 *4278*	414.7 *4464*	432.0 *4650*	449.3 *4836*	466.6 *5022*	483.8 *5208*	501.1 *5394*	518.4 *5580*	535.7 *5766*	553.0 *5952*	570.2 *6138*	587.5 *6324*	604.8 *6510*	622.1 *6696*	639.4 *6882*	656.6 *7068*	673.9 *7254*	691.2 *7440*
29 400	352.8 *3798*	370.4 *3987*	388.1 *4177*	405.7 *4367*	423.4 *4557*	441.0 *4747*	458.6 *4937*	476.3 *5127*	493.9 *5317*	511.6 *5506*	529.2 *5696*	546.8 *5886*	564.5 *6076*	582.1 *6266*	599.8 *6456*	617.4 *6646*	635.0 *6836*	652.7 *7025*	670.3 *7215*	688.0 *7405*	705.6 *7595*
30 000	360.0 *3875*	378.0 *4069*	396.0 *4263*	414.0 *4456*	432.0 *4650*	450.0 *4844*	468.0 *5038*	486.0 *5231*	504.0 *5425*	522.0 *5619*	540.0 *5813*	558.0 *6006*	576.0 *6200*	594.0 *6394*	612.0 *6588*	630.0 *6781*	648.0 *6975*	666.0 *7169*	684.0 *7363*	702.0 *7556*	720.0 *7750*
30 600	367.2 *3953*	385.6 *4150*	403.9 *4348*	422.3 *4545*	440.6 *4743*	459.0 *4941*	477.4 *5138*	495.7 *5336*	514.1 *5534*	532.4 *5731*	550.8 *5929*	569.2 *6126*	587.5 *6324*	605.9 *6522*	624.2 *6719*	642.6 *6917*	661.0 *7115*	679.2 *7312*	697.7 *7510*	716.0 *7707*	734.4 *7905*
31 200	374.4 *4030*	393.1 *4232*	411.8 *4433*	430.6 *4635*	449.3 *4836*	468.0 *5038*	486.7 *5239*	505.4 *5441*	524.2 *5642*	542.9 *5844*	561.6 *6045*	580.3 *6247*	599.0 *6448*	617.8 *6650*	636.5 *6851*	655.2 *7053*	673.9 *7254*	692.6 *7456*	711.4 *7657*	730.1 *7859*	748.8 *8060*
31 800	381.6 *4108*	400.7 *4313*	419.8 *4518*	438.8 *4724*	457.9 *4929*	477.0 *5134*	496.1 *5340*	515.2 *5545*	534.2 *5751*	553.3 *5956*	572.4 *6161*	591.5 *6367*	610.6 *6572*	629.6 *6777*	648.7 *6983*	667.8 *7188*	686.9 *7394*	706.0 *7599*	725.0 *7804*	744.1 *8010*	763.2 *8215*
32 400	388.8 *4185*	408.2 *4394*	427.7 *4604*	447.1 *4813*	466.6 *5022*	486.0 *5231*	505.4 *5441*	524.9 *5650*	544.3 *5859*	563.8 *6068*	583.2 *6276*	602.6 *6487*	622.1 *6696*	641.5 *6905*	661.0 *7115*	680.4 *7324*	699.8 *7533*	719.3 *7742*	738.7 *7952*	758.2 *8161*	777.6 *8370*
33 000	396.0 *4263*	415.8 *4476*	435.6 *4689*	455.4 *4902*	475.2 *5115*	495.0 *5328*	514.8 *5541*	534.6 *5754*	554.4 *5968*	574.2 *6181*	594.0 *6394*	613.8 *6607*	633.6 *6820*	653.4 *7033*	673.2 *7246*	693.0 *7459*	712.8 *7673*	732.6 *7886*	752.4 *8099*	772.2 *8312*	792.0 *8525*
33 600	403.2 *4340*	423.4 *4557*	443.5 *4774*	463.7 *4991*	483.8 *5208*	504.0 *5425*	524.2 *5642*	544.3 *5859*	564.5 *6076*	584.6 *6293*	604.8 *6510*	625.0 *6727*	645.1 *6944*	665.3 *7161*	685.4 *7378*	705.6 *7595*	725.8 *7812*	745.9 *8029*	766.1 *8246*	786.2 *8463*	806.4 *8680*
34 200	410.4 *4418*	430.9 *4638*	451.4 *4859*	472.0 *5080*	492.5 *5301*	513.0 *5522*	533.5 *5743*	554.0 *5964*	574.6 *6185*	595.1 *6405*	615.6 *6626*	636.1 *6847*	656.6 *7068*	677.2 *7289*	697.7 *7510*	718.2 *7731*	738.7 *7952*	759.2 *8172*	779.8 *8393*	800.3 *8614*	820.8 *8835*
34 800	417.6 *4495*	438.5 *4720*	459.4 *4945*	480.2 *5169*	501.1 *5394*	522.0 *5619*	542.9 *5844*	563.8 *6068*	584.6 *6293*	605.5 *6518*	626.4 *6743*	647.3 *6967*	668.2 *7192*	689.0 *7417*	709.9 *7642*	730.8 *7866*	751.7 *8091*	772.6 *8316*	793.4 *8541*	814.3 *8765*	835.2 *8990*
35 400	424.8 *4573*	446.0 *4801*	467.3 *5030*	488.5 *5258*	509.8 *5487*	531.0 *5716*	552.2 *5944*	573.5 *6173*	594.7 *6402*	616.0 *6630*	637.2 *6859*	658.4 *7087*	679.7 *7316*	700.9 *7545*	722.2 *7773*	743.4 *8002*	764.6 *8231*	785.9 *8459*	807.1 *8688*	828.4 *8916*	849.6 *9145*
36 000	423.0 *4650*	453.6 *4883*	475.2 *5115*	496.8 *5348*	518.4 *5580*	540.0 *5813*	561.6 *6045*	583.2 *6278*	604.8 *6510*	626.4 *6743*	648.0 *6975*	669.6 *7208*	691.2 *7440*	712.8 *7673*	734.4 *7905*	756.0 *8138*	777.6 *8370*	799.2 *8603*	820.8 *8835*	842.4 *9068*	864.0 *9300*

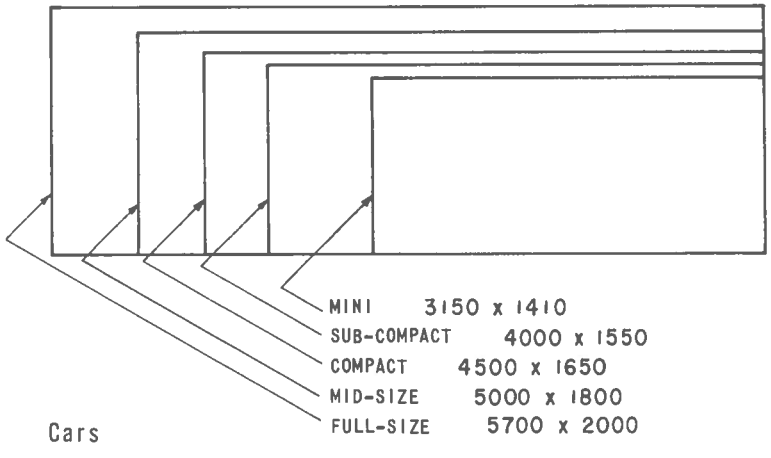
PART 7. EXTERNAL CIRCULATION

7.1 The illustrations shown in Figures 7.1 - 7.5 are included as examples of vehicles, and parking and turning spaces in metric dimensions. Designers are referred to the following comprehensive publications, both of which will be converted to metric in due course:

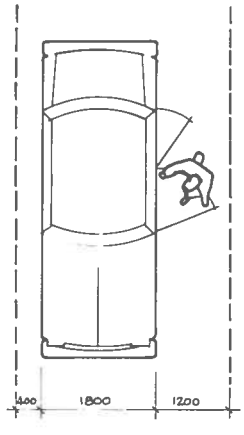
"Geometric Design Manual," Roads and Transportation Association of Canada (RTAC).

"A Policy on Geometric Design for Rural Highways," American Association of State Highway Officials (AASHO).

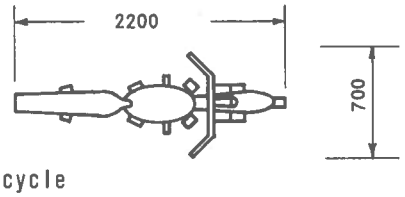
(It should be noted that some provincial and municipal authorities stipulate specific requirements for roads and parking areas within their jurisdiction.)



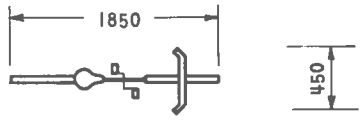
Cars



CAR SPACE



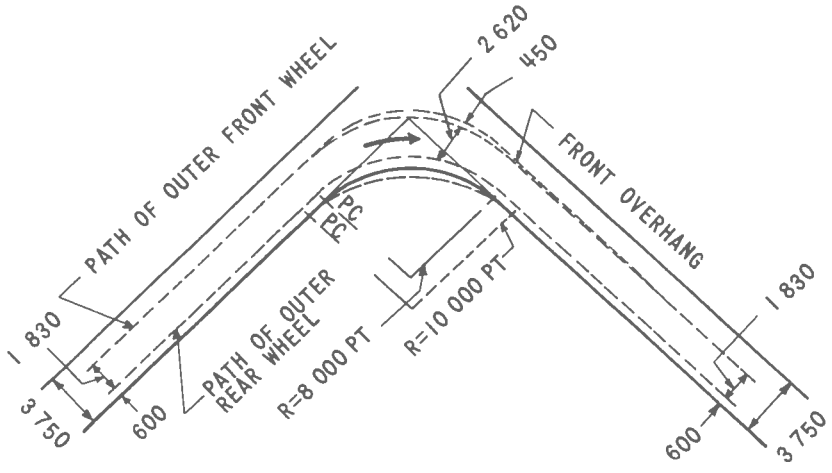
Motorcycle



Bicycle

NOTE: ALL DIMENSIONS ARE GIVEN IN MILLIMETRES

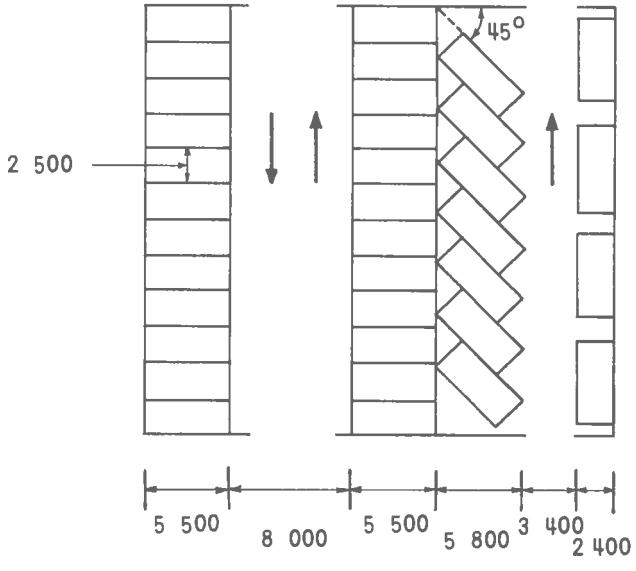
FIG. 7.1 SAMPLE VEHICLE SIZES



SCALE: 1:500

NOTE: ALL DIMENSIONS ARE GIVEN IN MILLIMETRES

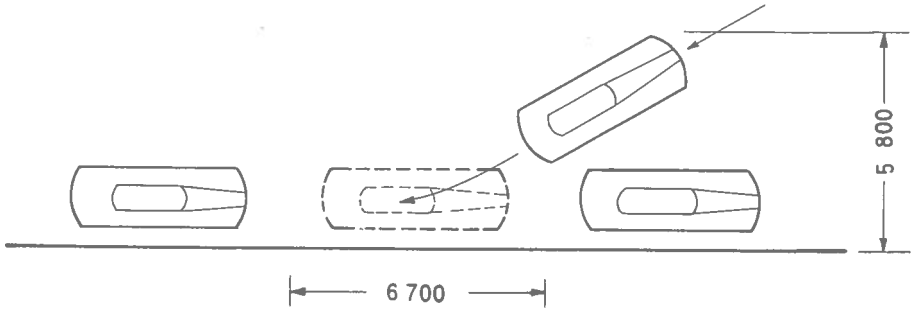
FIG. 7.2 MINIMUM SIMPLE CURVE (8000 OR 10 000 RADIUS)



SCALE: 1:500

NOTE: ALL DIMENSIONS ARE GIVEN IN MILLIMETRES

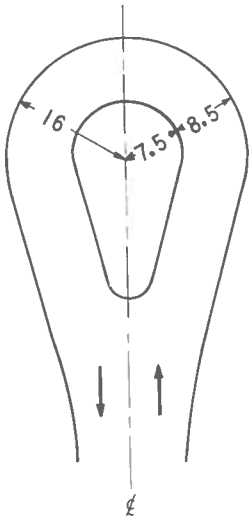
FIG. 7.3 SAMPLE PARKING LOT LAYOUT



SCALE: 1:200

NOTE: ALL DIMENSIONS ARE GIVEN IN MILLIMETRES

FIG. 7.4 TYPICAL CURB PARKING



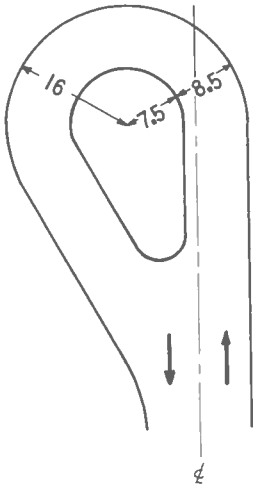
CIRCULAR

IN RESIDENTIAL AREAS

This cul-de-sac would permit a fire truck and a flusher equipped with a snow plough to turn even if an isolated car is parked along the curb.

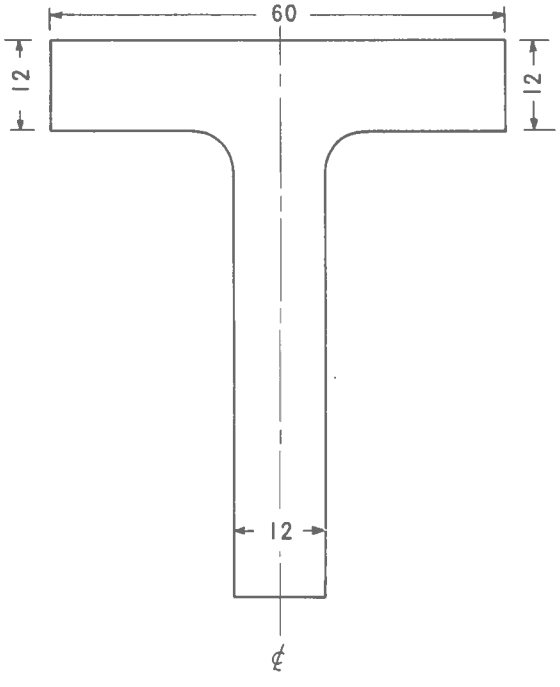
IN INDUSTRIAL AREAS

This cul-de-sac would permit a WB50 semitrailer to turn if no car is parked along the curb.

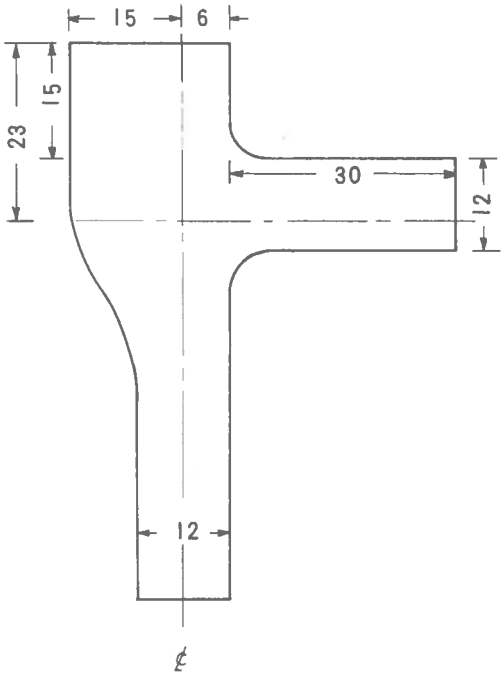


CIRCULAR OFFSET

MINIMUM DIMENSIONS REQUIRED
FOR MOVEMENTS OF A WB50 SEMITRAILER



T-TYPE



BRANCH TYPE

SCALE: 1:100

NOTE: All dimensions are given in metres

FIG. 7.5 SAMPLE CULS-DE-SAC

7.2 EXPRESSION OF SLOPE

7.2.1 *Conventions*

Previous practice used different ways to express slope in drawings: an angle was expressed in degrees and minutes; ratio of vertical to horizontal was expressed, for example, as inch per foot, foot per foot, or feet per mile; gradients were expressed as percentages. The use of millimetres or metres in building drawings favours the adaptation of nondimensional ratio as the expression of slope. This has been recognized in the draft standard CSA B78.3 "Building Drawing Practice." For instance, a slope of 1:2 (i.e., a vertical: horizontal ratio of 100:200 or of 50:100) is a clearer way of expressing slope than the angular equivalent of 26° 34'. It also simplifies site layout. In special cases where a high degree of accuracy is required, however, the draft standard accepts angular expressions for slopes.

7.2.2 *Expression of slope as a ratio*

In expressing slope as a ratio, the vertical component is always shown first. Thus for slopes less than 45°, the first number should always be shown as unity, e.g., a ratio of 1:5 indicates a rise of 1 mm for every 5 mm of horizontal dimension, or 1 m for every 5 m, etc. For slopes steeper than 45°, the second number, i.e., the horizontal component, should always be unity to facilitate easy verification. Ratio of 5:1 expresses a rise of 5 mm for a horizontal dimension of 1 mm or 5 m for each 1 m, etc. The use of mixed units, such as, 1 mm in 10 m, 5 m in 1 km should be avoided if possible.

Table 7.1 shows ratios, angular expressions and percentages for easy calculation from one system to another.

Table 7.1 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°	∞

PART 8. CONVERSION FACTORS AND TABLES

To enable the conversion of quantities used in technical literature, drawings, and calculations, conversion factors for units used in the construction industry and tables of already calculated, most commonly used, quantities are published on the following pages.

TABLE 8.1: LENGTH (1)

Inches and fractions of inches (up to 12 in.) to millimetres
Basis: 1 in. = 25.4 mm exactly

inches	0	1	2	3	4	5	6	7	8	9	10	11
fractions of inch	millimetres (mm)											
-	-	25.40	50.80	76.20	101.60	127.00	152.40	177.80	203.20	228.60	254.00	279.40
1/32	0.79	26.19	51.59	76.99	102.39	127.79	153.19	178.59	203.99	229.39	254.79	280.19
1/16	1.59	26.99	52.39	77.79	103.19	128.59	153.99	179.39	204.79	230.19	255.59	280.99
3/32	2.38	27.78	53.18	78.58	103.98	129.38	154.78	180.18	205.58	230.98	256.38	281.78
1/8	3.18	28.58	53.98	79.38	104.78	130.18	155.58	180.98	206.38	231.78	257.18	282.58
5/32	3.97	29.37	54.77	80.17	105.57	130.97	156.37	181.77	207.17	232.57	257.97	283.37
3/16	4.76	30.16	55.56	80.96	106.36	131.76	157.16	182.56	207.96	233.36	258.76	284.16
7/32	5.56	30.96	56.36	81.76	107.16	132.56	157.96	183.36	208.76	234.16	259.56	284.96
1/4	6.35	31.75	57.15	82.55	107.95	133.35	158.75	184.15	209.55	234.95	260.35	285.75
9/32	7.14	32.54	57.94	83.34	108.74	134.14	159.54	184.94	210.34	235.74	261.14	286.54
5/16	7.94	33.34	58.74	84.14	109.54	134.94	160.34	185.74	211.14	236.54	261.94	287.34
11/32	8.73	34.13	59.53	84.93	110.33	135.73	161.13	186.53	211.93	237.33	262.73	288.13
3/8	9.53	34.93	60.33	85.73	111.13	136.53	161.93	187.33	212.73	238.13	263.53	288.93
13/32	10.32	35.72	61.12	86.52	111.92	137.32	162.72	188.12	213.52	238.92	264.32	289.72
7/16	11.11	36.51	61.91	87.31	112.71	138.11	163.51	188.91	214.31	239.71	265.11	290.51
15/32	11.91	37.31	62.71	88.11	113.51	138.91	164.31	189.71	215.11	240.51	265.91	291.31
1/2	12.70	38.10	63.50	88.90	114.30	139.70	165.10	190.50	215.90	241.30	266.70	292.10
17/32	13.49	38.89	64.29	89.69	115.09	140.49	165.89	191.29	216.69	242.09	267.49	292.89
9/16	14.29	39.69	65.09	90.49	115.89	141.29	166.69	192.09	217.49	242.89	268.29	293.69
19/32	15.08	40.48	65.88	91.28	116.68	142.08	167.48	192.88	218.28	243.68	269.08	294.48
5/8	15.88	41.28	66.68	92.08	117.48	142.88	168.28	193.68	219.08	244.48	269.88	295.28
21/32	16.67	42.07	67.47	92.87	118.27	143.67	169.07	194.47	219.87	245.27	270.67	296.07
11/16	17.46	42.86	68.26	93.66	119.06	144.46	169.86	195.26	220.66	246.06	271.46	296.86
23/32	18.26	43.66	69.06	94.46	119.86	145.26	170.66	196.06	221.46	246.86	272.26	297.66
3/4	19.05	44.45	69.85	95.25	120.65	146.05	171.45	196.85	222.25	247.65	273.05	298.45
25/32	19.84	45.24	70.64	96.04	121.44	146.84	172.24	197.64	223.04	248.44	273.34	299.24
13/16	20.64	46.04	71.44	96.84	122.24	147.64	173.04	198.44	223.84	249.24	274.64	300.04
27/32	21.43	46.83	72.23	97.63	123.03	148.43	173.83	199.23	224.63	250.03	275.43	300.83
7/8	22.23	47.63	73.03	98.43	123.83	149.23	174.63	200.03	225.43	250.83	276.23	301.63
29/32	23.02	48.42	73.82	99.22	124.62	150.02	175.42	200.82	226.22	251.62	277.02	302.42
15/16	23.81	49.21	74.61	100.01	125.41	150.81	176.21	201.61	227.01	252.41	277.81	303.21
31/32	24.61	50.01	75.41	100.81	126.21	151.61	177.01	202.41	227.81	253.21	278.61	304.01

TABLE 8.2: LENGTH (2)

Feet and inches (up to 65 ft 8 in.) to metres - to three places of decimals
Basis: 1 ft = 0.3048 m exactly

feet	inches											
	0	1	2	3	4	5	6	7	8	9	10	11
	metres (m) - to three decimal places											
0	-	0.025	0.051	0.076	0.102	0.127	0.152	0.178	0.203	0.229	0.254	0.279
1	0.305	0.330	0.356	0.381	0.406	0.432	0.457	0.483	0.508	0.533	0.559	0.584
2	0.610	0.635	0.660	0.686	0.711	0.737	0.762	0.787	0.813	0.838	0.864	0.889
3	0.914	0.940	0.965	0.991	1.016	1.041	1.067	1.092	1.118	1.143	1.168	1.194
4	1.219	1.245	1.270	1.295	1.321	1.346	1.372	1.397	1.422	1.448	1.473	1.499
5	1.524	1.549	1.575	1.600	1.626	1.651	1.676	1.702	1.727	1.753	1.778	1.803
6	1.829	1.854	1.880	1.905	1.930	1.956	1.981	2.007	2.032	2.057	2.083	2.108
7	2.134	2.159	2.184	2.210	2.235	2.261	2.286	2.311	2.337	2.362	2.388	2.413
8	2.438	2.464	2.489	2.515	2.540	2.565	2.591	2.616	2.642	2.667	2.692	2.718
9	2.743	2.769	2.794	2.819	2.845	2.870	2.896	2.921	2.946	2.972	2.997	3 023
10	3.048	3.073	3.099	3.124	3.150	3.175	3.200	3.226	3.251	3.277	3.302	3.327
11	3.353	3.378	3.404	3.429	3.454	3.480	3.505	3.531	3.556	3.581	3.607	3.632
12	3.658	3.683	3.708	3.734	3.759	3.785	3.810	3.835	3.861	3.886	3.912	3.937
13	3.962	3.988	4.013	4.039	4.064	4.089	4.115	4.140	4.166	4.191	4.216	4.242
14	4.267	4.293	4.318	4.343	4.369	4.394	4.420	4.445	4.470	4.496	4.521	4.547
15	4.572	4.597	4.623	4.648	4.674	4.699	4.724	4.750	4.775	4.801	4.826	4.851
16	4.877	4.902	4.928	4.953	4.978	5.004	5.029	5.055	5.080	5.105	5.131	5.156
17	5.182	5.207	5.232	5.258	5.283	5.309	5.334	5.359	5.385	5.410	5.436	5.461
18	5.486	5.512	5.537	5.563	5.588	5.613	5.639	5.664	5.690	5.715	5.740	5.766
19	5.791	5.817	5.842	5.867	5.893	5.918	5.944	5.969	5.994	6.020	6.045	6.071
20	6.096	6.121	6.147	6.172	6.198	6.223	6.248	6.274	6.299	6.325	6.350	6.375
21	6.401	6.426	6.452	6.477	6.502	6.528	6.553	6.579	6.604	6.629	6.655	6.680
22	6.706	6.731	6.756	6.782	6.807	6.833	6.858	6.883	6.909	6.934	6.960	6.985
23	7.010	7.036	7.061	7.087	7.112	7.137	7.163	7.188	7.214	7.239	7.264	7.290
24	7.315	7.341	7.366	7.391	7.417	7.442	7.468	7.493	7.518	7.544	7.569	7.595
25	7.620	7.645	7.671	7.696	7.722	7.747	7.772	7.798	7.823	7.849	7.874	7.899
26	7.925	7.950	7.976	8.001	8.026	8.052	8.077	8.103	8.128	8.153	8.179	8.204
27	8.230	8.255	8.280	8.306	8.331	8.357	8.382	8.407	8.433	8.458	8.484	8.509
28	8.534	8.560	8.585	8.611	8.636	8.661	8.687	8.712	8.738	8.763	8.788	8.814
29	8.839	8.865	8.890	8.915	8.941	8.966	8.992	9.017	9.042	9.068	9.093	9.119
30	9.144	9.169	9.195	9.220	9.246	9.271	9.296	9.322	9.347	9.373	9.398	9.423
31	9.449	9.474	9.500	9.525	9.550	9.576	9.601	9.627	9.652	9.677	9.703	9.728
32	9.754	9.779	9.804	9.830	9.855	9.881	9.906	9.931	9.957	9.982	10.008	10.033
33	10.058	10.084	10.109	10.135	10.160	10.185	10.211	10.236	10.262	10.287	10.312	10.338
34	10.363	10.389	10.414	10.439	10.465	10.490	10.516	10.541	10.566	10.592	10.617	10.643
35	10.668	10.693	10.719	10.744	10.770	10.795	10.820	10.846	10.871	10.897	10.922	10.947
36	10.973	10.998	11.024	11.049	11.074	11.100	11.125	11.151	11.176	11.201	11.227	11.252
37	11.278	11.303	11.328	11.354	11.379	11.405	11.430	11.455	11.481	11.506	11.532	11.557
38	11.582	11.608	11.633	11.659	11.684	11.709	11.735	11.760	11.786	11.811	11.836	11.862
39	11.887	11.913	11.938	11.963	11.989	12.014	12.040	12.065	12.090	12.116	12.141	12.167
40	12.192	12.217	12.243	12.268	12.294	12.319	12.344	12.370	12.395	12.421	12.446	12.471
41	12.497	12.522	12.548	12.573	12.598	12.624	12.649	12.675	12.700	12.725	12.751	12.776
42	12.802	12.827	12.852	12.878	12.903	12.929	12.954	12.979	13.005	13.030	13.056	13.081
43	13.106	13.132	13.157	13.183	13.208	13.233	13.259	13.284	13.310	13.335	13.360	13.386
44	13.411	13.437	13.462	13.487	13.513	13.538	13.564	13.589	13.614	13.640	13.665	13.691
45	13.716	13.741	13.767	13.792	13.818	13.843	13.868	13.894	13.919	13.945	13.970	13.995
46	14.021	14.046	14.072	14.097	14.122	14.148	14.173	14.199	14.224	14.249	14.275	14.300
47	14.326	14.351	14.376	14.402	14.427	14.453	14.478	14.503	14.529	14.554	14.580	14.605
48	14.630	14.656	14.681	14.707	14.732	14.757	14.783	14.808	14.834	14.859	14.884	14.910
49	14.935	14.961	14.986	15.011	15.037	15.062	15.088	15.113	15.138	15.164	15.189	15.215
50	15.240	15.265	15.291	15.316	15.342	15.367	15.392	15.418	15.443	15.469	15.494	15.519
51	15.545	15.570	15.596	15.621	15.646	15.672	15.697	15.723	15.748	15.773	15.799	15.824
52	15.850	15.875	15.900	15.926	15.951	15.977	16.002	16.027	16.053	16.078	16.104	16.129
53	16.154	16.180	16.205	16.231	16.256	16.281	16.307	16.332	16.358	16.383	16.408	16.434
54	16.459	16.485	16.510	16.535	16.561	16.586	16.612	16.637	16.662	16.688	16.713	16.739
55	16.764	16.789	16.815	16.840	16.866	16.891	16.916	16.942	16.967	16.993	17.018	17.043
56	17.069	17.094	17.120	17.145	17.170	17.196	17.221	17.247	17.272	17.297	17.323	17.348
57	17.374	17.399	17.424	17.450	17.475	17.501	17.526	17.551	17.577	17.602	17.628	17.653
58	17.678	17.704	17.729	17.755	17.780	17.805	17.830	17.856	17.882	17.907	17.932	17.958
59	17.983	18.009	18.034	18.059	18.085	18.110	18.136	18.161	18.186	18.212	18.237	18.263
60	18.288	18.313	18.339	18.364	18.390	18.415	18.440	18.466	18.491	18.517	18.542	18.567
61	18.593	18.618	18.644	18.669	18.694	18.720	18.745	18.771	18.796	18.821	18.847	18.872
62	18.898	18.923	18.948	18.974	18.999	19.025	19.050	19.075	19.101	19.126	19.152	19.177
63	19.202	19.228	19.253	19.279	19.304	19.329	19.355	19.380	19.406	19.431	19.456	19.482
64	19.507	19.533	19.558	19.583	19.609	19.634	19.660	19.685	19.710	19.736	19.761	19.787
65	19.812	19.837	19.863	19.888	19.914	19.939	19.964	19.990	20.015			

TABLE 8.3: AREA (1)

Square inches (up to 100 $in.^2$) to square millimetres
Basis: 1 $in.^2$ = 645.16 mm^2 exactly

square inches (in^2)	0	1	2	3	4	5	6	7	8	9
	square millimetres (mm^2)									
0	-	645.2	1 290.3	1 935.5	2 580.6	3 225.8	3 871.0	4 516.1	5 161.3	5 806.4
10	6 451.6	7 096.8	7 741.9	8 387.1	9 032.2	9 677.4	10 322.6	10 967.7	11 612.9	12 258.0
20	12 903.2	13 548.4	14 193.5	14 838.7	15 483.8	16 129.0	16 774.2	17 419.3	18 064.5	18 709.6
30	19 354.8	20 000.0	20 645.1	21 290.3	21 935.4	22 580.6	23 225.8	23 870.9	24 516.1	25 161.2
40	25 806.4	26 451.6	27 096.7	27 741.9	28 387.0	29 032.2	29 677.4	30 322.5	30 967.7	31 612.8
50	32 258.0	32 903.2	33 548.3	34 193.5	34 838.6	35 483.8	36 129.0	36 774.1	37 419.3	38 064.4
60	38 709.6	39 354.8	39 999.9	40 645.1	41 290.2	41 935.4	42 580.6	43 225.7	43 870.9	44 516.0
70	45 161.2	45 806.4	46 451.5	47 096.7	47 741.8	48 387.0	49 032.2	49 677.3	50 322.5	50 967.6
80	51 612.8	52 258.0	52 903.1	53 548.3	54 193.4	54 838.6	55 483.8	56 128.9	56 774.1	57 419.2
90	58 064.4	58 709.6	59 354.7	59 999.9	60 645.0	61 290.2	61 935.4	62 580.5	63 225.7	63 870.8
100	64 516.0									

TABLE 8.4: AREA (2)

Square feet (up to 400 ft^2) to square metres
Basis: 1 ft^2 = 0.092 903 m^2

square feet (ft^2)	0	1	2	3	4	5	6	7	8	9
	square metres (m^2)									
0	-	0.09	0.19	0.28	0.37	0.46	0.56	0.65	0.74	0.84
10	0.93	1.02	1.11	1.21	1.30	1.39	1.49	1.58	1.67	1.77
20	1.86	1.95	2.04	2.14	2.23	2.32	2.42	2.51	2.60	2.69
30	2.79	2.88	2.97	3.07	3.16	3.25	3.34	3.44	3.53	3.62
40	3.72	3.81	3.90	3.99	4.09	4.18	4.27	4.37	4.46	4.55
50	4.65	4.74	4.83	4.92	5.02	5.11	5.20	5.30	5.39	5.48
60	5.57	5.67	5.76	5.85	5.95	6.04	6.13	6.22	6.32	6.41
70	6.50	6.60	6.69	6.78	6.87	6.97	7.06	7.15	7.25	7.34
80	7.43	7.53	7.62	7.71	7.80	7.90	7.99	8.08	8.18	8.27
90	8.36	8.45	8.55	8.64	8.73	8.83	8.92	9.01	9.10	9.20
100	9.29	9.38	9.48	9.57	9.66	9.75	9.85	9.94	10.03	10.13
110	10.22	10.31	10.41	10.50	10.59	10.68	10.78	10.87	10.96	11.06
120	11.15	11.24	11.33	11.43	11.52	11.61	11.71	11.80	11.89	11.98
130	12.08	12.17	12.26	12.36	12.45	12.54	12.63	12.73	12.82	12.91
140	13.01	13.10	13.19	13.29	13.38	13.47	13.56	13.66	13.75	13.84
150	13.94	14.03	14.12	14.21	14.31	14.40	14.49	14.59	14.68	14.77
160	14.86	14.96	15.05	15.14	15.24	15.33	15.42	15.51	15.61	15.70
170	15.79	15.89	15.98	16.07	16.17	16.26	16.35	16.44	16.54	16.63
180	16.72	16.82	16.91	17.00	17.09	17.19	17.28	17.37	17.47	17.56
190	17.65	17.74	17.84	17.93	18.02	18.12	18.21	18.30	18.39	18.49
200	18.58	18.67	18.77	18.86	18.95	19.05	19.14	19.23	19.32	19.42
210	19.51	19.60	19.70	19.79	19.88	19.97	20.07	20.16	20.25	20.35
220	20.44	20.53	20.62	20.72	20.81	20.90	21.00	21.09	21.18	21.27
230	21.37	21.46	21.55	21.65	21.74	21.83	21.93	22.02	22.11	22.20
240	22.30	22.39	22.48	22.58	22.67	22.76	22.85	22.95	23.04	23.13
250	23.23	23.32	23.41	23.50	23.60	23.69	23.78	23.88	23.97	24.06
260	24.15	24.25	24.34	24.43	24.53	24.62	24.71	24.81	24.90	24.99
270	25.08	25.18	25.27	25.36	25.46	25.55	25.64	25.73	25.83	25.92
280	26.01	26.11	26.20	26.29	26.38	26.48	26.57	26.66	26.76	26.85
290	26.94	27.03	27.13	27.22	27.31	27.41	27.50	27.59	27.69	27.78
300	27.87	27.96	28.06	28.15	28.24	28.34	28.43	28.52	28.61	28.71
310	28.80	28.89	28.99	29.08	29.17	29.26	29.36	29.45	29.54	29.64
320	29.73	29.82	29.91	30.01	30.10	30.19	30.29	30.38	30.47	30.57
330	30.66	30.75	30.84	30.94	31.03	31.12	31.22	31.31	31.40	31.49
340	31.59	31.68	31.77	31.87	31.96	32.05	32.14	32.24	32.33	32.42
350	32.52	32.61	32.70	32.79	32.89	32.98	33.07	33.17	33.26	33.35
360	33.45	33.54	33.63	33.72	33.82	33.91	34.00	34.10	34.19	34.28
370	34.37	34.47	34.56	34.65	34.75	34.84	34.93	35.02	35.12	35.21
380	35.30	35.40	35.49	35.58	35.67	35.77	35.86	35.95	36.05	36.14
390	36.23	36.33	36.42	36.51	36.60	36.70	36.79	36.88	36.98	37.07
400	37.16									

TABLE 8.5: AREA (3)

Acres (up to 100 acres) to hectares
Basis: 1 acre = 0.404 686 ha

acres	0	1	2	3	4	5	6	7	8	9
	hectares (ha)									
0	-	0.40	0.81	1.21	1.62	2.02	2.43	2.83	3.24	3.64
10	4.05	4.45	4.86	5.26	5.67	6.07	6.47	6.88	7.28	7.69
20	8.09	8.50	8.90	9.31	9.71	10.12	10.52	10.93	11.33	11.74
30	12.14	12.54	12.95	13.35	13.76	14.16	14.57	14.97	15.38	15.78
40	16.19	16.59	17.00	17.40	17.81	18.21	18.62	19.02	19.42	19.83
50	20.23	20.64	21.04	21.45	21.85	22.26	22.66	23.07	23.47	23.88
60	24.28	24.69	25.09	25.49	25.90	26.30	26.71	27.11	27.52	27.92
70	28.33	28.73	29.14	29.54	29.95	30.35	30.76	31.16	31.57	31.97
80	32.37	32.78	33.18	33.59	33.99	34.40	34.80	35.21	35.61	36.02
90	36.42	36.83	37.23	37.64	38.04	38.45	38.85	39.25	39.66	40.06
100	40.47									

TABLE 8.6: VOLUME (1)

Cubic feet (up to 106 ft^3) to cubic metres
Basis: 1 ft^3 = 0.028 317 m^3

cubic feet (ft^3)	0	1	2	3	4	5	6	7	8	9
	cubic metres (m^3)									
0	-	0.03	0.06	0.08	0.11	0.14	0.17	0.20	0.23	0.25
10	0.28	0.31	0.34	0.37	0.40	0.42	0.45	0.48	0.51	0.54
20	0.57	0.59	0.62	0.65	0.68	0.71	0.74	0.76	0.79	0.82
30	0.85	0.88	0.91	0.93	0.96	0.99	1.02	1.05	1.08	1.10
40	1.13	1.16	1.19	1.22	1.25	1.27	1.30	1.33	1.36	1.39
50	1.42	1.44	1.47	1.50	1.53	1.56	1.59	1.61	1.64	1.67
60	1.70	1.73	1.76	1.78	1.81	1.84	1.87	1.90	1.93	1.95
70	1.98	2.01	2.04	2.07	2.10	2.12	2.15	2.18	2.21	2.24
80	2.27	2.29	2.32	2.35	2.38	2.41	2.44	2.46	2.49	2.52
90	2.55	2.58	2.61	2.63	2.66	2.69	2.72	2.75	2.78	2.80
100	2.83	2.86	2.89	2.9	2.94	2.97	3.00			

TABLE 8.7: VOLUME (2)

Gallons (up to 110 gal) to litres
Basis: 1 gal = 4.546 09 ℓ

gallons	0	1	2	3	4	5	6	7	8	9
	litres (ℓ)									
0	-	4.55	9.09	13.64	18.18	22.73	27.28	31.82	36.37	40.91
10	45.46	50.01	54.55	59.10	63.65	68.19	72.74	77.28	81.83	86.38
20	90.92	95.47	100.01	104.56	109.11	113.65	118.20	122.74	127.29	131.84
30	136.38	140.93	145.48	150.02	154.57	159.11	163.66	168.21	172.75	177.30
40	181.84	186.39	190.94	195.48	200.03	204.57	209.12	213.67	218.21	222.76
50	227.30	231.85	236.40	240.94	245.49	250.03	254.58	259.13	263.67	268.22
60	272.77	277.31	281.86	286.40	290.95	295.50	300.04	304.59	309.13	313.68
70	318.23	322.77	327.32	331.87	336.41	340.96	345.50	350.05	354.60	359.14
80	363.69	368.23	372.78	377.33	381.87	386.42	390.96	395.51	400.06	404.60
90	409.15	413.69	418.24	422.79	427.33	431.88	436.42	440.97	445.52	450.06
100	454.61	459.16	463.70	468.25	472.79	477.34	481.89	486.43	490.98	495.52
110	500.07									

TABLE 8.8: ILLUMINATION

Lumens per square foot (up to 1000 lm/ft^2) to lux
Basis: 1 lm/ft^2 = 10.7639 lx

lumens/ft^2	0	1	2	3	4	5	6	7	8	9
	lux (lx)									
0	-	10.764	21.528	32.292	43.056	53.820	64.583	75.347	86.111	96.875
10	107.639	118.403	129.167	139.931	150.695	161.459	172.223	182.986	193.750	204.514
20	215.278	226.012	236.806	247.570	258.334	269.098	279.862	290.626	301.389	312.153
30	322.917	333.681	344.445	355.209	365.973	376.737	387.501	398.265	409.029	419.793
40	430.556	441.320	452.084	462.848	473.612	484.376	495.140	505.904	516.668	527.432
50	538.196	548.959	559.723	570.487	581.251	592.015	602.779	613.543	624.307	635.071
60	645.835	656.599	667.362	678.126	688.890	699.654	710.418	721.182	731.946	742.710
70	753.474	764.238	775.002	785.765	796.529	807.293	818.057	828.821	839.585	850.349
80	861.113	871.877	882.641	893.405	904.168	914.932	925.696	936.460	947.224	957.988
90	968.752	979.516	990.280	1001.04	1011.81	1022.57	1033.34	1044.10	1054.86	1065.63
	0	10	20	30	40	50	60	70	80	90
	lux (lx)									
100	1076.39	1184.03	1291.67	1399.31	1506.95	1614.59	1722.23	1829.86	1937.50	2045.14
200	2152.78	2260.42	2368.06	2475.70	2583.34	2690.98	2798.62	2906.26	3013.89	3121.53
300	3229.17	3336.81	3444.45	3552.09	3659.73	3767.37	3875.01	3982.65	4090.29	4197.93
400	4305.56	4413.20	4520.84	4628.48	4736.12	4843.76	4951.40	5059.04	5166.68	5274.32
500	5381.96	5489.59	5597.23	5704.87	5812.51	5920.15	6027.79	6135.43	6243.07	6350.71
600	6458.35	6565.99	6673.62	6781.26	6888.90	6996.54	7104.18	7211.82	7319.46	7427.10
700	7534.74	7642.38	7750.02	7857.65	7965.29	8072.93	8180.57	8288.21	8395.85	8503.49
800	8611.13	8718.77	8826.41	8934.05	9041.68	9149.32	9256.96	9364.60	9472.24	9579.88
900	9687.52	9795.16	9902.80	10010.4	10118.1	10225.7	10333.4	10441.0	10548.6	10656.3
1000	10763.9									

TABLE 8.9: MASS

Pounds (up to 250 lb) to kg
Basis: 1 lb = 0.453 592 kg

pounds (lb)	0	1	2	3	4	5	6	7	8	9
	kilograms (kg)									
0	-	0.45	0.91	1.36	1.81	2.27	2.72	3.18	3.63	4.08
10	4.54	4.99	5.44	5.90	6.35	6.80	7.26	7.71	8.16	8.62
20	9.07	9.53	9.98	10.43	10.89	11.34	11.79	12.25	12.70	13.15
30	13.61	14.06	14.52	14.97	15.42	15.88	16.33	16.78	17.24	17.69
40	18.14	18.60	19.05	19.50	19.96	20.41	20.87	21.32	21.77	22.23
50	22.68	23.13	23.59	24.04	24.49	24.95	25.40	25.85	26.31	26.76
60	27.22	27.67	28.12	28.58	29.03	29.48	29.94	30.39	30.84	31.30
70	31.75	32.21	32.66	33.11	33.57	34.02	34.47	34.93	35.38	35.83
80	36.29	36.74	37.19	37.65	38.10	38.56	39.01	39.46	39.92	40.37
90	40.82	41.28	41.73	42.18	42.64	43.09	43.54	44.00	44.45	44.91
100	45.36	45.81	46.27	46.72	47.17	47.63	48.08	48.53	48.99	49.44
110	49.90	50.35	50.80	51.26	51.71	52.16	52.62	53.07	53.52	53.98
120	54.43	54.88	55.34	55.79	56.25	56.70	57.15	57.61	58.06	58.51
130	58.97	59.42	59.87	60.33	60.78	61.24	61.69	62.14	62.60	63.05
140	63.50	63.96	64.41	64.86	65.32	65.77	66.22	66.68	67.13	67.59
150	68.04	68.49	68.95	69.40	69.85	70.31	70.76	71.21	71.67	72.12
160	72 57	73.03	73.48	73.94	74.39	74.84	75.30	75.75	76.20	76.66
170	77.11	77.56	78.02	78.47	78.93	79.38	79.83	80.29	80.74	81.19
180	81.65	82.10	82.55	83.01	83.46	83.91	84.37	84 82	85.28	85.73
190	86.18	86.64	87.09	87.54	88.00	88.45	88.90	89.36	89.81	90.26
200	90.72	91.17	91.63	92.08	92.53	92.99	93.44	93.89	94.35	94.80
210	95.25	95.71	96.16	96.62	97.07	97.52	97.98	98.43	98.88	99.34
220	99.79	100.24	100.70	101.15	101.61	102.06	102.51	102.97	103.42	103.87
230	104.33	104.78	105.23	105.69	106.14	106.59	107.05	107.50	107.96	108.41
240	108.86	109.32	109.77	110.22	110.68	111.13	111.58	112.04	112.49	112.94
250	113.40									

TABLE 8.10: FORCE (1)

Pound-force (up to 1000 lbf) to newtons
Basis: 1 lbf = 4.448 222 N

lbf	0	1	2	3	4	5	6	7	8	9
	newtons (N)									
0	-	4.4482	8.8964	13.3447	17.7929	22.2411	26.6893	31.1376	35.5858	40.0340
10	44.4822	48.9304	53.3787	57.8269	62.2751	66.7233	71.1715	75.6198	80.0680	84.5162
20	88.9644	93.4127	97.8609	102.309	106.757	111.206	115.654	120.102	124.550	128.998
30	133.447	137.895	142.343	146.791	151.240	155.688	160.136	164.584	169.032	173.481
40	177.929	182.377	186.825	191.274	195.722	200.170	204.618	209.066	213.515	217.963
50	222.411	226.859	231.308	235.756	240.204	244.652	249.100	253.549	257.997	262.445
60	266.893	271.342	275.790	280.238	284.686	289.134	293.583	298.031	302.479	306.927
70	311.376	315.824	320.272	324.720	329.168	333.617	338.065	342.513	346.961	351.410
80	355.858	360.306	364.754	369.202	373.651	378.099	382.547	386.995	391.444	395.892
90	400.340	404.788	409.236	413.685	418.133	422.581	427.029	431.477	435.926	440.374
	0	10	20	30	40	50	60	70	80	90
	newtons (N)									
100	444.822	489.304	533.787	578.269	622.751	667.233	711.715	756.198	800.680	845.162
200	889.644	934.127	978.609	1023.09	1067.57	1112.06	1156.54	1201.02	1245.50	1289.98
300	1334.47	1378.95	1423.43	1467.91	1512.40	1556.88	1601.36	1645.84	1690.32	1734.81
400	1779.29	1823.77	1868.25	1912.74	1957.22	2001.70	2046.18	2090.66	2135.15	2179.63
500	2224.11	2268.59	2313.08	2357.56	2402.04	2446.52	2491.00	2535.49	2579.97	2624.45
600	2668.93	2713.42	2757.90	2802.38	2846.86	2891.34	2935.83	2980.31	3024.79	3069.27
700	3113.76	3158.24	3202.72	3247.20	3291.68	3336.17	3380.65	3425.13	3469.61	3514.10
800	3558.58	3603.06	3647.54	3692.02	3736.51	3780.99	3825.47	3869.95	3914.44	3958.92
900	4003.40	4047.88	4092.36	4136.85	4181.33	4225.81	4270.29	4314.77	4359.26	4403.74
1000	4448.22	-	-	-	-	-	-	-	-	-

TABLE 8.11: FORCE (2)

Kip (up to 1000 kips) to kilonewtons
Basis: 1 kip = 4.448222 kN

Kip	0	1	2	3	4	5	6	7	8	9
	kilonewtons (kN)									
0		4.448222	8.896444	13.344666	17.792888	22.241110	26.689332	31.137554	35.585776	40.033998
10	44.482220	48.930442	53.378664	57.826886	62.275108	66.723330	71.171552	75.619774	80.067996	84.516218
20	88.964440	93.412662	97.860884	102.309106	106.757328	111.205550	115.653772	120.101994	124.550216	128.998438
30	133.446660	137.894882	142.343104	146.791326	151.239548	155.687770	160.135992	164.584214	169.032436	173.480658
40	177.928880	182.377102	186.825324	191.273546	195.721768	200.169990	204.618212	209.066434	213.514656	217.962878
50	222.411100	226.859322	231.307544	235.755766	240.203988	244.652210	249.100432	253.548654	257.996876	262.445098
60	266.893320	271.341542	275.789764	280.237986	284.686208	289.134430	293.582652	298.030874	302.479096	306.927318
70	311.375540	315.823762	320.271984	324.720206	329.168428	333.616650	338.064872	342.513094	346.961316	351.409538
80	355.857760	360.305982	364.754204	369.202426	373.650648	378.098870	382.547092	386.995314	391.443536	395.891758
90	400.339980	404.788202	409.236424	413.684646	418.132868	422.581090	427.029312	431.477534	435.925756	440.373978
	0	10	20	30	40	50	60	70	80	90
	kilonewtons (kN)									
100	444.8222	489.30442	533.78664	578.26886	622.75108	667.23330	711.71552	756.19774	800.67996	845.16218
200	889.6444	934.12662	978.60884	1023.09106	1067.57328	1112.05550	1156.53772	1201.01994	1245.50216	1289.98438
300	1334.4666	1376.94882	1423.43104	1467.91326	1512.39548	1556.87770	1601.35992	1645.84214	1690.32436	1734.80658
400	1779.2888	1823.77102	1868.25324	1912.73546	1957.21768	2001.69990	2046.18212	2090.66434	2135.14656	2179.62878
500	2224.1110	2268.59322	2313.07544	2357.55766	2402.03988	2446.52210	2491.00432	2535.48654	2579.96876	2624.45098
600	2668.9332	2713.41542	2757.89764	2802.37986	2846.86208	2891.34430	2935.82652	2980.30874	3024.79096	3069.27318
700	3113.7554	3158.23762	3202.71984	3227.20206	3291.68428	3336.16650	3380.64872	3425.13094	3489.61316	3514.09538
800	3558.5776	3603.05982	3647.54204	3692.02426	3736.50648	3780.98870	3825.47092	3869.95314	3914.43536	3958.91758
900	4003.3998	4047.88202	4092.36424	4136.84646	4181.32868	4225.81090	4270.29312	4314.77534	4359.25756	4403.73978
1000	4448.222									

TABLE 8.12: PRESSURE/STRESS (1)

Pound-force per square foot (up to 1000 lbf/ft^2) to kilopascals
Basis: 1 lbf/ft^2 = 47.8803 Pa

lbf/ft2	0	10	20	30	40	50	60	70	80	90
	kilopascals (kPa)									
0	-	0.4788	0.9576	1.4364	1.9152	2.3940	2.8728	3.3516	3.8304	4.3092
100	4.7880	5.2668	5.7456	6.2244	6.7032	7.1820	7.6608	8.1396	8.6185	9.0973
200	9.5761	10.0549	10.5337	11.0125	11.4913	11.9701	12.4489	12.9277	13.4065	13.8853
300	14.3641	14.8429	15.3217	15.8005	16.2793	16.7581	17.2369	17.7157	18.1945	18.6733
400	19.1521	19.6309	20.1097	20.5885	21.0673	21.5461	22.0249	22.5037	22.9825	23.4613
500	23.9401	24.4189	24.8977	25.3765	25.8553	26.3341	26.8129	27.2917	27.7706	28.2494
600	28.7282	29.2070	29.6858	30.1646	30.6434	31.1222	31.6010	32.0798	32.5586	33.0374
700	33.5162	33.9950	34.4738	34.9526	35.4314	35.9102	36.3890	36.8678	37.3466	37.8254
800	38.3042	38.7830	39.2618	39.7406	40.2194	40.6982	41.1770	41.6558	42.1346	42.6134
900	43.0922	43.5710	44.0498	44.5286	45.0074	45.4862	45.9650	46.4439	46.9227	47.4015
1000	47.8803	-	-	-	-	-	-	-	-	-

TABLE 8.13: PRESSURE/STRESS (2)

Pound-force per square inch (up to 1000 lbf/in.^{2}) to kilopascals
Basis: 1 lbf/in.^{2} = 6.894 76 kPa

lbf/in2	0	10	20	30	40	50	60	70	80	90
	kilopascals (kPa)									
0		68.9476	137.895	206.843	275.790	344.738	413.685	482.633	551.581	620.528
100	689.476	758.423	827.371	896.318	965.266	1034.21	1103.16	1172.11	1241.06	1310.00
200	1378.95	1447.90	1516.85	1585.79	1654.74	1723.69	1792.64	1861.58	1930.53	1999.48
300	2068.43	2137.37	2206.32	2275.27	2344.22	2413.17	2482.11	2551.06	2620.01	2688.96
400	2757.90	2826.85	2895.80	2964.75	3033.69	3102.64	3171.59	3240.54	3309.48	3378.43
500	3447.38	3516.33	3585.27	3654.22	3723.17	3792.12	3861.06	3930.01	3998.96	4067.91
600	4136.85	4205.80	4274.75	4343.70	4412.64	4481.59	4550.54	4619.49	4688.43	4757.38
700	4826.33	4895.28	4964.23	5033.17	5102.12	5171.07	5240.02	5308.96	5377.91	5446.86
800	5515.81	5584.75	5653.70	5722.65	5791.60	5860.54	5929.49	5998.44	6067.39	6136.33
900	6205.28	6274.23	6343.18	6412.12	6481.07	6550.02	6618.97	6687.91	6756.86	6825.81
1000	6894.76	-	-	-	-	-	-	-	-	-

TABLE 8.14: PRESSURE/STRESS (3)

Ton-force per square inch (up to 100 tonf/in.^{2}) to megapascals
Basis: 1 tonf/in.^{2} = 13.7895 MPa

ton/in.2	0	1	2	3	4	5	6	7	8	9
	megapascals (MPa)									
0		13.7895	27.5790	41.3685	55.1580	68.9475	82.7370	96.5265	110.3160	124.1055
10	137.895	151.6845	165.4740	179.2635	193.0530	206.8425	220.6320	234.4215	248.2110	262.0005
20	275.790	289.5795	303.3690	317.1585	330.9480	344.7375	358.5270	372.3165	386.1060	399.8955
30	413.685	427.4745	441.2640	455.0535	468.8430	482.6325	496.4220	510.2115	524.0010	537.7905
40	551.580	565.3695	579.1590	592.9485	606.7380	620.5275	634.3170	648.1065	661.8960	675.6855
50	689.4750	703.2645	717.0540	730.8435	744.6330	758.4225	772.2120	786.0015	799.7910	813.5805
60	827.3700	841.1595	854.9490	868.7385	882.5280	896.3175	910.1070	923.8965	937.6860	951.4755
70	965.2650	979.0545	992.8440	1006.6335	1020.4230	1034.2125	1048.0020	1061.7915	1075.5810	1089.3705
80	1103.1600	1116.9495	1130.7390	1144.5285	1158.3180	1172.1075	1185.8970	1199.6865	1213.4760	1227.2655
90	1241.0550	1254.8445	1268.6340	1282.4235	1296.2130	1310.0025	1323.7920	1337.5815	1351.3710	1365.1605
100	1378.9500									

TABLE 8.15 CONVERSION FACTORS FOR UNITS USED IN THE CONSTRUCTION INDUSTRY

(Conversion factors are taken to six significant figures where appropriate.)

Metric to Imperial			Imperial to Metric		
Length					
1 km	= 0.621 371	mile	1 mile	= 1.609 344	km
	= 49.7097	chain	1 chain	= 20.1168	m
1 m	= 1.093 61	yd	1 yd	= 0.9144	m
	= 3.280 84	ft	1 ft	= 0.3048	m
1 mm	= 0.039 370 1	in.		= 304.8	mm
			1 in.	= 25.4	mm
Area					
1 km^2	= 0.386 102	$mile^2$	1 $mile^2$	= 2.589 99	km^2
1 ha	= 2.471 05	acre	1 acre	= 0.404 686	ha
1 m^2	= 1.195 99	yd^2		= 4046.86	m^2
	= 10.7639	ft^2	1 yd^2	= 0.836 127	m^2
1 mm^2	= 0.001 550	$in.^2$	1 ft^2	= 0.092 903	m^2
			1 $in.^2$	= 645.16	mm^2
Volume, Capacity, Modulus of Section					
1 m^3	= $0.810\ 713 \times 10^{-3}$	acre ft	1 acre ft	= 1233.48	m^3
	= 1.307 95	yd^3	1 yd^3	= 0.764 555	m^3
	= 35.3147	ft^3			
			1 ft^3	= 0.028 316 8	m^3
1 mm^3	= 61.0237×10^{-6}	$in.^3$		= 28.3168	ℓ
*1 ℓ	= 0.035 314 7	ft^3	1 $in.^3$	= 16 387.1	mm^3
	= 0.219 969	gal		= 16.3871	ml
	= 1.759 76	pt	1 gal	= 4.546 09	ℓ
*1 ml	= 0.061 023 7	$in.^3$	1 pt	= 568.261	ml
	= 0.035 195 1	fl oz	1 fl oz	= 28.413 0	ml
Second Moment of Area					
1 mm^4	= $2.402\ 51 \times 10^{-6}$	$in.^4$	1 $in.^4$	= 416 231	mm^4
				= $0.416\ 231 \times 10^{-6}$	m^4
Velocity, Speed					
1 m/s	= 3.280 84	ft/s	1 ft/s	= 0.3048	m/s
	= 2.236 94	mile/h	1 mile/h	= 1.609 344	km/h
1 km/h	= 0.621 371	mile/h		= 0.447 04	m/s
Acceleration					
1 m/s^2	= 3.280 84	ft/s^2	1 ft/s^2	= 0.3048	m/s^2

*Note: According to a recent decision of the CSA Committee on Metric Practice Guide, the symbols for litre (shown as ℓ) and millilitre (shown as ml) are to be replaced by L (for litre) and mL (for millilitre).

TABLE 8.15 (cont'd)

Metric to Imperial			Imperial to Metric		
Volume Rate of Flow					
1 m^3/s	= 35.3147	ft^3/s	1 ft^3/s	= 0.028 316 8	m^3/s
	= 19.0053	10^6 gal/d	1 ft^3/min	= 0.471 947	ℓ/s
	= 0.810 713 x 10^{-3}	acre ft/s	1 gal/min	= 0.075 768 2	ℓ/s
*1 ℓ/s	= 2.118 88	ft^3/min	1 gal/h	= 0.001 262 8	ℓ/s
	= 13.198 2	gal/min	10^6 gal/d	= 0.005 261 68	m^3/s
	= 791.891	gal/h	1 acre ft/s	= 1233.48	m^3/s
Equivalent Temperature Value (°C = K-273.15)					
°C	= 5/9 °F-32		°F	= 9/5 °C+32	
Temperature Interval					
1 °C	= 1 K = 1.8 °F		1 °F	= 0.555 556 °C = 5/9 °C = 5/9 K	
Mass					
1 tonne (t)	= 0.984 207	long ton	1 long ton	= 1.016 05	t
	= 19.684 1	cwt	1 cwt	= 50.8023	kg
1 kg	= 2.204 62	lb	1 lb	= 0.453 592	kg
1 g	= 0.035 274	oz	1 oz	= 28.3495	g
1 tonne (t)	= 1.102 312	short ton	1 short ton	= 0.907 184	t
Mass/Unit Length					
1 kg/m	= 0.671 969	lb/ft	1 lb/ft	= 1.488 16	kg/m
1 g/m	= 3.547 99	lb/mile	1 lb/mile	= 0.281 849	g/m
Mass/Unit Area					
1 kg/m^2	= 0.204 816	lb/ft^2	1 lb/ft^2	= 4.882 43	kg/m^2
1 g/m^2	= 0.029 494	oz/yd^2	1 oz/yd^2	= 33.9057	g/m^2
	= 0.003 277 06	oz/ft^2	1 oz/ft^2	= 305.152	g/m^2
Density (Mass/Unit Volume)					
1 kg/m^3	= 0.062 428	lb/ft^3	1 lb/ft^3	= 16.0185	kg/m^3
	= 1.685 56	lb/yd^3	1 lb/yd^3	= 0.593 278	kg/m^3
1 t/m^3	= 0.752 48	long ton/yd^3	1 long ton/yd^3	= 1.328 94	t/m^3
1 t/m^3	= 0.842 777	short ton/yd^3	1 short ton/yd^3	= 1.186 553	t/m^3

* Note: According to a recent decision of the CSA Committee on Metric Practice Guide, the symbols for litre (shown as ℓ) and millilitre (shown as ml) are to be replaced by L (for litre) and mL (for millilitre).

TABLE 8.15 (cont'd)

Metric to Imperial			Imperial to Metric		
Mass/Unit Time					
1 kg/s	= 2.204 62	lb/s	1 lb/s	= 0.453 592	kg/s
1 t/h	= 0.984 207	ton/h	1 ton/h	= 1.016 05	t/h
1 t/h	= 1.102 312	short ton/h	1 short ton/h	= 0.907 184	t/h
Moment of Inertia					
1 kg·m^2	= 23.7304	lb·ft^2	1 lb·ft^2	= 0.042 140 1	kg·m^2
	= 3417.17	lb·in.^{2}	1 lb·in.^{2}	= 292.640	kg·mm^2
Force					
1 MN	= 100.361	tonf	1 tonf	= 9.964 02	kN
1 kN	= 0.100 361	tonf	1 lbf	= 4.448 22	N
	= 224.809	lbf	1 tonf (short ton)	= 8.896 44	kN
1 N	= 0.224 809	lbf			
1 kN	= 0.112 404	tonf (short ton)			
Moment of Force, Torque					
1 N·m	= 0.737 562	lbf·ft	1 lbf·ft	= 1.355 82	N·m
	= 8.850 75	lbf·in.	1 lbf·in.	= 0.112 985	N·m
1 kN·m	= 0.329 269	tonf·ft	1 tonf·ft	= 3.037 03	kN·m
	= 0.737 562	kip·ft	1 kip·ft	= 1.355 82	kN·m
Force/Unit Length					
1 N/m	= 0.068 521 8	lbf/ft	1 lbf/ft	= 14.5939	N/m
1 kN/m	= 0.030 590 1	tonf/ft	1 tonf/ft	= 32.6903	kN/m
1 kN/m	= 0.034 260 8	short tonf/ft	1 short tonf/ft	= 29.187 808	kN/m
Pressure, Stress, Modulus of Elasticity (1 Pa = 1 N/m^2)					
1 MPa	= 0.064 749	tonf/in.^{2}	1 tonf/in.^{2}	= 15.4443	MPa
	= 0.323 85	tonf/ft^2	1 tonf/ft^2	= 107.252	kPa
	= 145.038	lbf/in.^{2}	1 lbf/in.^{2}	= 6.894 76	kPa
1 kPa	= 20.8854	lbf/ft^2	1 lbf/ft^2	= 47.8803	Pa
1 MPa	= 0.072 519	short tonf/in^2	1 short tonf/in^2	= 13.789 514	MPa
1 MPa	= 145.0376	ksi	1 ksi	= 6.894 757	MPa
Work, Energy, Heat (1 J = 1 W·s)					
1 MJ	= 0.277 778	kW·h	1 kW·h	= 3.6	MJ
1 kJ	= 0.947 817	Btu	1 Btu	= 1.055 06	kJ
1 J	= 0.737 562	ft·lbf		= 1055.06	J
			1 ft·lbf	= 1.355 82	J

TABLE 8.15 (cont'd)

Metric to Imperial			Imperial to Metric		
Power, Heat Flow Rate					
1 kW	= 1.341 02	hp	1 hp	= 0.745 700	kW
1 W	= 3.412 14	Btu/h		= 745.700	W
	= 0.737 562	ft·lbf/s	1 Btu/h	= 0.293 071	W
			1 ft·lbf/s	= 1.355 82	W
Intensity of Heat Flow (Heat Loss from Surfaces)					
1 W/m^2	= 0.316 998	$Btu/(ft^2 \cdot h)$	1 $Btu/(ft^2 \cdot h)$	= 3.154 59	W/m^2
Thermal Conductance (Heat Transfer Coefficient)					
1 $W/(m^2 \cdot °C)$	= 0.176 110	$Btu/(ft^2 \cdot h \cdot °F)$	1 $Btu/(ft^2 \cdot h \cdot °F)$	= 5.678 26	$W/(m^2 \cdot °C)$
Thermal Conductivity					
1 $W/(m \cdot °C)$	= 0.577 789	$Btu/(ft \cdot h \cdot °F)$	1 $Btu/(ft \cdot h \cdot °F)$	= 1.730 73	$W/(m \cdot °C)$
Calorific Value (Mass and Volume Basis)					
1 kJ/kg (1 J/g)	= 0.429 923	Btu/lb	1 Btu/lb	= 2.326	kJ/kg (J/g)
1 kJ/m^3	= 0.026 839 2	Btu/ft^3	1 Btu/ft^3	= 37.2589	kJ/m^3
Thermal Capacity (Mass and Volume Basis)					
1 $kJ/(kg \cdot °C)$	= 0.238 846	$Btu/(lb \cdot °F)$	1 $Btu(lb \cdot °F)$	= 4.1868	$kJ/(kg \cdot °C)$
1 $kJ/(m^3 \cdot °C)$	= 0.014 910 7	$Btu/(ft^3 \cdot °F)$	1 $Btu/(ft^3 \cdot °F)$	= 67.0661	$kJ/(m^3 \cdot °C)$
Illumination					
1 lx	= 0.092 903	lm/ft^2	1 lm/ft^2	= 10.7639	lx
Luminance					
1 cd/m^2	= 0.092 903	cd/ft^2	1 cd/ft^2	= 10.7639	cd/m^2

PART 9. SI UNITS FOR USE IN DESIGN AND CONSTRUCTION

UNITS FOR ARCHITECTURE AND ENGINEERING

Quantity	SI Unit Symbol	Recommended Unit		Typical Application	Remarks
		Symbol	Name		
Length	m	m	metre	Levels, over-all dimensions; spans, column heights, etc.	
		cm	centimetre	Snowfall, glass pane dimensions.	
		mm	millimetre	Spans; dimensions in buildings; depth and width of sections; displacement, settlement, deflection, elongation; slump of concrete, size of aggregate; radius of gyration; eccentricity, detailed dimensions generally, rain fall.	
		μm	micrometre	Thickness of coatings (paint, galvanizing, etc.) thin sheet materials size of fine aggregates.	
Area	m^2	m^2	square metre	Small land areas; area of cross-section of earthworks.	
		cm^2	square centimetre	Area in special applications.	
		mm^2	square millimetre	Area of cross-section of structural and other sections, bars, etc.	
* Volume, Capacity	m^3	m^3	cubic metre	Volume, capacity (large quantities); volume of earthwork, excavation, concrete, timber, fluids, etc.	1 m^3 = 10^3 ℓ
		mm^3	cubic millimetre	Volume, capacity (small quantities).	
		ℓ	litre	Volume of fluids and containers for fluids only.	1 ℓ = 1 dm^3 1 ml = 10^3 mm^3
Modulus of section	m^3	cm^3	centimetre to third power	Geometric properties of structural section.	first moment of area
		mm^3	millimetre to third power		
Moment of inertia	m^4	cm^4	centimetre to fourth power	Geometric properties of structural sections.	second moment of area
		mm^4	millimetre to fourth power		
Time	s	s	second	Time used in methods of test; unit used for coherent derived units involving time.	
		h	hour	Time used in methods of test.	
		d	day		
		a	year		
Temperature	K	°C	degree Celsius		Temperature value is normally measured in °C °C ≙ 273.15 K

*Note: According to a recent decision of the CSA Committee on Metric Practice Guide, the symbols for litre (shown as ℓ) and millilitre (shown as ml) are to be replaced by L (for litre) and mL (for millilitre).

UNITS FOR ARCHITECTURE AND ENGINEERING (Cont'd)

Quantity	SI Unit Symbol	Recommended Unit		Typical Application	Remarks
		Symbol	Name		
Temperature interval	K	°C	degree Celsius	Calculations involving thermal expansion; temperature value and temperature interval in test methods, etc.	1 K = 1°C
Base Temperature "Degree Day"				18°C used for calculation of degree-day tables. (See NRC/DBR publication BR Note 98: Converting Heating Degree-Days From Below 65°F to below 18°C by D.W. Boyd.)	
Velocity, Speed	m/s	m/s	metre per second	Velocity and speed in general; velocity of fluids.	1 m/s = 3.6 km/h
		km/h	kilometre per hour	Wind speed.	
Mass	kg	kg	kilogram	Mass of quantities of materials in general.	
		t	tonne	Mass of large quantities of structural steel, reinforcement, concrete, ratings of lifting equipment.	1 t = 10^3 kg
		g	gram	Mass of samples of material for testing.	
Mass per unit length	kg/m	kg/m	kilogram per metre	Mass per unit length of sections, bars, and similar items of uniform cross-section.	also known as "linear density"
		g/m	gram per metre	Mass per unit length of wire and similar material of uniform cross-section.	
Mass per unit area	kg/m^2	kg/m^2	kilogram per square metre	Mass per unit area of slabs, plates, and similar items of uniform thickness or depth; rating for load-carrying capacities of floors (for display on notices, not for use in calculations).	also known as "area density"
		g/m^2	gram per square metre	Mass per unit area of thin sheet materials, coatings, etc.	
Density Concentration	kg/m^3	kg/m^3	kilogram per cubic metre	Density of materials in general; mass per unit volume of materials in a concrete mix.	also known as "mass per unit volume"
Force	N	kN	kilonewton	Forces in columns, piles, ties, pre-stressing tendons, etc; concentrated forces, axial forces; reactions, shear force, gravitational force (load).	
Force per unit length	N/m	kN/m	kilonewton per metre	Transverse force (load) per unit length on a beam, columns, etc; force distributed in a linear direction.	

UNITS FOR ARCHITECTURE AND ENGINEERING (Cont'd)

Quantity	SI Unit Symbol	Recommended Unit		Typical Application	Remarks
		Symbol	Name		
Force per unit area	N/m^2	kN/m^2	kilonewton per square metre	Uniformly distributed loads on floors, under footings, wind load, snow load, dead and live load, etc.	
Moment of force or torque	N·m	kN·m	kilonewton metre	Bending moment; torsional moment; overturning moment; tightening torque for high-strength bolts, etc.	
Pressure	Pa	kPa	kilopascal	Pressure in fluids and gases	1 Pa = 1 N/m^2
Stress modulus of elasticity	Pa	MPa	megapascal	Modulus of elasticity; stress (ultimate, proof, yield, permissible, calculated, etc.) in structural material.	1 MPa = 1 N/mm^2 = 1 MN/m^2

UNITS FOR USE IN ACOUSTICAL ENGINEERING

Frequency	Hz	kHz MHz GHz	kilohertz megahertz gigahertz		1 Hz = 1 revolution per second
Sound power	W	W pW	watt picowatt	1 pW is the reference quantity for sound power level, i.e., Sound power level, L = $= 10 \log_{10} \frac{\text{actual power (W)}}{10^{-12}\ \text{(W)}}$ dB	
Sound intensity	W/m^2	W/m^2 pW/m^2	watt per square metre picowatt per square metre	1 pW/m^2 is the reference quantity for sound intensity level, i.e., Sound intensity level L_I = $= 10 \log_{10} \frac{\text{actual intensity } (W/m^2)}{10^{-12}\ (W/m^2)}$ dB	
Sound pressure	Pa	µPa	micropascal	20 µPa is the reference quantity for sound pressure level, i.e., Sound pressure level L_p = $= 20 \log_{10} \frac{\text{actual pressure (Pa)}}{20 \times 10^{-6}\ \text{(Pa)}}$ dB	

UNITS FOR USE IN ESTIMATING AND SPECIFICATION

Quantity	SI Unit Symbol	Recommended Unit		Typical Application	Remarks
		Symbol	Name		
Length	m	m	metre	Trenches, curbs, fences, timber lengths, pipes and conduits; length of building materials generally.	
		mm	millimetre	Timber cross-sections; thicknesses, diameters, gauges of sheet metal, fasteners; all building product dimensions.	
Area	m^2	m^2	square metre	Site clearing, paving, brickwork, roofing, glass areas, wall and floor finishes, surface treatment, paintwork, plastering, membranes, lining materials, insulation, reinforcing mesh, formwork; areas of all building components.	Replaces sq ft, sq yd, square. Brickwork to be specified by wall area × wall thickness.
		cm^2	square centimetre	Small areas in special applications.	
		mm^2	square millimetre	Small areas in special applications.	
* Volume	m^3	m^3	cubic metre	Excavation, filling, waste removal; supply of concrete, sand, all bulk materials supplied by volume and large quantities of timber.	Replaces cu ft and cu yd 1 m^3 = 10^3 ℓ
		ℓ	litre	Liquid materials and containers for same.	
Mass	kg	kg	kilogram	All bulk materials supplied by mass.	
		t	tonne	Large masses, aggregates, structural steel and reinforcement.	1 t = 10^3 kg
Time	s	h	hour	All calculations involving time; labour time, plant hire, testing periods.	1 h = 3.6×10^3 s
Stress	Pa	MPa	megapascal	Concrete strength grade, steel strength grades.	

* Note: According to a recent decision of the CSA Committee on Metric Practice Guide, the symbols for litre (shown as ℓ) and millilitre (shown as ml) are to be replaced by L (for litre) and mL (for millilitre).

UNITS FOR USE IN LAND SURVEYING

Quantity	SI Unit Symbol	Recommended Unit		Typical Application	Remarks
		Symbol	Name		
Length	m	m	metre	Boundary and cadastral surveys; survey plans; heights, geodetic surveying; contours.	
		km	kilometre	Geographical and statistical purposes.	
		mm	millimetre	Measurements carried out on maps, plans and photographs.	
Area	m^2	m^2	square metre	Small land areas, area in general.	
		ha	hectare	Areas on boundary and cadastral survey plans; other survey plans.	1 ha = 10^4 m^2 1 km^2 = 10^2 ha "Concession" will probably be retained as a legal term, expressed in ha
		mm^2	square millimetre	Measurement carried out on maps, plans and photographs.	
* Volume	m^3	m^3	cubic metre	General applications.	1 m^3 = 10^3 ℓ
		ℓ	litre	Small liquid volumes	
Plane angle	rad	° ' ''	degree minute second	Bearings shown on boundary and cadastral survey plans; geodetic surveying.	$1° = \frac{\pi}{180}$ rad
Temperature	K	°C	degree Celsius		Temperature interval 1°C = 1 K

UNITS FOR USE IN ILLUMINATION ENGINEERING

Luminous intensity	cd	cd	candela	Used in the determination of illumination levels and lighting layouts.	
Luminous flux	lm	lm	lumen		
Illuminance	lx	lx	lux	Replaces foot candle (lm/ft^2) and phot (1 ph = 10^4 lx).	
Luminance	cd/m^2	cd/m^2	candela per square metre	Replaces stilb (1 sb = 10^4 cd/m^2).	

*Note: According to a recent decision of the CSA Committee on Metric Practice Guide, the symbols for litre (shown as ℓ) and millilitre (shown as ml) are to be replaced by L (for litre) and mL (for millilitre).

UNITS FOR USE IN HYDRAULIC ENGINEERING

Quantity	SI Unit Symbol	Recommended Unit		Typical Application	Remarks
		Symbol	Name		
Length	m	m	metre	Pipe and channel lengths, storage depths of reservoirs, aquifer thickness, drawdown in wells, height of potentiometric head, hydraulic head, piezometric head, level meters, staff gauges.	
		km	kilometre	Longer pipes and channels.	
		mm	millimetre	Pipe diameters, radius of ground water wells, height of capillary rise, depth of irrigation watering, rainfall precipitation, evaporation.	
Area measurement	m^2	m^2	square metre	Cross-sectional area of channels and larger diameter pipes, surface areas of reservoirs, smaller catchment areas.	1 ha = 10^4 m^2
		cm^2	square centimetre	Small areas in special applications.	
		mm^2	square millimetre	Cross-sectional area of small diameter pipes.	1 m^2 = 10^6 mm^2
		km^2	square kilometre	Large catchment areas.	1 km^2 = 10^2 ha
		ha	hectare	Land areas, irrigation areas.	
* Volume	m^3	m^3	cubic metre	Water distribution, irrigation diversions, sewage, storage capacity, underground basins. As far as possible the cubic metre should be the preferred unit of volume for engineering and scientific purposes. The litre and its multiples and submultiples may be used for domestic and industrial supplies where an interface with the public exists.	1 m^3 = 1000 ℓ
		ℓ	litre	Domestic supply, domestic billing. All recommended units of volume can be expressed 'per day' (ℓ/d), 'per year' (ℓ/a), etc., if the context implies the total volume delivered over the particular period.	
Velocity	m/s	m/s	metre per second	River or stream flow velocity, pipe flow velocity.	
Instantaneous volumetric flow rates	m^3/s	m^3/s	cubic metre per second	Flow in pipes, channel flow, flow in rivers and streams, sludge flow, irrigation spray demand. Attention is drawn to the remarks opposite 'Volume'.	
		ℓ/s	litre per second		
		ml/s	millilitre per second	Lesser flow rates.	
Pressure	Pa	kPa MPa	kilopascal megapascal	Hydraulic head is measured in metres.	1 Pa = 1 N/m^2
Work	J	kJ MJ	kilojoule megajoule	Work done, energy available, quantity of heat. The kilowatt hour is a unit for the measurement of electrical energy only.	1 MJ = 0.277 778 kW·h

*Note: According to a recent decision of the CSA Committee on Metric Practice Guide, the symbols for litre (shown as ℓ) and millilitre (shown as ml) are to be replaced by L (for litre) and mL (for millilitre).

UNITS FOR USE IN HYDRAULIC ENGINEERING (Cont'd)

Quantity	SI Unit Symbol	Recommended Unit		Typical Application	Remarks
		Symbol	Name		
Power	W	kW	kilowatt	Heat flow meters, motor powers, rate of doing work.	
Sewage contribution			cubic metre per person per day		
*Concentrations		mg/ℓ	milligram per litre		

UNITS FOR MECHANICAL ENGINEERING

Mass	kg	kg t	kilogram tonne	Masses of structures, machines, etc. Generally the kilogram is to be used in calculations, specifications, etc. However, masses of the order of 10 kg and greater may conveniently be expressed in tonnes.	1 t = 10^3 kg
* Volume	m^3	m^3 ℓ	cubic metre litre	Volumes of fuel oil tanks, water tanks and containers. Gas volumes. Generally the cubic metre is to be used in calculations, specifications, etc. The litre will only be used where an interface with the public arises, or when the volumes concerned are less than 1 m^3.	1 m^3 = 10^3 ℓ
Mass per unit length	kg/m	kg/m	kilogram per metre	Evaluation of the masses of structural sections, cables, etc.	known also as "linear density"
Mass per unit area	kg/m^2	kg/m^2	kilogram per square metre	Evaluation of the masses of walls, floors, glass, plates, sheets, etc.	known also as "area density"
Density	kg/m^3	kg/m^3	kilogram per cubic metre	Evaluation of the masses of structures and materials.	known also as "mass per unit volume"
Mass per unit time	kg/s	kg/s t/h	kilogram per second tonne per hour	Rate of transport of material on conveyors. Rate of gas flows in special cases.	
Velocity	m/s	m/s km/h	metre per second kilometre per hour	Calculations involving rectilinear motion, wind velocities.	1 m/s = 3.6 km/h
Speed	m/s	km/h	kilometre per hour	The speed of cars and vehicles of all descriptions.	1 m/s = 3.6 km/h
Acceleration	m/s^2	m/s^2	metre per second squared	Kinematics and calculation of dynamic forces.	Standard gravitational acceleration g = 9.806 65 m/s^2
Force	N	kN	kilonewton	Calculations involving dynamic forces, forces in cables.	1 N = 1 kg·m/s^2
Pressure	Pa	kPa MPa	kilopascal megapascal	Bearing pressures, stresses in materials, vapour pressure.	1 Pa = 1 N/m^2

*Note: According to a recent decision of the CSA Committee on Metric Practice Guide, the symbols for litre (shown as ℓ) and millilitre (shown as ml) are to be replaced by L (for litre) and mL (for millilitre).

UNITS FOR USE IN MECHANICAL ENGINEERING (Cont'd)

Quantity	SI Unit Symbol	Recommended Unit		Typical Application	Remarks
		Symbol	Name		
Momentum	kg·m/s	kg·m/s	kilogram metre per second	Evaluation of impact and dynamic forces	
Angular velocity	rad/s	r/s	revolutions per second	Calculations involving rotational motion.	The revolution per second will be used for describing machinery speeds.
		r/min	revolutions per minute		
Torque	N·m	N·m kN·m MN·m	newton metre kilonewton metre meganewton metre	Calculations involving rotational motion, bending moments in structural sections, torque in engine drive shafts, axles, etc.	Also known as "moment of force."
Moment of inertia	kg·m^2	kg·m^2	kilogram metre to second power	Rotational dynamics. Evaluation of the restraining forces required for propellers, windmills, etc.	
Dynamic viscosity	Pa·s	Pa·s	pascal second	Shear stresses in fluids.	The centipoise (cP) = 10^{-3} Pa·s will not be used.
Kinematic viscosity	m^2/s	mm^2/s	square millimetre per second	Computing Reynolds number.	The centistoke (cSt) = 10^{-6} m^2/s will not be used.
* Volume flow rate	m^3/s	m^3/s	cubic metre per second	Flow (general)	Comparatively high rate
		ℓ/s	litre per second	Flow (general)	Comparatively low rate fluids only.
		m^3/s	cubic metre per second	Flows in pipes, air conditioning ducts and the like.	
		ℓ/s	litre per second	Fluids only	
Concentration	kg/m^3	μg/m^3	microgram per cubic metre	Pollution control	
Enthalpy Latent heat Sensible heat	J	J kJ MJ	joule kilojoule megajoule	Thermal energy calculations. Mechanical and electrical energy.	
Work, Energy		kW·h	kilowatt hour	Electrical metering purposes only.	1 kW·h = 3.6 MJ
Power	W	W mW kW MW	watt milliwatt kilowatt megawatt	Power input, output, rating, etc., of heavy power plant. Power in general (mechanical, electrical, thermal, etc.); input, output rating, etc., of motors, engines, heating and ventilating plant and other equipment in general. Heat flow rate through walls, windows, etc.	

*Note: According to a recent decision of the CSA Committee on Metric Practice Guide, the symbols for litre (shown as ℓ) and millilitre (shown as ml) are to be replaced by L (for litre) and mL (for millilitre).

UNITS FOR USE IN MECHANICAL ENGINEERING (Cont'd)

Quantity	SI Unit Symbol	Recommended Unit		Typical Application	Remarks
		Symbol	Name		
Temperature	K	K	kelvin	Expression of thermodynamic temperature, calculations involving units of temperature.	°C ≙ 273.15 K
		°C	degree Celsius	Most commonly used temperature scale. Will be used in meteorology, engineering and all facets of building and construction.	
Temperature interval	K	°C	degree Celsius	Heat transfer calculations.	1K = 1°C
Coefficient of linear expansion	1/K	1/°C	reciprocal degree Celsius	Expansion of material subjected to a change in temperature; expressed as a ratio per degree Celsius.	
Heat flux density, intensity of heat flow	W/m^2	W/m^2	watt per square metre	Flow of heat through buildings, walls and other heat transfer surfaces. Transmission calculations.	
		kW/m^2	kilowatt per square metre		
Thermal conductivity, heat transfer coefficient	W/m·K	W/m·°C	watt per metre degree Celsius	Estimation of thermal behaviour of materials and systems. Heat transmission calculations.	k-value
Thermal conductance	$W/m^2 \cdot K$	$W/m^2 \cdot °C$	watt per square metre degree Celsius	Heat transmission calculations.	U-value
Thermal resistivity	m·K/W	m·°C/W	metre degree Celsius per watt	Heat transmission calculations.	
Thermal resistance	$m^2 \cdot K/W$	$m^2 \cdot °C/W$	square metre degree Celsius per watt	Heat transmission calculations.	R-value
Heat capacity	J/K	J/°C	joule per degree Celsius	Thermal behaviour of materials. Heat transmission calculations.	
Specific heat capacity	J/kg·K	kJ/kg·°C	kilojoule per kilogram degree Celsius	Heat transmission calculations.	
Specific energy	J/kg	kJ/kg	kilojoule per kilogram	Heat and energy contained in materials. Calorific values of fuels.	
		MJ/kg	megajoule per kilogram		
Specific sensible heat. Specific latent heat				Psychrometric calculations	
Specific volume	m^3/kg	m^3/kg	cubic metre per kilogram	Calculations involving fluids.	
Moisture content	kg/kg	kg/kg	kilogram per kilogram	Psychrometric calculations.	
		g/kg	gram per kilogram		

UNITS FOR USE IN MECHANICAL ENGINEERING (Cont'd)

Quantity	SI Unit Symbol	Recommended Unit		Typical Application	Remarks
		Symbol	Name		
Permeability		ng/Pa·s·m	nanogram per pascal second metre	Water vapour transmission	
Permeance		ng/Pa·s·m^2	nanogram per pascal second metre squared	Water vapour transmission through walls, etc.	

UNITS FOR USE IN ELECTRICAL ENGINEERING

Electric current (intensity of electric current)	A	kA A mA µA	kiloampere ampere milliampere microampere	Service rating of an electrical installation. Leakage current.	
Electric charge. Quantity of electricity	C	kC C µC nC pC	kilocoulomb coulomb microcoulomb nanocoulomb picocoulomb	The voltage on a unit with capacitive type characteristics may be related to the amount of charge present (e.g., electrostatic precipitators). Storage battery capacities.	
Electric potential. Potential difference. Electromotive force	V	MV kV mV µV	megavolt kilovolt millivolt microvolt	The electric field strength gives the potential gradient at points in space. This may be used to calculate or test electrical parameters such as dielectric strength.	
Electric field strength	V/m	MV/m kV/m mV/m µV/m	megavolt per metre kilovolt per metre millivolt per metre microvolt per metre	The electric field strength gives the potential gradient at points in space. This may be used to calculate or test electrical parameters such as dielectric strength.	
Capacitance	F	F mF µF nF pF	farad millifarad microfarad nanofarad picofarad	Electronic components. Electrical design and performance calculators.	
Current density	$A/µm^2$	A/m^2 kA/m^2	ampere per square metre kiloampere per square metre	Design of cross-sectional area of electrical conductor.	
Magnetic field strength	A/m	A/m kA/m	ampere per metre kiloampere per metre	Magnetic field strength used in calculation of magnetic circuitry such as transformers, magnetic amplifiers and general cores.	
Magnetomotive force. Magnetic potential difference	A	kA A mA	kiloampere ampere milliampere	Used in the calculations involved in magnetic circuits.	

UNITS FOR USE IN ELECTRICAL ENGINEERING (Cont'd)

Quantity	SI Unit Symbol	Recommended Unit		Typical Application	Remarks
		Symbol	Name		
Flux of magnetic induction. Magnetic flux	Wb	mWb	milliweber	Used in the calculations involved in magnetic circuits.	
Magnetic flux density. Magnetic induction	T	T mT μT nT	tesla millitesla microtesla nanotesla	Used in the calculations involved in magnetic circuits.	
Magnetic vector potential	Wb/m	kWb/m	kiloweber per metre	Used in the calculations involved in magnetic circuits.	
Self-inductance. Mutual inductance	H	H mH μH nH pH	henry millihenry microhenry nanohenry picohenry	Used in analysis and calculations involving transformers.	
Permeability	H/m	H/m μH/m nH/m	henry per metre microhenry per metre nanohenry per metre	Permeability gives the relationship between the magnetic flux density and the magnetic field strength.	
Resistance	Ω	GΩ MΩ kΩ Ω mΩ	gigaohm megohm kilohm ohm milliohm	The design of electrical devices with finite resistance such as motors, generators, heaters.	
Conductance, Admittance, Susceptance	S	MS kS S mS μS	megasiemens kilosiemens siemens millisiemens microsiemens	The design of electrical devices with finite resistance such as motors, generators, heaters.	
Resistivity	Ω·m	GΩ·m MΩ·m kΩ·m Ω·m mΩ·m μΩ·m nΩ·m	gigaohm metre megohm metre kilohm metre ohm metre milliohm metre microohm metre nanoohm metre	The design of electrical devices with finite resistance such as motors, generators, heaters.	
Conductivity	S/m	MS/m kS/m S/m μS/m	megasiemens per metre kilosiemens per metre siemens per metre microsiemens per metre	The design of electrical devices with finite resistance such as motors, generators, heaters. A parameter for measuring water quality.	
Reluctance	H^{-1}	H^{-1}	reciprocal henry	Design of motors and generators.	
Permeance	H	H	henry		

UNITS FOR USE IN ELECTRICAL ENGINEERING (Cont'd)

Quantity	SI unit Symbol	Recommended Unit		Typical Application	Remarks
		Symbol	Name		
Impedance, Reactance	Ω	MΩ kΩ mΩ	megohm kilohm milliohm	The design of electrical motors, generators and transmission lines.	
Active Power	W	TW GW MW kW W mW μW	terawatt gigawatt megawatt kilowatt watt milliwatt microwatt	The useful power in an electrical circuit.	
Apparent Power	V·A	TV·A GV·A MV·A kV·A V·A mV·A μV·A	teravolt ampere gigavolt ampere megavolt ampere kilovolt ampere volt ampere millivolt ampere microvolt ampere	The total volt-amperes in an electrical circuit	Reactive power is expressed in vars (var).

CONSTANTS FOR GENERAL USE

Name	Symbol	Value	Unit
Standard atmosphere pressure	P_o	100.0	kPa
Absolute zero (temperature)	T	-273.15°C	
Standard acceleration due to gravity	g	9.806 65	m/s^2
Velocity of sound in air (P_o, 20°C, 50%, R.H.)	M	344	m/s
Specific volume of perfect gas at STP	V_o	22.414	$m^3/kmol$
Characteristic gas constant for air	R_a	287.045	J/kg·K
Characteristic gas constant for water vapour	R_v	461.52	J/kg·K
Natural logarithms	e	2.718 281 828 5	
Pi	π	3.141 592 653 6	

APPENDIX A

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