

**QUEENSLAND**

**THE SURVEYORS' BOARD**

**DIRECTIONS  
FOR THE GUIDANCE OF SURVEYORS  
EFFECTING SURVEYS  
UNDER THE REAL PROPERTY ACTS  
OF 1861 AND 1877**

**GAZETTED 11th AUGUST, 1928**

QUEENSLAND.

THE SURVEYORS' BOARD.

DIRECTIONS

For the Guidance of Surveyors effecting  
Surveys under the Real Property Acts of  
1861 and 1877.

Published by the Authority of His  
Excellency the Governor in Council.

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Department of Public Lands,  
Brisbane, 9th August, 1928.

**H**IS Excellency the Governor, with the advice of the Executive Council, has been pleased to approve of the following By-law under the provisions of "*The Land Surveyors Acts, 1908 to 1916.*"

E.M. 9-8-1928.

THOS. DUNSTAN.

## The Land Surveyors Acts, 1908 to 1916.

### DIRECTIONS FOR THE GUIDANCE OF SURVEYORS EFFECTING SURVEYS UNDER THE REAL PROPERTY ACTS OF 1861 AND 1877.

#### BY-LAW No. 2.

WHEREAS by the provisions of section 24 of "*The Land Surveyors Acts, 1908 to 1916*," the Surveyors Board is authorised to make By-laws for all or any of the purposes in the said Acts mentioned: It is hereby resolved by the said Board that the following additional By-law shall be in force from the date of the publication hereof in the *Gazette*:—

#### BY-LAW No. 7.

##### *Repeal.*

By-law No. 2, published in the *Gazette* dated 28th May, 1910, pages 1502-5, is hereby repealed, and the following By-law substituted in lieu thereof:—

#### AMENDED BY-LAW No. 2.

##### *Interpretation.*

In the interpretation of this By-law, unless the context otherwise indicates, the following terms shall have the meanings set against them respectively, that is to say:—

"Board"—The Surveyors' Board constituted under "*The Land Surveyors Acts, 1908 to 1916*."

"The Real Property Act"—The Real Property Acts of 1861 and 1877.

"The Registrar of Titles"—The Registrar of Titles appointed by the Governor in Council under the provisions of "*The Registrar of Titles Act of 1884*."

The following terms, viz.:—"Land," "Transfer," "Grant," "Instrument," "Proprietor," "Certificate of Title" shall have the meanings set against them respectively in the third section of the "*Real Property Act of 1861*."

### DIRECTIONS FOR THE GUIDANCE OF SURVEYORS EFFECTING SURVEYS UNDER THE REAL PROPERTY ACTS OF 1861 AND 1877.

#### GENERAL.

##### *Surveys by authorised surveyors in accordance with these Directions.*

1. Every survey, resurvey, or subdivision made for the purposes of any application or dealings under the Real Property Act shall be made by a surveyor authorised by registration under "*The Land Surveyors Acts, 1908 to 1916*," and such survey, resurvey, or subdivision, and every plan submitted purporting to represent the same respectively, must be made in strict accordance with these Directions.

##### *Minimum size of parcels.*

2. As Local Authorities have power to fix the minimum size of allotments, surveyors should consult the authority concerned before carrying out the survey of any proposed subdivision.

##### *Surveyor should obtain all available information.*

3. Before making a survey of any land, the surveyor should obtain all available information respecting it in the offices of the Surveyor-General and the Registrar of Titles.



“*The Local Authorities Acts Amendment Act of 1923*” and “*The City of Brisbane Act of 1924.*”

4. In case of a subdivision, involving the opening of any new road, the attention of surveyors is directed to the provisions of section 18 of “*The Local Authorities Acts Amendment Act of 1923*” and to the ordinances of the Brisbane City Council.

*Surveyor to disclose all doubts and discrepancies.*

5. The surveyor will be expected to disclose all doubts, discrepancies, and difficulties, and to afford all information obtainable by him relative to the property under survey that may aid in securing accuracy and completeness in the title to the land.

In these matters he must consider himself as an agent and adviser of the Government, and regard for the interests of his employer will not be considered as excusing in any degree the withholding of any information affecting the survey, even though the plan and description supplied may be technically correct.

*Existing titles to be satisfied; if necessary survey to be extended to adjoining lands.*

6. Whenever the survey of an area discloses more land than is comprised in the deed thereof, the survey shall not be considered to be complete unless it shows, so far as may be practicable, that there is or is not sufficient land left to satisfy the reserved widths of adjoining streets, lanes, and roads, and the titles of adjoining owners under the most liberal interpretation of their rights.

*Resurveys necessitating the Surveyor-General's endorsement or the correction of deed.*

7. In the event of a resurvey of any land held in fee from the Crown differing from the original survey to any serious extent, the resurvey must receive the Surveyor-General's endorsement, or the deed must be corrected before it will be accepted by the Registrar of Titles.

*Surveyor to comply with requisition for amendment of survey.*

8. On receipt of a requisition from the Surveyor-General or the Registrar of Titles to amend a survey or to supply more information concerning it than is contained in the field-notes or shown on the plan, the surveyor concerned must immediately, and so far as may be practicable, comply with the requisition.

*Disputes in relation to conduct of a survey may be referred to the Board.*

9. In the event of a dispute arising between the Registrar of Titles and a surveyor as to whether any survey made under these Directions has been properly effected, the matter may be referred to the Board, which shall inquire into it and advise the Registrar of Titles and the surveyor of its finding.

*Greatest accuracy in survey work essential; inaccurate work to be reported to the Board.*

10. The necessity for the greatest accuracy cannot be too strongly impressed upon surveyors. In many instances no means may exist whereby errors can be immediately detected; this renders it all the more necessary to deal stringently with surveyors whose work is found to be inaccurate.

If, therefore, it is found that the work of any surveyor is inaccurate and defective, it shall be the duty of the Surveyor-General, the Registrar of Titles, or other Authority to report the matter to the Board, which shall inquire into it and deal with the surveyor in accordance with the provisions of Section 18 of “*The Land Surveyors Acts, 1908 to 1916.*”

## FIELD WORK.

*Angular work to be effected with theodolite; linear measurements to be made with steel band.*

11. All surveys effected under these Directions must be made with a theodolite in accurate adjustment and a steel band maintained in adjustment with the standard of the Survey Office. Every boundary or traverse line must be laid out instrumentally and measured.

*All bearings to be determined by angular measurements.*

12. All bearings shall be determined by angular measurement and be recorded in degrees, minutes, and seconds of arc reading from zero round through east to 360 degrees.

*All measurements to be in links.*

13. All measurements shall be in links and in decimal parts of a link.

*Datum of bearings of resurveys.*

14. Usually in a resurvey, the original bearing of the longest side—of which the terminal points have been verified—should be adopted as the datum of the bearings of the resurvey.

*Traverse and offset lines.*

15. Traverse lines following watercourse boundaries should be located within an offset limit of three chains on country lands and one chain on town and suburban lands. Offsets should be taken at intervals of about two chains, or at shorter intervals if necessary to correctly define the irregularities of the boundary.

*The boundaries originally marked on the ground are the true boundaries—Diligent search should be made for marks of original survey.*

16. In the resurvey of lands held under grant, the surveyor must adhere to the principle that the boundaries originally marked on the ground by the Government surveyor are the true boundaries, although the bearings and lengths of such boundaries may not on resurvey be found to agree with the bearings and lengths recorded on the original plans.

But where it is evident that some of the original marks found have been placed in error and do not reasonably represent the metes and bounds of the land conveyed, it may be desirable to ignore these marks. In this case a full report of the circumstances shall be made to the Surveyor-General, and approval sought of the action proposed to be taken.

In the reinstatement of original boundaries the following system of procedure shall be practised:—

*Action where corner-post and reference-tree are found.*

17. Where the corner-post and reference-tree are found, the position of the post shall be checked by comparing its actual bearing and distance with that originally determined and recorded on the plan.

*Action where reference-tree only is found.*

18. At a corner where the reference-tree only is found, the post shall be reinstated on the originally determined and recorded bearing and distance therefrom.

*Action where line-pegs, lockspits, or blazed trees are found.*

19. Where neither post at corner nor reference-tree is found, but indications of the original survey are afforded by line-pegs, lockspits, or blazed trees, boundaries and corners must be reinstated in correct relation to such marks, but before adoption shall be checked by measured reference to existing adjacent corners or boundaries.

*Action where no marks are found.*

20. Where no marks of original survey can be found, it must be shown that the boundaries and corners have been reinstated in correctly measured relation to adjacent boundaries, to those situated on opposite sides of roads, to fences, or to such other evidence of original location as may be found.

*The position of marks to be entered in field-book.*

21. The position of all original marks found must be shown in the field-book and on the plan. (See Clause 45.)

*Action where lengths as resurveyed are in excess.*

22. Where resurvey shows lengths of boundaries in excess of original lengths, field-notes and plan must show satisfactory evidence that the excess is not due to encroachment on adjoining lands or roads. In the absence of sufficient original marks, this shall be ascertained by the actual measurement of so much of the boundaries of adjoining lands as is necessary to ascertain whether such boundaries contain their granted lengths in full.

*Surveyed connections to original corners.*

23. If part only of the land in a Grant or a Certificate of Title is subdivided, the subdivisive survey must be connected by actual survey:—

On country lands—to a corner or corners of the previous survey.

On town lands—to a corner or corners of the previous survey, or to the corners of sections, or to the intersections of streets or lanes, or to permanent marks established by alignment, standard traverse, or other official survey.

## MARKING.

*Boundary and road lines.—Clearing and blazing.*

24. Resurveyed and subdivisive boundary lines on town and on country lands shall be cleared to a width of two feet by the removal of all scrub, undergrowth, and trees less than six inches in diameter. In scrub and in forest country the trees standing nearest to the line shall be marked with a horseshoe mark cut into the heartwood on opposite sides of the tree in such positions that the marks face along the boundary line.

Trees left standing, through which the line passes, shall be double marked on opposite sides in such positions that the marks face along the boundary line.

*Pegs, and lockspits, on boundary and road lines on country lands.*

25. On resurveyed and on subdivisive boundary lines on country lands, at distances not exceeding ten chains apart, and always so situated as to be visible one from the other, hardwood pegs eighteen inches long and two inches square shall be aligned with the theodolite and driven twelve inches into the ground.

On each side of the pegs and distant about one foot, lockspits three feet long and six inches deep shall be dug in the direction of the boundary lines, and the earth taken out of the trenches shall be heaped up round the pegs.

On very stony lands, rows of stones placed in the direction of the boundary lines may be substituted for dug-out lockspits.

In dense scrubs lockspits at pegs are not required.

*Country lands.—Posts, pegs, and pointer pegs at corners.*

26. In subdivisive surveys on country lands, the principal corners shall be marked with hardwood posts, not less than four inches square and three feet long, sunk two feet into the ground. All other corners shall be marked with hardwood pegs, not less than three inches square and two feet long, sunk eighteen inches into the ground. Twenty links

from each corner pointer pegs twelve inches long and one and one-half inch square, free of sapwood, are to be driven flush with the ground on the exact alignment of the boundaries forming the corner.

The numbers of the subdivisions shall be cut into the posts and pegs, or into the nearest suitable tree, which should be referred by recorded bearing and distance to the post or peg.

*Town lands.—Posts or pegs and lockspits at corners.*

27. In subdivisional surveys, where the subdivisions are marked out in blocks or sections, each block or section corner should, if practicable, be truncated in the interests of fast moving traffic.

Where not truncated the corner shall be marked with a hardwood post not less than four inches square sunk two feet into the ground. Outside a fifteen-inch radius from the post lockspits three feet long and six inches deep shall be dug in the direction of the boundary lines. The number of the section and of the corner subdivision are to be cut into the post or painted thereon with black figures upon a white ground.

Where truncated, pegs three inches by two and eighteen inches long are to be aligned and driven twenty links back from the intersection of the sidelines and lockspitted and marked as above, but the distance (twenty links) may be modified at acute angles or where circumstances render it expedient.

All other subdivisional corners are to be marked with hardwood pegs two inches square and eighteen inches long carefully aligned, lockspitted, and marked with the numbers of the subdivisions as above.

*Town lands.—Permanent marks.*

28. Where section corners are not truncated, iron rods one inch in diameter and twelve inches in length are to be driven perpendicularly into the ground to a depth of eighteen inches (*i.e.*, the top of the rod to be six inches below the surface) on alternate frontage lines at points on these lines produced each way exactly five links from the corners.

Where corners are truncated rods as above are to be inserted exactly at the intersection of the frontage lines except in towns where civic improvements would interfere with them, in which case they should be placed on the alignment five links from the pegs, as specified for corners that are not truncated.

In the case of a curved boundary the straight line from which it springs should be produced far enough to be well clear of the curve and a rod inserted as above.

The exact position of all permanent marks is to be shown in field books and on plans, and a sketch or print showing their position forwarded to the Surveyor-General when the plans are lodged with the Registrar of Titles.

*Control of permanent marks.*

29. The care, control, and maintenance of permanent survey marks shall be vested in the Surveyor-General, who shall at all times have access thereto, and may take proceedings for the recovery of penalties for any breach of the clauses relating to permanent survey marks.

*Disturbance of permanent marks.*

30. A person (including a Council or the servant of a Council) shall not move, injure, or in any way interfere with any permanent survey mark.

(a) Where any person (including a Council or any statutory body) proposes to carry out any work which would be likely to interfere with any permanent survey mark, such person shall give notice to the Surveyor-General, who shall, where advisable, take all necessary steps to safeguard such mark, and the proposed work shall not be commenced until this has been done.

(b) If such work involve the temporary removal of the mark, the Surveyor-General shall cause the position of the mark to be properly recorded by reference and measurements, and shall then give notice to such person that the work may be commenced. Such person shall not commence the work until he receives such notice, and on completion shall give notice to the Surveyor-General, who shall forthwith restore the mark to its original position or to such other position as he may find to be advisable.

(c) If any alteration of the position of any mark be made by the Surveyor-General he shall record such alteration on the plans lodged in his office, and shall forthwith furnish notice and particulars of such alterations to the Registrar of Titles, who shall likewise record such alterations appropriately.

(d) The cost of any work carried out by the Surveyor-General under this clause shall be paid by and be recoverable from such person.

(e) Any surveyor who, in the exercise of his profession, finds that a permanent survey mark has been moved or destroyed, shall forthwith report the fact to the Surveyor-General.

(f) If any Council lays paving or otherwise alters the surface of the road it shall, where the Surveyor-General considers that it is necessary to preserve ready access to any permanent survey mark, cover it (to the finished surface) with a movable block of concrete or other suitable material approved by the Surveyor-General, and such block shall be so made and arranged that it may be lifted with ease when necessary.

#### *Penalties.*

31. Any person committing a breach of any of the provisions of clause 30 of this By-law shall be liable to a penalty not exceeding twenty pounds.

#### *Rocks at corners.*

32. If rocks that cannot be removed are found to be situated at corners of subdivisions, they should be marked by a hole drilled to a depth of not less than one inch and with pick-marks in the direction of the boundary lines. If practicable, the subdivisional numbers should be cut into the rock.

#### *Re-marking original boundaries.*

33. Original boundaries being resurveyed shall be marked, posted, pegged, and lockspitted in accordance with the requirements of the foregoing directions, and old reference-trees shall be dressed up or new reference-trees provided. The adoption of a fence post as a corner should be distinctly indicated by marking it with a broad-arrow.

#### *Identification surveys.*

34. Within sixty days of the execution of any identification survey made for the purpose of re-establishing original corners, a sketch plan (not necessarily to scale) must be lodged with the Registrar of Titles. Such plan shall show clearly the original marks found, the method of reinstating any that were missing and the measurements made in so doing.

#### **FIELD-BOOKS.**

##### *Size of field-book.*

35. The field-book used should in size be in proportion to the extent of the survey of which it is a record.

##### *To be carefully kept.*

36. The field-book shall be so lucidly kept as to enable a draftsman, without other information than it affords, to draw a true plan of the survey.

##### *The first page.*

37. The first page of the field-book shall contain the signature of the surveyor, the title of the survey, with particulars of the county, parish, town, &c., in which it is situated; and the date of the commencement of the survey.

*The first page—Certificate that steel tape used has been compared with standard.*

38. The first page of the field-book shall also contain the following statement duly filled in by the surveyor:—

“The steel tape used on this survey agrees in length with standard steel tape No. [or official standard laid down at , as the case may be] as determined by comparison made on the day of , 19 .”

*Datum of survey to be described.*

39. The details of the survey work shall be prefaced by a description of the datum upon which the survey is based; if obtained by the adoption of an original boundary, the original marks found on it and the data by which they were identified shall be described in the field-book.

*Field-notes of “Surround,” by separate entry.*

40. The field-notes of the surround of a resurvey should be kept together, be separated from those of the internal subdivision, and each line should be entered separately in the sequence in which it is measured.

*Subdivisional work, by separate entry or by diagram.*

41. The internal subdivisional work on country lands should also be entered separately in sequence; but the internal subdivisional work on town lands may be shown in the field-book by diagrams.

*Angular and linear measurements to be recorded in detail.*

42. Field-notes shall contain a clear record of the instrumental bearings of lines, the actually measured or contour lengths, the angles of elevation and depression, and corrections therefor; the temperature, and correction for changes thereof; the horizontal lengths of lines; the measurement of offsets to watercourse boundaries; the bearings and distances from the reference-trees; and the measurements made to improvements.

*Closure and intersections to be recorded.*

43. The angular closure, and the measured positions of the points of intersection of all surveyed lines, shall be recorded in the field-notes of the intersecting and intersected lines.

*Distance to traverse, to post, and to watercourse to be recorded.*

44. Field-notes of boundaries terminating at watercourses shall show the distance to traverse, to post, and to watercourse, respectively.

*Exact positions of all marks to be recorded.*

45. The exact position of any mark found or inserted shall be entered in the field-notes, and shall be described by noting at the reduced distance the word “post,” “peg,” &c., as the case may require.

*Field-notes to be certified to.*

46. The date of the completion of the survey and the following certificate must be entered at the end of the field-notes, and be subscribed by the surveyor:—

“This is to certify that the field-notes herein contained are the actual results of my observations and measurements in the field.”

A. B., Surveyor.

*Field-book shall accompany the plan.*

47. In every case the field-book shall accompany the plan of survey, or be lodged in the Office of the Registrar of Titles for safe custody.

## COMPUTATIONS.

*Measurements to be checked by closure.*

48. The measurements made on each survey shall be checked by the calculation of the difference of latitude and departure of each line, computed to tenths of links for country and to hundredths of links for town lands.

*Areas by double longitudes.*

49. Areas of portions or subdivisions, except such as are rectangular, shall be carefully computed by double longitudes.

*Computations to be forwarded.*

50. Calculations of closure and of area shall be forwarded with the field-books and plans to which they refer.

*Limit of error.*

51. The error in the linear measurement of surveys should not exceed—

On Town Lands—

1 inch in ten chains, equal to 1 link in a mile.

On Country Lands—

On undulating country, 1 link in 50 chains.

On rough and broken country, 2 links in 50 chains.

## PLANS.

*Drafting.*

52. All plans shall be drawn by the surveyor himself, or under his supervision, on the plan forms supplied by the Registrar of Titles. All compiled or partly compiled plans shall bear a certificate giving catalogue numbers of plans and the office or offices from which the information has been obtained.

*Scale of plans.*

53. Plans should be accurately plotted with the North point upwards, and should be drawn to the scales prescribed hereunder, viz. :—

Not exceeding 24 perches—not less than 1 chain to 1 inch.

Not exceeding 1 acre—not less than 2 chains to 1 inch.

Not exceeding 5 acres—not less than 5 chains to 1 inch.

Not exceeding 80 acres—not less than 10 chains to 1 inch.

Exceeding 80 acres—20 chains to 1 inch.

The scale to which the plan is drawn must be stated on the plan form.

*Diagrams.*

54. Diagrams, on enlarged scales, may be drawn on plans to show clearly details of measurements or of improvements.

*Limit of fractional quantities.*

55. On plans of survey of country lands, fractional quantities shall be omitted from areas as specified hereunder :—

In areas not exceeding 2 acres—less than 1/10 perch.

More than 2 acres, but not exceeding 10 acres—less than  $\frac{1}{2}$  perch:

More than 10 acres, but not exceeding 40 acres—less than 1 perch.

More than 40 acres, but not exceeding 640 acres—less than 1 rood.

*Plans may not be coloured.*

56. Plans shall not be coloured or tinted, except those required for Railway resumptions. Easements should be plotted in blue and their details shown in same colour by an enlarged diagram where necessary.

*Delineation of lines.*

57. Boundaries shall be ruled in firm black lines, the actual measurements made and the bearings observed in the field shall be written along the lines in black figures. Original lengths and bearings may also be written but shall be in brown figures.

*Of traverse lines.*

58. Traverses shall be ruled in firm blue lines, and the actual measurements made and the bearings observed in the field shall be written along the lines in blue figures, or these particulars may be written in a tablet on the plan form.

*Coasts and watercourses.*

59. Lines of coast, banks of rivers, creeks, &c., where surveyed shall be shown by firm black lines, and where unsurveyed by broken black lines.

Opposite sides of watercourses and an arrow pointing down stream shall be sketched on plans.

*Title.*

60. The title of the plan shall be written on the plan form in the space provided for it, and shall show the numbers of the subdivisions, allotments, sections, or portions measured, the names of the county, parish, town, or other particular locality in which the survey is situated.

*Plan forms.*

61. For convenience of record, plans shall not be drawn on forms larger than is necessary to contain the work.

*Plan must show details.*

62. Every plan must show with their respective names all roads, streets, passages, thoroughfares, rights-of-way, easements, squares, or reserves appropriated or set apart for the use of the purchasers or for public use, and also all the subdivisions into which the land has been divided, marked with distinct numbers, and must also show the areas of the said subdivisions.

*Plans must show widths of roads, &c.*

63. The widths of all roads, streets, lanes, or rights-of-way adjoining the land under survey shall be recorded in the field-notes and be shown on the plans; but no width of any road, street, lane, or right-of-way shall be recorded or shown unless it has been accurately measured in the course of the survey.

When dealing with land containing a reservation for road or other purposes, a surveyor shall not allocate on the plan the whole or any part of the reservation to any subdivision or resubdivision, but shall show the gross area of each with a note on the plan showing that the reservation is included.

*Plan must show original boundaries.*

64. When a subdivisional survey includes more than one original allotment or portion, the true position of the original boundaries must be shown on the plan.

*Disputed ownership.*

65. Should the location of a common boundary be in dispute between the owners of adjoining lands, all particulars of occupation and evidences of original location must be shown on the plan.

*Plan must show nature of boundaries.*

66. Every plan of a resurvey must show the nature of the boundaries at the time of resurvey, whether lines, fences, roads, streets, natural features, buildings, or walls.



If a boundary is a wall, it shall be described on the plan as "not a party wall," "party wall," "two walls," &c. The width of all party walls shall be stated, and it shall be shown if the boundary divides the wall evenly, if not its position relative to the centre of the wall shall be stated.

Such detailed information can be satisfactorily shown by a large scale diagram.

*Encroachment must be shown.*

67. If any building encroach beyond the building line of a street, the extent of the encroachment must be shown on the plan, preferably by a large scale diagram.

*Statutory declaration.*

68. In accordance with the provisions of section 119 of "The Real Property Act of 1861," each map or plan must be accompanied by a declaration in the form as set out in the Schedule hereto.

DESCRIPTIONS.

*Descriptions must agree or be corrected.*

69. Descriptions of subdivisions inserted in the transfers or other instruments lodged for registration must agree, or be corrected to agree, with the certified plan as finally approved.

*Alterations must be initialled.*

70. Any material alteration in any plan made after the original execution of the instrument or lodgment of the plan must be initialled in token of approval by all persons whose rights or interests may be affected by such alteration: Provided always that in the correction of any such error the original words or figures shall not be erased or rendered illegible, and the date of alteration shall be affixed and initialled.

SCHEDULE.

I, \_\_\_\_\_, do hereby solemnly and sincerely declare that I have faithfully and truly surveyed, measured, and marked on the ground the parcel of land referred to in the within declaration, and that the measurements and boundaries given in this plan \_\_\_\_\_ situated in the county of \_\_\_\_\_, parish of \_\_\_\_\_, are correct, and do not, to the best of my belief, in any way interfere with the rights or property of any persons, owners, or occupiers of land adjoining the above land, and described in the said plan; and I make this solemn declaration, conscientiously believing the same to be true, and by virtue of the provisions of the "Oaths Act of 1867."

(Signature)

Authorised Surveyor.

Made and signed at \_\_\_\_\_ this \_\_\_\_\_ day of \_\_\_\_\_ 19 \_\_\_\_\_, before me—

(Signature of Registrar of Titles or of a Magistrate.)

*Certificate.*

The foregoing By-law was made and passed by the Surveyors' Board on the fourteenth day of July, 1928.

F. B. C. FORD, President.

## APPENDIX I.—REDUCING TABLE.

Table of Links to be deducted from each chain measured on a slope to reduce it to horizontal measurement.

## REDUCTION PER CHAIN.

	0°	1°	2°	3°	4°	5°	
0	0-0000	0-0152	0-0609	0-1371	0-2436	0-3805	0
2	0-0000	0-163	0-630	1-401	2-477	3-856	2
4	0-0001	0-173	0-651	1-432	2-518	3-907	4
6	0-0002	0-184	0-672	1-463	2-559	3-959	6
8	0-0003	0-196	0-693	1-495	2-601	4-011	8
10	0-0004	0-207	0-715	1-527	2-643	4-063	10
12	0-0006	0-219	0-737	1-559	2-686	4-116	12
14	0-0008	0-232	0-760	1-592	2-728	4-169	14
16	0-0011	0-244	0-782	1-625	2-771	4-222	16
18	0-0014	0-257	0-806	1-658	2-815	4-275	18
20	0-0017	0-271	0-829	1-692	2-859	4-329	20
22	0-0021	0-284	0-853	1-726	2-903	4-384	22
24	0-0024	0-299	0-877	1-760	2-947	4-438	24
26	0-0029	0-313	0-902	1-795	2-992	4-493	26
28	0-0033	0-328	0-927	1-830	3-037	4-548	28
30	0-0038	0-343	0-952	1-865	3-083	4-604	30
32	0-0043	0-358	0-977	1-901	3-129	4-660	32
34	0-0049	0-374	1-003	1-937	3-175	4-716	34
36	0-0055	0-390	1-029	1-973	3-221	4-773	36
38	0-0061	0-406	1-056	2-010	3-268	4-830	38
40	0-0068	0-423	1-083	2-047	3-315	4-887	40
42	0-0075	0-440	1-110	2-084	3-363	4-944	42
44	0-0082	0-458	1-138	2-122	3-411	5-002	44
46	0-0090	0-475	1-166	2-160	3-459	5-061	46
48	0-0098	0-493	1-194	2-199	3-507	5-119	48
50	0-0106	0-512	1-223	2-237	3-556	5-178	50
52	0-0114	0-531	1-251	2-276	3-605	5-238	52
54	0-0123	0-550	1-281	2-316	3-655	5-297	54
56	0-0133	0-569	1-310	2-356	3-705	5-357	56
58	0-0142	0-589	1-340	2-396	3-755	5-418	58
60	0-0152	0-609	1-371	2-436	3-805	5-478	60

  

	6°	7°	8°	9°	10°	
0	0-5478	0-7454	0-9732	1-2312	1-5192	0
2	0-5539	0-7525	0-9813	1-2403	1-5293	2
4	0-5600	0-7596	0-9895	1-2494	1-5395	4
6	0-5662	0-7668	0-9976	1-2586	1-5497	6
8	0-5724	0-7740	1-0059	1-2678	1-5599	8
10	0-5786	0-7813	1-0141	1-2771	1-5702	10
12	0-5849	0-7885	1-0224	1-2864	1-5804	12
14	0-5912	0-7958	1-0307	1-2957	1-5908	14
16	0-5975	0-8032	1-0390	1-3050	1-6011	16
18	0-6039	0-8106	1-0474	1-3144	1-6115	18
20	0-6103	0-8180	1-0558	1-3239	1-6219	20
22	0-6167	0-8254	1-0643	1-3333	1-6324	22
24	0-6232	0-8329	1-0728	1-3428	1-6429	24
26	0-6297	0-8404	1-0813	1-3523	1-6534	26
28	0-6363	0-8479	1-0898	1-3619	1-6639	28
30	0-6428	0-8555	1-0984	1-3714	1-6745	30
32	0-6494	0-8631	1-1070	1-3811	1-6851	32
34	0-6561	0-8708	1-1157	1-3907	1-6958	34
36	0-6627	0-8785	1-1244	1-4004	1-7065	36
38	0-6694	0-8862	1-1331	1-4101	1-7172	38
40	0-6762	0-8939	1-1418	1-4199	1-7279	40
42	0-6829	0-9017	1-1506	1-4297	1-7387	42
44	0-6897	0-9095	1-1594	1-4395	1-7495	44
46	0-6966	0-9173	1-1683	1-4493	1-7604	46
48	0-7035	0-9252	1-1772	1-4592	1-7713	48
50	0-7104	0-9331	1-1861	1-4691	1-7822	50
52	0-7173	0-9411	1-1950	1-4791	1-7931	52
54	0-7243	0-9491	1-2040	1-4891	1-8041	54
56	0-7313	0-9571	1-2130	1-4991	1-8152	56
58	0-7383	0-9651	1-2221	1-5091	1-8262	58
60	0-7454	0-9732	1-2312	1-5192	1-8373	60

REDUCING TABLE—*continued.*

Table of Links to be deducted from each chain measured on a slope to reduce it to horizontal measurement.

## REDUCTION PER CHAIN.

'	11°	12°	13°	14°	15°	'
0	1.8372	2.1852	2.5630	2.9704	3.4074	0
2	1.8484	2.1973	2.5761	2.9845	3.4225	2
4	1.8595	2.2095	2.5892	2.9986	3.4376	4
6	1.8707	2.2217	2.6024	3.0128	3.4527	6
8	1.8819	2.2339	2.6156	3.0270	3.4679	8
10	1.8932	2.2461	2.6288	3.0412	3.4831	10
12	1.9045	2.2584	2.6421	3.0555	3.4983	12
14	1.9158	2.2707	2.6554	3.0697	3.5136	14
16	1.9271	2.2831	2.6687	3.0841	3.5289	16
18	1.9385	2.2954	2.6821	3.0984	3.5443	18
20	1.9499	2.3078	2.6955	3.1128	3.5596	20
22	1.9614	2.3203	2.7089	3.1272	3.5750	22
24	1.9729	2.3328	2.7224	3.1417	3.5905	24
26	1.9844	2.3453	2.7359	3.1562	3.6059	26
28	1.9959	2.3578	2.7494	3.1707	3.6214	28
30	2.0075	2.3704	2.7630	3.1852	3.6369	30
32	2.0191	2.3830	2.7766	3.1998	3.6525	32
34	2.0308	2.3956	2.7902	3.2144	3.6681	34
36	2.0425	2.4083	2.8039	3.2291	3.6837	36
38	2.0542	2.4210	2.8176	3.2438	3.6994	38
40	2.0659	2.4338	2.8313	3.2585	3.7151	40
42	2.0777	2.4465	2.8451	3.2732	3.7308	42
44	2.0895	2.4593	2.8589	3.2880	3.7466	44
46	2.1014	2.4722	2.8727	3.3028	3.7624	46
48	2.1133	2.4851	2.8866	3.3177	3.7782	48
50	2.1252	2.4980	2.9005	3.3325	3.7941	50
52	2.1371	2.5109	2.9144	3.3474	3.8099	52
54	2.1491	2.5239	2.9283	3.3624	3.8259	54
56	2.1611	2.5369	2.9423	3.3774	3.8418	56
58	2.1732	2.5499	2.9564	3.3924	3.8578	58
60	2.1852	2.5630	2.9704	3.4074	3.8738	60

'	16°	17°	18°	19°	20°	'
0	3.8738	4.3695	4.8943	5.4481	6.0307	0
2	3.8899	4.3865	4.9123	5.4671	6.0506	2
4	3.9060	4.4036	4.9304	5.4861	6.0706	4
6	3.9221	4.4207	4.9484	5.5051	6.0906	6
8	3.9382	4.4378	4.9665	5.5242	6.1106	8
10	3.9544	4.4550	4.9846	5.5432	6.1306	10
12	3.9706	4.4722	5.0028	5.5624	6.1507	12
14	3.9869	4.4894	5.0210	5.5815	6.1708	14
16	4.0032	4.5066	5.0392	5.6007	6.1909	16
18	4.0195	4.5239	5.0574	5.6199	6.2111	18
20	4.0358	4.5412	5.0757	5.6391	6.2313	20
22	4.0522	4.5586	5.0940	5.6584	6.2515	22
24	4.0686	4.5760	5.1124	5.6777	6.2718	24
26	4.0850	4.5934	5.1308	5.6971	6.2921	26
28	4.1015	4.6108	5.1492	5.7164	6.3124	28
30	4.1180	4.6283	5.1676	5.7358	6.3328	30
32	4.1346	4.6458	5.1861	5.7553	6.3532	32
34	4.1511	4.6634	5.2046	5.7747	6.3736	34
36	4.1677	4.6809	5.2232	5.7942	6.3940	36
38	4.1844	4.6985	5.2417	5.8138	6.4145	38
40	4.2010	4.7162	5.2603	5.8333	6.4350	40
42	4.2177	4.7338	5.2790	5.8529	6.4556	42
44	4.2345	4.7516	5.2976	5.8726	6.4762	44
46	4.2512	4.7693	5.3163	5.8922	6.4968	46
48	4.2680	4.7871	5.3351	5.9119	6.5174	48
50	4.2849	4.8049	5.3538	5.9316	6.5381	50
52	4.3017	4.8227	5.3726	5.9514	6.5588	52
54	4.3186	4.8406	5.3915	5.9712	6.5795	54
56	4.3356	4.8585	5.4103	5.9910	6.6003	56
58	4.3525	4.8764	5.4292	6.0109	6.6211	58
60	4.3695	4.8943	5.4481	6.0307	6.6420	60

REDUCING TABLE—*continued.*

Table of Links to be deducted from each chain measured on a slope to reduce it to horizontal measurement.

## REDUCTION PER CHAIN.

	21°	22°	23°	24°	25°	
0	6-6420	7-2816	7-9495	8-6454	9-3692	0
2	6-6628	7-3034	7-9723	8-6691	9-3938	2
4	6-6837	7-3253	7-9950	8-6928	9-4185	4
6	6-7047	7-3471	8-0178	8-7166	9-4431	6
8	6-7256	7-3690	8-0407	8-7403	9-4678	8
10	6-7466	7-3909	8-0636	8-7642	9-4925	10
12	6-7676	7-4129	8-0865	8-7880	9-5173	12
14	6-7887	7-4349	8-1094	8-8118	9-5421	14
16	6-8098	7-4570	8-1324	8-8357	9-5669	16
18	6-8309	7-4790	8-1554	8-8597	9-5918	18
20	6-8520	7-5011	8-1784	8-8836	9-6166	20
22	6-8732	7-5232	8-2014	8-9076	9-6415	22
24	6-8944	7-5454	8-2245	8-9316	9-6665	24
26	6-9157	7-5676	8-2477	8-9557	9-6914	26
28	6-9369	7-5898	8-2708	8-9798	9-7164	28
30	6-9582	7-6120	8-2940	9-0039	9-7415	30
32	6-9796	7-6343	8-3172	9-0280	9-7665	32
34	7-0010	7-6566	8-3404	9-0522	9-7916	34
36	7-0224	7-6789	8-3637	9-0764	9-8168	36
38	7-0438	7-7013	8-3870	9-1006	9-8419	38
40	7-0653	7-7238	8-4104	9-1249	9-8671	40
42	7-0867	7-7462	8-4337	9-1492	9-8923	42
44	7-1083	7-7687	8-4571	9-1735	9-9175	44
46	7-1298	7-7911	8-4806	9-1979	9-9428	46
48	7-1514	7-8137	8-5040	9-2222	9-9681	48
50	7-1730	7-8362	8-5275	9-2467	9-9935	50
52	7-1947	7-8588	8-5510	9-2711	10-0188	52
54	7-2164	7-8814	8-5746	9-2956	10-0442	54
56	7-2381	7-9041	8-5982	9-3201	10-0697	56
58	7-2598	7-9268	8-6218	9-3446	10-0951	58
60	7-2816	7-9495	8-6454	9-3692	10-1206	60

  

	26°	27°	28°	29°	30°	
0	10-1206	10-8993	11-7052	12-5380	13-3974	0
2	10-1461	10-9257	11-7325	12-5662	13-4265	2
4	10-1716	10-9522	11-7599	12-5945	13-4557	4
6	10-1972	10-9787	11-7873	12-6227	13-4848	6
8	10-2228	11-0052	11-8147	12-6510	13-5140	8
10	10-2484	11-0317	11-8421	12-6794	13-5432	10
12	10-2741	11-0583	11-8696	12-7077	13-5725	12
14	10-2998	11-0849	11-8971	12-7361	13-6018	14
16	10-3256	11-1116	11-9247	12-7645	13-6311	16
18	10-3513	11-1382	11-9522	12-7930	13-6604	18
20	10-3771	11-1649	11-9798	12-8215	13-6898	20
22	10-4029	11-1917	12-0074	12-8500	13-7192	22
24	10-4288	11-2184	12-0351	12-8786	13-7486	24
26	10-4547	11-2452	12-0628	12-9071	13-7780	26
28	10-4806	11-2720	12-0905	12-9358	13-8075	28
30	10-5065	11-2989	12-1182	12-9644	13-8370	30
32	10-5325	11-3258	12-1460	12-9930	13-8666	32
34	10-5586	11-3527	12-1738	13-0217	13-8962	34
36	10-5845	11-3796	12-2017	13-0505	13-9258	36
38	10-6106	11-4066	12-2295	13-0792	13-9554	38
40	10-6367	11-4336	12-2574	13-1080	13-9850	40
42	10-6628	11-4606	12-2853	13-1368	14-0147	42
44	10-6890	11-4877	12-3133	13-1656	14-0444	44
46	10-7152	11-5147	12-3413	13-1945	14-0742	46
48	10-7414	11-5419	12-3693	13-2234	14-1040	48
50	10-7676	11-5690	12-3973	13-2523	14-1338	50
52	10-7939	11-5962	12-4254	13-2813	14-1636	52
54	10-8202	11-6234	12-4535	13-3103	14-1935	54
56	10-8465	11-6506	12-4816	13-3393	14-2234	56
58	10-8729	11-6779	12-5098	13-3683	14-2533	58
60	10-8993	11-7052	12-5380	13-3974	14-2832	60

## APPENDIX 2.

**Correction for Expansion or Contraction of Steel Measuring Tapes.**

For each degree Fah. above or below that at which they are standard length at a constant tension and supported throughout:—

$$\text{Co-efficient} = .0000625.$$

*Example.*

Tape standard at	..	..	..	Fah. 62°
Observed temperature	..	..	..	Fah. 90°
Difference	..	..	..	28°

Measured distance = 2500 links.

.0000625	Co-efficient, as above.
28	Difference in temperature.
<hr/>	
00005000	
00001250	
<hr/>	
0.000175	
2500	Measured distance.
<hr/>	
00087500	
000350	
<hr/>	
+000.437500	Correction (expansion)
2500	
<hr/>	
2500.44	= Corrected distance.
<hr/> <hr/>	

APPENDIX 3.  
Table of Gradients.

Angle.	Gradient, 1 in	Angle.	Gradient, 1 in	Angle.	Gradient, 1 in	Angle.	Gradient, 1 in
0-57	60-31	3-0	19-08	5-0	11-43	7-0	8-14
1-5	52-88	3-5	18-56	5-5	11-24	7-15	7-86
1-9	49-82	3-10	18-07	5-10	11-06	7-30	7-60
1-15	45-83	3-15	17-61	5-15	10-88	7-45	7-35
1-20	42-96	3-20	17-17	5-20	10-71	8-0	7-12
1-25	40-44	3-25	16-75	5-25	10-55	8-15	6-90
1-30	38-19	3-30	16-35	5-30	10-39	8-30	6-69
1-35	36-18	3-35	15-97	5-35	10-23	8-45	6-50
1-40	34-37	3-40	15-60	5-40	10-08	9-0	6-31
1-45	32-73	3-45	15-26	5-45	9-93	9-15	6-14
1-50	31-24	3-50	14-92	5-50	9-79	9-30	5-98
1-55	29-88	3-55	14-61	5-55	9-65	9-45	5-82
2-0	28-64	4-0	14-30	6-0	9-51	10-0	5-67
2-5	27-49	4-5	14-01	6-5	9-38	10-15	5-53
2-10	26-43	4-10	13-73	6-10	9-26	10-30	5-40
2-15	25-45	4-15	13-46	6-15	9-13	10-45	5-27
2-20	24-54	4-20	13-20	6-20	9-01	11-0	5-14
2-25	23-69	4-25	12-95	6-25	8-89	11-15	5-03
2-30	22-90	4-30	12-71	6-30	8-78	11-30	4-92
2-35	22-16	4-35	12-47	6-35	8-66	11-45	4-81
2-40	21-47	4-40	12-25	6-40	8-56	12-0	4-70
2-45	20-82	4-45	12-03	6-45	8-45	12-15	4-61
2-50	20-21	4-50	11-83	6-50	8-34	12-30	4-51
2-55	19-63	4-55	11-62	6-55	8-24	12-45	4-42
3-0	19-08	5-0	11-43	7-0	8-14	13-0	4-33

APPENDIX 4.  
Table for Converting Links to Feet.

Links.	Feet and Decimals.	Links.	Feet and Decimals.	Links.	Feet and Decimals.	Links.	Feet and Decimals.
1	0-66	28	18-48	55	36-30	82	54-12
2	1-32	29	19-14	56	36-96	83	54-78
3	1-98	30	19-80	57	37-62	84	55-44
4	2-64	31	20-46	58	38-28	85	56-10
5	3-30	32	21-12	59	38-94	86	56-76
6	3-96	33	21-78	60	39-60	87	57-42
7	4-62	34	22-44	61	40-26	88	58-08
8	5-28	35	23-10	62	40-92	89	58-74
9	5-94	36	23-76	63	41-58	90	59-40
10	6-60	37	24-42	64	42-24	91	60-06
11	7-26	38	25-08	65	42-90	92	60-72
12	7-92	39	25-74	66	43-56	93	61-38
13	8-58	40	26-40	67	44-22	94	62-04
14	9-24	41	27-06	68	44-88	95	62-70
15	9-90	42	27-72	69	45-54	96	63-36
16	10-56	43	28-38	70	46-20	97	64-02
17	11-22	44	29-04	71	46-86	98	64-68
18	11-88	45	29-70	72	47-52	99	65-34
19	12-54	46	30-36	73	48-18	100	66-00
20	13-20	47	31-02	74	48-84	200	132-00
21	13-86	48	31-68	75	49-50	300	198-00
22	14-52	49	32-34	76	50-16	400	264-00
23	15-18	50	33-00	77	50-82	500	330-00
24	15-84	51	33-66	78	51-48	600	396-00
25	16-50	52	34-32	79	52-14	700	462-00
26	17-16	53	34-98	80	52-80	800	528-00
27	17-82	54	35-64	81	53-46	900	594-00

## APPENDIX 5.

Table for Converting Feet to Links.

Feet.	Links.	Feet.	Links.	Feet.	Links.	Feet.	Links.
1	1.5	28	42.4	55	83.3	82	124.2
2	3.0	29	43.0	56	84.8	83	125.8
3	4.5	30	45.4	57	86.4	84	127.3
4	6.0	31	47.0	58	87.9	85	128.8
5	7.6	32	48.5	59	89.4	86	130.3
6	9.1	33	50.0	60	90.9	87	131.8
7	10.6	34	51.5	61	92.4	88	133.3
8	12.1	35	53.0	62	93.9	89	134.8
9	13.6	36	54.5	63	95.4	90	136.3
10	15.1	37	56.1	64	97.0	91	137.9
11	16.7	38	57.6	65	98.5	92	139.4
12	18.2	39	59.1	66	100.0	93	140.9
13	19.7	40	60.6	67	101.5	94	142.4
14	21.2	41	62.1	68	103.0	95	143.0
15	22.7	42	63.6	69	104.5	96	145.4
16	24.2	43	65.1	70	106.0	97	147.0
17	25.8	44	66.7	71	107.6	98	148.5
18	27.3	45	68.2	72	109.1	99	150.0
19	28.8	46	69.7	73	110.6	100	151.5
20	30.3	47	71.2	74	112.1	200	303.0
21	31.8	48	72.7	75	113.6	300	454.5
22	33.3	49	74.2	76	115.1	400	606.0
23	34.8	50	75.7	77	116.7	500	757.6
24	36.3	51	77.3	78	118.2	600	909.1
25	37.9	52	78.8	79	119.7	700	1060.6
26	39.4	53	80.3	80	121.2	800	1212.1
27	40.9	54	81.8	81	122.7	900	1363.6