

PART C

Chapter 4

Estimating

This chapter provides guidance on calculating the quantities of masonry units, mortar and grout for particular projects.

Contents

4.1 BASIS OF TABLE

4.2 WORKED EXAMPLE

4.1

BASIS OF TABLE

There are slight variations in face shell widths, core tapers, core dimensions and web rebates of hollow concrete blocks throughout Australia. When calculating mortar and grout quantities, exact dimensions should be sought from the manufacturer and adjustments should be made to account for the peculiarities of the particular units.

Numbers of blocks

When calculating the number of blocks required for a particular wall area, it is necessary to know the effective face area of one masonry unit and the mortar associated with it. Since mortar joints are 10 mm thick, the effective face area is given by (length of unit + 10 mm) x (height of unit + 10 mm)

Mortar

The mortar volume tables are based on the following assumptions:

- 90-mm- and 110-mm-wide units are fully bedded (considered to be solid or cored units) and have full perpendicular joints. All joints are 10 mm thick and an allowance of 10% for frogs, cores and wastage. If a higher wastage is expected, the estimator should make the appropriate allowance.
- 140-mm- and 190-mm-wide units are face-shell bedded (considered as hollow units) and have face-shell bedded perpendicular joints. Minimum face shell widths of 25 mm and 30 mm have been allowed for 140-mm and 190-mm units respectively. All joints are 10 mm thick and an allowance of 50% for overflow into cores and for wastage. If a higher wastage is expected, the estimator should make the appropriate allowance.

Grout

The tabulated grout quantities are based on the percentage solid for the most common core sizes, as set out below. An allowance of 10% for wastage has also been included.

Width of unit (mm)	Percentage solid (%)
90	68 (cannot be grouted)
110	100 (cannot be grouted)
140	55
190	51

Density Of Materials

The following densities can be used to calculate wall mass, for purposes of determining vertical gravity loads on supporting structures, earthquake loads and sound attenuation.

Material	Density (kg/m ³)
Dense-weight concrete masonry units	2180
Lightweight concrete masonry units	1800
Mortar	2100
Grout	2400
Plasterboard	800

Table 4.1

Table 4.1 sets out block, mortar and grout quantities as described on this page.

To calculate the quantities in a project, use the **Estimating Sheet**.

Table 4.1 *Block, Mortar and Grout Quantities*

Unit dimensions				Number of units per 100 m ² of wall	Volume of mortar (m ³) per		Volume of grout (m ³) per					
Length (mm)	Height (mm)	Width (mm)	% solid		100 m ² of wall	1000 units	100 m ² of wall	1000 units	100 m ² of wall	1000 units	100 m ² of wall	1000 units
							Every core filled		Grouted @ 800 crs		Grouted @ 2000 crs	
390	190	90	68	1250	0.73	0.58	-	-	-	-	-	-
		110	100	1250	0.89	0.71	-	-	-	-	-	-
		140	55	1250	0.55	0.44	6.8	5.4	1.7	1.4	0.7	0.5
		190	51	1250	0.66	0.53	10.0	8.0	2.5	2.0	1.0	0.8
390	140	90	68	1667	0.89	0.53	-	-	-	-	-	-
		110	100	1667	1.09	0.65	-	-	-	-	-	-
		140	55	1667	0.68	0.41	6.8	4.1	1.7	1.0	0.7	0.4
		190	51	1667	0.81	0.49	10.0	6.0	2.5	1.5	1.0	0.6
390	90	90	68	2500	1.21	0.49	-	-	-	-	-	-
		110	100	2500	1.48	0.59	-	-	-	-	-	-
		140	55	2500	0.92	0.37	6.8	2.7	1.7	0.7	0.7	0.3
		190	51	2500	1.10	0.44	10.0	4.0	2.5	1.0	1.0	0.4
290	162	90	68	1938	0.89	0.46	-	-	-	-	-	-
		110	100	1938	1.08	0.56	-	-	-	-	-	-
		140	55	1938	0.67	0.35	6.7	3.5	1.7	0.9	0.7	0.3
		190	51	1938	0.81	0.42	9.9	5.1	2.5	1.3	1.0	0.5
290	119	90	68	2584	1.07	0.41	-	-	-	-	-	-
		110	100	2584	1.31	0.51	-	-	-	-	-	-
		140	55	2584	0.81	0.31	6.7	2.6	1.7	0.6	0.7	0.3
		190	51	2584	0.97	0.38	9.9	3.8	2.5	1.0	1.0	0.4
290	90	90	68	3333	1.29	0.39	-	-	-	-	-	-
		110	100	3333	1.57	0.47	-	-	-	-	-	-
		140	55	3333	0.98	0.29	6.7	2.0	1.7	0.5	0.7	0.2
		190	51	3333	1.17	0.35	9.9	3.0	2.5	0.7	1.0	0.3
290	76	90	68	3876	1.44	0.37	-	-	-	-	-	-
		110	100	3876	1.76	0.45	-	-	-	-	-	-
		140	55	3876	1.09	0.28	6.7	1.7	1.7	0.4	0.7	0.2
		190	51	3876	1.31	0.34	9.9	2.6	2.5	0.6	1.0	0.3
230	76	90	68	4845	1.52	0.31	-	-	-	-	-	-
		110	100	4845	1.85	0.38	-	-	-	-	-	-
		140	55	4845	1.15	0.24	6.6	1.4	1.7	0.3	0.7	0.1
		190	51	4845	1.38	0.28	9.8	2.0	2.5	0.5	1.0	0.2

Estimating Sheet

Estimating Sheet

[Print Page]

CALCULATION OF NUMBER OF UNITS REQUIRED

	Gross area of wall	_____	m ²
	Deduct openings	_____	m ²
	Net area of wall	_____	m ²
n = Number of corners	Deduct corners:		
H = Height of wall (m)	$\frac{n \times H \times t}{1000}$	_____	m ²
t = Thickness of wall (mm)		_____	m ²
	Net masonry area	_____	m ²
	Face dimensions of units (length x height)	_____	mm
From Table 4.1	Number of units per 100 m ² of wall	_____	
	Total number of units	_____	
	Deduct special units:	Full Half Three-quarter	
	Number of corner units	_____	
	Number of lintel units	_____	
	Number of sash/jamb units	_____	
	Number of control joint units	_____	
	Number of other units	_____	
	Total number of special units	_____	
	Total deduction in stretcher units	_____	

Net number of stretcher units _____

CALCULATION OF QUANTITY OF MORTAR REQUIRED

	Net area of masonry	_____	m ²
	Dimensions of units (length x height x width)	_____	mm
From Table 4.1	Volume of mortar per 100 m ² of wall	_____	m ³ /100 m ²
	Total volume of mortar required	_____	m ³

CALCULATION OF QUANTITY OF GROUT REQUIRED

	Spacing of grouted cores	_____	mm
	Dimensions of units (length x height x width)	_____	mm
From Table 4.1	Volume of grout per 100 m ² of wall	_____	m ³ /100 m ²
	Total volume of grout required	_____	m ³

4.2

WORKED EXAMPLE

Worked Example

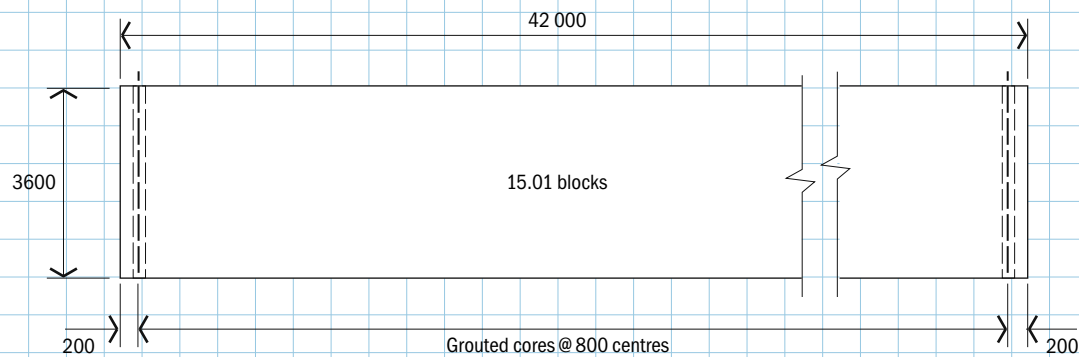
[Page 1 of 2]

INTRODUCTION

The purpose of this worked example is to demonstrate the derivation of Table 4.1 and to enable similar calculations to be carried out.

AIM

To find the number of blocks, volume of mortar and volume of grout required for the wall illustrated.



DATA

Face area of wall:	$A_w = 3.6 \times 42.0$ $= 151 \text{ m}^2$	Percentage solid:	$p = 55\%$ $= 0.55$
Unit length:	$L_u = 390 \text{ mm}$	Thickness of mortar:	$t_m = 10 \text{ mm}$
Unit height:	$H_u = 190 \text{ mm}$	Grouted core spacing:	$S = 800 \text{ mm}$
Unit width:	$W_u = 140 \text{ mm}$	Face shell width:	$t_s = 25 \text{ mm}$



CALCULATIONS

Number of units per 100 m² of wall:

$$\begin{aligned} N_{100} &= \frac{100,000,000}{(L_u + t_m)(H_u + t_m)} \\ &= \frac{100,000,000}{(390 + 10)(190 + 10)} \\ &= 1250 \text{ units per } 100 \text{ m}^2 \text{ of wall} \end{aligned}$$

Number of units in wall:

$$\begin{aligned} N &= N_{100} \frac{A_w}{100} \\ &= \frac{1250 \times 151}{100} \\ &= 1890 \text{ units say} \end{aligned}$$

NOTE:

When ordering, make allowance for halves, fittings and breakage

Volume of mortar per 100 m² of wall, allowing for 50% wastage:

$$\begin{aligned} V_{m100} &= \frac{N_{100}(L_u + H_u + t_m) t_m 2 t_s \times 1.5}{1,000,000,000} \\ &= \frac{1250(390 + 190 + 10) 10 \times 2 \times 25 \times 1.5}{1,000,000,000} \\ &= 0.55 \text{ m}^3 \text{ per } 100 \text{ m}^2 \text{ of wall} \end{aligned}$$

Volume of mortar in wall:

$$\begin{aligned} V_m &= V_{m100} \frac{A_w}{100} \\ &= \frac{0.55 \times 151}{100} \\ &= 0.83 \text{ m}^3 \end{aligned}$$

Volume of grout per 100 m² of wall, allowing for 10% wastage:

$$\begin{aligned} V_{g100} &= \frac{N_{100}(1 - p) L_u W_u (H_u + t_m) 1.1}{1,000,000,000} \times \frac{200}{S} \\ &= \frac{1250(1 - 0.55) \times 390 \times 140 \times (190 + 10) \times 1.1}{1,000,000,000} \times \frac{200}{800} \\ &= \frac{6.8 \times 200}{800} \\ &= 1.7 \text{ m}^3 \text{ per } 100 \text{ m}^2 \text{ of wall} \end{aligned}$$

Volume of grout in wall:

$$\begin{aligned} V_g &= V_{g100} \frac{A_w}{100} \\ &= \frac{1.7 \times 151}{100} \\ &= 2.6 \text{ m}^3 \end{aligned}$$