

Scaling Tools

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5.1 Scaling Tools

All scaling computation software and measuring devices must comply with Ministry of Forests and Range and/or CSA standards for accuracy (CSA CAN3-0302.1-M86-12.x). It is the responsibility of scalers to ensure the accuracy of their equipment.

5.1.1 BC Metric Scaling Stick

The BC Metric Scaling Stick is the principle piece of scaling equipment used in log scaling in BC. Diameters, lengths and volume calculations can all be determined using only this piece of equipment.

5.1.2 Tally sheets

Tally sheets are used to record scale data. The data is then key-punched into computers which use Smalian's formula to calculate volumes. These forms, the FS 1210, 1211 and 1212, and Volume Estimates can be found on the [MOFR Forms Website](#).

5.1.3 Hand-held Computers

Hand-held computers and data capture units, using ministry approved scaling software are now preferred over the tally sheet system. After entering the data, the computer generates a detailed log listing including volumes by species and grades which must be retained for check scaling purposes. Paper forms may be used in some circumstances, but most scale is now submitted electronically. Please see the link for instructions regarding electronic submission to HBS: [HBS Industry Manual](#).

5.1.4 Volume Tables

The FS 546 *Table of the Half Volume of Cylinders in Cubic Decimetres* contains half volumes of cylinders with lengths from 2 m to 29.9 m and radii from 1 cm to 100 cm. It is sometimes used to assist in hand compiling log volumes.

5.1.5 Measuring Tapes

The metric steel loggers' tape, calibrated to 0.01 m (0.1 dm) increments, is used to measure log lengths. Tapes are available in 10.0, 15.0, 20.0, and 25.0 m lengths. Tapes should be compared to a scale stick or other known length to ensure accuracy.

5.1.6 Limits of Error

Limits of Error and Tolerances for all Local Standards of Length are as per the Regulation of the Weights and Measures Act at: [Weights and Measures Regulations](#).

5.2 The BC Metric Scale Stick

The BC Metric Scale stick is the fundamental scaling tool. It is used to measure log diameters and lengths; and to calculate volumes and defect deductions. The stick is manufactured in three lengths; 1 m, 1.5 m, and 2 m. The handles of the 1 m and the 1.5 m sticks are in addition to the stick length, whereas the handle is included in the length of the 2 m stick. Scale sticks are also manufactured in left or right handed styles, in a version which is somewhat slimmer than standard sticks, and with a "spud" attached, similar to the American Scribner stick. This spud is used to break out wedges of wood from log ends and knots so they may be examined for rot.

Equipped only with a metric scale stick, an approved tally sheet and a pencil, the licensed scaler can perform the official scale. The stick will allow the scaler to measure log diameters and lengths, slab widths and thicknesses, defect dimensions, knot sizes and twist and to calculate the gross log volume, the defect volume and the net volume and/or net dimensions and grade. It is the principle piece of scaling equipment.

5.2.1 Application of the Scale Stick to Measure Diameters

Smalian's Formula requires a log's top and butt radii and length to calculate a volume. The scale stick is graduated in 2 cm increments called "radius class units" or rads. This design allows the scaler to measure and express a log's diameters in rads and as well as expressing the radii in centimetres. Therefore, in measuring a round object:

A diameter in rads is equal to the radius in centimetres.

5.2.2 Application of the Scale Stick to Measure Widths and Thicknesses

The scale stick is designed primarily for measuring diameters and calculating the volumes of round logs by giving the radius in centimetres. Widths and thickness of three and four sided slabs are also measured in rads but the mathematical correlation is different because radii are not involved. For example, a slab measuring 10 rads by 10 rads represents a width and thickness of 20 cm by 20 cm, not a radius of 10 cm. To avoid conversion of rads to centimetres for finding volumes, factors are applied, and the slab measurement section (Chapter 6) describes the application and use of these factors.

5.2.3 The Application of the Scale Stick to Measure Lengths

The scale stick may also be used for measuring length. Starting from the tine of the stick, lengths are graduated in 0.1 m (1 dm) increments. Odd decimetres are marked with a red line at the exact increment and even decimetres are indicated by red numbers which are offset from the exact increment.

5.2.4 The Application of the Scale Stick for Unit Volumes

Reference to unit volumes and average unit volumes are made throughout this manual. A unit volume is the volume of a 1 m length of one end of a log in cubic decimetres per metre, and an average unit volume is the average of the unit volumes of both ends of a log. They are directly proportional to end areas of a log; the end area in square decimetres is always 1/10 of the unit volume. Unit volumes are provided on the scale stick to calculate gross volumes, defect volumes, and net volumes.

5.2.5 The Application of the Scale Stick for Half Volumes

References to half volumes are made throughout this chapter. They are simply the expression of the volume, in cubic decimetres, of a log or slab of any given length for one-half of its length. Half volumes are provided on the scale stick to allow the calculation of a volume by simply adding the half volumes from each end of a log, rather than calculating a full volume for each end and dividing by two.

Figures 5.1 through 5.8 on the following pages illustrate the parts and use of the scale stick.

The approved BC Metric Scale stick specifications are documented at the end of this chapter.

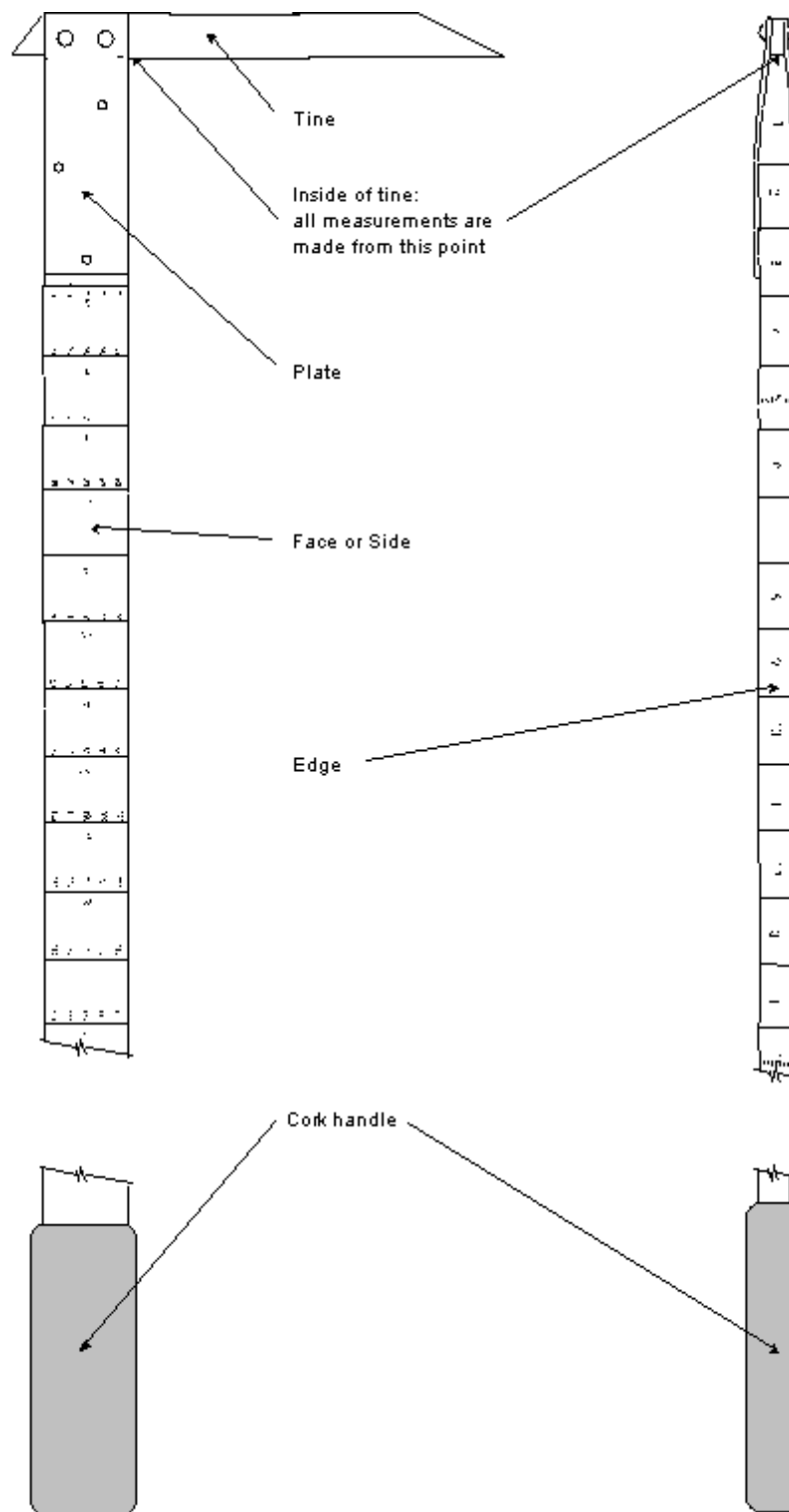


Figure 5.1 Basic Parts of the Official BC Metric Scale Stick.

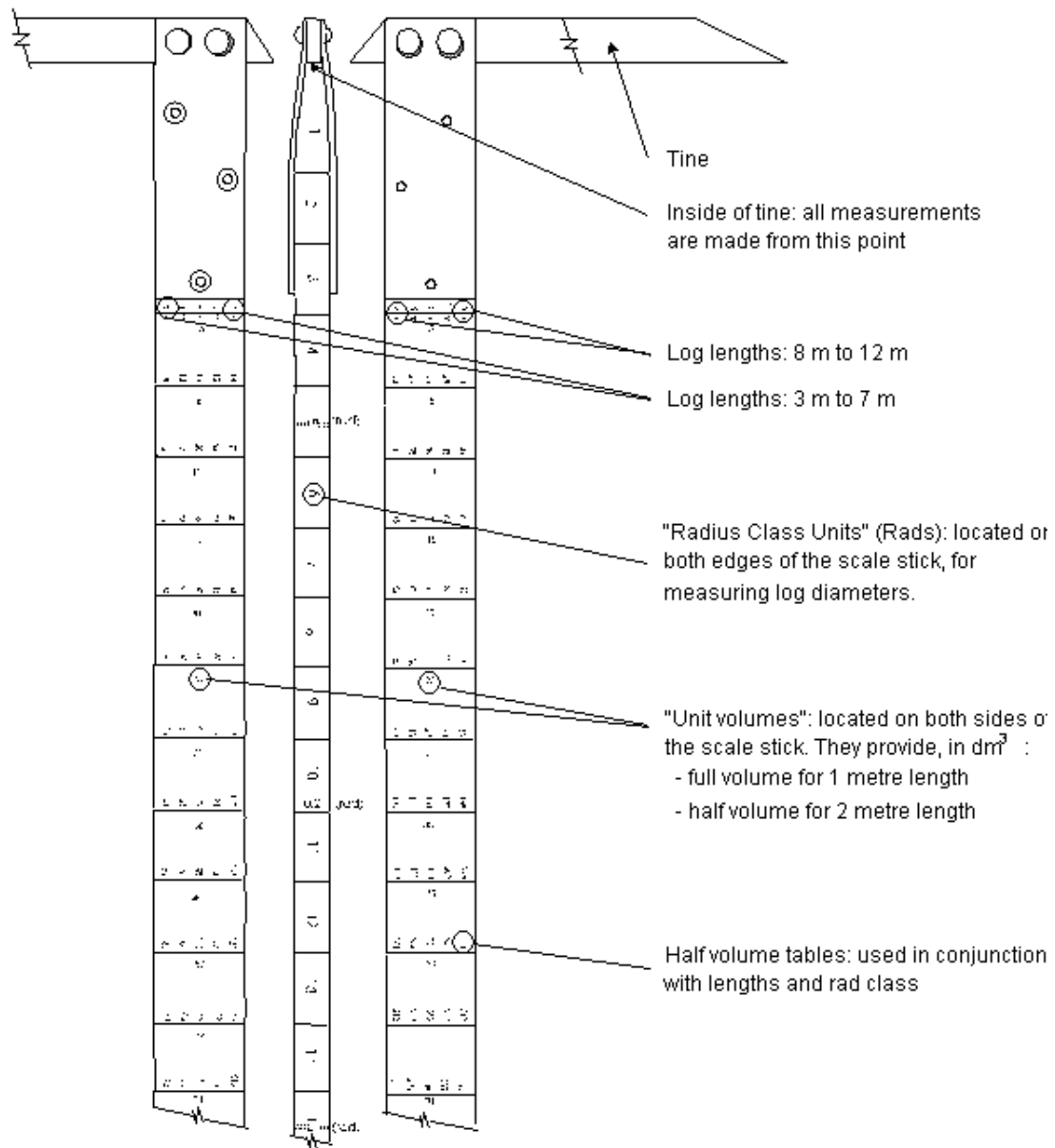


Figure 5.2 Sides and Edge of a BC Metric Scale Stick.

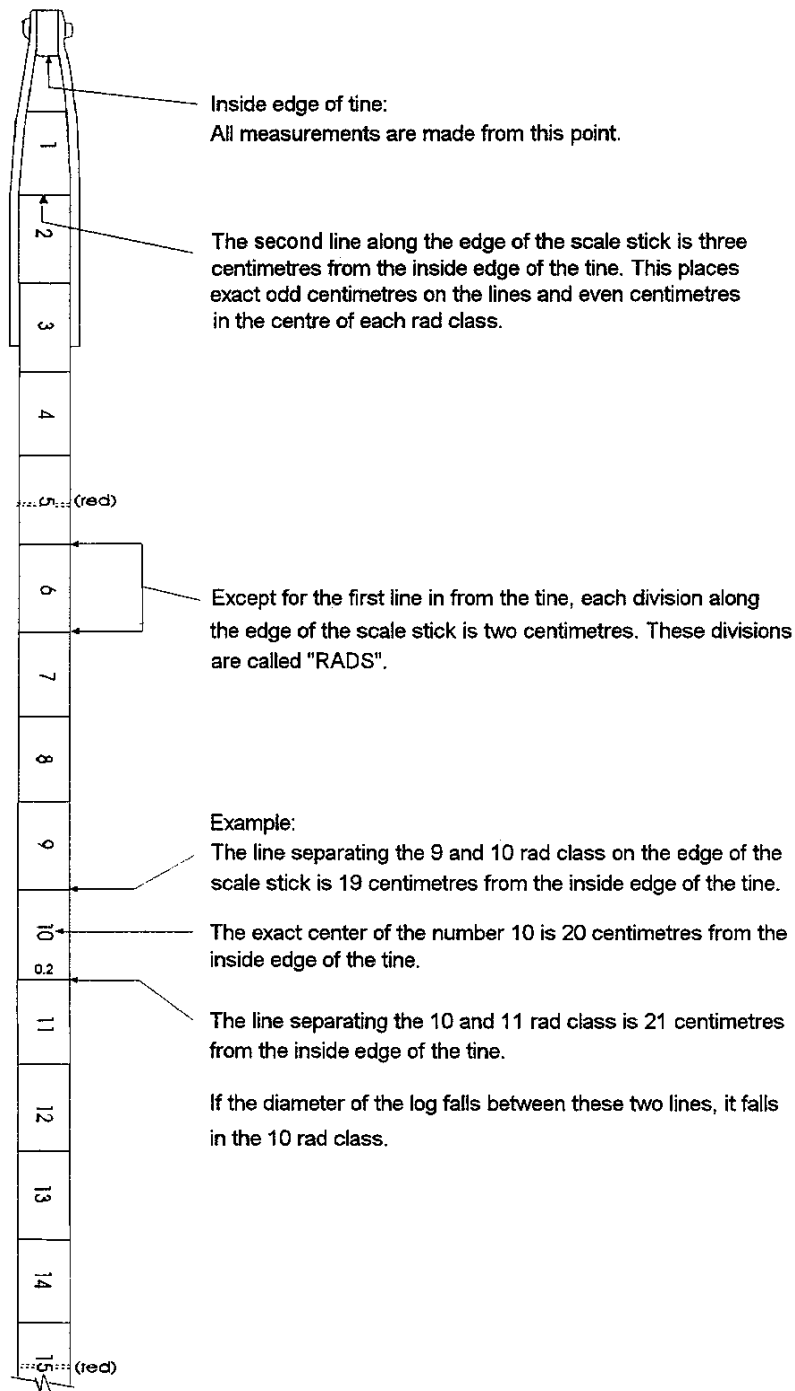


Figure 5.3 Locating Centimetres from the Edge of a BC Metric Scale Stick.

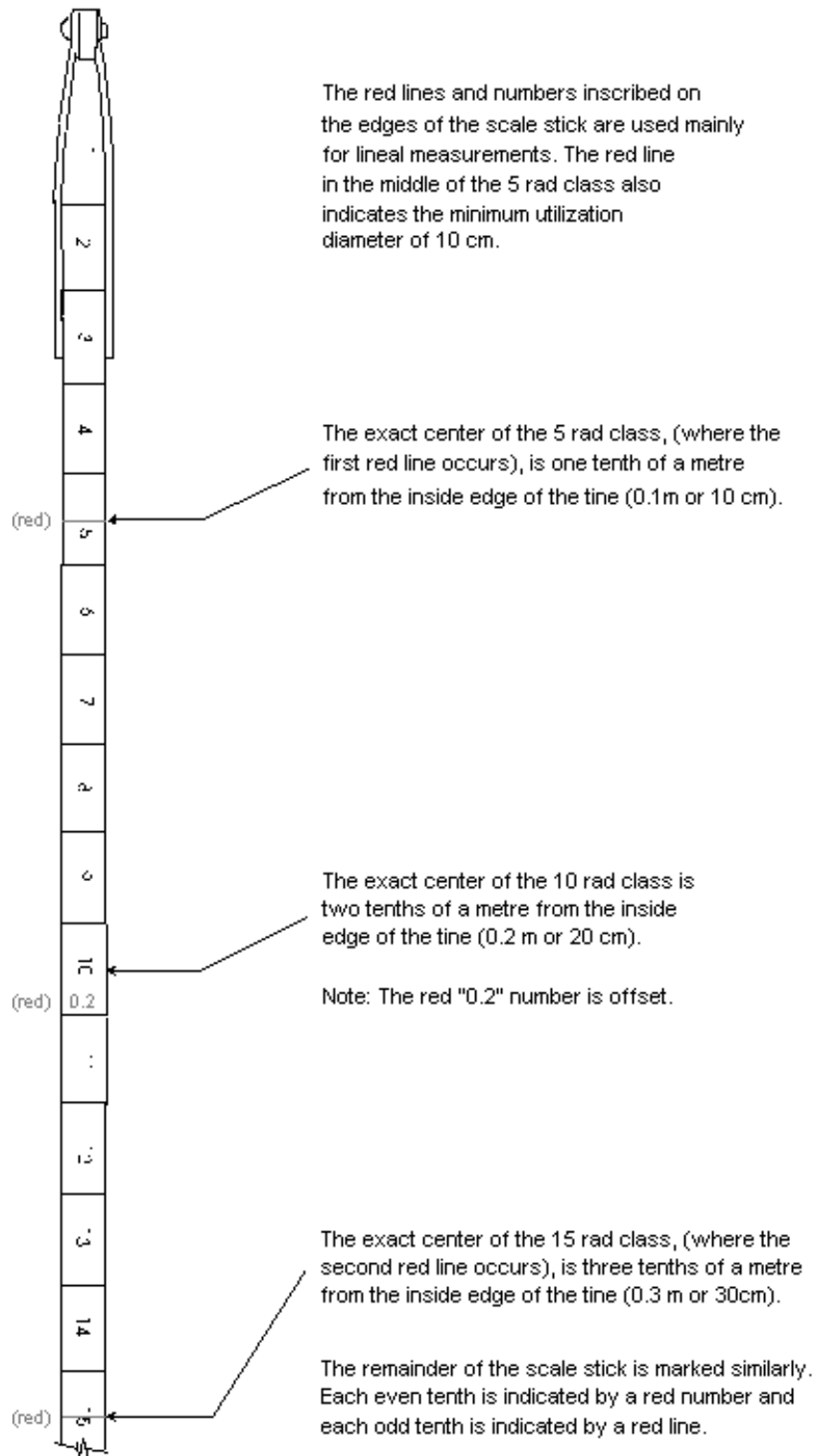


Figure 5.4 Scale Stick Edges Showing the Red Markings for Length Measurements.

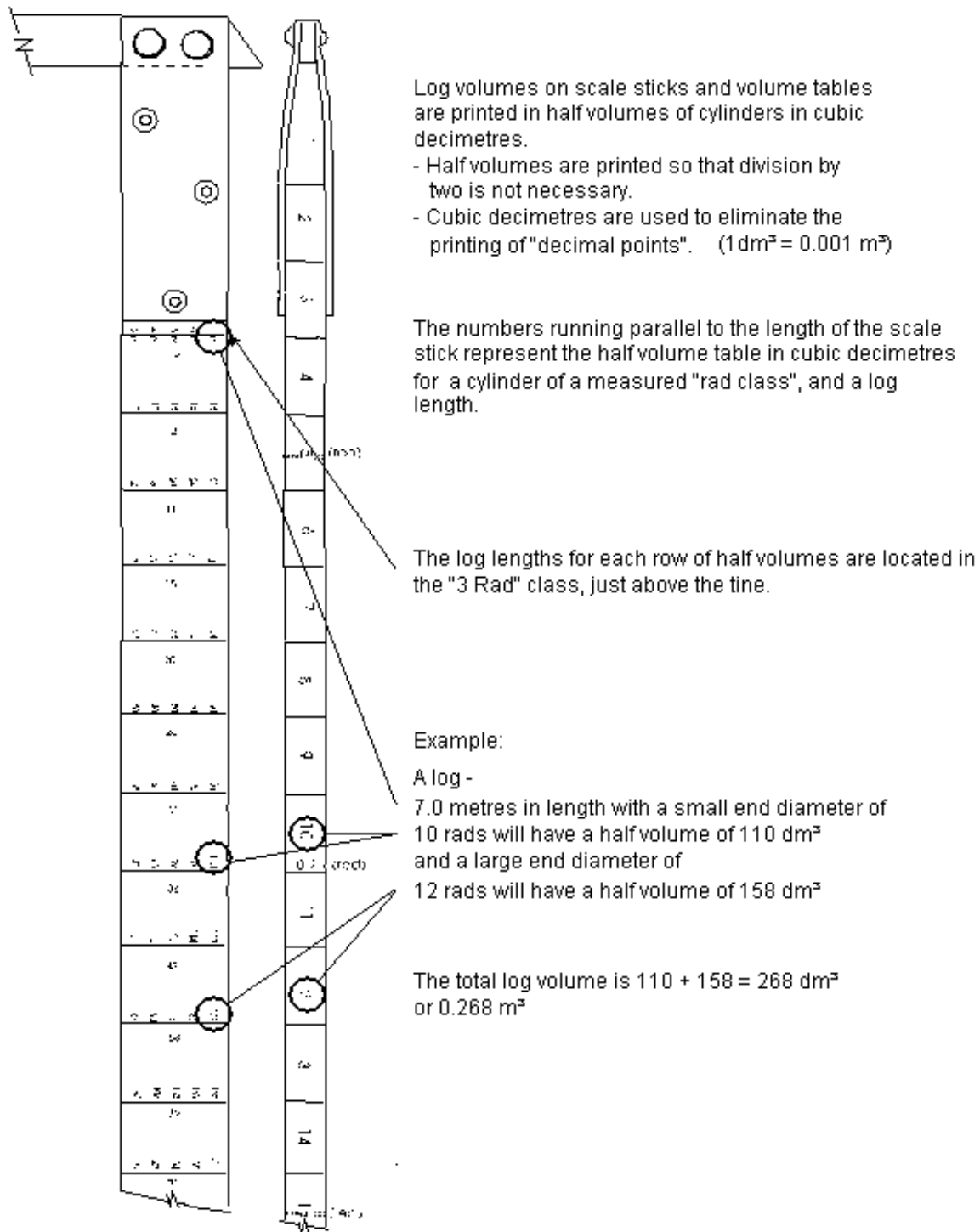


Figure 5.5 Using the BC Metric Scale Stick to Calculate Half Volumes.

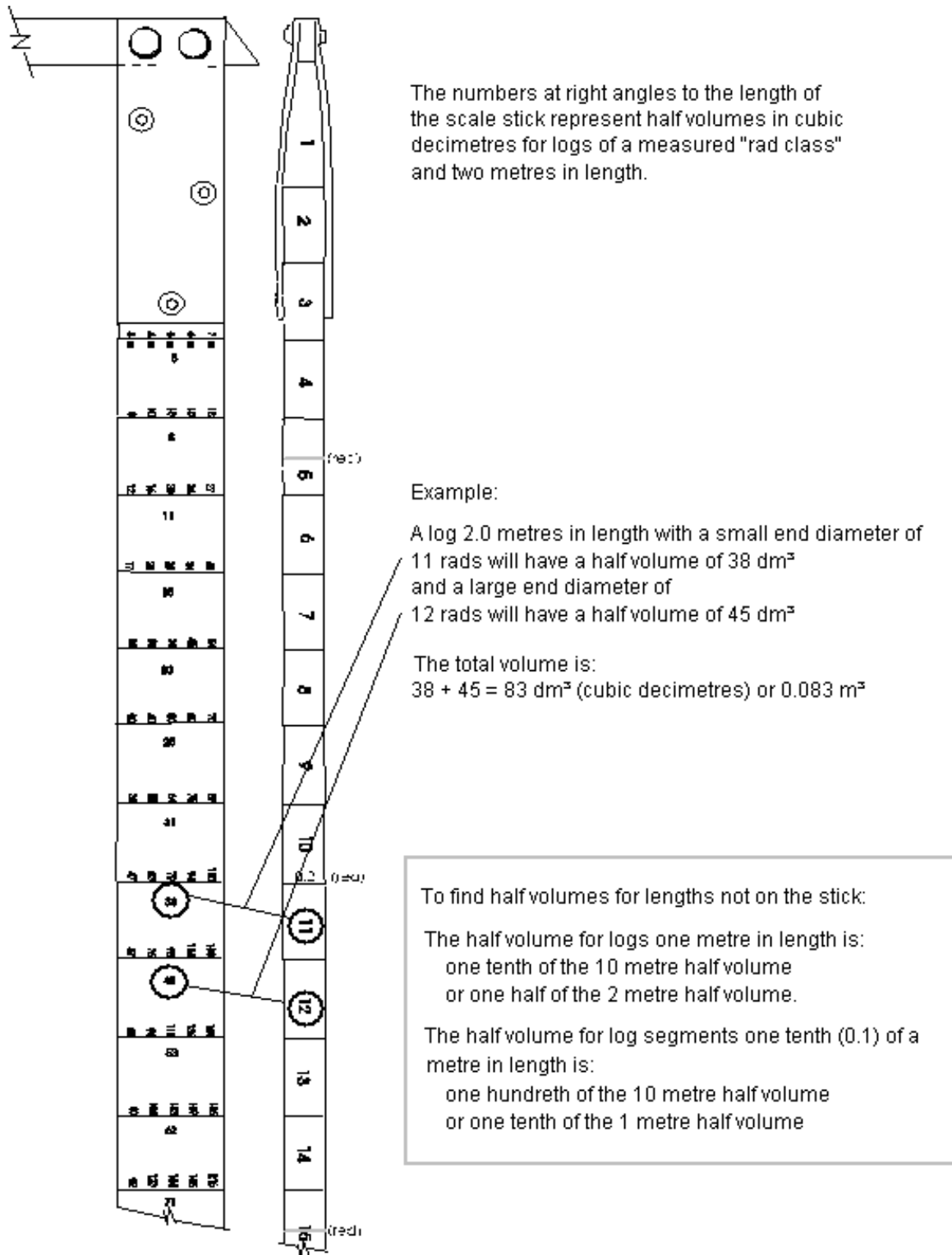


Figure 5.6 Use of the Side and Edge of the Stick in Calculating 2 m Half Volumes.

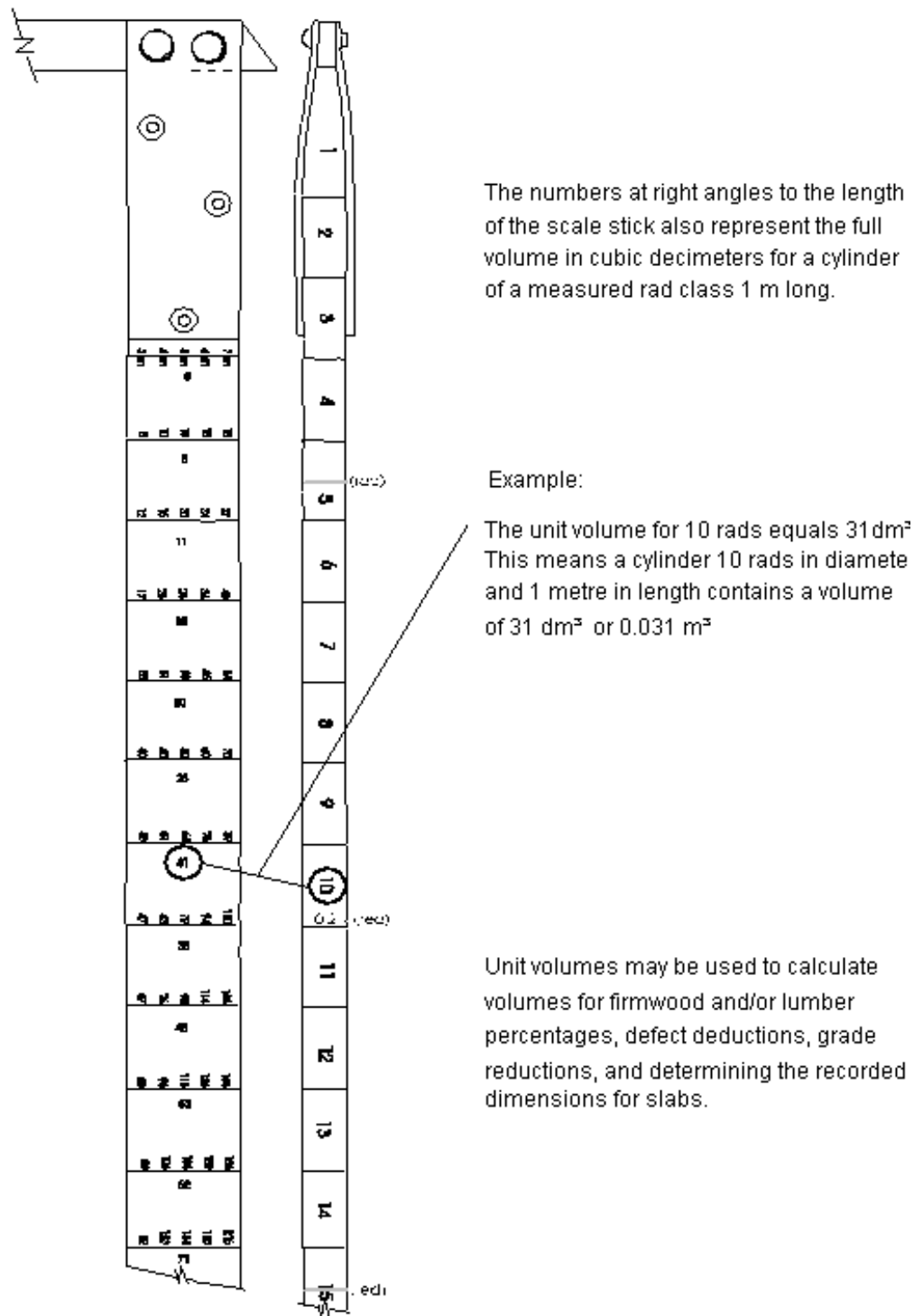


Figure 5.7 *Obtaining Unit Volumes (or “factors” from the Scale Stick.*

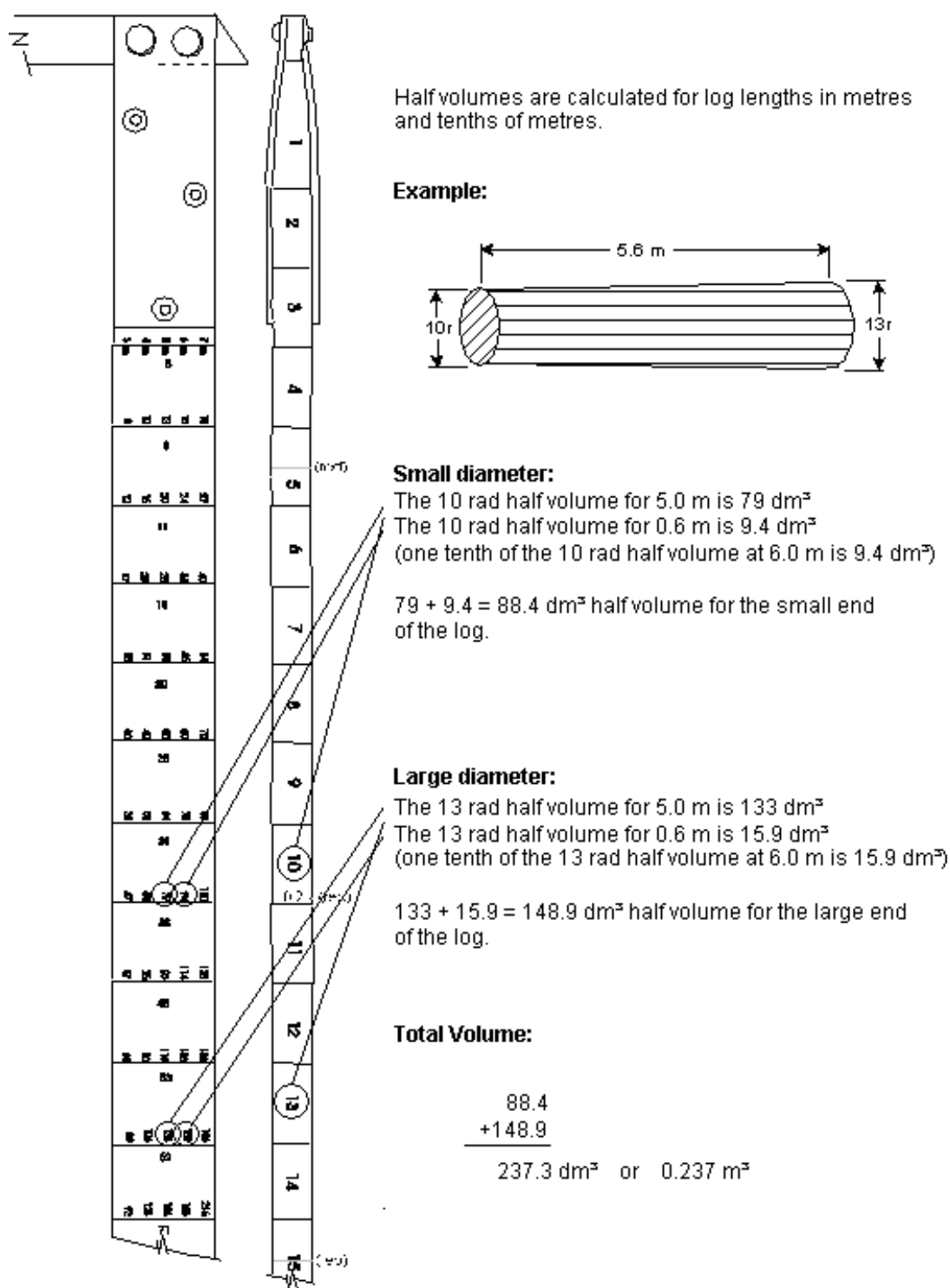


Figure 5.8 Using the Side and Edge of the Stick for Lengths in Tenths of Metres.

Table 5-1 Volumes of One Metre Cylinders in Cubic Decimetres							
Radius Class	Unit Volume	Radius Class	Unit Volume	Radius Class	Unit Volume	Radius Class	Unit Volume
4	5	26	212	48	724	70	1539
5	8	27	229	49	754	71	1584
6	11	28	246	50	785	72	1629
7	15	29	264	51	817	73	1674
8	20	30	283	52	849	74	1720
9	25	31	302	53	882	75	1767
10	31	32	322	54	916	76	1815
11	38	33	342	55	950	77	1863
12	45	34	363	56	985	78	1911
13	53	35	385	57	1021	79	1961
14	62	36	407	58	1057	80	2011
15	71	37	430	59	1094	81	2061
16	80	38	454	60	1131	82	2112
17	91	39	478	61	1169	83	2164
18	102	40	503	62	1208	84	2217
19	113	41	528	63	1247	85	2270
20	126	42	554	64	1287	86	2324
21	139	43	581	65	1327	87	2378
22	152	44	608	66	1368	88	2433
23	166	45	636	67	1410	89	2488
24	181	46	665	68	1453	90	2545
25	196	47	694	69	1496	91	2602

5.3 Log Scale Stick Specifications as Approved for Official Scaling in British Columbia

- a) Scale sticks shall be of one design but manufactured in three lengths. These lengths will be:
- b) Coast Stick: 2 m from the inside of the tine up to and including the handle.
- c) Interior 1.5 m Stick: 1.51 m from the inside of the tine up to but excluding the handle.
- d) Interior 1 m Stick: 1.01 m from the inside of the tine up to but excluding the handle.
- e) The stick must be of straight-grained hickory, hard maple or other approved wood of equivalent texture and strength and finished in good quality clear varnish or approved coating or, alternatively, of straight-grained spruce or yellow cedar covered with fibreglass. The finish shall be of such quality and so applied that it does not fracture, craze or become opaque under normal conditions of use. The type of wood and finish will be specified on the purchase order.
- f) The stick is to be 23 mm in width; it must, if fibreglass, be built up an additional 2 mm on each edge with fibreglass. It is to be not over 10 mm in thickness.
- g) The total weight of the stick, including tine and handle, is not to be over 540 g.
- h) The handle of the stick is to be of hard cork or similar material 15 cm long and is to be so fashioned that it provides a comfortable grip.
- i) The tine is to be of stainless steel 13 mm wide; 215 mm in length for coast sticks, 130 mm in length for interior sticks; with face plates of a minimum length of 63 mm, outside measurements and a width of that of the stick extending up the broad faces of the stick. Tine and plate must be riveted with steel rivets, not less than four (4) in number, two (2) of which attach the tine to the plate so that the tine is at true right angles to the stick.
- j) All required numbering and lettering must be in waterproof ink or paint, red or black as specified, so that the required items are readily legible and will not be obliterated as a result of normal use. Alternative methods of lettering are acceptable, so long as they provide a durability and legibility equivalent to the aforesaid.
- k) Numerals representing diameter radius classes, to be shown on both edges of the stick, must be approximately 8 mm high, black in colour, and in bolder face than the other numerals on the stick and must be burned, or otherwise impressed into the wood. Where the stick is fibre glassed, the burning is optional.

- l) Black lines marking the limits of the diameter radius classes shall be in bold face and burned into the wood. Where the stick is fibre glassed, the burning is optional. Such lines shall be at 2 cm intervals along the stick at 3 cm, 5 cm, 7 cm, etc. from the inside of the tine with the uppermost line at the handle. Maximum permissible deviations from true measurements indicated shall be 0.8 mm for these markings.
- m) Numerals representing lengths, to be shown on both edges of the stick, must be approximately 5 mm high, red in colour, at right angles to the numerals representing diameters and readable from the handle. The red numerals will be 0.2, 0.4, 0.6, 0.8, 1.0 and for longer sticks 1.2, 1.4, 1.6, 1.8 and will be located in the diameter radius classes of 10, 20, 30, 40, 50, 60, 70, 80, and 90.
- n) Red lines marking the limits of the length classes, shall be in bold face and burned, or otherwise impressed, into the wood. Where the stick is fibre glassed, the burning or impressment is optional. These red lines will be at 0.1 m, 0.3 m, 0.5 m, 0.7 m, 0.9 m, and for longer sticks 1.1 m, 1.3 m, 1.5 m and 1.7 m respectively, from the inside of the tine. Maximum permissible deviations from true measurements indicated shall be 0.8 mm for these markings.
- o) Numerals representing half volumes of cylinders in cubic decimetres, to be shown on the sides of the stick, must be black in colour and approximately 3 mm high. Half volumes of cylinders for the range of diameter radius classes and lengths used on the stick will be taken from Table 1, Half Volumes of Cylinders in Cubic Decimetres.
- p) The half volume numerals for each diameter radius class will be separated by black lines corresponding to the diameter radius class lines described above. Maximum permissible deviations from true measurements indicated shall be 1 mm for these markings.
- q) Characters identifying the lengths of cylinders for which half volumes are to be shown on the side in the diameter radius class next to the handle and next to the plate, must be black in colour and approximately 3 mm high. The cylinder lengths shown shall be 3 m, 4 m, 5 m, 6 m, or 7 m on the face with the tine pointing down, and 8 m, 9 m, 10 m, 11 m, or 12 m on the other face, with the tine pointing up.
- r) Numerals, representing unit volumes in dm³ for each diameter radius class must be black in colour and approximately 3 mm high. These numerals shall be recorded on each face at right angles to the half volume numerals described in (1) above and shall be readable from the handle. Unit volumes for the sides of the stick will be taken from F.S. 546 – Table of the Half Volume of Cylinders in Cubic Decimetres.

- s) The following shall be lettered, in black letters approximately 3 mm high, on both sides of the stick in the diameter radius class next to the handle.

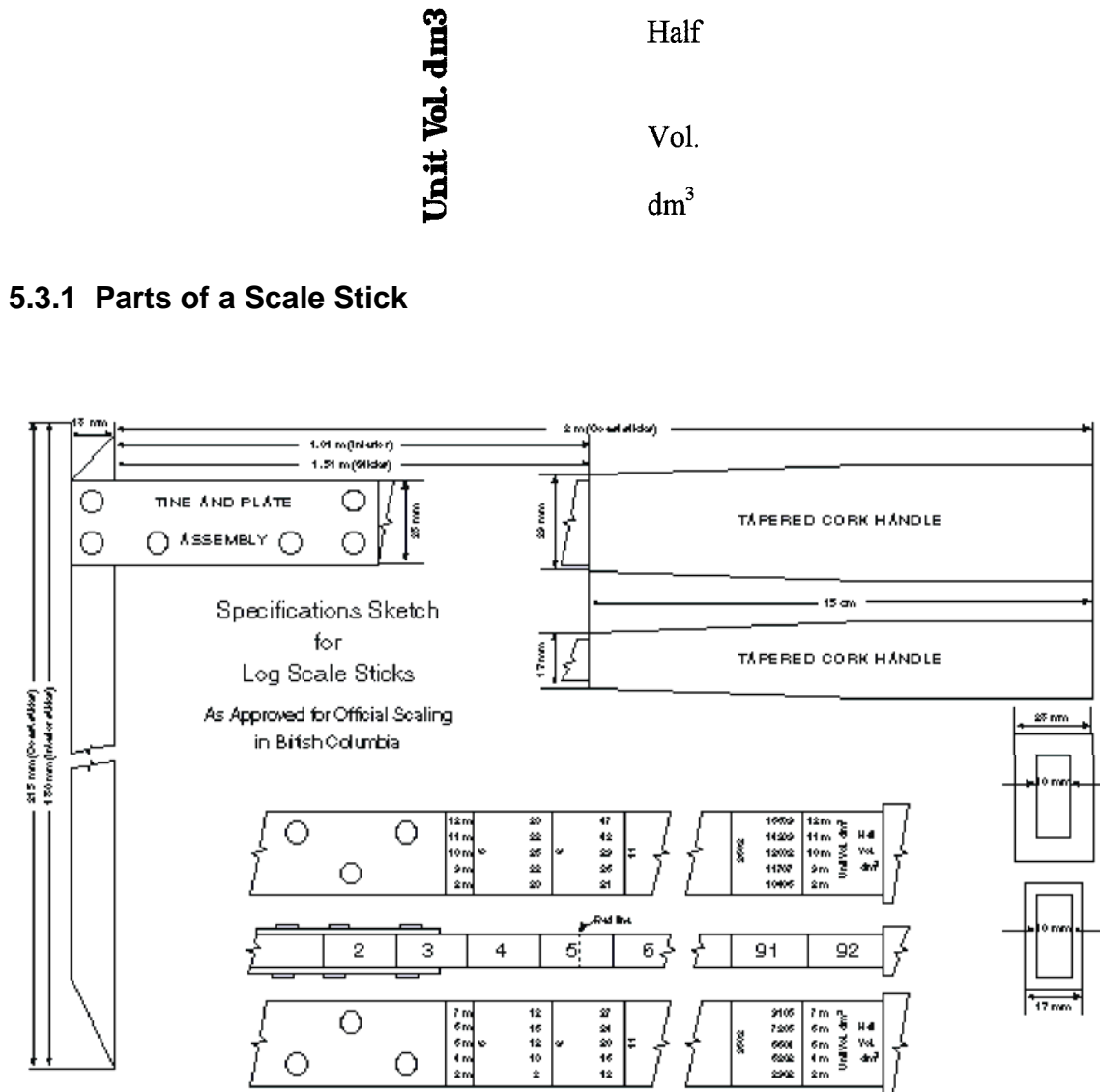


Figure 5.9 BC Metric Log Scale Stick – Specifications Sketch.