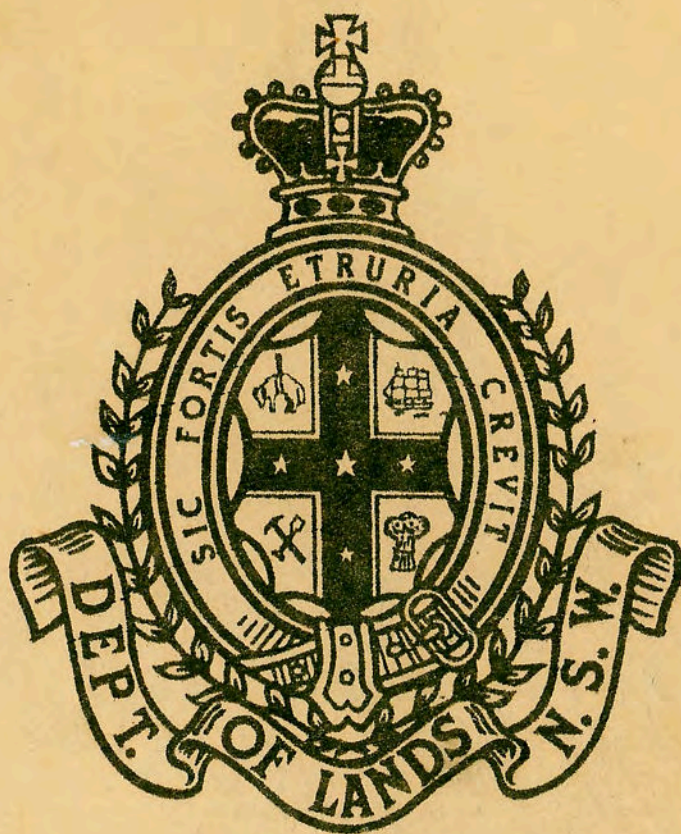




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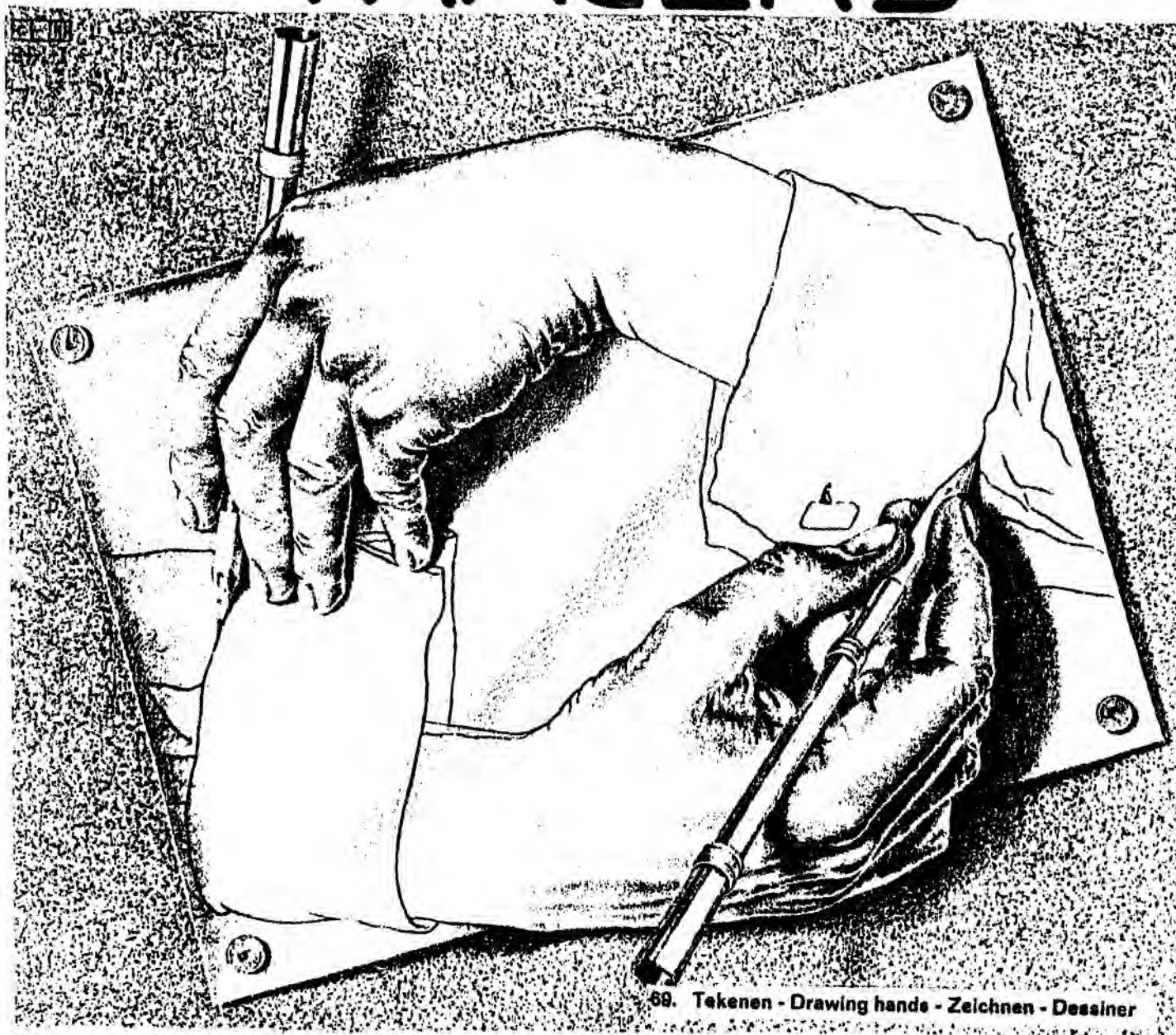
LANDS

OFFICE

TRACER'S

MANUAL

MANUAL FOR TRACERS



20th May, 1980

Training Manual for Tracers

The training of tracers is a duty common to draftsmen and draftswomen in all Land Board Offices and drafting sections of the Crown Lands Office. Two officers from Nowra Land Board Office, Messrs. J. T. Sloane and T. S. New have produced this training manual to help reduce the preparation time required by all other officers.

The manual was designed as a reference book for tracers and tutors alike. It covers the basic principles of tracing including lettering for use on maps and in the preparation of plans and diagrams, use and maintenance of drafting instruments, use of paints, both water and oil, metric conversion and calculations.

As a reference book, the manual will need to be supplemented with material available in each Office and on-the-job instruction by tutors. One pilot group of trainee tracers have followed the manual programme, and are now an effective part of the Office workforce.

I commend the professional attitude Messrs. Sloane and New have shown in producing this training manual. The manual was originally submitted to the "suggestion awards scheme" where it received favourable attention.

I invite other officers to assist in the development of this Department by using the "suggestion awards scheme" and by designing other training programmes which can be used throughout the Crown Lands Office.



A. E. LLEWELLYN,
Director of Crown Lands.

Terry New and John Sloane wish to acknowledge the co-operation and assistance of the following people, without whose help this Manual could not have been prepared in the Nowra Land Board Office.

TYPING: Linda Barr and Dianne Mansell

TRACING: Rhonda Ellison and Iris White

PRINTING: Arthur Seymour

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TRAINING MANUAL FOR TRACERS - INTRODUCTION

1. INTRODUCTION

The object of this manual is to provide the basis of a training course to prepare trainee Tracers to work in the Crown Lands Office of the Department of Lands environment.

The programme will provide a sound basis in lettering, linework, tinting and understanding of the drafting records - plans, aerial photos, maps etc. Its aim is to teach, but with sufficient variety to avoid boredom.

2. DUTIES OF A TRACER

Within the framework of the Crown Lands Office, the duties of a Tracer might be summarised as:-

- (a) Noting
- (b) Preparation of diagrams and plans
- (c) Minor casework
- (d) Miscellaneous

2(a) NOTING - Parish Maps

The major noting operations effected by a Tracer are on the office maps. Notings are effected from various sources such as the Government Gazette, applications and miscellaneous advices from Head Office and other sources.

To further explain the noting, it must be understood that each Land Board Office has a set of Parish maps covering the whole of its District. These maps show the status of all land within the District and any area of land may be described either as a Portion/Lot of the Parish in which it is situated, or, in relation to such Portion/Lots or other physical features shown on the map. These maps are kept up-to-date as regards reservations, tenures, etc. over Crown land and they also record the Portion/Lots which have been alienated and therefore left the jurisdiction of the Crown Lands Office. Transfers of Crown tenures are not noted on the maps and the name appearing on the map is either the original holder of the appropriate tenure or the original grantee of the Crown Grant issued over the land.

It is the Tracer's duty to keep these maps up-to-date and, as mentioned above, one of the major sources of information for doing this is the Government Gazette which is published on Friday of each week and includes a section devoted to Lands Department notices. Quite a lot of the office noting comes from this section of the Government Gazette, although the office maps may be noted from other sections of the Gazette, such as notifications under the Forestry Act, Mining Act, Local Government Act, etc. The noting under this heading

may broadly be classified as the notation of granting of such tenures as Special Leases, ~~Auction Purchases, After Auction Purchases~~ and Special Purchases, the notification and revocation of reserves and dedications, the closing and opening of roads, the notification of Auction Sales and Tender Purchases, the appointment of Trustees and the proclamation and variation of town and country planning schemes.

Maps are noted according to the directions contained in Section 62, Manual of Procedures - this Manual governs all activities carried out by Officers of the Crown Lands Office and this particular section includes accepted abbreviations and the various edgings and tintings to designate various tenures, reservations, etc. 

NOTING - Crown Lands Agents Maps

Whenever a notation is made to an Office map, either from the Gazette or from any other source, it should also be noted in the Crown Land Agent's Notation Book. There is a Crown Land Agent's Notation Book for each of the Land Districts within say the Nowra Land Board District, except the Nowra Land District itself. That is, there are four sets of Crown Land Agent's Books, one each for Moss Vale, Kiama, Moruya and Bega. Each of these four Crown Land Agents has a separate set of Parish maps covering the land within his District and it is the Tracer's duty (from the Crown Land Agent's Notation Books) to call up, in at least three-monthly intervals, the maps which are to be noted.

The Crown Land Agent forwards these maps to the Land Board Office and from the Notation Book a notation corresponding to that made on the Land Board Office map is made to the Crown Land Agent's copy of the Parish map.

NOTING - Description of further sources of information for noting

A second source of noting information, mentioned above, is from applications. Officers receive applications for Crown tenures (now mainly Special Leases, After Auction Purchases and applications for conversion of Special Leases, Crown Leases, Homestead Farms and Homestead Selections). They are then passed to the Tracer to indicate the existence of such application by pencil notation on the Parish map or notation on the Parish cards. ~~There is no need to record these pencil notations in the Crown Land Agent's Notation Book, because the Crown Land Agent notes these himself when the application is originally received.~~

Each month a list of Portions/Lots/Closed Roads in respect of which Crown Grants have issued is supplied by the Crown Grants Section of the Registrar General's Office and this provides another source of noting work for the Tracer. In this case, the grantee's name is recorded on the map (with the former holder's name struck out, if it is not the same) and the word "former" placed after the tenure and placed in parenthesis, e.g.

2(a) Continued

(S.P. 74/1 former). The block is then tinted grey to indicate that it is now freehold.

When tenures, which are not gazetted, are granted or refused, the decision is usually forwarded to the applicant by letter and from either a copy of such advice or the file, the Tracer again brings the Office maps up-to-date, ~~noting, if appropriate, the Crown Land Agent's Notation Book.~~

2(b) PREPARATION OF DIAGRAMS AND PLANS

As well as assisting Officers in the notation of applications, the Tracer assists them by preparing diagrams to illustrate cases with which they deal. Most reports prepared by Officers in the Land Board Office are illustrated by diagrams and the Tracer may prepare these by obtaining dye-line copies or photo-copies of existing diagrams or may actually be required to plot and draw a diagram especially for the particular case. The diagrams are tinted and a legend placed on them under the guidance of the Officer for whom they are prepared. In all noting and diagram preparation work, the Tracer is expected to letter to the best of her ability and this is a valuable field in which the Tracer may obtain lettering practice.

Plans of surveys effected by the Staff Surveyors are prepared in the Land Board Office under the guidance of the Examining Draftsman. These plans are eventually placed on public record in the Registrar General's Office. Instructions in scaling and plotting to enable the Tracer to do this work are an integral part of this manual.

2(c) MINOR CASE WORK

During the course of notation work, the Tracer gains valuable experience in map reading and the Officer-in-Charge often allocates to the Tracer searches requested by Solicitors as to status of land and requests for such information as to whether Road Permits or Permissive Occupancies attach to their client's land. Applications for Permissive Occupancies or Road Enclosures may also be given to Tracers to carry out the necessary administrative work.

Detailed directions for this are contained in the Manual of Procedures and the Work Narratives, and instructions in calculating areas are included in this manual.

2(d) MISCELLANEOUS

This all embracing term covers other work allocated to Tracers in the Office.

The Tracer may be required to search the plan and diagram records for Officers doing case work or to order photo-copies of original plans from Head Office or the Registrar General's Office.

The Tracer will also file away the plan and map records

of the Office.

The Air Photo Library is under the oversight of the Tracer who may be required to identify air photos and extract same from the Library when required by senior Officers or for issue to Field Officers. Periodically, when new runs of air photos are available, the Tracer informs the Air Photo Librarian in Head Office of the particular photos which are required in the Office's Air Photo Library.

3. CONCLUSION

From the foregoing it will be seen that the Tracer has a wide range of duties, which are integrated into the general routine of the Land Board Office. It has already been pointed out how the Tracer assists Officers by noting their applications and preparing their diagrams and it is obvious that the efficient conduct of business depends to a large extent on the accuracy of noting. The Office maps are a source of information to the general public and it is imperative for this reason, and also for the efficient running of the Office generally, that the notations be up-to-date and accurate at all times. 

PROGRAMME FOR TRAINEE TRACERS

The following programme is designed to have Tracers sufficiently trained in tracing skills to become fully effective members of the Office staff by the fifth week.

Day 1 of the first week will usually be taken up with introductions, general outline of the functions of the Office etc. but trainees should be introduced as soon as possible to Microfont and Egyptian lettering and commence practice.

The programme is set out on a weekly basis of instruction and practice. The programme for say Week 1, is repeated on each day of that week.

← Refers to annexures, circulars and special points of interest throughout the Manual.

PROGRAMME

WEEK 1

INSTRUCTION - in use of materials which will allow trainee to commence lettering, e.g. sizes of guidelines, angle of slope lines, use of parallel ruler, sharp pencils etc.

HOURL 1 - Instruction and practice in drawing of large scale Egyptian capitals, lower case and numerals IN PENCIL as shown on annexures with Chapter 1. White or graph paper should be used. ←

HOURL 2 - Instruction and practice in drawing of large scale Microfont letters and numerals IN PENCIL on white or graph paper - see Chapter 2. Graph paper in metric divisions is ideal for trainees to learn the shapes of letters. ←

HOURLS 3 & 4 - Instruction in filing of diagrams, standards, roughs etc. Instruction on information shown on Parish maps (see Section 62, Manual of Procedures, Vol. I). See also Chapter 16. ←

HOURLS 5 & 6 - Plotting experience following initial instruction in use of scales and purpose of bearings - see Chapter 3 on Scales and Conversion of Imperial/Metric Units and Chapter 4 on the Protractor and Plotting. ←

HOURL 7 - Further practice or instruction as necessary, including, towards the end of the week, instruction on scaling of areas of geometric figures - see Chapter 5. ←

WEEK 2

INSTRUCTION - in use of paints, brushes and Micronorm pens.

HOURLS 1 & 2 - As for Week 1.

HOURL 3 - Instruction and practice in use of water paints, see Chapter 6. ←

HOURL 4 - Filing of diagrams etc. as required. Instruction in reproduction processes available in Office (e.g. dyeline copying).

WEEK 2 (Continued)

HOURS 5 & 6 - Instruction on use of Micronorm pens - see Chapter 7. Practice in Egyptian and Microfont lettering and numbers IN INK. ←

HOURL 7 - Instruction on scaling of roads of even width - see Chapter 8. Instruction on scaling of irregular areas by division into regular figures - see Chapter 9. ←

WEEK 3

INSTRUCTION - in use of mapping inks, if used in Office, erasing, stencils and planimeter.

HOURL 1 - Practice in Egyptian and Microfont letters and numbers in ink.

HOURL 2 - Instruction in use of mapping inks and practice. See Chapter 10. ←

HOURL 3 - Filing as required and instruction in simple map noting.

HOURL 4 - Instruction in erasing methods - see Chapter 11. ←

HOURS 5 & 6 - Preparations of simple diagrams etc. as required. For preparation of diagrams for Government Gazettes, see Special Circular 76/12D. ←

HOURL 7 - Instruction in use of stencils and planimeter - see Chapters 12 and 13. ←

WEEK 4

INSTRUCTION - as to Gazette noting, scaling of areas and enlargement and reduction.

HOURL 1 - As for Week 3.

HOURS 2-7 - (a) Preparation of diagrams, tinting or filing as required.

(b) Instruction as to Gazette noting and possible first Gazette.

(c) Map noting.

(d) Instruction in scaling of areas using transparent square overlay - see Chapter 14. ←

(e) Enlargement and reduction of diagrams - see Chapter 15. ←

WEEK 5

INSTRUCTION - as to plan drawing.

HOURL 1 - As for Week 3.

HOURS 2-7 - Normal Tracer's duties as required but include preparation of a practice plan following instruction as to layout etc. by the Examining Draftsman.

The foregoing programme is a guide only and can be varied or advanced according to the ability of the trainee. Its main aim is to teach and to avoid boredom.

CHAPTER 1

EGYPTIAN LETTERING AND SPACINGEGYPTIAN LETTERING

Egyptian lettering is sharp and distinct and ideal for use in noting maps. It is made up of two strokes, one thick and one thin, but because of its reduced size appears on most map noting as letters and numerals of even thickness.

Both lower case and capital letters are based to a great extent on the circle. However, although lower case letters "a", "b", "d", "h", "n" etc. are based on the circle, the curved line is slightly clipped, i.e. it departs from the line of the circle just before joining the straight portion. This clipping tends to bring the point of commencement of the straight lines slightly nearer to the centre of the letter.

In practice it will be found that direct, upright Egyptian letters should be drawn slightly backhand. If some of the letters slope slightly forward, the difference can be seen immediately when compared to the upright letters. However, if some of the letters slope slightly backhand, when compared to the upright letters, the optical impression is that all of the letters are upright.

The optical impression or overall final presentation of the lettering is more important than the technically correct shape of each individual letter or numeral.

Examples of capitals, lower case and numerals are shown on annexures "A", "B" and "C". 

For lower case practice, it is suggested that the trainee use additional guidelines, or unit divisions, as for capitals during the first week.

SPACING

Letters may be divided into three classes:-

CIRCULAR: B, C, D, G, O, Q, S, R and P

NORMAL: E, H, I, M, N and U

IRREGULAR: A, F, J, K, L, T, V, W, X, Y and Z

Normal letters can be spaced mechanically to give an even result. However, gaps between circular and irregular letters need to be avoided by fitting them closer together according to their shape.

Circular and irregular shaped letters should intrude into the spaces between them and the letters adjoining their curved or irregular sides. This helps to compensate for the extra space created by the shape of the letter.

Letters can also be grouped as:-

NARROW: B, E, F, I, J, L, N, P, S, T and Y

NORMAL: C, D, G, H, K, M, R, U, V, X and Z

WIDE: A, M, O, Q and W

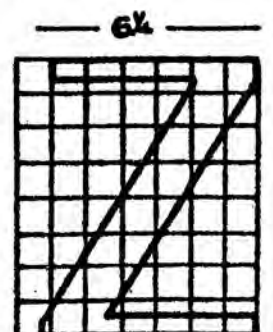
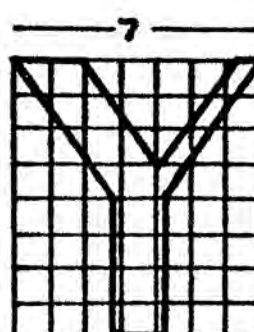
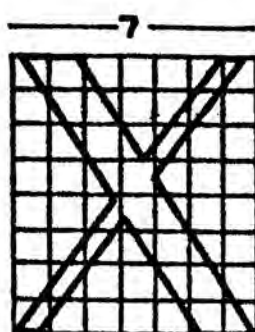
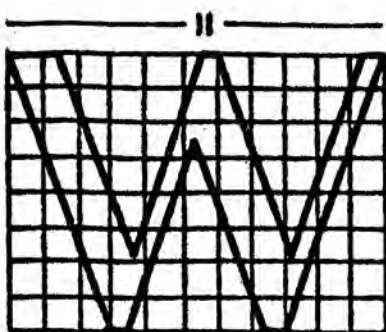
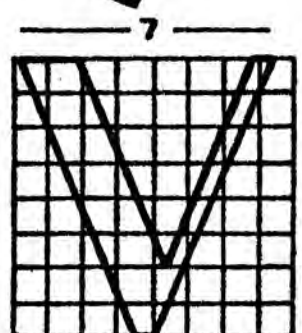
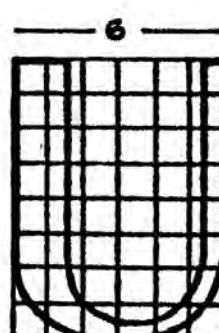
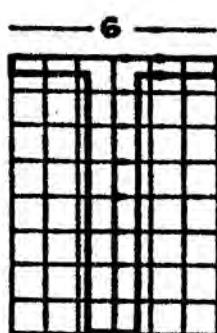
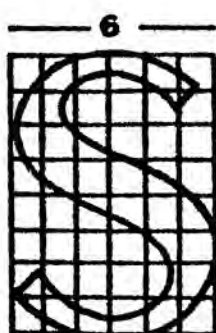
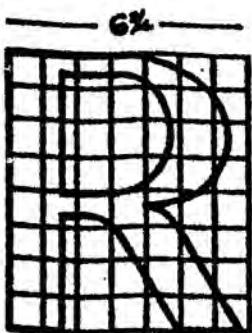
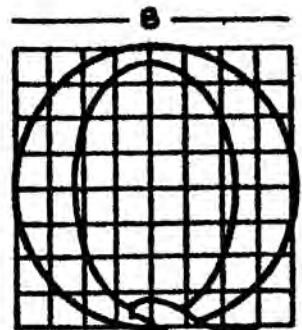
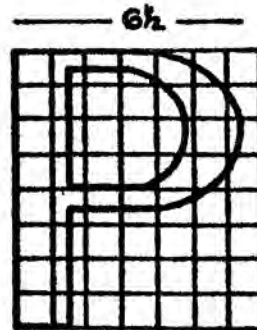
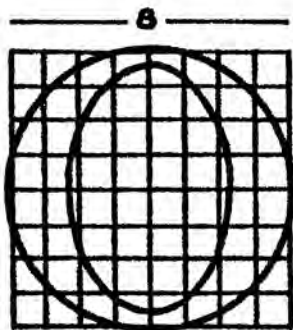
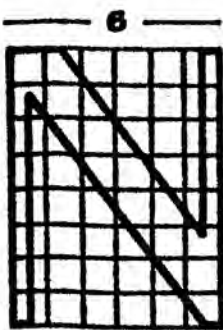
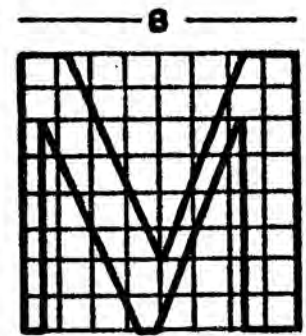
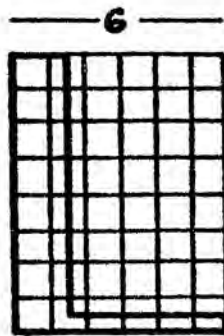
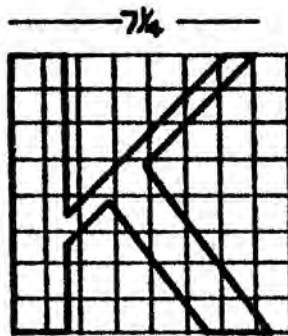
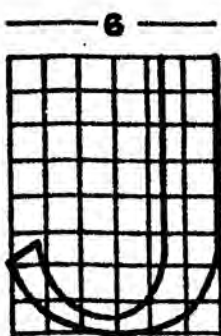
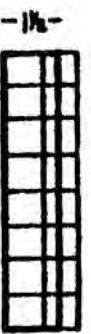
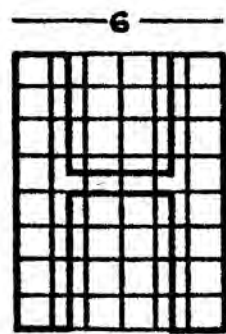
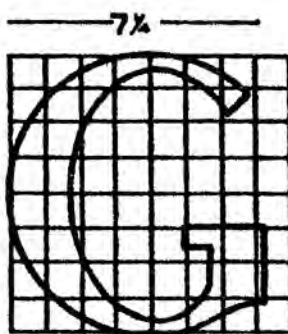
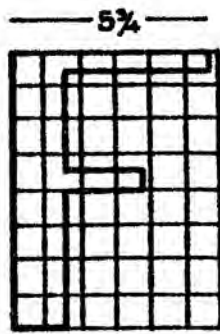
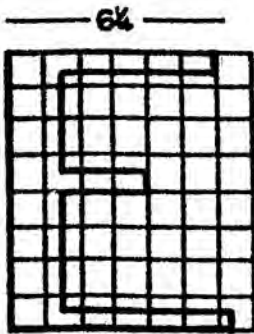
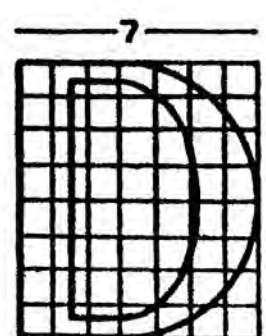
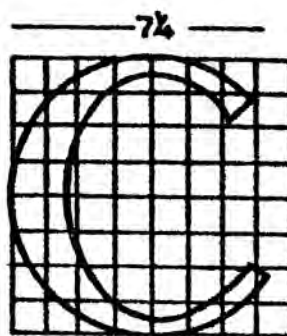
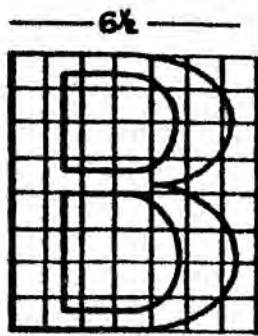
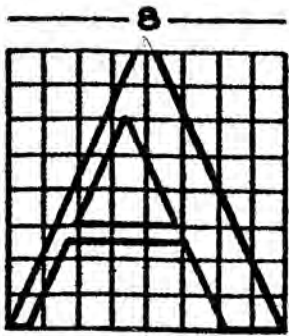
Errors in shape and spacing will occur if wide letters are compressed, and narrow letters are stretched, to make them fit into a normal space.

Letters should be spaced "optically" rather than "mechanically". Where purely mechanical spacing is used, allowance must be made for the intrusion of wide and circular letters into the dividing spaces and the widening of the spacing by the "narrow" letters, particularly "I".

Trainees will need to use mechanical methods initially but a proper sense of visual proportion should be developed as early as possible.

Annexure "D" herewith gives a guide to spacing.





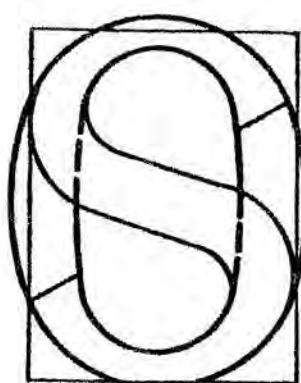
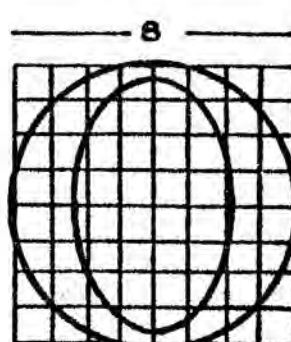
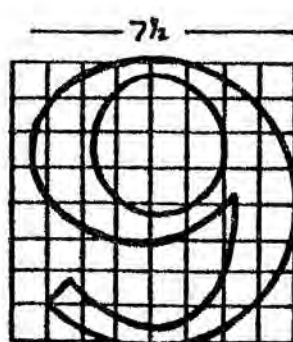
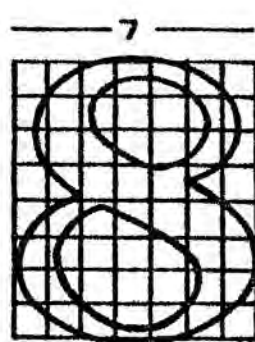
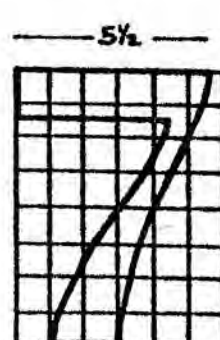
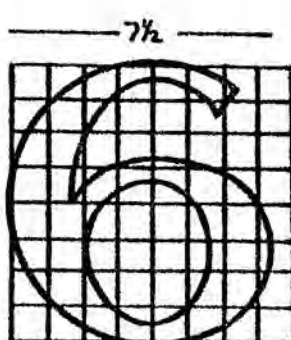
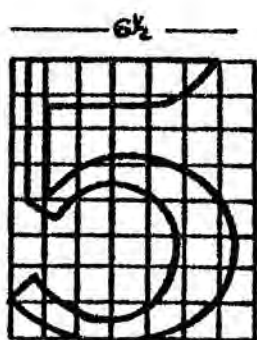
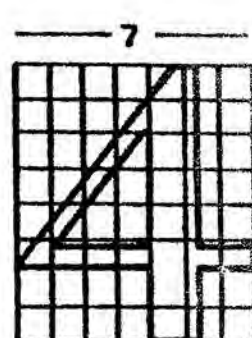
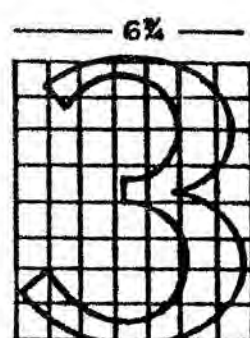
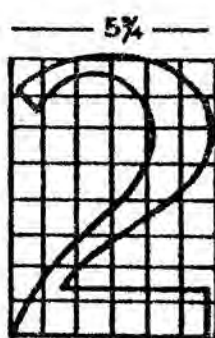
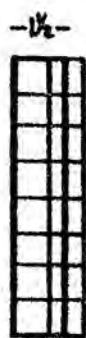
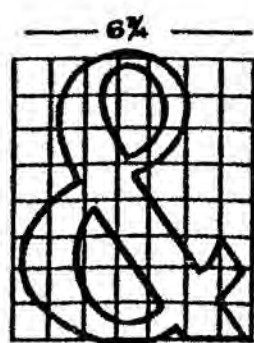
a b c d e

f g h i j k

l m n o

p q r s t u

v w x y z



SPACING

S P A C I N

MECHANICAL

S P A C I N

OPTICAL

CHAPTER 2

MICROFONT LETTERING

This style has been developed by the American National Microfilm Association Drafting Committee for optimum clarity of reproduction and microfilming.

It will be noted that this type of lettering is more open-ended, i.e. there is less "fill" in the letters than in more commonly accepted styles. This is particularly obvious in the letters C, M, S, W and numbers 3, 5, 6 and 9 and ensures a legible copy at a reduced size.

Almost all of the letters used on plans are capitals and the only lower case letters used are those denoting areas such as "ha".

Annexure "A" herewith shows spacing, height and thickness ratios with examples for lettering. A lower case style is shown for use as required. 

As a general rule, the ratio of character height to line thickness shall be 10:1, i.e. for characters 2.5 mm in height, a nib of size 0.25 mm shall be used. The minimum line thickness for plans of survey is 0.25 mm.

Pen points in the "Micronorm" range of 0.25 mm, 0.35 mm, 0.5 mm, 0.7 mm are available and these sizes should be used.

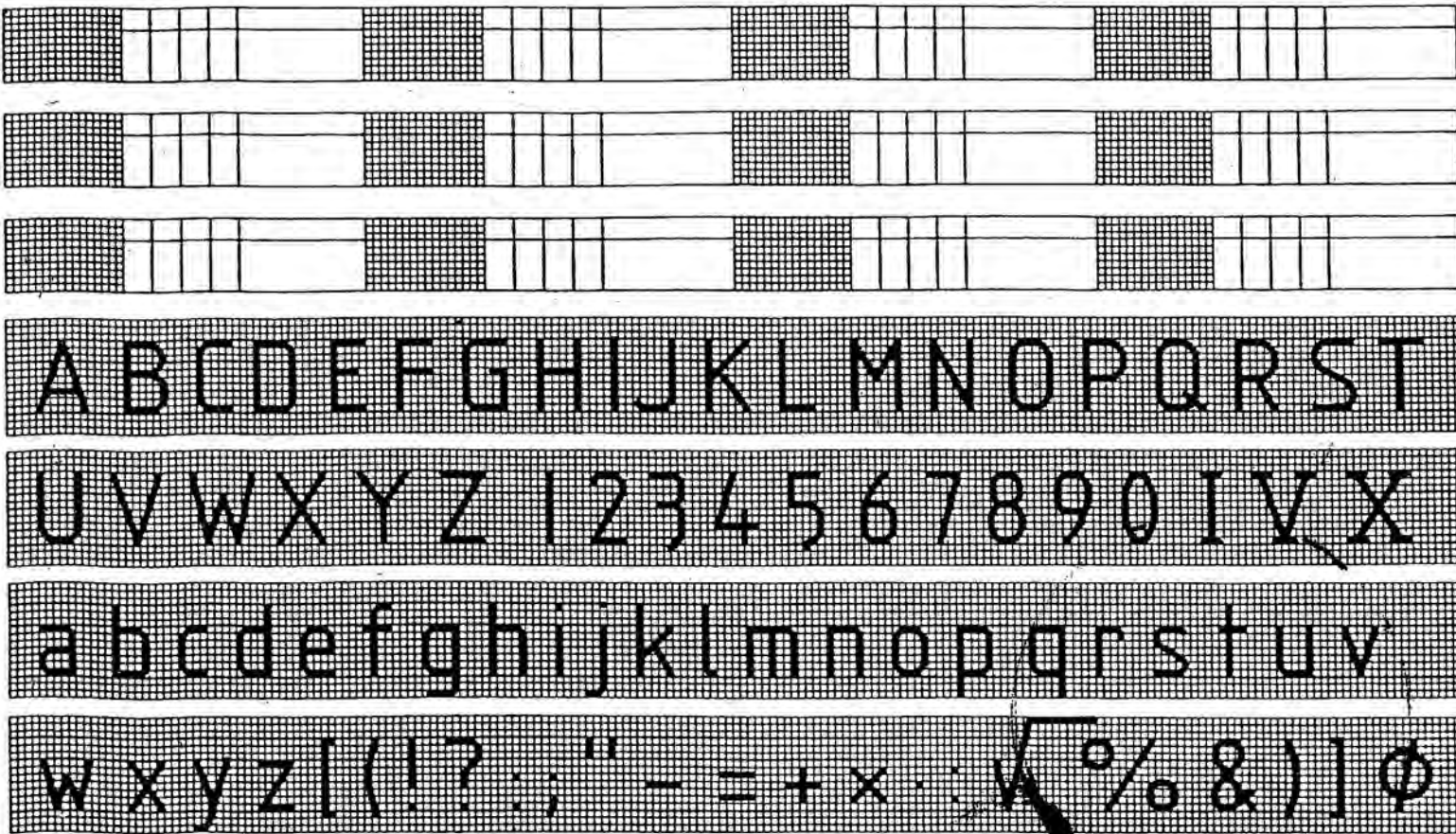
See Annexure "D" with Chapter 1 for advice on spacing. 

Annexure "B" herewith is an example of the ROTRING Standard Lettering Practice Sheet for guidance in formation of letters. 

MICROFONT LETTERING

Nominal heights in mm: 2.5-3.5-5-7

Lettering feature		ratio
Height of capital letters	h	(10/10)h
Height of small letters (without upper or lower lengths)	c	(7/10)h
Minimum space between characters	a	(2/10)h
Minimum space between base lines	b	(16/10)h
Minimum space between words	e	(6/10)h
Line thickness	d	(1/10)h



ANNEXURE B



Standard lettering practice sheet

[illegible]

SCALES AND CONVERSION IMPERIAL/METRIC UNITS

Scales

There is a statement on every plan or map as to the scale or reduction ratio - that is to say the representation on paper of the particular area.

Scales can be divided into distinct types - Imperial Scales and Natural Ratios (or Reduction Ratios). See Annexure "A" herewith for an example of each of these scales. 

Imperial Scales

These were the scales in use before the metric conversion came into effect from 1st July, 1972. These scales have a basic unit of one inch which is divided up into a stated number of division, i.e. an imperial 40 scale has 40 divisions to the inch. This scale can be used for scaling 40 chains to an inch; 40 feet to an inch; 40 links to an inch, etc. or multiples of 10 thereof.

The range of imperial scales is 10, 20, 30, 40, 50, 60, 80, 100. These scales are identified simply by the fact that they will have one of these numbers on its face. Tutor to show examples of plans at Imperial scales from Office records.

Natural Ratios (or Reduction Ratios)

These are shown on a plan or map as say 1:2000 and there will be a statement as to the unit of measurement.

They are a natural representation, at a scale that can be handled, of what is on the ground, i.e. if a piece of land measures 50 metres by 100 metres, a plan at the full scale would be that same size and would not fit on any plan form. Consequently it is reduced by a ratio that will enable it to be conveniently handled - thus at a scale or reduction ratio of 1:100 each 100 units, or metres in this case, will be shown as 1 metre on paper and a plan 0.5 x 1 metre would result.

The same principle applies no matter what unit of measurement is used - metres, yards, links or chains.

Thus if a plan is plotted at 1:8000, you can scale - metres if you have a 1:8000 metres scale; feet if you have a 1:8000 feet scale, yards if you have a 1:8000 yards scale. But note carefully the unit of measurement and ensure that your scale is calibrated for the unit of measurement used. A 1:8000 scale calibrated for metrics (as used by the Lands Department) cannot be used on a plan of 1:8000 with measurements in feet. Tutor to show examples of plans at metric Reduction Ratios from Office records.

Note that Imperial scales can be expressed as reduction ratios. Forty chains to an inch is 1:31680.

This is obtained by expressing 40 chains in inches, i.e. 40 chain x 66 feet x 12 inches = 31680 inches.

The principle is the reduction of the scale to the plan measurement unit. That is, the plan has been drawn with one inch representing 40 chains and there are two different units, inches and chains. They should be reduced to a practical common unit of inches with one inch representing 31680 inches or 1:31680. (Table showing exact equivalents of existing Imperial scales converted to the metric natural scales is attached as Annexure "B").

Demonstration by Tutor

Measure and show lengths from plans and maps in Office, first checking scale and unit measurements.

Exercise

Tracer to provide answers to certain exercises by scale and to draw lines to scale. See exercise sheet Annexure "C".

Conversion

Imperial measurements may be converted to metres by use of the metric conversion tables - blue book - compiled by the Registrar General's Office.

Each section to be explained by Tutor.

Conversion factors are given in the front of the blue book and multiplication of given figures by the appropriate factor will give the same results as looking up the book.

Demonstration by Tutor

- (1) Use book to convert feet to metres;
links to metres
- (2) Use book to convert area
- (3) Calculate by multiplication

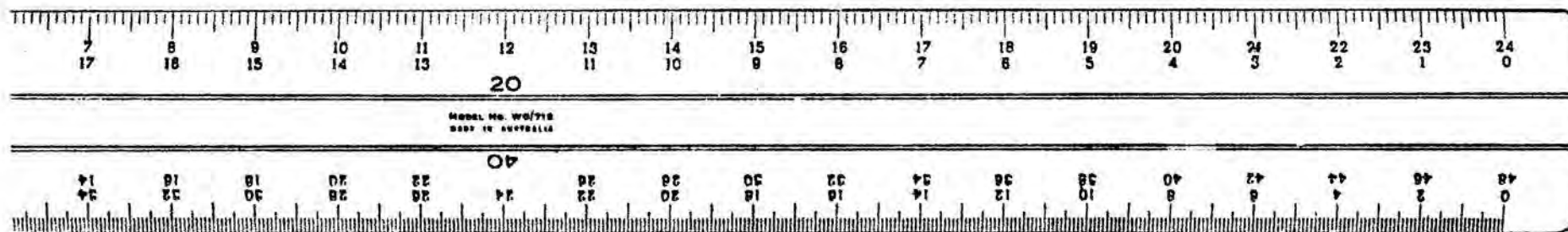
Exercise

Tracer to provide answers to questions by book and multiplication, see exercise sheet Annexure "C".

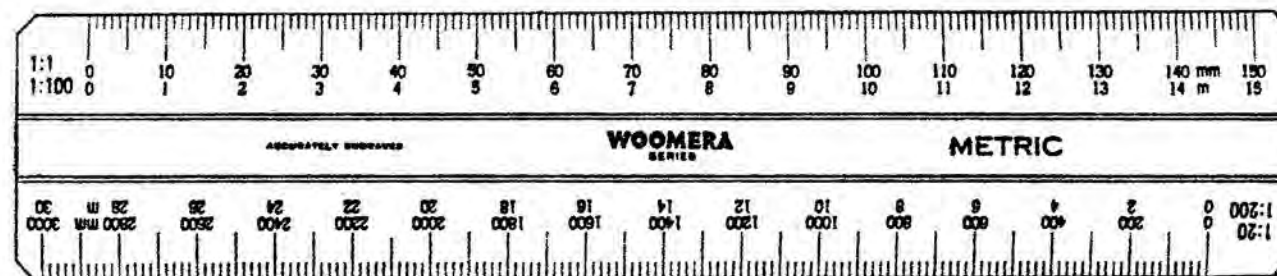
Tutor to explain acceptable "rounding-off" procedure as per Special Circular 73/5F.

General Information

Annexure "D" herewith provides general information in calculation of areas which can be used in the general work situation.



EXAMPLE OF IMPERIAL SCALE



EXAMPLE OF METRIC SCALE

TABLES SHOWING THE EXISTING (IMPERIAL) SCALES
CONVERTED TO EXACT EQUIVALENT IN METRIC NATURAL SCALE

IMPERIAL SCALES	METRIC EQUIVALENT		
	Where Units are in CHAINS	Where Units are in LINKS	Where Units are in FEET
100 Units to an inch	1:79200		1:1200
80 " " " "	1:63360	1:634	1:960
60 " " " "	1:47520	1:475	1:720
50 " " " "	1:39600	1:396	1:600
40 " " " "	1:31680	1:317	1:480
30 " " " "	1:23760	1:238	1:360
20 " " " "	1:15840	1:158	1:240
10 " " " "	1:7920	1:79	1:120
8 " " " "	1:6336		
6 " " " "	1:4752		
5 " " " "	1:3960		
4 " " " "	1:3168		
3 " " " "	1:2376		
2 " " " "	1:1584		
1 " " " "	1:792		

EXERCISES IN SCALING AND CONVERSIONSSCALING

Using the scales quoted, draw lines to length:-

- 75 chains at 30 chains to 1 inch
- 75 chains at 60 chains to 1 inch
- 5 feet 6 inches at 2 feet to 1 inch
- 100 metres at 1:1000
- 55 metres at 1:1000
- 25.5 metres at 1:500
- 475 metres at 1:4000

CONVERSIONS

Using the blue metric conversion tables book, convert the following Imperial units to metrics:-

75 feet	30 acres
179 feet 7 $\frac{1}{4}$ inches	1 r. 27 $\frac{1}{4}$ p.
46.2 links	189 a. 3 r. 38 $\frac{1}{4}$ p.
942.48 links	4729 a. 2 r.

Again using the blue book, convert the following metric units to Imperial:-

- 195 metres to both feet and links
- 76 hectares to acres, roods and perches

Using the conversion factors quoted in the front of the blue book, convert the following Imperial units to metric and the metrics to Imperials:-

1.6 feet	7 metres to both feet and links
20.16 links	7 ha to acres, roods and perches
3 a. 2 r.	
1 a. 1 r.	

GENERAL INFORMATION SHEET FOR USE
IN CALCULATION OF AREAS
AND METRICATION

In calculating areas, the following points have to be remembered:-

100 links	= 1 chain
100,000 sq. links	= 1 acre
10 sq. chains	= 1 acre
40 perches	= 1 rood
4 roods	= 1 acre

To convert square links to acres, move the decimal point 5 places to the left.

To convert decimals of an acre to roods, multiply by 4.

To convert decimal of a rood to perches, multiply by 40, i.e.:

$$9.63251 \text{ acres} = 9 \text{ acres } 2 \text{ roods } 21 \text{ perches}$$

$$\begin{array}{r} 9.63251 \text{ acres} \\ 4 \times \\ \hline 2.53004 \text{ roods} \\ 40 \times \\ \hline 21.20160 \text{ perches} \\ \hline \end{array}$$

Tables exist for converting square feet to acres, roods and perches.

$$10,000 \text{ sq. metres} = 1 \text{ hectare}$$

To convert square metres to hectares, move the decimal point 4 places to the left.

GENERAL INFORMATION ON METRICATION

Specific information on metrication can be obtained from the following circulars:-

Crown Lands Office:

1. Circular 72/6B - Metric Conversion - Survey Plans
2. Circular to all Registered Surveyors dated 6.12.72
3. Circular to all Registered Surveyors dated 1.3.76

Registrar General's Office:

1. Metrication, dated May, 1972
2. Metrication - 1972, dated 5.6.1972
3. Metrication, dated March, 1975

PROTRACTOR AND PLOTTINGProtractor

The protractor is used for plotting bearings of lines, setting out angles and the approximate measuring of angles.

The protractor (be it portable plastic or printed on forms A338, A339 and A340) is a full circle of 360 degrees and is divided into 36 equal divisions of 10 degrees each. These divisions are again divided into 10 units with each unit representing one degree. Then according to the size of the protractor, each unit is divided in halves with each half representing 30 minutes (half a degree) or divided into quarters with each quarter representing 15 minutes (quarter of a degree).

A bearing is a direction of a line in relation to a meridian. In the Crown Lands Office, most work is effected in relation to the Magnetic North (M.M.) which bears 0° and all lines are then angles turned from this meridian.

A series of bearings can be laid out now from a central point for practice and then using form A338 a series of bearings can be laid out elsewhere on the sheet by using the parallel ruler.

Tutor to demonstrate and set appropriate exercises.

Plotting

The section above gives a brief description of the protractor and its use to lay out a bearing and Chapter 3 explained Scales. 

These two are now put together to form the process known as plotting.

Plotting is laying out to scale the dimensions of a parcel of land in relation to a meridian. The process involves drawing in sequence a series of lines with given bearings and distances.

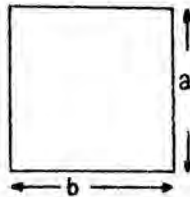
A starting point is selected and the appropriate bearing located on the protractor with the line transferred by the parallel ruler to the starting point. The scale is used to determine the length of the line. The second bearing is then located and again transferred to the terminal of the first line by the parallel ruler and again the scale is used, for the appropriate line length. This process is repeated to the completion of the plot.

Tutor to demonstrate and then provide plotting exercises from Office records.

SCALING OF AREAS OF GEOMETRICAL FIGURES

1. SQUARE - all four sides the same length and at right angles to each other.

Area obtained by multiplying one side x another.

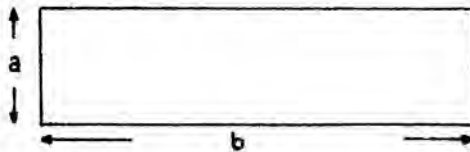


$$\text{Area} = a \times b$$

$$\text{or } a^2$$

2. RECTANGLE - four sided figure with four sides at right angles to each other and opposite sides the same length.

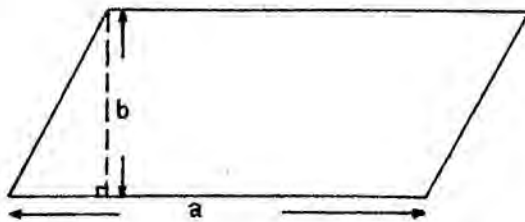
Area obtained by multiplying long side x short side.



$$\text{Area} = a \times b$$

3. PARALLELOGRAM - four sided figure with opposite sides the same length and parallel.

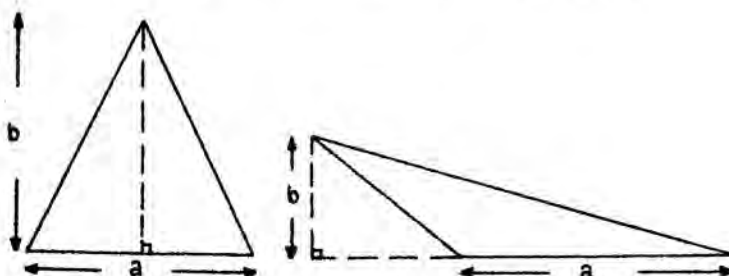
Area obtained by multiplying length of one side by the perpendicular height.



$$\text{Area} = a \times b$$

4. TRIANGLE - three sided figure each line intersecting at different points.

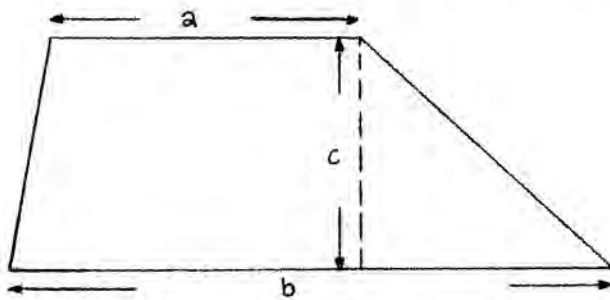
Area obtained by multiplying the base by the perpendicular height and dividing by two.



$$\text{Area} = \frac{a \times b}{2}$$

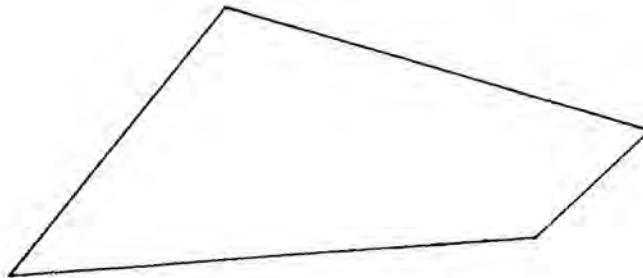
5. TRAPEZIUM - an irregular four sided figure with one pair of opposite sides parallel.

Area obtained by adding the parallel sides, dividing by two and multiplying by the perpendicular height.



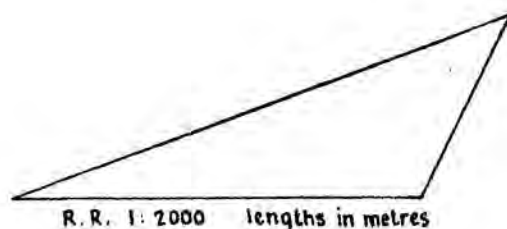
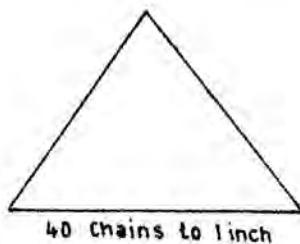
$$\text{Area} = \frac{a + b}{2} \times c$$

6. QUADRILATERAL - four sided figure - see appropriate formula above or if an irregular figure, adjust as per instructions in Chapter 9.

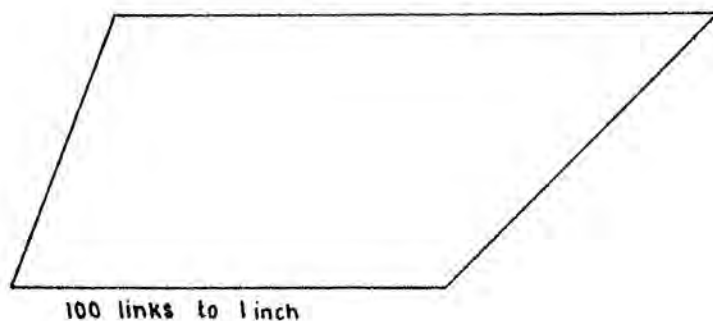


Exercises

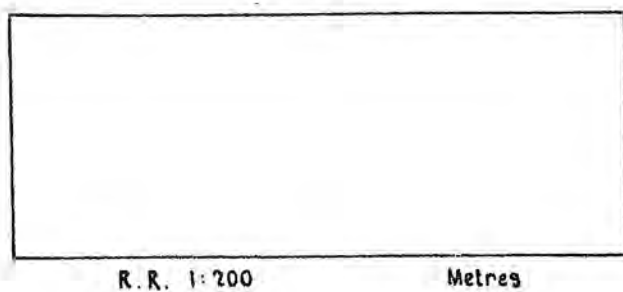
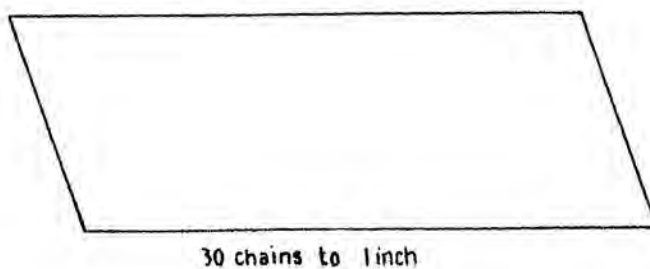
1. What is the area of a square with sides of 150 links? Convert to metrics.
2. What is the area of a rectangle with sides of 60 feet and 147 feet? Convert to metrics.
3. What is the area of a parallelogram with sides of 25 metres and 40 metres and a perpendicular distance between the long sides of 20 metres.
4. What are the areas of the following triangles?



5. What is the area of this Trapezium? Convert to metrics.



6. What are the areas of these quadrilaterals?



7. Further exercises to be provided by Tutor as required.

USE OF WATER COLOURS

Proficiency in the use of water colours is important in the notation of Parish maps and the preparation of diagrams to illustrate instructions, reports and references.

COLOURS

The basic water colours used on maps and diagrams are:-

Red:	Carmine
Green:	Hookers Green
Brown:	Burnt Sienna
Blue:	Prussian Blue
Yellow:	Chrome Yellow
Grey:	Paynes Grey

All of the above are Windsor and Newton Artists' Water Colours.

BRUSHES

Sablé hair brushes in sizes 4, 6 and 8 should be sufficient for day to day use. The brushes should be pointed rather than square ended.

PALLETES

A set of six is necessary. Pallettes should be wiped free of dust before mixing paints.

MIXING

Clean water, brush and palette are essential. Remember not to make the mixture too dark as a blotchy wash often results, particularly with red and blue paints which are quickly absorbed into the paper. Remember that a dark wash cannot be lightened but a light wash can be darkened by a fresh application of paint.

APPLICATION

1. The diagram to be tinted should be held at an angle of approximately 15° to 30° .
2. The wash should be applied in a straight line along the top of the area to be tinted.
3. The brush should contain sufficient paint to leave a wet residue at the bottom of the part already painted, so that it will run freely into the next application. Should the residue dry before the next application is applied, a darker line will be evident in the finished wash.
4. The second and subsequent applications should be similar to the first until the bottom of the area to be tinted is reached. The brush should then be dried on blotting paper and any surplus paint removed with the dry brush.
5. A second wash should not be applied unless the first wash is completely dry.

RESERVOIR PENS
USE AND MAINTENANCE

Reservoir pens do not require frequent filling with ink, are available for immediate use and avoid ink spillage.

There are various brand names, including Rotring, Staedtler, Stanograph, Erograph etc. Of these, Rotring pens are the most commonly used, are reliable and come in the Micronorm range.

Rotring micronorm pens should be maintained by:-

1. Periodic cleaning, normally when the reservoir runs dry. For cleaning instructions see Annexure "B". This method of cleaning should also be used for other brand pens of similar structure. However, for cleaning instructions for the recently introduced Rotring Isograph range and some Staedtler makes see Annexure "A".
2. Removal of ink from the nib and neck of the pen at frequent intervals.
3. Recapping the pen immediately after use.

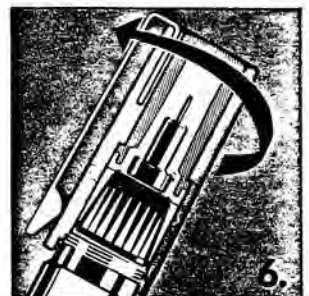
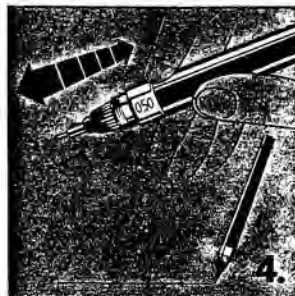
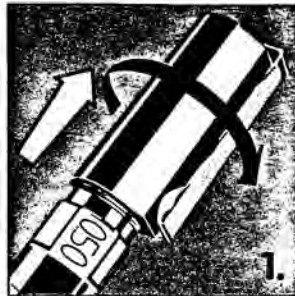
AVOID:

- (a) Pressing heavily on the pen, which could bend the pen point or force it into the plastic ink holder.
- (b) Shaking the pen too vigorously, which could result in ink splashing onto maps, etc.
- (c) Filling the reservoir with too much ink, which will cause ink to drip from the pen. This also occurs when the reservoir is almost empty.
- (d) Removing the regulating wire from inside the drawing tube when cleaning, as it is easily bent when re-inserting it in the nib.

Hints on looking after your easy-to-service isograph pens

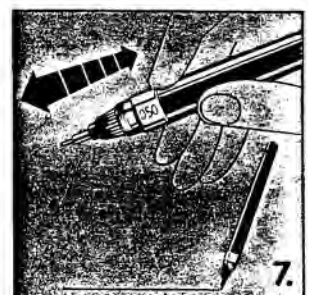
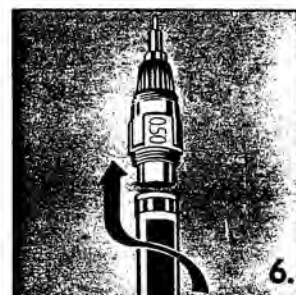
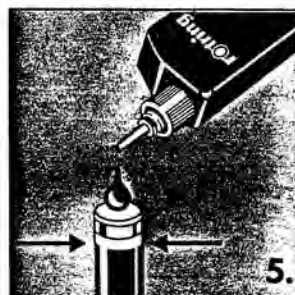
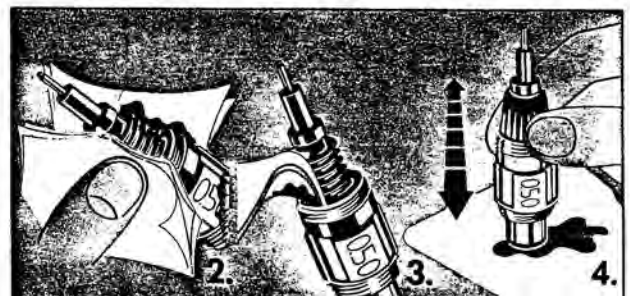
First filling:

1. Screw off cap.
2. Twist off transparent reservoir.
3. Always fill reservoir to just below the chromium ring and twist back on.
4. Shake pen **gently** in horizontal position before use.
5. + 6. Screw cap back on as soon as work is interrupted – two short turns are sufficient.



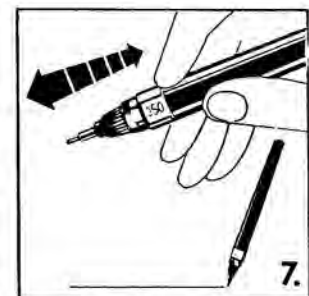
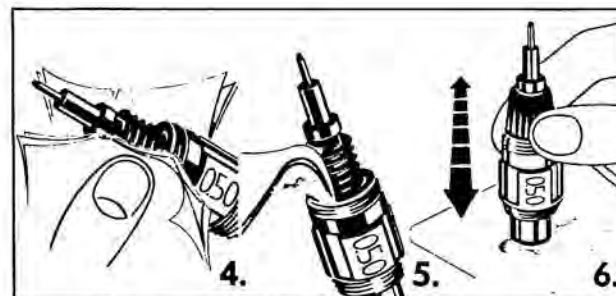
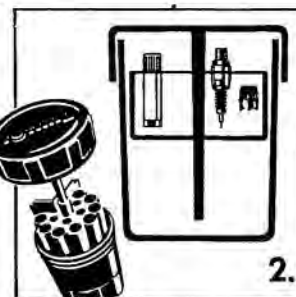
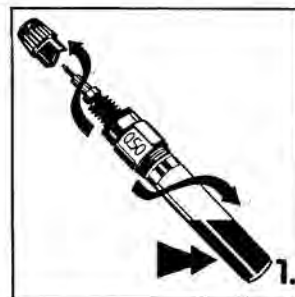
Refilling:

1. Twist off push-on sleeve and transparent reservoir.
- 2., 3. + 4. Wipe helix thoroughly. Soak up ink from under colour-code ring, then twist sleeve right on. Tap all remaining ink out of drawing point section.
5. Always fill reservoir to just below the chromium ring.
6. Twist reservoir back on.
7. Shake pen **gently** in horizontal position before use.

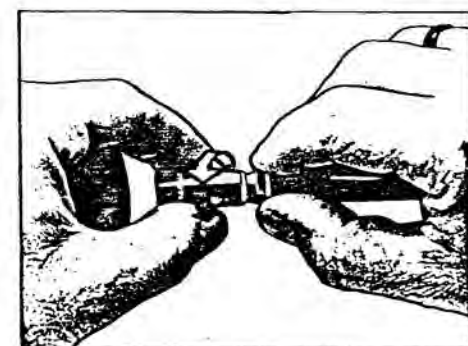
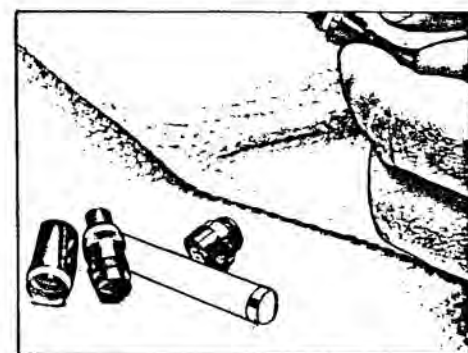
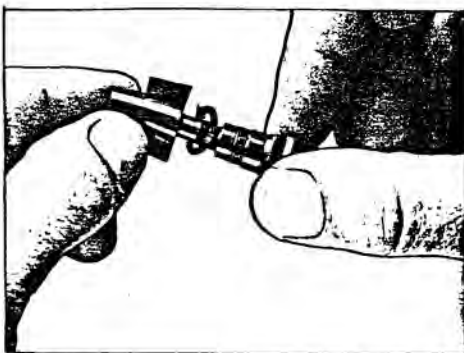
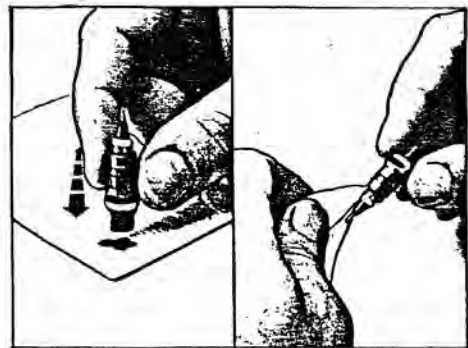
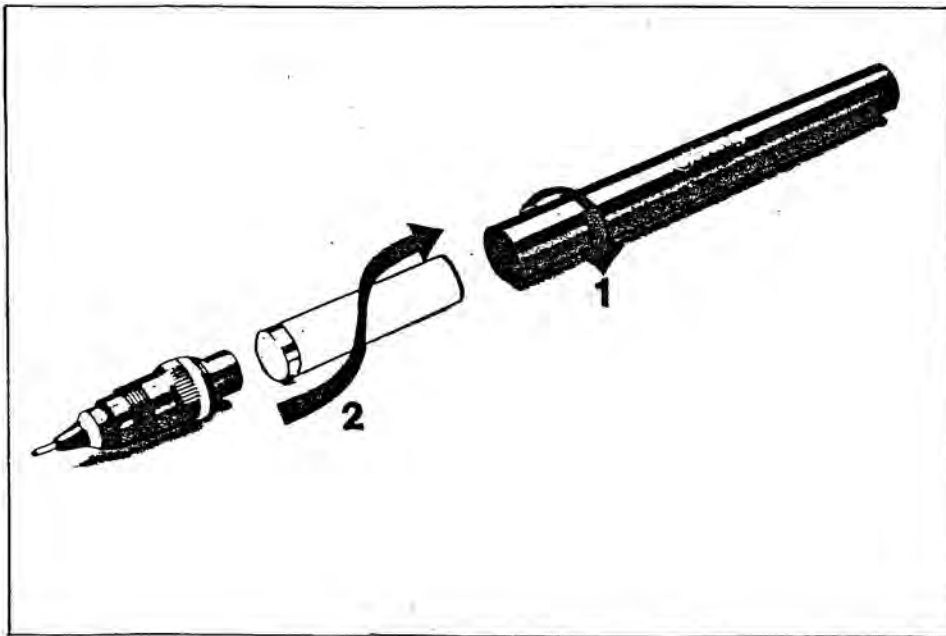


Cleaning:

1. Twist off push-on sleeve and transparent reservoir.
2. If pen has dried up: place parts in pen cleaning unit or...
3. ... if only a minor disorder: rinse drawing point section and cap under running water.
- 4., 5. + 6. Dry helix and cap thoroughly. Soak up water from under colour-code ring, then twist sleeve right on. Tap all remaining water out of drawing point section, then refill reservoir and twist back on.
7. Shake pen **gently** in horizontal position before use.



Cleaning and maintenance of the micronorm $\overline{m}$,



SCALING OF ROADS OF EVEN WIDTHS TO OBTAIN AREAS

Chapter 5 gave the formulae for obtaining areas of Geometrical figures and three of these - formulae for parallelogram, rectangle and trapezium - are used for obtaining areas of roads of even width. 

Roads which can be classed as parallelograms, rectangles or trapeziums can have areas worked out simply by measuring the appropriate side or sides and multiplying by the width of the road.

Roads which wander through a portion or Parish follow a similar principle of multiplication of length by width.

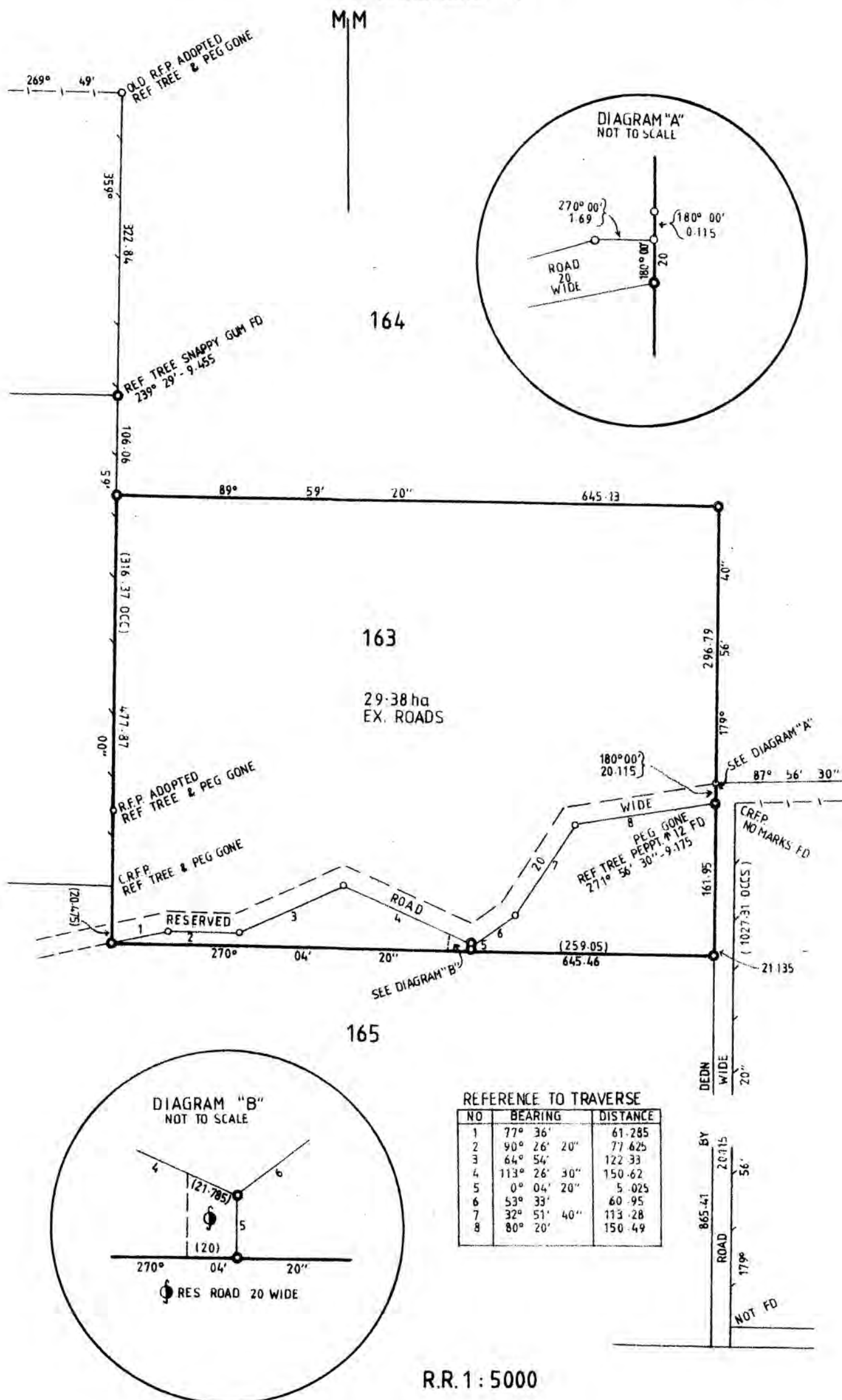
If there are a number of bends so that the full length of both sides would end up about the same, it is sufficient to scale just one side and multiply by the width - this would be treating the road like a parallelogram or rectangle. See Annexure "A" of this Chapter for an example of a road with compensating bends. 

If there is no compensating feature in the angles, then the lengths of both sides should be measured, added together, divided by two and multiplied by the width as is a trapezium.

The Tutor can refer to Parish maps and copies of plans held in the Office to illustrate these principles and to set exercises in the line of:-

- (a) What is the area of the road separating Portion 100 from 101 and 102, Parish X - a straight road?
- (b) What is the area of the road from the northern boundary of Portion 167 southerly through Portions 167, 168 and 170 to Stoney Creek, Parish Y - a road featuring bends?

ANNEXURE A



NO	BEARING	DISTANCE
1	77° 36'	61.285
2	90° 26' 20"	77.625
3	64° 54'	122.33
4	113° 26' 30"	150.62
5	0° 04' 20"	5.025
6	53° 33'	60.95
7	32° 51' 40"	113.28
8	80° 20'	150.49

R.R. 1 : 5000

SCALING OF IRREGULAR AREAS BY DIVISION INTO
REGULAR FIGURES

When a parcel does not fit into the pattern of any of the regular geometric figures discussed in Chapter 5, then another method of obtaining the area must be sought.

Since this chapter again deals with scaling of areas, the particular parcel, if bounded by right lines, can be reduced to the basics previously discussed.

In the case of Annexure "A" in this chapter, a line can be run parallel to the western boundary. The figure is thus reduced to a trapezium and a triangle. Use of the appropriate formulae can now produce the required area. ←

Annexure "B" may be divided into a series of triangles as illustrated by broken lines with the appropriate formula applied to obtain the area. ←

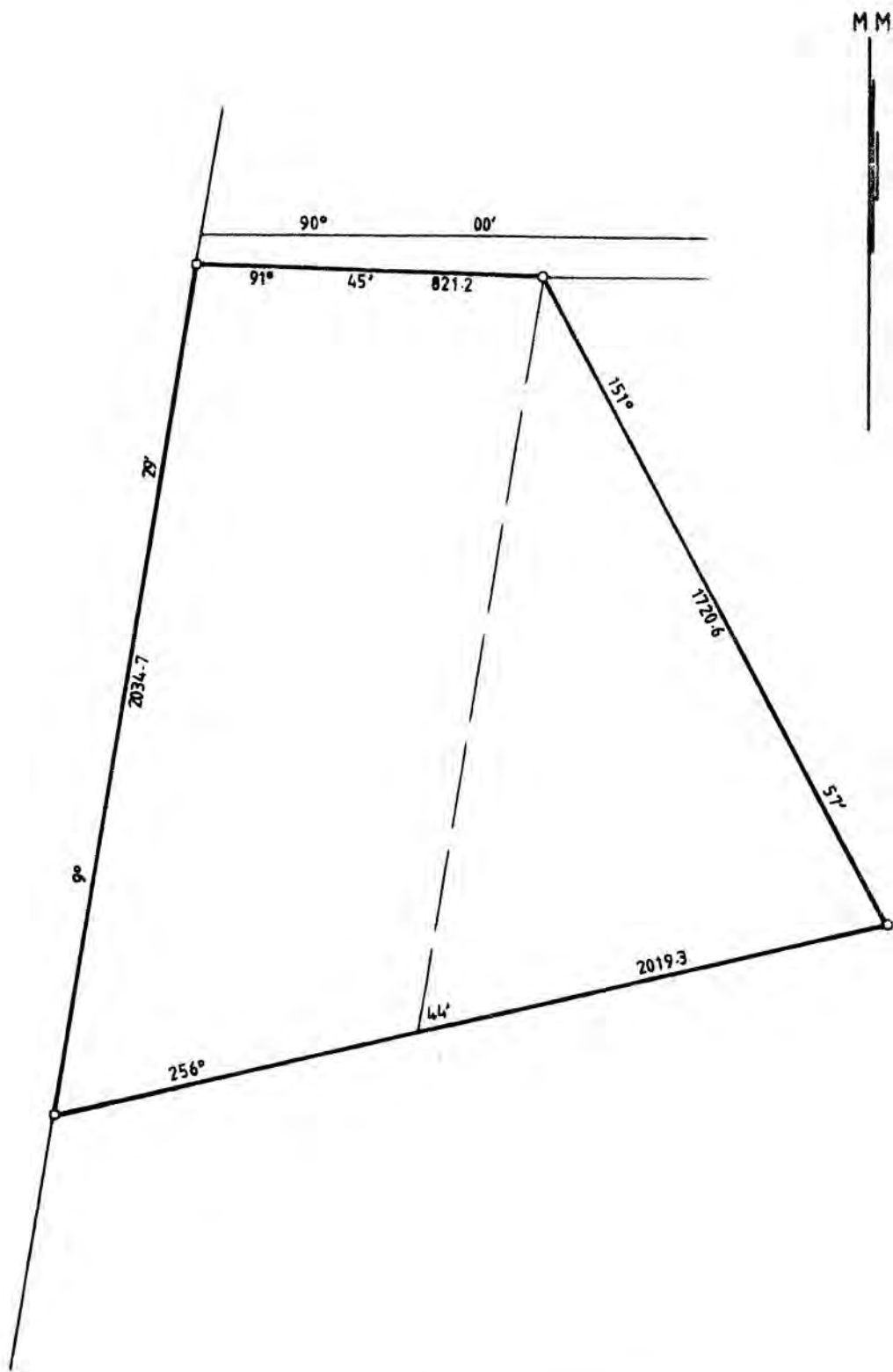
The Tutor should supply suitable plans from the Office to enable the trainee to obtain practice in scaling of areas.

NOTE

It is well to stress at this point that scaling by its nature is approximate only but, notwithstanding this, it serves a useful purpose.

A further point to be stressed is that reproduction of plans and diagrams often results in distortion and will affect any length and area obtained by scale.

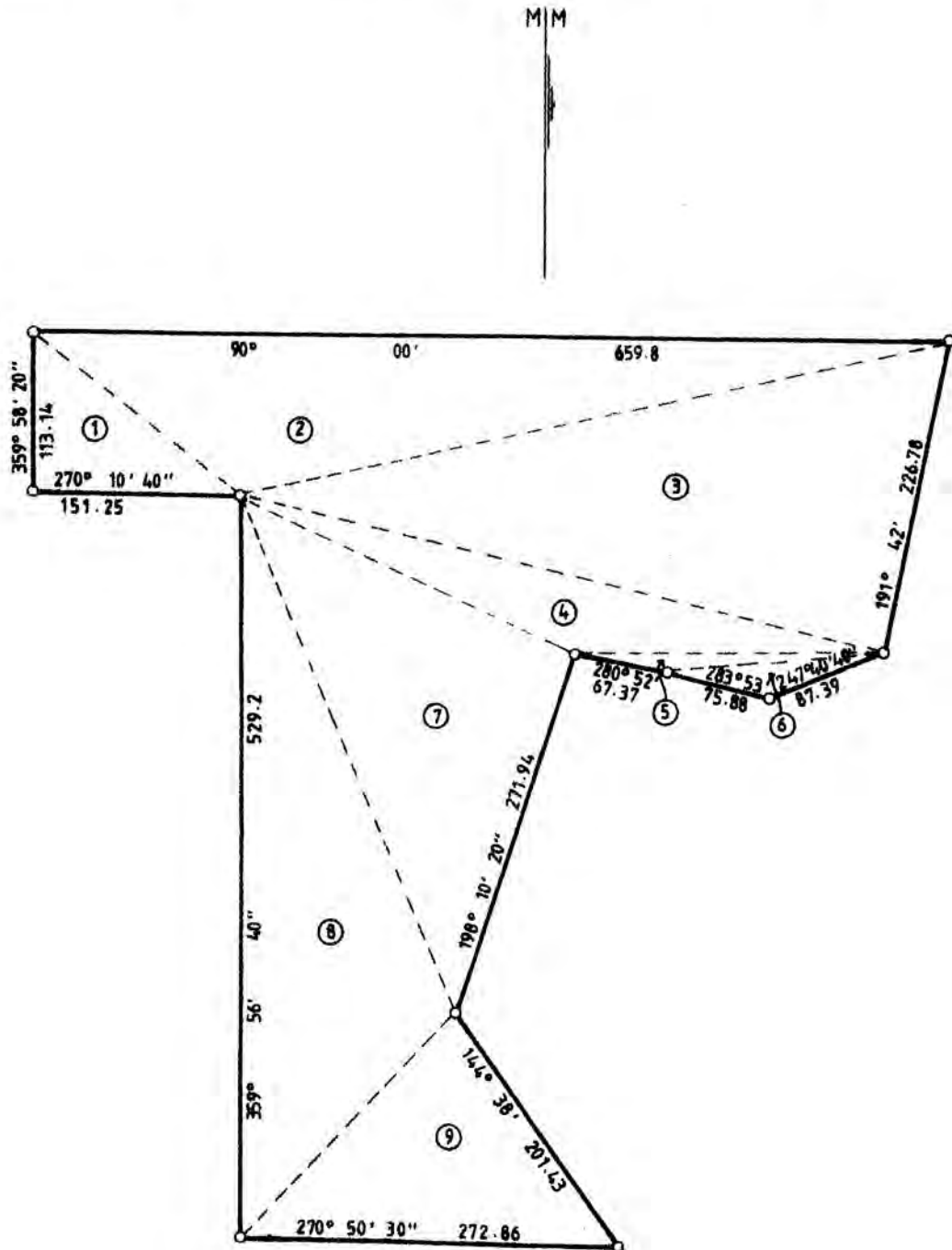
EXAMPLE OF DIAGRAM DIVIDED INTO
TRAPEZIUM "X" AND TRIANGLE "Y"



SCALE : 4 CHAINS TO 1 INCH
(MEASUREMENTS IN LINKS)

ANNEXURE B

EXAMPLE OF DIAGRAM DIVIDED INTO NINE (9) TRIANGLES
 TOTAL AREA 21.53ha R.R. 1: 5000 (MEASUREMENTS IN METRES)



MAPPING INKS

Mapping inks are transparent oil colours used for colouring large areas on maps and have a number of advantages and disadvantages when compared to water colours.

ADVANTAGES:

1. Application of the inks can be interrupted and recommenced at a later time without leaving "ridge" lines on the work. With water colours, the application must be continuous to prevent the last worked surface from drying.
2. The inks are ideal for larger surfaces for the above reason.
3. Colours used conform to the colours on zoning maps and are easily interpreted by Council planning and engineering staff and by the Planning and Environment Commission.
4. The inks give an overall even finish and present a professional image to outside individuals and organisations.
5. Uniform absorption of the inks on all surfaces.

DISADVANTAGES:

1. Inks must be thinned and brushes and palettes washed in mineral turpentine.
2. Preparation of the inks and cleaning of materials take longer.
3. Ink splashes on furniture and other work, if not detected, can dry and prove difficult to remove.
4. Use of the inks for a small diagram does not justify the time taken in preparation and cleaning.

Mapping inks, although not used as widely as water colours, should be used in offices where there is a good flow of large diagrams dealing with reserves, subdivisions and zonings and the trainee tracer should be taught to become proficient in their application.

APPLICATION

Unlike water colours, there is no necessity for the work to be held at an angle, in fact the work should be laid on a flat surface.

APPLICATION (Continued)

The inks are mixed with mineral turpentine to gain the right consistency. This is usually when the ink will commence to drip slowly from a fully laden brush.

In applying the inks to the surface there is no real necessity to govern the amount applied as any excess ink should be wiped off with a rag or tissue and then blotted with blotting paper to remove any residue. In practice the less ink applied the less effort required in removing the residue.

Small areas should be worked at a time, usually up to 10 cm x 10 cm. The surface should then be wiped and blotted and the next surface commenced. There will be no join lines showing between the adjoining surfaces painted.

The work when completed will need to dry for a longer period than water colours but will give a better finish.

ERASING

To err is human and tracers are not exempt. For this reason, trainees will need to acquire skill in the different methods of erasing.

All erasing must be carried out with great care to avoid damage to the surface of the diagram or map.

Various instruments and rubbers can be used in erasing and they comprise:-

1. PENCIL RUBBER - Usually an artgum or plastic eraser which will erase pencil, softer than 3H, without much difficulty. Artgum erasers, while effective, tend to leave a great deal of residue and the plastic type of rubber is preferable.
2. INK RUBBER - These come in various types and most are effective. For removal of ink on plastic tracing film, the ROTRING T20 Eraser removes the ink chemically without damaging the surface. Initially the eraser will not remove the ink, but as the friction of rubbing heats the eraser, a chemical reaction takes place which dissolves and removes the dried ink. The advantage of this eraser is that you can draw over the erased spot without delay and without specially priming the surface.
3. ERASING SHIELD - These are made in plastic or metal but the metal one is more exact and durable and can be used safely with an electric eraser. The shield is used to localise erasures and the selection of an opening in the shield will depend on the size and shape of the area to be erased.
4. ERASING KNIFE - All Tracers should become expert in the use of an erasing knife which can be used for the removal of stubborn ink or paint from pinpoint to very large areas.

The knife gradually shaves the surface of the material until all of the ink or paint has been removed. The surface left will be furry and should be burnished with a smooth, rounded glass or plastic object before any further ink or paint is applied.

5. SCALPELS - These are initially sharper than erasing knives but lose their edge very quickly and cannot be resharpened as they are hollow ground. However, a scalpel should be included in each Tracer's kit of instruments to assist in removal of troublesome ink or paint areas. Metal handles with replaceable blades appear to be the most effective and a size 4 scalpel should cover most work.
6. ELECTRIC ERASER - This is most effective where large areas are involved but can be efficient on small areas also.

It is essential with an electric eraser that undue pressure is not applied as it will quickly tear a hole

6. ELECTRIC ERASER (Continued)

in the material being worked. The rotating rubber should be applied very lightly to the area being erased and moved with a stroking action in the required direction until the ink or paint has disappeared.

As the rubber wears away, it should be repositioned in the chuck, ensuring that $\frac{1}{4}$ inch of rubber projects beyond the jaws of the chuck. The most effective erasures are made with this amount of rubber showing. Damage may result if the metal chuck is allowed to come into contact with the diagram or map.

This is the quickest method of erasing and has an added advantage in that burnishing of the work is not required before adding further ink or paint.

7. LIGHTER FLUID - Can be used effectively, when rubbed gently with a tissue, to remove pencil work from plastic film without damaging line work on the film.

LETTERING GUIDES - STENCILS

The use of stencils to give a professional finish to plans is essential unless the Tracer's direct lettering is of a very high standard.

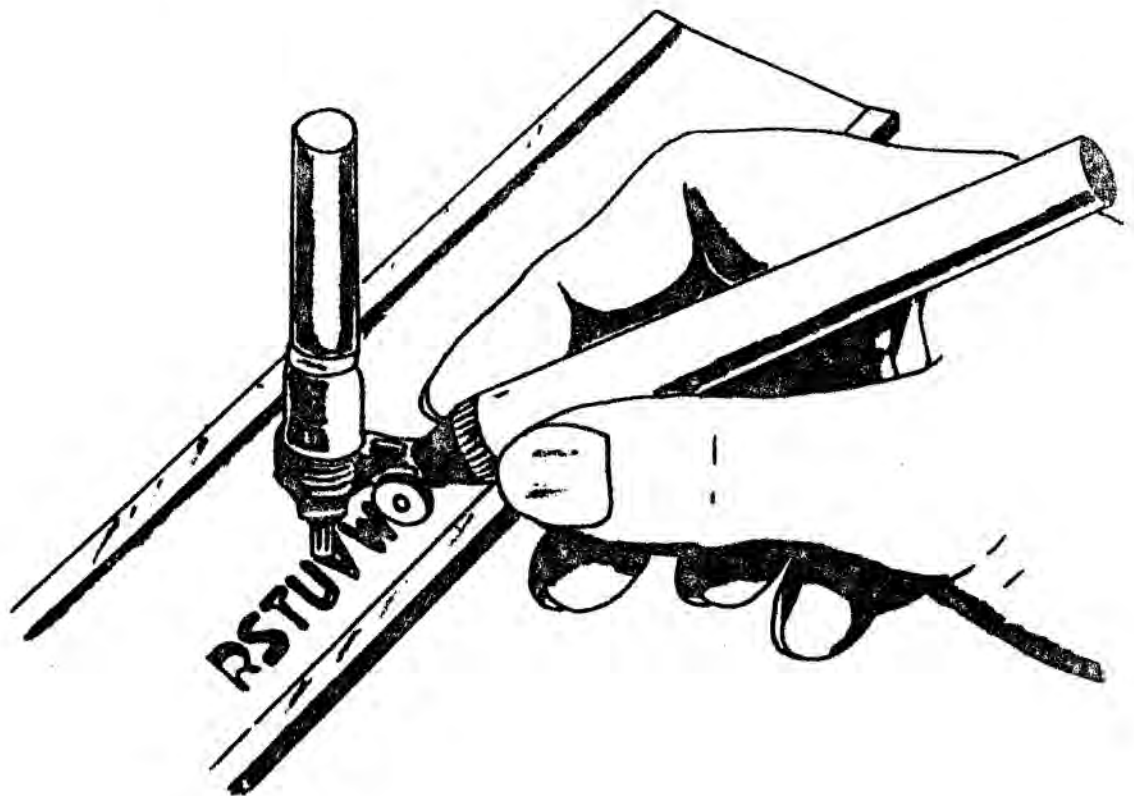
Use of the stencils gives a uniform presentation of letters and numerals in keeping with Micronorm standards. Guides are available in the Micronorm range from all leading drafting equipment firms.

Heavy, metal, rubber backed stencil guides should be used to provide a firm base along which the stencil can be moved. If a stencil guide is not available, it will be necessary for the Tracer to use a large set square or ruler, with weights added to avoid movement, along which the stencil can be moved. A set square or ruler is easily moved out of position and for this reason, use of the stencil guide is recommended.

A standard attachment with most Micronorm pen-sets screws easily into the barrel of the pen and the remaining part of the pen screws into the attachment. This attachment is adjustable so that the nib of the pen can be aligned at right angles to the stencil. If adjusted at any other angle, the pen gives an uneven finish to the work.

Care must be taken when using stencils that the work is not smudged when removing from the paper. It is also essential that dried ink be removed from the stencil at regular intervals to maintain even linework. An old toothbrush and warm water will remove most of this ink.

Although stencils are recommended for all high quality work such as engineering or survey plans, Tracers should still improve their skill by drawing tracings, etc. freehand.



PLANIMETER

The Planimeter is an instrument for determining the areas of figures on a plane surface having either straight or irregular boundaries.

There are basically two types of planimeters, (A) Polar - fixed arm and (B) Compensating Polar.

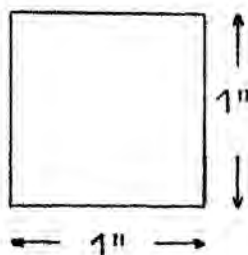
- A. Polar - Fixed Arm - generally for use on diagrams drawn to Imperial scales

Method of Use - Weight outside of Area

- (a) Place magnifier in approximate centre of area to be measured and the weight (pole) arm at right angles ensuring that magnifier can move freely around the area to be measured.
- (b) Mark a starting point and place centre index of magnifier on it.
- (c) Read and note the recording dial, measuring wheel and wheel vernier, e.g. 12.34.
- (d) Carefully trace the boundary of the area in a clockwise direction, ensuring that the centre index of the circle in the magnifier is kept on the boundary line.
- (e) Again read and note the dials and subtract the first reading from the second - this answer is the number of square inches on the paper.
- (f) Repeat steps (c), (d) and (e) at least three times, disregarding any answer that is not in tune with the others, then obtain the average of the answers.
- (g) Multiply the average answer by the square of the scale of the diagram, where drawn to Imperial scales, to obtain the area in square feet or square chains as appropriate.

Principle - To illustrate why the square of the scale is used, note the diagram below.

It is a square with sides 1 inch long and has an area of 1 square inch.



Area: 1 sq. inch

Principle (Continued)

If the diagram is drawn at say 4 chains to an inch then the sides equate to 4 chains each and it has an area of 16 square chains. Thus for each square inch in a diagram drawn at 4 chains to an inch there is an area of 16 square chains. Note that 16 is the square of 4.

Similarly, by squaring the scale of any Imperial diagram and multiplying it by the number of square inches in the diagram the area of the parcel can be obtained.

Whilst the fixed arm polar planimeter is usually used on diagrams drawn to Imperial scales, it can be used on metric diagrams by conversion of square inches to square centimetres.

Method

1. Effect usual readings and obtain average reading in square inches.
2. One square inch equals 6.4516 square centimetres so multiply the average reading by 6.4516 to get an answer in square centimetres.
3. Square the reduction ratio of the plan or diagram and multiply by previous square centimetres answer - this answer is still in square centimetres.
4. To obtain answer in square metres, divide by 10,000 (10,000 square centimetres in a square metre).

Example:

Reduction Ratio 1:400

Average planimeter reading: 6.18 square inches

1 square inch = 6.4516 square centimetres

$6.18 \times 6.4516 = 39.8709$ square centimetres

Square of Reduction Ratio:

$400 \text{ squared} = 160,000$

Multiply square centimetre answer x square of R.R.

$39.8709 \times 160,000 = 6,379,344$ square centimetres

Convert to square metres by dividing by 10,000

$6,379,344 \div 10,000 = 637.9344$ square metres

- B. Compensating Polar - Variable arm generally for use on either metric plans or plans drawn to a feet scale.

Method of Use - Weight outside of Area

- (a) Select from the table enclosed in the planimeter case the tracer arm setting appropriate to the scale or reduction ratio of the diagram. Move carriage to substantial ~~type~~ this setting, tighten the clamp and complete final adjustment by means of the fine movement screw to obtain desired setting on the vernier.

Method of Use (Continued)

- (b) Complete steps (b) to (d) of fixed arm planimeter.
- (c) Read and note the dial and subtract the first reading from the second - this answer is the number of units on the paper.
- (d) Take at least three readings and disregard any that are not comparable. Average the answers.
- (e) Multiply the average answer by the appropriate unit area from column three of the tables in the planimeter case.

C. Explanation of "Compensation" Feature

The compensation feature of the Compensating Polar Planimeter is in the construction of the unit as it allows the carriage to pass freely beneath the weight arm and thus permits the carriage to be either left or right of the Tracer when the weight is outside of the figure or area.

This allows instrument errors to be balanced out by measuring firstly with the carriage to the left and then with the carriage to the right of the weight arm - without moving this arm. The average of these readings, together with additional pairs of readings will be the desired area.

D. Points to be Noted

- (a) It is possible to measure large areas with the weight arm inside of the area to be measured - however, it is preferable (and gives better results in general) to divide the area into several smaller parts and measure each with the weight arm outside. Additions will then give the total area.
- (b) Remember - as in scaling, all areas obtained by planimeter are "about" areas.

E. Tutor to provide suitable exercises from Office maps and plans.

CHAPTER 14

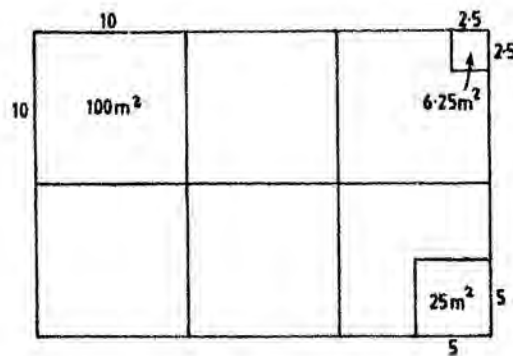
SCALING USING TRANSPARENT SQUARE OVERLAY

This involves the use of a transparent sheet placed over an area. On the transparent sheet is a square or a number of squares drawn to scale so that the area of each square is known.

The example drawn below at a reduction ratio of 1:500 has squares measuring 10 x 10 metres for an area of 100 square metres. These squares can be reduced to smaller sizes of a half or a quarter, etc. of the above area.

The principle then involves laying the transparency over the area and counting the number of whole or partial squares to obtain an area.

Similar transparent overlays can be prepared for any scale and provide a convenient method of giving an approximate area.



R.R. 1:500 (Metres)

The W & G "Douglas" Combined Protractor and Parallel Rule is a transparent tool already divided into half inch squares and may be used as a substitute for preparation of a transparent sheet in certain circumstances.

ENLARGEMENT AND REDUCTION OF DIAGRAMS

The most frequently used methods employed in enlargement and reduction of plans are:-

- (a) The Pantograph
- (b) Proportional Dividers
- (c) Parallel Ruler
- (d) Squares
- (e) Plotting

(a) The Pantograph

Pantographs are used for the automatic enlarging or reducing of plans. The theory of the Pantograph is based on the similarity of movement resulting from a parallelogram jointed at all four corners and secured at one corner to the fulcrum. It consists of four metal arms jointed together so that the interior space is a parallelogram.

The two shorter arms and the adjustable long arm of the instrument are graduated and adjustments are made to correspond with the ratio of the enlargement or reduction required.

The instrument in each office should have instructions for use.

(b) Proportional Dividers

These consist of a double-ended pair of dividers held together by a pivot which can be slid up and down in a slot cut in the centre of each arm. This pivot can be clamped in any desired position. If the pivot is exactly in the centre when the dividers are opened, each pair of points is the same distance apart. As the pivot is moved to one end so the distance between the points at that end is diminished in comparison with the points at the other end.

Graduations show the ratio of the distance at one end to the distance at the other end. The instrument is usually graduated on either side of the central slot. Generally, the problem is to enlarge or reduce by some particular ratio such as 2-1, 3-1, 4-1 etc. In such cases, the correct position of the pivot must be set at the particular ratio. In the event of some irregular ratio, the correct position of the pivot can be found by trial and error.

In the application of the proportional dividers for say, an enlargement, distances are taken from the smaller plan by using the smaller or diminished end of the dividers and then reversing the dividers, applying the opposite end on to the enlargement. Hence a distance on the diminished end of say $1\frac{1}{4}$ inches would, with a ratio of 4 to 1, equal 5 inches between the points at the other end.

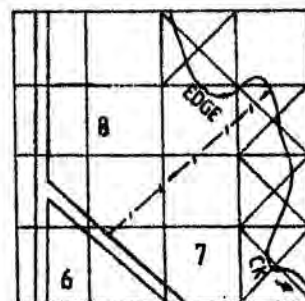
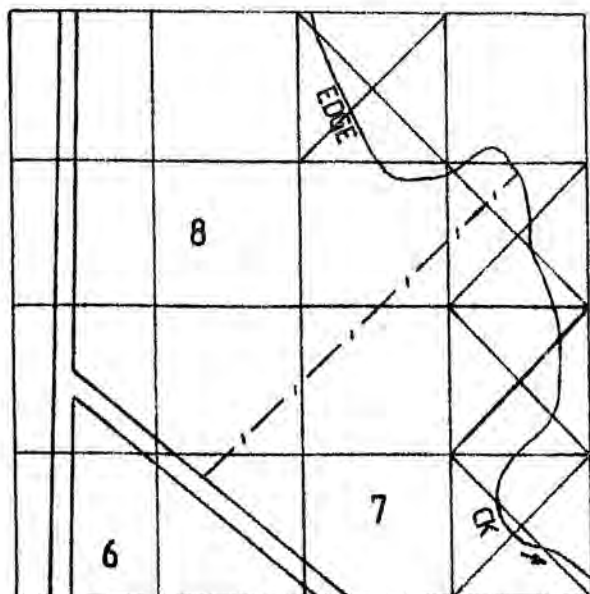
(c) Parallel Ruler Method

This method can be used with reasonably accurate results by fixing the plan to be enlarged or reduced to the drawing table (preferably using adhesive tape across the corners) and also fixing the plain paper (in a similar manner) which is to carry the enlarged or reduced plan adjacent to it. Then by means of the roller type of parallel ruler, the lines of the plan are run on to the plain paper and the respective distances scaled on to the new plan. Only one line at a time can be drawn as it is necessary to scale each line as it is run out. It is necessary to take care with the use of the scales.

(d) Squares Method

This method is generally used to enlarge a locality plan especially where rivers, creeks, railways, winding roads, etc. are in existence. This method is not as accurate as the parallel ruler method but will approximate closely the original plan. The method is to lay down squares over the original plan to be enlarged or reduced. In this method it needs to be remembered that with enlargements, any error is enlarged and with reductions, of course, the error will be reduced. This aspect has a bearing on the size of the squares to be laid down on the original as for an enlargement, the smaller sized square would be better, and for a reduction, a larger sized square may be adopted.

After deciding on the size of squares and the laying down of them on the original, the ratio of the enlargement or reduction is taken into consideration, and a set of squares is laid on the paper that will carry the enlargement or reduction to that ratio. That is, if reduction is say half the scale of the plan, then one-inch squares on the original plan would be half inch squares on the reduction. To show rivers, creeks, etc. the squares can be again subdivided by joining opposite corners thus making the square comprise four equal triangles; these sides can be used for marking the course of the river, creek, etc.



Example of squares method

(d) Squares Method (Continued)

In enlarging or reducing a plan it is important to be clear as to whether the size or the scale of a plan is to be enlarged or reduced. The size refers to the paper occupied by a plan and the scale refers to the ratio of plan area to the actual area on the ground. Thus in the example above, the original plan has been reduced to half the scale of the original and the area reduced to a quarter of the original.

(e) Plotting Method

The plotting method for reducing or enlarging plans is the most accurate and perhaps the most popular method. It is necessary to have all bearings and distances (together with creek or river traverses and offset distances and radiations to particular points) which are to be shown. The rest is a matter of scale. A plan can be enlarged or reduced to any particular scale or to any required ratio of existing scale of the plan.

MAPS

Reference should be made to Section 62, Manual of Procedures, Volume 1 for information as to the colours used on maps and general information on the procedures for map noting. ←

This section of the Departmental Manual advises Officers on the care and storage of maps, the procedures for placing new maps into use, etc.

The Tutor should ensure that the trainees are conversant with the contents of Section 62, Manual of Procedures.

For ready reference by trainees, Schedules "A" to "D" of Section 62, Manual of Procedures, Volume 1 are reproduced hereunder. ←

These schedules show the present and obsolete distinguishing boundaries used on maps (D and A), letters significant of holdings and reserves (B) and abbreviations used (C).

SCHEDULE "A"

DEPARTMENT OF LANDS, N.S.W.

DISTINGUISHING BOUNDARIES USED ON MAPS

SCHEDULE "A"

DISTINCTIVE BOUNDARIES & SYMBOLS

This schedule indicates symbols and boundaries used on all Departmental maps existing in 1959 and re-issues of those maps since that date. Some of the symbols and boundaries are now redundant but are repeated hereunder for information only. The new series set forth in Schedule "D" will be used on all future compilations.

State	— + — + — + —
Territorial Division	— — — — —
County	— x — x — x —
Parish	— . — . — . —
Land District	— — — + — — — + —
Shire	— + — + — + — + —
Shire Riding	— — — — —
Urban Area	— — — — —
City, Town or Village	— — — — —
Town or Village under Local Govt. Act	— — — — —
Suburban	— — — — —
Municipality (or City under Local Govt. Act)	— — — — —
Municipality Ward	— + — + — + — + —
Police Offences Act	— — — — —
Developmental Scheme (Town & Country Planning)	— — — — —
Population Area (Now redundant)	— — — — —
Regulation of Buildings Area	— — — — —
Proclaimed Gold or Mineral Field	— — — — —
Reserve From Conditional Sale within Gold Field	— — — — —
Area of Erosion Hazard	— x o x — — — x o x —
Fauna Protection District or Bird and Animal Sanctuary	— — — — —
Pastures Protection District	— — — — —
State Forest	— — — — —
National Forest	— — — — —
Classified Area (Now redundant)	— — — — —
State Coal Mine	— — — — —
Catchment Area	— — — — —
Land Acquired for Irrigation	— — — — —
Irrigation Area	— — — — —
Domestic & Stock Water Supply & Irrigation District ①	— — — — —
Water Trust District ②	— — — — —
Survey Area	— — — — —
Reserve from Lease or License	— — — — —
do. do. Sale, Lease or License	— — — — —
do. do. Sale	— — — — —
do. do. Occupation under Mining Act	— — — — —
do. do. Mining Lease	— — — — —
Pastoral Holding, Occn. License	{ Surveyed — — — — —
and Pref. Occn. License	{ Unsurveyed — — — — —
do. do. Dividing Line (Western Division)	{ Surveyed — — — — —
	{ Unsurveyed — — — — —
Maximum Withdrawal Area (Western Division)	— — — — —

① Includes also Flood Control & Irrigation District, Domestic & Stock Water Supply District, River Improvement District

② Includes also Bore Water Trust District, Artesian Wells District, Irrigation Trust District, Flood Prevention Trust District

NOTE: When two boundaries are coincident, such as County & Parish, the more important should be delineated.

Railway	{ on large scale map	— — — — —
	{ on small scale map	— — — — —
Public Road		— — — — —
Surveyed Reserved Road		— — — — —
T.S.R. etc. under P.P. Board Control (Now redundant)		— — — — —
Fence	{ when on a boundary	— — — — —
	{ when not on a boundary	— — — — —
Track		— — — — —
Private Subdivision		— — — — —
Horizontal Control Point or Trigonometrical Station	Major	△ 37' (formerly △)
(with Altitude in feet)	Minor	○ 62' (formerly Resection Point)
	Unobserved	△
Permanent Mark (Survey Co-ordination Act)		△
Observing Station		△ 62'
Astronomical Station		△ MAY
Photo Centre		○

See also Appendix "A", Survey Co-ordination Regulations.

SCHEDULE "B"

LETTERS SIGNIFICANT OF HOLDINGS AND RESERVES

SCHEDULE "B"

LETTERS SIGNIFICANT OF HOLDINGS & RESERVES

used on maps & plans in the Department of Lands, N.S.W.

HOLDINGS	
A.A.N.I.B.	After Auction Non-irrigable Block
A.A.P.	After-auction Purchase
A.A.T.L.B.	After-auction Town Lands Block
A.A.T.T.L.L.	(After Auction Tender Town Lands Lease
A.Cn.L.	Additional Crown-lease
A.C.P.	Additional Conditional Purchase
A.C.P.L.	Additional Conditional Purchase Lease
A.H.F.	Additional Homestead Farm
A.H.L.	Additional Homestead Lease
A.H.S.	Additional Homestead Selection
A.L.	Annual Lease
A.N.R.C.P.	(Additional Non-residential Conditional Purchase
A.P.	Auction Purchase
A.R.L.	Additional Residential Lease
A.S.H.	Additional Suburban Holding
A.S.L.	Additional Settlement Lease
A.T.P.	After-tender Purchase (Clo. Sett.)
A.W.L.	Artesian Well Lease
B.L.	Business License
C.L.	Conditional Lease
C.P.	Conditional Purchase
C.P.L.	Conditional Purchase Lease
C.S.	Conditional Sale
Cn.L.	Crown-lease
C.S.L.	Closer Settlement Lease
F.L.	Farm Lease (Church and School Lands)
G.L.	Gold Lease
G.P.L.	Group Purchase Lease
H.F.	Homestead Farm
H.L.	Homestead Lease
H.S.	Homestead Selection
I.A.H.	Irrigation Area Holding
I.F.L.	Irrigation Farm Lease
I.F.P.	Irrigation Farm Purchase
I.L.	Improvement Lease
I.P.	Improvement Purchase
Inf.L.L.	Inferior Lands Lease
L.A.	Leasehold Area
M.C.P.	Mining Conditional Purchase
M.L.	Mineral Lease
M.P.	Mining Permit
M.R.	Miner's Right
M.T.	Mining Tenement
N.I.B.	Non-irrigable Block
N.I.L.	Non-irrigable Lease
N.I.P.	Non-irrigable Purchase
N.R.C.P.	Non-residential Conditional Purchase
O.L.	Occupation License
P.G.L.	Private Gold Lease
P.H.	Pastoral Holding
P.L.	(Pastoral Lease (Church and School Lands)
P.M.L.	Private Mineral Lease
P.M.T.	Private Mining Tenement
P.O.L.	Preferential Occupation License
P.P.A.	Prickly-pear Agreement
P.P.L.	Prickly-pear Lease
P.S.	Public School
P.W.P.	Public Watering Place
R.A.	Resumed Area
R.L.	Residential Lease
R.L.P.	Residential Lease Purchase
R.S.S.H.	Returned Soldiers Special Holding
R.S.S.H.P.	(Returned Soldiers Special Holding Purchase
S.A.	Special Area
S.C.P.L.	Special Conditional Purchase Lease
S.G.P.	Soldiers Group Purchase
S.G.P.A.	Soldiers Group Purchase Area
S.H.	Suburban Holding
S.H.P.	Suburban Holding Purchase
S.L.	Settlement Lease
Sc.L.	Scrub Lease
Sp.L.	Special Lease
S.P.	Settlement Purchase
S.P.L.	Settlement Purchase Lease
S.P.A.	Settlement Purchase Area
S.P.G.L.	Special Private Gold Lease
Sp. Pur.	Special Purchase
S.P.M.L.	Special Private Mineral Lease
T.L.	Tenant's Lease
T.L.B.	Town Lands Block
T.L.L.	Town Lands Lease
T.L.P.	Town Lands Purchase
T.Pur.	Tender Purchase (Crown lands)
T.P.	Tender Purchase (Clo. Sett.)
V.L.O.	Volunteer Land Order
W.E.L.	Week-end Lease
W.E.L.P.	Week-end Lease Purchase
W.L.L.	Western Lands Lease
18th Sec.L.	18th Section Lease

RESERVES ETC	
A.R.	Aborigines Reserve
Acc.R.	Access do
C.R.	Camping do
D.R.	Drainage do
F.R.	Forest do
G.R.	Old Government Reserve
Q.R.	Quarry do
R.P.B.	Public Buildings do
Rec.R.	Recreation do
R.R.F.	Refuge from Flood do
R.R.	Railway Reserve
S.F.	State Forest
S.R.A.	State Recreation Area
T.C.	Temporary Common
T.R.	Trigonometrical Reserve
T.S.R.	Travelling Stock do
V.R.	Village do
W.R.	Water do
R.fm.Sle.	Reserve from Sale
R.fm.L.	Reserve from Lease
R.fm.Lce.	do do License
R.fm.L. or Lce.	do do Lease or License
R.fm.S. or L.	do do Sale or Lease
R.fm.S. or L.	do do Sale or Lease other
other than A.L.	do do than Annual Lease
R.fm. S. for	do do Sale for Future
F.P.R.	Public Requirements

Those abbreviations are to be used only where there is insufficient space, otherwise the particulars are to be written at length

SCHEDULE "C"

ABBREVIATIONS OF WORDS ON MAPS

SCHEDULE "C"

ABBREVIATIONS OF WORDS

used on maps & plans in the Department of Lands, N.S.W.,

Australian Map Grid..... A.M.G.	Exclusive Excl, Ex	Part Pt.
About Abt.	Executors Exors.	Partly Ptly.
Acres Ac.	Extension Extn.	Pastoral Past.
Addition Ad.	Field Book F.B.	Pastures Protection } P.P.D.
Administrator Admor.	Folio Fol.	District }
Agricultural Agr.	Foot (or Feet) Ft.	Pastures Protection } P.P.Bd.
Allotment Allot.	Galvanized Iron G.I.	Board }
Altitude Alt.	Gazette Gaz.	Permanent Permt.
Applicant App.	Geodetic Geod.	Permanent Mark P.M.
Approved Appd.	General Gen.	Permissive } Per. Occ.
Approximate Approx.	Geographical Geo.	Occupancy } p.o.
Association Assoc.	Government Govt.	Per Original p.o.
Astronomical Astro.	Governor Gov.	Place Pl.
Australian Aust.	Grant Gr.	Police Station Pol.Stn.
Avenue Ave.	Hectare Ha.	Portion Por.
Azimuth Az.	High School H.S.	Post Office P.O.
Bank Bk.	Highway Hwy.	Pre-emptive Pre.
Baptist Bap.	Horticultural Hort.	Presbyterian Presbyt.
Bench Mark B.M.	Hospital Hosp.	Private Priv.
Board Bd.	Improvement Impt.	Proclamation Procl.
Book Bk.	Inclusive Incl.	Proposed Pro.
Boundary Bdy.	Independent Indep.	Proprietary Pty.
Bridge Br.	Institute Inst.	Public Pub.
By Original b.o.	Integrated Survey Grid I.S.G.	Public School P.S.
Business Bus.	Irrigation Irr.	Purchase Pur.
Cardinal Points (N., S., E., W.)	Island Isl.	Purpose Purp.
Cemetery Cem.	Junior Jun.	Railway Rly.
Centimetre cm.	Kilometre km.	Range Ra.
Certificate Cert.	Land Board District L.B.D.	Recreation Rec.
Certificate of Title C.T.	Latitude Lat.	Reference Ref.
Chain Ch.	Lease Lse.	Reference Mark R.M.
Church Ch.	Leasehold Lhold.	Register Regr.
Church of England C. of E.	License Lic.	Regulation Reg.
Circuit Circ.	Limited Ltd.	Reserve Res.
Commissioners Commrs.	Link Lk.	Residence Res.
Common Com.	Lithograph Litho	Revocation Rev.
Company Co.	Longitude Long.	River Riv.
Concrete Block Conc.Bk.	Magnetic Mag.	Road Rd.
Confirmed Confd.	Main Northern Railway M.N.Ry.	Roman Catholic R.C.
Condition Con.	Main Southern Railway M.S.Ry.	Saint St.
Conservation Conserv.	Main Western Railway M.W.Ry.	School Sch.
Control Point C.P.	Maximum Max.	Section Sec.
Co-operative Co-op.	Measurement Meost.	Senior Sen.
Corporation Corp.	Memorandum Memo	Settlement Set.
Council Co.	Meridian Mer.	Society Soc.
County Co.	Methodist Meth.	State Survey Mark S.S.M.
Creek Ck.	Metre m.	Station Stn.
Crescent Cres.	Metropolitan Metrop.	Street St.
Crown Lands C.L.C.Act	Mile (Miles) Mi.	Square metres m ²
Consolidation Act } C.L.C.Act	Military Mil.	Subdivided Subd.
Declination Dec.	Millimetre mm.	Subdivision Subdn.
Dedicated Ded.	Minimum Min.	Suburban Sub.
Department Dept.	Ministerial Minl.	Swamp Sw.
Deposited plan D.P.	Miscellaneous Misc. Ms.	Telephone Tel.
Distance Dist.	Mount, Mountain Mt.	Temporary Temp.
District Dist.	Municipal, Municipality Mun.	Town Tn.
Division Div.	Navigable Nav.	Transverse Mercator T.M.
Easement Easmt.	Number No.	Universal } U.T.M.
Electorate Elect.	Occupation Occ.	Transverse Mercator }
Elongation (star) Elong.	Occupier Occ.	Traverse Trav.
Environ Envs.	Original Orig.	Trigonometrical Trig.
Estate Est.	Parish Ph.	Trustees Trust.
Executive Council Ex.Co.	Park Pk.	Variation Var.
		Village Vill.
		Volume Vol.
		Wesleyan Wes.
		Wharf Whf.

Some of these abbreviations may apply to various changes of a word, e.g. "App" for applicant, application, applied for; and others may apply to several words, e.g. "Co." for County, Company, Council. The correct word should readily be obtained from the context.

SCHEDULE "D" - NEW SERIES 1959

DISTINCTIVE BOUNDARIES & SYMBOLS

used on new maps & plans in the Department of Lands, N.S.W., 1961.

State.....	— + — + —
Territorial Division.....	— D — D —
County.....	— X — X —
Parish.....	— . — . —
Land District.....	— * — * —
Shire, Municipality or City (Under Local Govt. Act).....	— ■ — ■ —
Shire Riding.....	— + — + —
Urban Area.....	— U — U —
City, Town or Village.....	— T — T —
Town or Village under Local Govt. Act.....	— T — T —
Suburban.....	— S — S —
Municipality Ward.....	— W — W —
National Park, Historic Site, Nature Reserve.....	— P — P —
Developmental Scheme (Town & Country Planning).....	— Z — Z —
Regulation of Buildings Area.....	— ∞ — ∞ —
Proclaimed Gold or Mineral Field.....	— I — I —
Lands under Heritage Act or Australian Heritage Commission Act.....	— h — h —
Area of Erosion Hazard.....	— E — E —
Wildlife Refuge or Game Reserve.....	— O — O —
Pastures Protection District.....	— O — O —
Aboriginal Areas or Places, Archaeological Areas.....	— C — C —
State Forest.....	— : — : —
National Forest.....	— + — + —
State Coal Mine.....	— D — D —
Catchment Area.....	— C — C —
Irrigation Area.....	— A — A —
Domestic & Stock Water Supply & Irrigation District ①.....	— O — O —
Water Trust District ②.....	— O — O —
Survey Area.....	— S — S —
Reserves or Land vested in Councils.....	— V — V —
Reserve from Sale or Lease or License.....	— — —
do. do. Occupation under Mining Act.....	— A — A —
do. do. Mining Lease.....	— M — M —
Pastoral Holding, Occn. License { Surveyed.....	— S — S —
and Pref. Occn. License { Unsurveyed.....	— X — X —
do. do. Dividing Line { Surveyed.....	— S — S —
(Western Division) { Unsurveyed.....	— X — X —
Maximum Withdrawal Area (Western Division).....	— W — W —
State Recreation Area.....	— R — R —
① Includes also Flood Control & Irrigation District, Domestic & Stock Water Supply District, River Improvement District.	
② Includes also Bore Water Trust District, Artesian Wells District, Irrigation Trust District, Flood Prevention Trust District.	

NOTE When boundaries are concurrent they should be combined as in the following example ----
County, Parish, Land District, Town and Reserve from Sale boundaries :

— X + T — X + T —

Railway { on large scale map.....	— — — — —
{ on small scale map.....	— — — — —
Public Road.....	— — — — —
Surveyed Reserved Road.....	— — — — —
Fence { when on a boundary.....	— — — — —
{ when not on a boundary.....	— — — — —
Track.....	— — — — —
Private Subdivision.....	— — — — —
Horizontal Control Point.....	monumented Δ 8/17 m
	Other $\circ$ 75 m
Permanent Mark (Survey Co-ordination Act).....	$\square$
Observing Station.....	Δ 1000 1/2 15'
Astronomical Station.....	$\diamond$ MAY

See also Appendix "A", Survey Co-ordination Regulations.

Where a county and a parish boundary are coincident, the county symbol only is to be shown.

City, town or village, and suburban boundaries are to be shown as minor boundaries on parish maps and as major on town or village maps.

Where a reserve from Sale, and a reserve from Occupation boundary are coincident, they are to be shown e.g.

— 10 — 10 — 10 —