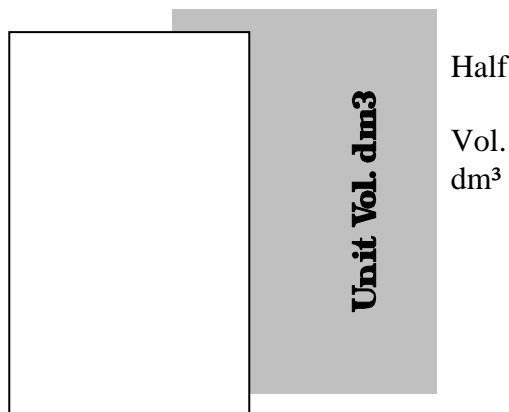

LOG SCALE STICK SPECIFICATIONS

11

11.0 Log Scale Stick

- a. Scale sticks shall be of one design and manufactured in one length. This length will be:
Yukon 1 m stick: 1.01 m from the inside of the tine up to but excluding the handle.
- b. 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, crack or become opaque under normal conditions of use. The type of wood and finish will be specified on the purchase order.
- c. 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.
- d. The total weight of the stick, including tine and handle, is not to be over 540 g.
- e. 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.
- f. The tine is to be of stainless steel 13 mm wide; 130 mm in length; 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.
- g. 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 erased 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.
- h. 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 fibreglassed, the burning is optional.
- i. Black lines marking the limits of the diameter radius classes shall be in bold face and burned into the wood. Where the stick is fibreglassed, 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.
- j. 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 will be located in the diameter radius classes of 10, 20, 30, 40, and 50.

- k. 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 fibreglassed, 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 1 m respectively, from the inside of the tine. Maximum permissible deviations from true measurements indicated shall be 2 mm for these markings.
- l. 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*.
- m. Black lines corresponding to the diameter radius class lines described in (i) above will separate the half volume numerals for each diameter radius class. Maximum permissible deviations from true measurements indicated shall be 1 mm for these markings.
- n. Characters identifying the lengths of cylinders for which half volumes are shown, will be shown on the side in the diameter radius class next to the handle and next to the plate, they 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.
- o. Numerals, representing unit volumes in dm^3 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 Table 2, *Volumes of one Metre Cylinders in Cubic Decimetres*.
- p. 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.



11.1 Half Volume of Cylinders in Cubic Decimetres

	Radius Class (cm)									
Length (m)	4	5	6	7	8	9	10	11	12	13
	Half Volumes (dm ³)									
12	30	47	68	92	121	153	188	228	271	319
11	28	43	62	85	111	140	173	209	249	292
10	25	39	57	77	101	127	157	190	226	265
9	23	35	51	69	90	115	141	171	204	239
8	20	31	45	62	80	102	126	152	181	212
7	18	27	40	54	70	89	110	133	158	186
6	15	24	34	46	60	76	94	114	136	159
5	13	20	28	38	50	64	79	95	113	133
4	10	16	23	31	40	51	63	76	90	106
3	8	12	17	23	30	38	47	57	68	80

	Radius Class (cm)									
Length (m)	14	15	16	17	18	19	20	21	22	23
	Half Volumes (dm ³)									
12	369	424	483	545	611	680	754	831	912	997
11	339	389	442	499	560	624	691	762	836	914
10	308	353	402	454	509	567	628	693	760	831
9	277	318	362	409	458	510	565	623	684	748
8	246	283	322	363	407	454	503	554	608	665
7	216	247	281	318	356	397	440	485	532	582
6	185	212	241	272	305	340	377	416	456	499
5	154	177	201	227	254	284	314	346	380	415
4	123	141	161	182	204	227	251	277	304	332
3	92	106	121	136	153	170	188	208	228	249

Table of half volumes (continued)

	Radius Class (cm)									
Length (m)	24	25	26	27	28	29	30	31	32	33
	Half Volumes (dm ³)									
12	1086	1178	1274	1374	1478	1585	1696	1811	1930	2053
11	995	1080	1168	1260	1355	1453	1555	1660	1769	1882
10	905	982	1062	1145	1232	1321	1414	1510	1608	1711
9	814	884	956	1031	1108	1189	1272	1359	1448	1540
8	724	785	849	916	985	1057	1131	1208	1287	1368
7	633	687	743	802	862	925	990	1057	1126	1197
6	543	589	637	687	739	793	848	906	965	1026
5	452	491	531	573	616	661	707	755	804	855
4	362	393	425	458	493	528	565	604	643	684
3	271	295	319	344	369	396	424	453	483	513

	Radius Class (cm)									
Length (m)	34	35	36	37	38	39	40	41	42	43
	Half Volumes (dm ³)									
12	2179	2309	2443	2581	2722	2867	3016	3169	3325	3485
11	1997	2117	2239	2365	2495	2628	2765	2905	3048	3195
10	1816	1924	2036	2150	2268	2389	2513	2641	2771	2904
9	1634	1732	1832	1935	2041	2150	2262	2376	2494	2614
8	1453	1539	1629	1720	1815	1911	2011	2112	2217	2324
7	1271	1347	1425	1505	1588	1672	1759	1848	1940	2033
6	1090	1155	1221	1290	1361	1434	1508	1584	1663	1743
5	908	962	1018	1075	1134	1195	1257	1320	1385	1452
4	726	770	814	860	907	956	1005	1056	1108	1162
3	545	577	611	645	680	717	754	792	831	871

Table of half volumes (continued)

	Radius Class (cm)									
Length (m)	44	45	46	47	48	49	50	51	52	53
	Half Volumes (dm ³)									
12	3649	3817	3989	4164	4343	4526	4712	4903	5097	5295
11	3345	3499	3656	3817	3981	4149	4320	4494	4672	4854
10	3041	3181	3324	3470	3619	3771	3927	4086	4247	4412
9	2737	2863	2991	3123	3257	3394	3534	3677	3823	3971
8	2433	2545	2659	2776	2895	3017	3142	3269	3398	3530
7	2129	2227	2327	2429	2533	2640	2749	2860	2973	3089
6	1825	1909	1994	2082	2171	2263	2356	2451	2548	2647
5	1521	1590	1662	1735	1810	1886	1963	2043	2124	2206
4	1216	1272	1330	1388	1448	1509	1571	1634	1699	1765
3	912	954	997	1041	1086	1131	1178	1226	1274	1324

	Radius Class (cm)									
Length (m)	54	55	56	57	58	59	60	61	62	63
	Half Volumes (dm ³)									
12	5497	5702	5911	6124	6341	6562	6786	7014	7246	7481
11	5038	5227	5419	5614	5813	6015	6220	6429	6642	6858
10	4580	4752	4926	5104	5284	5468	5655	5845	6038	6234
9	4122	4276	4433	4593	4756	4921	5089	5260	5434	5611
8	3664	3801	3941	4083	4227	4374	4524	4676	4831	4988
7	3206	3326	3448	3572	3699	3828	3958	4091	4227	4364
6	2748	2851	2956	3062	3170	3281	3393	3507	3623	3741
5	2290	2376	2463	2552	2642	2734	2827	2922	3019	3117
4	1832	1901	1970	2041	2114	2187	2262	2338	2415	2494
3	1374	1425	1478	1531	1585	1640	1696	1753	1811	1870

Table of half volumes (continued)

	Radius Class (cm)									
Length (m)	64	65	66	67	68	69	70	71	72	73
	Half Volumes (dm ³)									
12	7721	7964	8211	8462	8716	8974	9236	9502	9772	10043
11	7077	7300	7527	7756	7990	8226	8467	8710	8957	9208
10	6434	6637	6842	7051	7263	7479	7697	7918	8143	8371
9	5791	5973	6158	6346	6537	6731	6927	7127	7329	7534
8	5147	5309	5474	5641	5811	5983	6158	5335	6514	6697
7	4504	4646	4790	4936	5084	5235	5388	5543	5700	5860
6	3860	3982	4105	4231	4358	4487	4618	4751	4886	5022
5	3217	3318	3421	3526	3632	3739	3848	3959	4072	4185
4	2574	2655	2737	2821	2905	2991	3079	3167	3257	3348
3	1930	1991	2053	2115	2179	2244	2309	2376	2443	2511

	Radius Class (cm)									
Length (m)	74	75	76	77	78	79	80	81	82	83
	Half Volumes (dm ³)									
12	10322	10603	10888	11176	11468	11764	12064	12367	12674	12985
11	9462	9719	9980	10245	10512	10784	11058	11337	11618	11903
10	8602	8836	9073	9313	9557	9803	10053	10306	10562	10821
9	7742	7952	8166	8382	8601	8823	9048	9275	9506	9739
8	6881	7069	7258	7451	7645	7843	8042	8245	8450	8657
7	6021	6185	6351	6519	6690	6862	7037	7214	7393	7575
6	5161	5301	5444	5588	5734	5882	6032	6184	6337	6493
5	4301	4418	4536	4657	4778	4902	5027	5153	5281	5411
4	3441	3534	3629	3725	3823	3921	4021	4122	4225	4328
3	2581	2651	2722	2794	2867	2941	3016	3092	3169	3246

Table of half volumes (continued)

	Radius Class (cm)							
Length (m)	84	85	86	87	88	89	90	91
	Half Volumes (dm ³)							
12	13300	13619	13941	14267	14597	14931	15268	15609
11	12192	12484	12779	13078	13381	13687	13996	14309
10	11084	11349	11618	11889	12164	12442	12723	13008
9	9975	10214	10456	10700	10948	11198	11451	11707
8	8867	9079	9294	9511	9731	9954	10179	10406
7	7758	7944	8132	8323	8515	8710	8906	9105
6	6650	6809	6971	7134	7299	7465	7634	7805
5	5542	5675	5809	5945	6082	6221	6362	6504
4	4433	4540	4647	4756	4866	4977	5089	5203
3	3325	3405	3485	3567	3649	3733	3817	3902

11.2 Cylinders in Cubic Decimetres**Volumes of One Metre**

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

11.3 The Yukon Metric Scale Stick

The Yukon Metric Scale Stick is the most important scaling tool. It is used to measure log diameters and lengths, and to calculate volumes and defect deductions. The stick is manufactured in two lengths; 1 m, 1.5 m, the handles of the 1 m and the 1.5 m sticks are in addition to the stick length. Scale sticks are also manufactured in left or right-handed styles, in a version that is somewhat slimmer than standard sticks, and with a "spud" attached, similar to the American scribner stick. The 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.

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.

11.3.1 Application of the Scale Stick to Measure Widths and Thickness

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 describes the application and use of these factors.

11.3.2 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.

11.3.3 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 are always 1/10 of the unit

volume. Unit volumes are provided on the scale stick to calculate gross volumes, defect volumes, and net volumes.

11.3.4 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.

The following pages illustrate the parts and use of the scale stick.

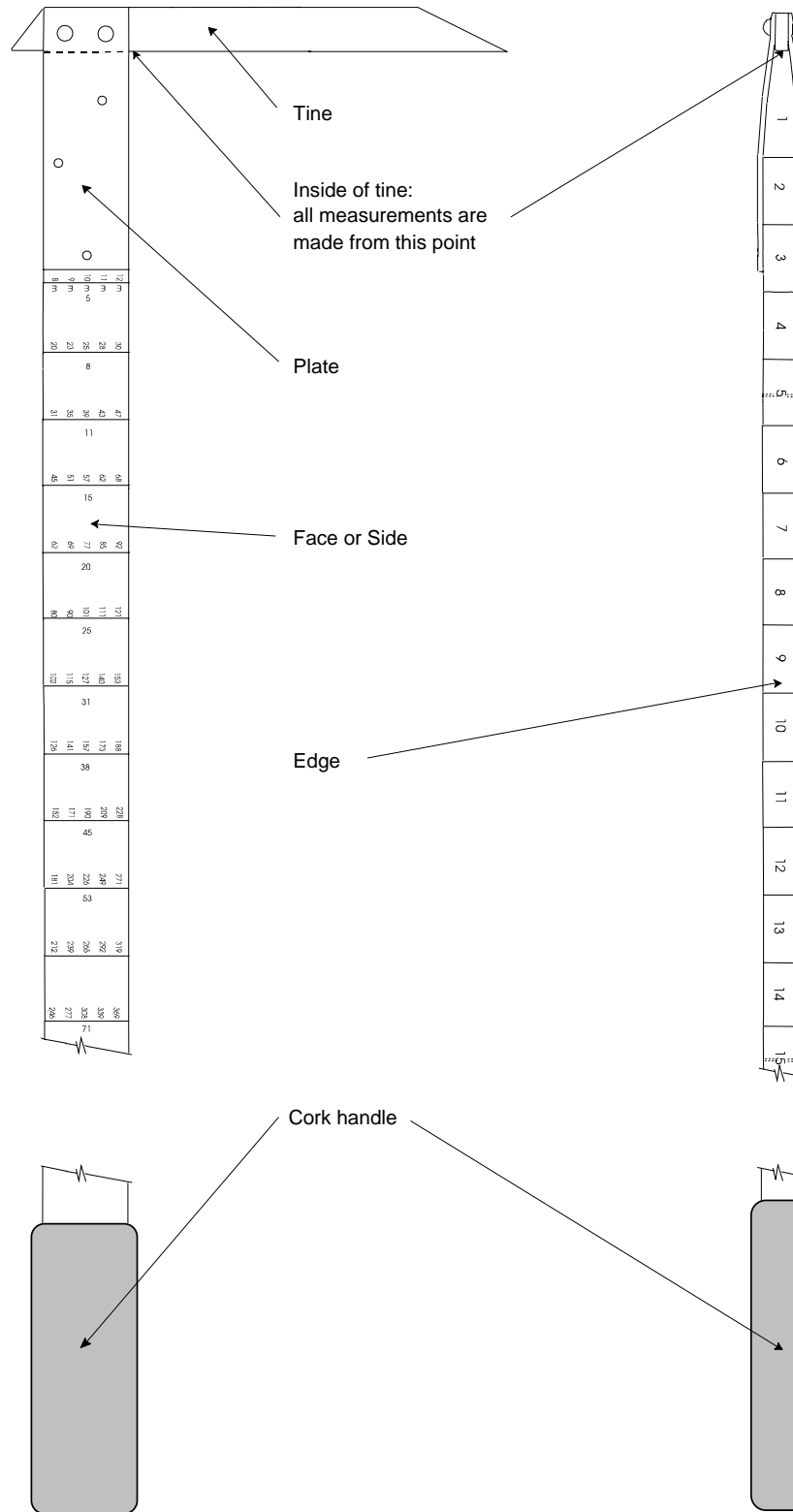


Figure 11.1 Basic Parts of the Official Yukon Metric Scale Stick

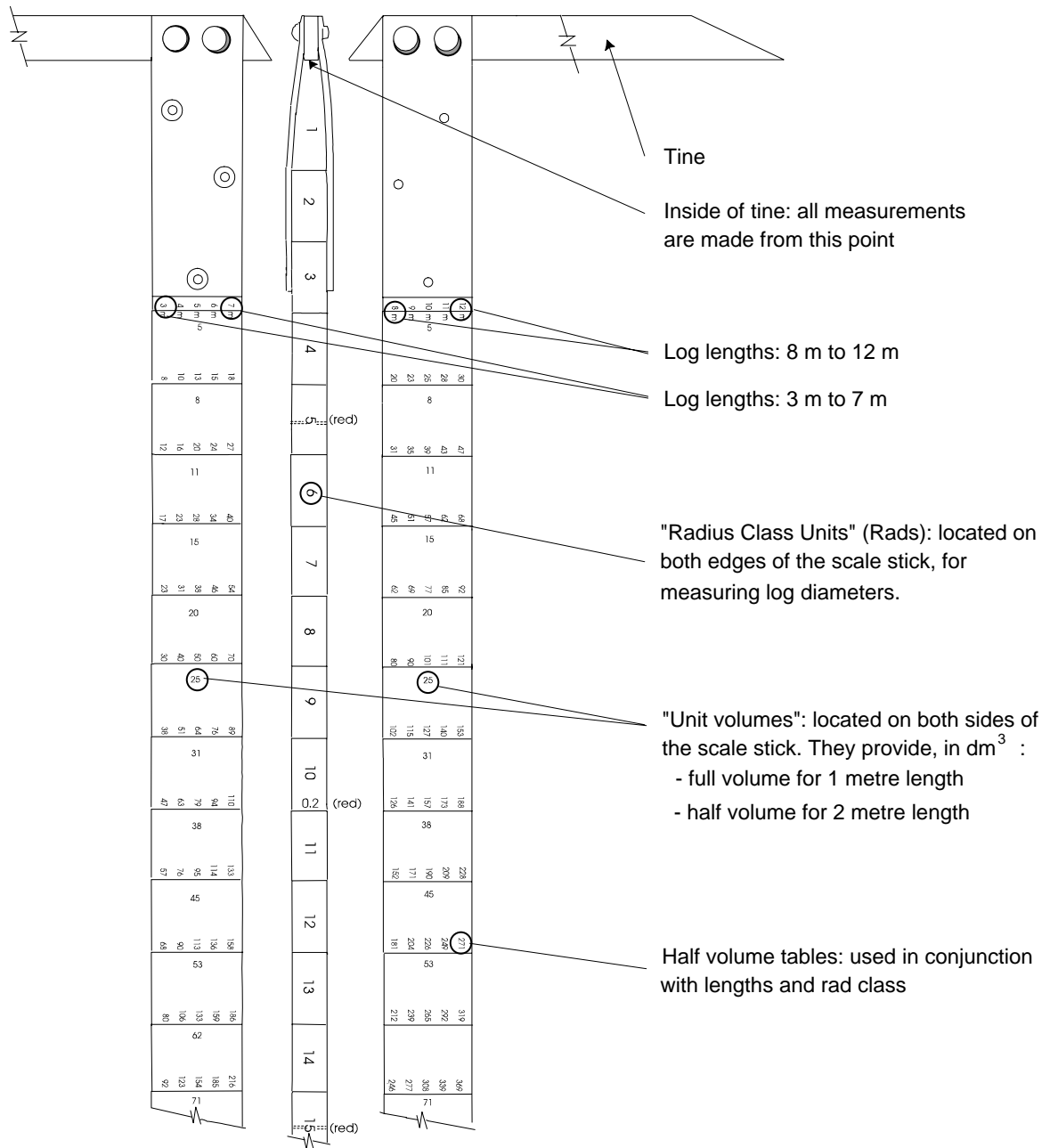


Figure 11.2 Sides and Edge of a Yukon Metric Scale Stick

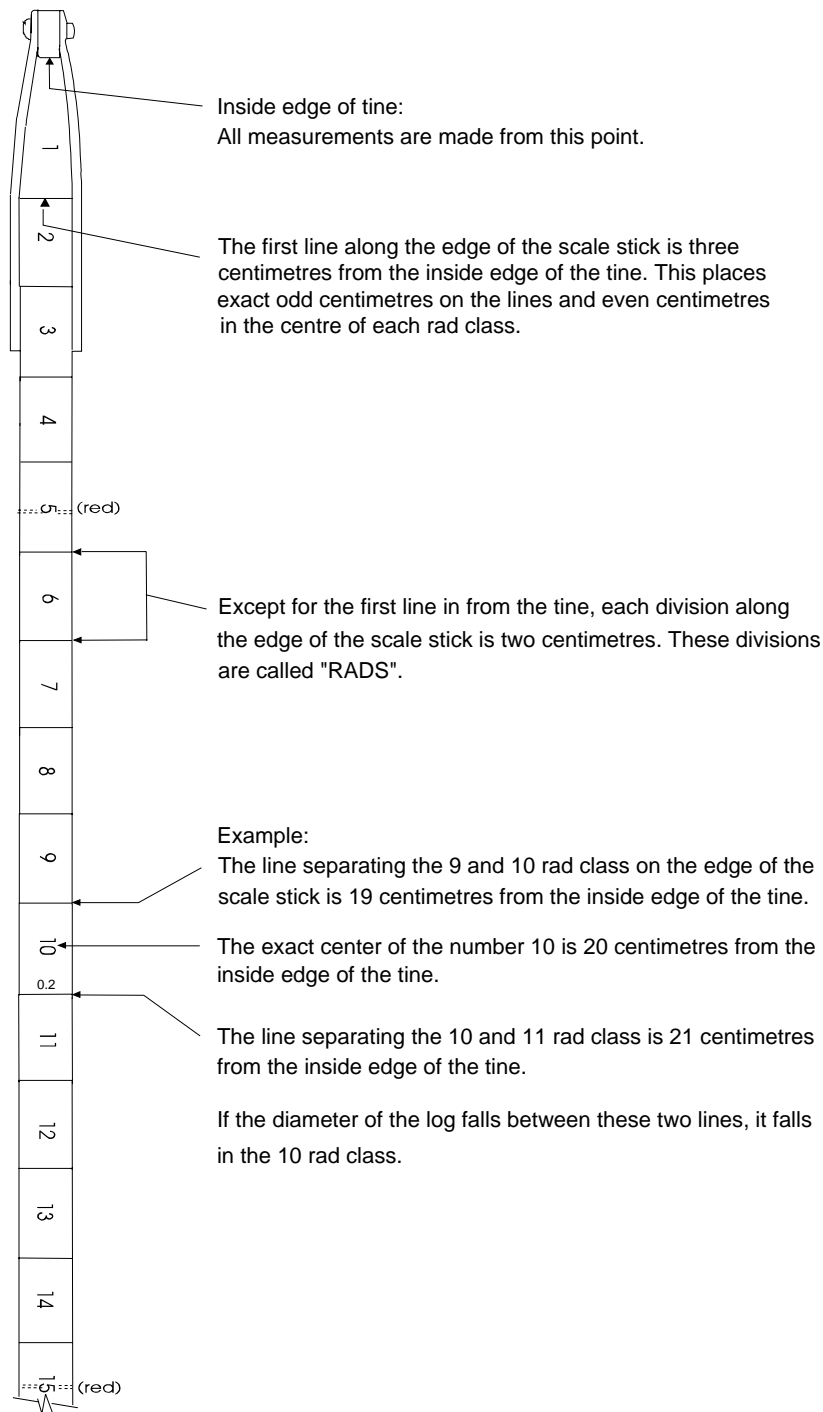


Figure 11.3 Locating Centimetres from the Edge of a Yukon Metric Scale Stick

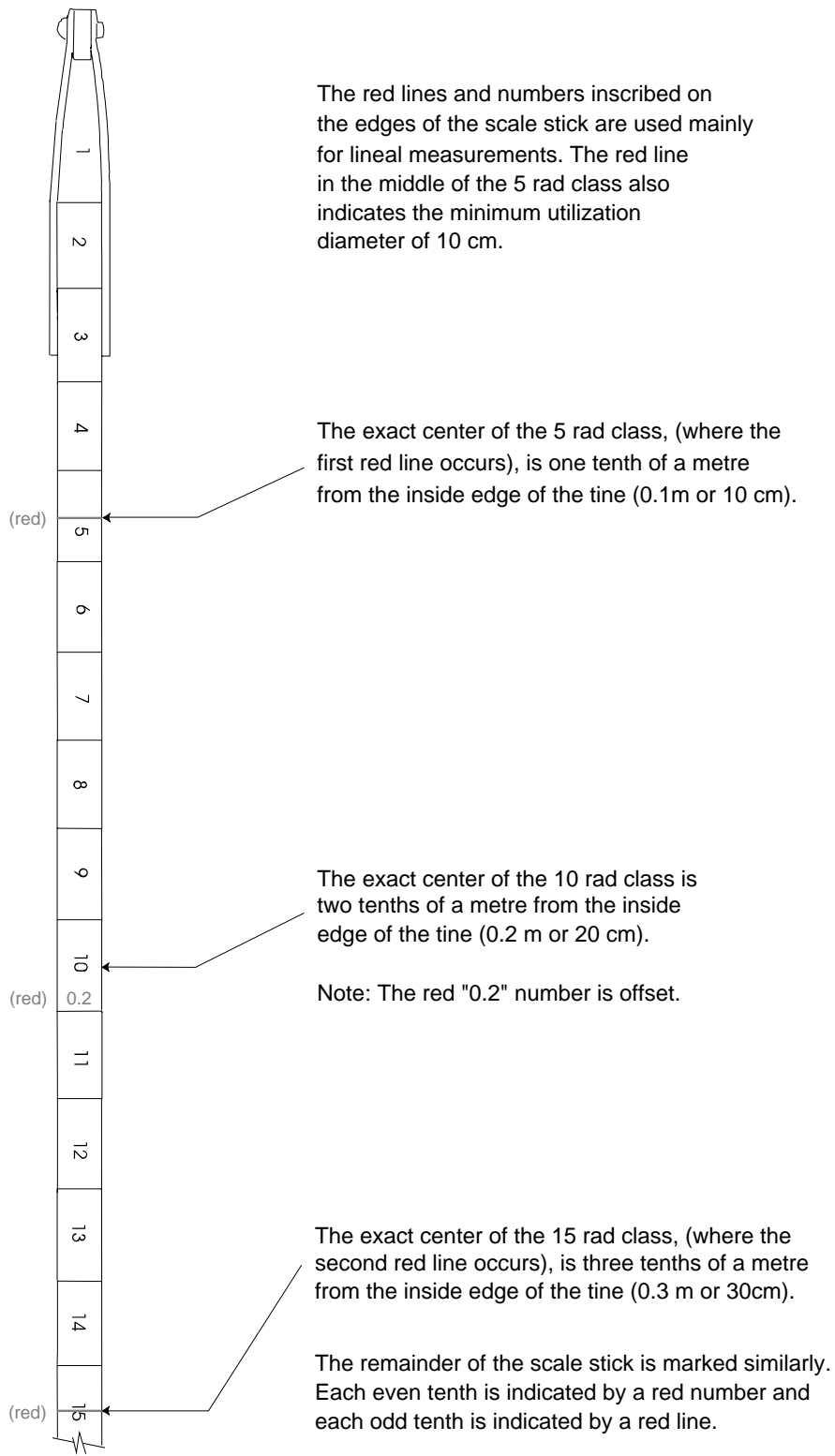
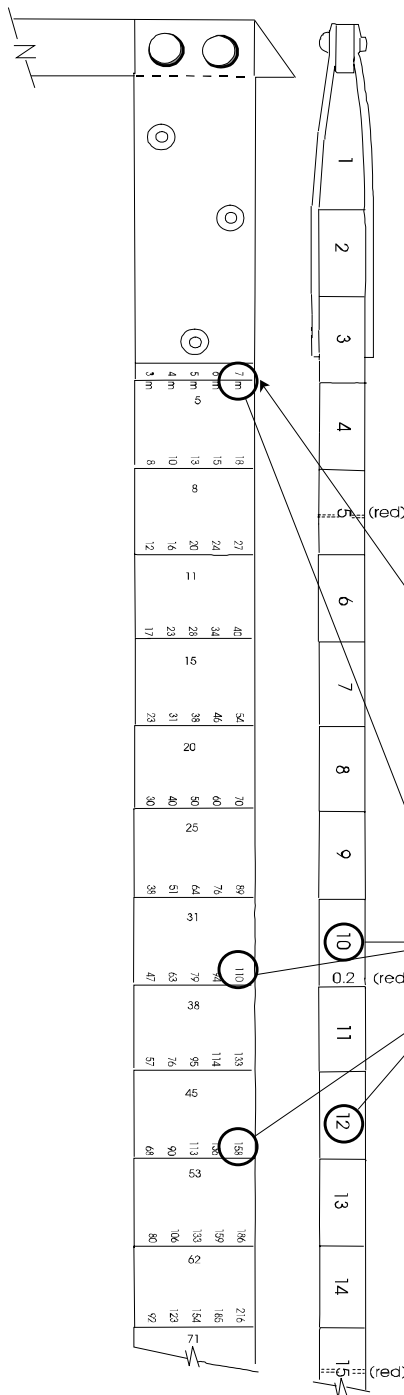


Figure 11.4 Scale Stick Edges Showing the Red Markings for Length Measurements



Log volumes on scale sticks and volume tables are printed in half volumes of cylinders in cubic decimetres.

- Half volumes are printed so that division by two is not necessary.
- Cubic decimetres are used to eliminate the printing of "decimal points". (1 dm³ = 0.001 m³)

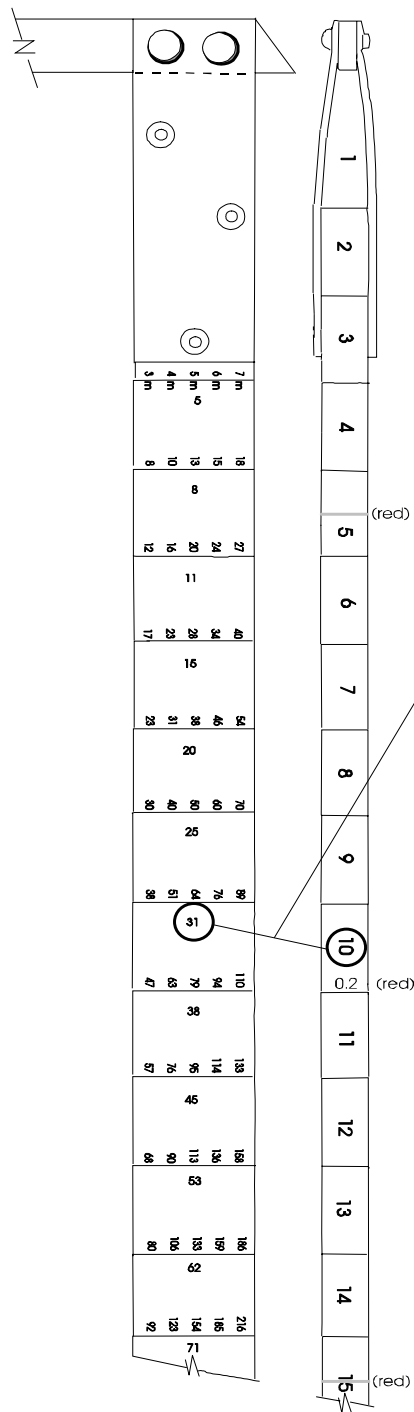
The numbers running parallel to the length of the scale stick represent the half volume table in cubic decimetres for a cylinder of a measured "rad class", and a log length.

The log lengths for each row of half volumes are located in the "3 Rad" class, just above the line.

Example:
 A log -
 7.0 metres in length with a small end diameter of 10 rads will have a half volume of 110 dm³ and a large end diameter of 12 rads will have a half volume of 158 dm³

The total log volume is 110 + 158 = 268 dm³ or 0.268 m³

Figure 11.5 Using the Yukon Metric Scale Stick to Calculate Half Volumes



The numbers at right angles to the length of the scale stick also represent the full volume in cubic decimeters for a cylinder of a measured rad class 1 m long.

Example:

The unit volume for 10 rads equals 31 dm³. This means a cylinder 10 rads in diameter and 1 metre in length contains a volume of 31 dm³ or 0.031 m³

Unit volumes may be used to calculate volumes for firmwood and/or lumber percentages, defect deductions, grade reductions, and determining the recorded dimensions for slabs.

Figure 11.7 Obtaining Unit Volumes (or "Factors") from the Scale Stick

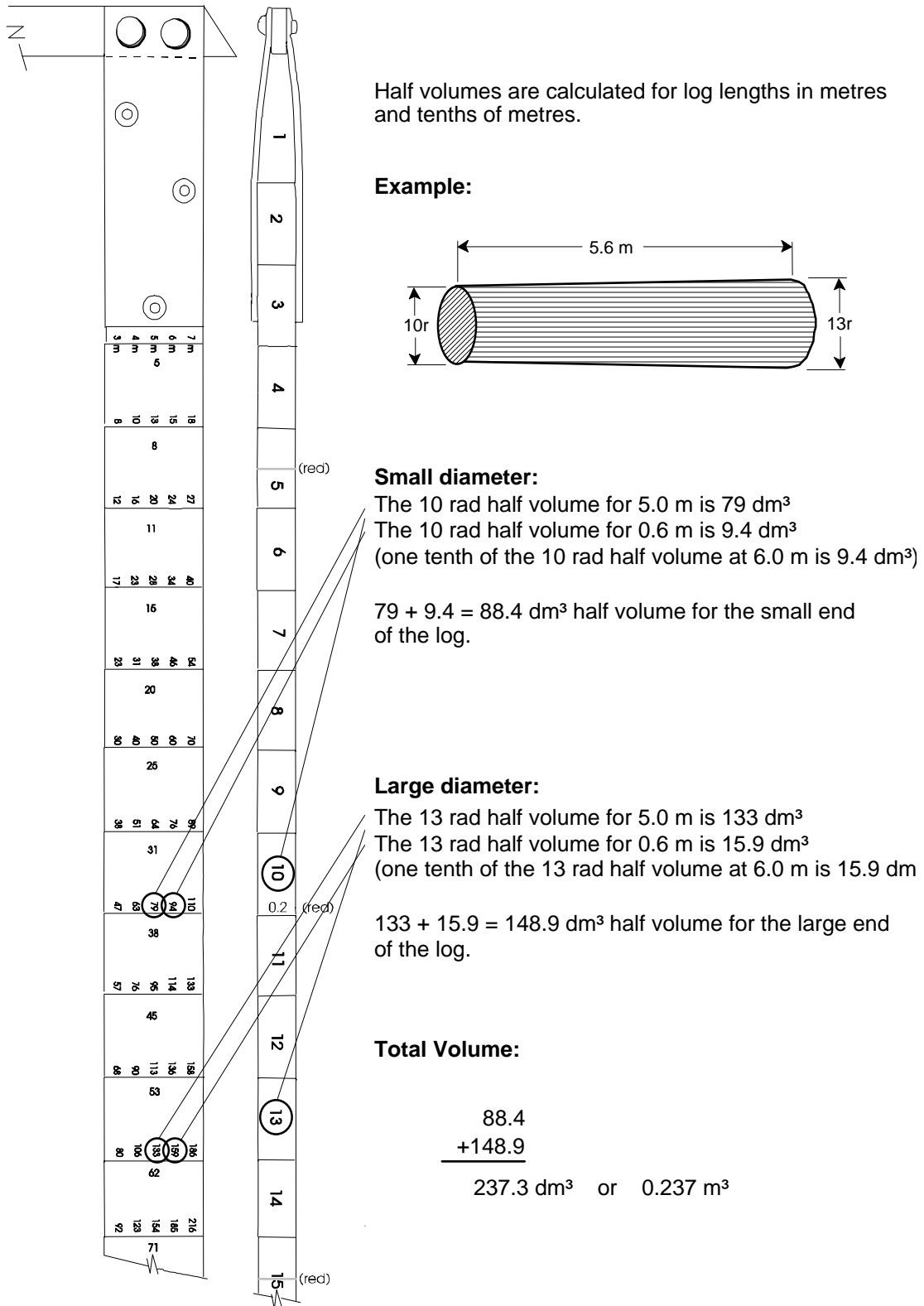


Figure 11.8 Using the Side and Edge of the Stick for Lengths in Tenths of Metres