



$V_1 = 1.000$  CU. FT.  
 $V_2 = 0.583$  CU. FT.  
 $V_3 = 0.750$  CU. FT.  
 $V_4 = 0.708$  CU. FT.

FROM PICTORIAL VIEW IT IS SEEN THAT:

$$V = \frac{V_1 W + 2V_2 (N-1) + V_3 (WN+1) + 2V_4}{27}$$

SUBSTITUTING VALUES OF ELEMENTARY VOLUMES:

$$V = \frac{1.000 W + 1.166(N-1) + 0.750(WN+1) + 1.416}{27}$$

V - INDICATES TOTAL VOLUME OF STEPS IN CUBIC YARDS.

$V_1, V_2, V_3$  &  $V_4$  - INDICATE ELEMENTARY VOLUMES USED IN COMPUTING V.

W - INDICATES CLEAR WIDTH OF STEPS, IN FEET, BETWEEN SIDEWALLS.

N - INDICATES NUMBER OF STEPS IN INSTALLATION EXCLUSIVE OF LANDING.

L1 - INDICATES LENGTH OF BARS A, IN INCHES.  $L1 = 13.416N + 8''$

L2 - INDICATES LENGTH OF BARS B, IN INCHES.  $L2 = 12W + 9''$

L3 - INDICATES LENGTH OF BARS C, IN INCHES.  $L3 = 13.416N + 18''$

A LANDING IS TO BE PROVIDED WHERE 12 OR MORE STEPS ARE REQUIRED. MINIMUM SIZE OF LANDING TO BE  $W + 1$  FOOT X 4 FEET.

THIS ITEM MAY BE PRECAST OR CAST IN PLACE. CONCRETE TO BE CLASS A3 IF CAST IN PLACE, 4000 PSI IF PRECAST.

FOR OTHER WIDTHS THE APPROXIMATE SPACING OF BARS A IN INCHES WILL BE EQUAL TO  $80/N$  WITH A MINIMUM SPACING OF 6". REINFORCING BARS TO BE USED IN INSTALLATIONS OF 6 OR MORE STEPS. FOR TABULATION OF CONCRETE AND STEEL QUANTITIES SEE SHEET 2.

		NUMBER OF BARS A								
		N=1-5	N=6	N=7	N=8	N=9	N=10	N=11	N=12	N=13-25
NO STEEL	W = 3'	4	5	5	6	6	7	7	8	
	W = 4'	5	6	7	7	8	8	9	10	
	W = 5'	6	7	8	9	9	10	11	12	

HANDRAIL IS TO BE PROVIDED FOR STEPS HAVING THREE OR MORE RISERS, AND WILL MEET THE FOLLOWING CONDITIONS:

- ON STEPS LESS THAN 44 INCHES WIDE HAVING BOTH SIDES ENCLOSED, AT LEAST ONE HANDRAIL, PREFERABLY ON THE RIGHT SIDE DESCENDING.
- ON STEPS LESS THAN 44 INCHES WIDE HAVING ONE SIDE OPEN, ONE HANDRAIL ON EACH SIDE.
- ON STEPS LESS THAN 44 INCHES WIDE HAVING BOTH SIDES OPEN, ONE HANDRAIL ON EACH SIDE.
- ON STEPS MORE THAN 44 INCHES WIDE BUT LESS THAN 88 INCHES WIDE, ONE HANDRAIL ON EACH SIDE.
- ON STEPS 88 OR MORE INCHES WIDE, ONE HANDRAIL ON EACH SIDE, AND ONE INTERMEDIATE HANDRAIL LOCATED APPROXIMATELY MIDWAY OF THE WIDTH.

SHEET 1 OF 2

SPECIFICATION REFERENCE

105  
504

## STANDARD CONCRETE STEPS FOR 2 : 1 SLOPE

VIRGINIA DEPARTMENT OF TRANSPORTATION

REV. 7/02

601.03