

V = Indicates total volume of steps in Cu. yards.
 V1, V2, V3, & V4 = Indicates 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".

V1 = 1.000 Cu. Ft.
 V2 = 0.583 Cu. Ft.
 V3 = 0.750 Cu. Ft.
 V4 = 0.708 Cu. Ft.

FROM PICTORIAL VIEW IT IS SEEN THAT:

$$V = \frac{V1W + (2) V2 (N-1) + V3 (WN+1) + (2) V4}{27}$$

SUBSTITUTING VALUES OF ELEMENTARY VOLUMES:

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

CONCRETE STEP VOLUMES (C.Y.)

N	W=3'	W=4'	W=5'	W=6'	W=7'
1	0.102	0.136	0.170	0.204	0.238
2	0.172	0.229	0.286	0.344	0.401
3	0.242	0.322	0.403	0.483	0.564
4	0.312	0.416	0.519	0.623	0.727
5	0.382	0.509	0.636	0.763	0.891
6	0.452	0.602	0.753	0.903	1.054
7	0.522	0.695	0.896	1.043	1.216
8	0.591	0.789	0.986	1.183	1.380
9	0.661	0.882	1.102	1.323	1.543
10	0.731	0.975	1.219	1.463	1.707
11	0.801	1.068	1.336	1.603	1.870
12	0.871	1.162	1.452	1.743	2.033
13	0.941	1.255	1.569	1.882	2.196
14	1.011	1.348	1.685	2.022	2.359
15	1.081	1.442	1.802	2.162	2.522

NOTES:

1. Provide 3/4" deep tooled score joints at 5'-0" O.C.
2. Expansion joints to be placed at 30' O.C. longitudinally, adjacent to curbs, and when butting existing structures, concrete, or buildings.
3. A landing is to be provided where 12 or more steps are required. Maximum size of landing to be W+1'-0" x 4'-0".
4. This item may be precast or cast-in-place. Concrete to be 3000 psi air entrained if cast-in-place or 4,000 PSI if precast.
5. For other widths the approximate spacing of bars A in inches will be equal to 80/N with a minimum spacing of 6".
6. Reinforcing bars to be used in installations of 6 or more steps.
7. Handrail is to be provided for steps having four or more risers, and will meet the following conditions:
 - A. On steps less than 44" wide having both sides enclosed, at least one handrail, preferably on the right side descending.
 - B. On steps less than 44" wide having one side open, one handrail on each side.
 - C. On steps less than 44" wide having both sides open, one handrail each side.
 - D. On steps more than 44" wide but less than 88" wide, one handrail each side.
 - E. On steps 88" or more wide, one handrail each side, and one intermediate handrail located approximately midway of the width.

Details Provided by APPIAN Consulting Engineers - www.appianengineers.com



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CITY OF DURHAM, NC
 USE WITH THE STANDARD SPECIFICATIONS ONLY

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**STANDARD CONCRETE STEPS
 (FOR 2:1 SLOPES)**

SCALE: Not to Scale	DETAIL# 409.01
REVISION DATE: 06/2017	SHEET# 3 of 3