CHAPTER 6 (A)
TECHNICAL PLANNING DATA
(OTHER THAN FOR EARTHWORKS)
SECTION 29
MATERIALS: QUANTITIES AND MOVEMENT

0627. Once the standards and construction details of a road are decided, the quantities of stores required and the number of loads to be moved can be determined.

Construction of Layers

0628. The volume of material required for construction layers of various dimensions is given in Table 6.6. The volumes given are for construction layers after compaction. This means that to allow for shrinkage, the amount of material transported to, and spread on, the site must be the volume indicated in Table 6.6 plus at least 10%. Where more accurate calculations are necessary, the data provided in Military Engineering Volume V, Part 1, Road Design and Construction should be used.

TABLE 6.6: VOLUME OF MATERIAL REQUIRED FOR CONSTRUCTION LAYERS

Serial	Road wide (m)	Volume of material required per 100 m length (m')					
		Thickness of of construction layer (mm)					
		40	50	60	75	100	150
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)
1	2.75	11	14	17	21	28	42
2	3.00	12	15	18	23	30	45
3	3.50	14	18	22	27	35	53
4	5.00	20	25	30	38	50	75
5	5.50	22	28	34	42	55	83
6	6.00	24	30	36	45	60	90
7	7.00	28	35	42	53	70	105
8	9.00	36	45	54	68	90	135

Vehicle Loads

0629. Materials required in terms of vehicle loads can be determined by applying the relevant data provided in Tables 6.7, 6.8 and 6.9. These data are approximate but they are sufficiently accurate for the purposes of this pamphlet.

TABLE 6.7: PROPERTIES OF EXCAVATED MATERIALS

Serial	Material	Properties	
		Tonnes per m^3	m^3 per tonne
(a)	(b)	(c)	(d)
1	Chalk	1.5	0.7
2	Gravel	2.1	0.5
3	Sand	2.0	0.5
4	Clay	1.7	0.6

TABLE 6.8: PERTIES OF LOOSE MATERIALS

Serial	Material	Properties	
		Tonnes per m^3	m^3 per tonne
(a)	(b)	(c)	(d)
1	Ashes	0.9	1.1
2	Clinker	0.8	1.3
3	Stone 63.0 to 38.0 mm	1.4	0.7
4	Stone 32.0 to 3.2 mm	1.3	0.8
5	Hardcore, brick	1.6	0.8

0630. The safe load for a particular type of vehicle can be found by multiplying the appropriate Figure in Column *(d)* of Tables 7.2 and 7.3 by the number of tonnes the vehicle can carry. For example, the safe load for a 10-tonnetruck carrying gravel (*see* Table 6.7, Serial 2) is 0.5 x 10 = 5 m3.

0631. In materials haulage, the limiting factor is often the capacity of the vehicle body, not the weight that the vehicle can carry. Where there is any doubt, the volume of the vehicle body should be measured and the amount of material that it can carry should be determined by reference to Column *(d)* of Tables 6.7 and 6.8.

0632. The carriage of quantities of surfacing stores may be limited by the bulk, not the weight, of the items.

TABLE 6.9: LOAD TABLES FOR SURFACING STORES

Serial	Item	Basis of calculation		Truckload			
		Unit	Weight (kg)	4-tonne	8-tonne	14-tonne	DROPS
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)
1	Bitumen in 160 litre drums	drum	180	24	44	77	N/A
2	Bitumen in 185 litre drums	drum	250	20	32	56	N/A
3	PSP Mk4, 0.4x3.0 m	panel	30	138	265	465	N/A
4	PSP Mk4, 0.4x1.5m	panel	15	275	533	933	N/A
5	PSP Mk4, standard pack of 24 long panels, 12 short and accessories	bundle	900	4	8	15	N/A
6	PSA	pallet	2400	2	4	6	N/A
7	AM-2	pallet	1228	3	6	12	N/A
8	Logistic Trackway (mammoth Mat)	roll	1700	2	4	4	3
9	Class 30 Trackway	roll	3.3 tons	1	1	2	2
10	Class 70 Trackway	roll	2.4 tons	-	1	2*(i)*	2

Note:

a. Set of Class 70 (4 rolls) usually carried on 14-tonne flat bed (2 rolls) towing a modified heavy bridging trailer (2 rolls).

0633. Horse-drawn Loads. A horse and cart can normally haul a load of about1,000 kg of material

Loading Loose Materials

0634. Useful constants for loading loose materials by hand and by means of wheeled tractors fitted with front loading shovels are given in Tables 6.10 and 6.11 respectively

TABLE 6.10 LOADING LOOSE MATERIALS BY HAND

Serial	Material	Time taken in loading into wagons, trucks or dumpers (man-hours)	
		Per tonne	Per m^3
(a)	(b)	(c)	(d)
1	Ashes	0.70	0.60
2	Asphalt	1.00	2.00
3	Bricks, loose	0.60	0.80
4.	Bricks, stacked	1.20	2.10
5.	Chalk	0.65	0.85
6.	Clay	0.80	1.00
7.	Clinker	0.70	0.50
8	Concrete, broken	0.80	0.97
9	Concrete, mixed	0.70	1.46
10.	Concrete, precast units	1.10	-
11.	Gravel	0.65	0.98
12.	Hardcore, building rubble	0.81	1.00
13.	Pipes, asbestos cement	1.20	-
14.	Pipes, cast iron	1.00	-
15.	Pipes, concrete or stoneware	1.10	-
16.	Rails	1.00	-
17	Road Metal	0.60	0.75
18	Rolled steel joists	1.00	-
19.	Sand	0.60	0.90
20.	Shingle	0.70	1.04
21.	Stone, briken 12 mm or less	0.60	0.85
22	Stone, briken 12 to 65 mm	0.65	0.98
23	Stone, briken 65 to100 mm	0.70	1.10
24.	Tarmacadam	1.10	1.17

TABLE 6.11 LOADING LOOSE MATERIALS INTO TRUCKS USING WHEELED TRACKTORS WITH FRONT LOADING SHOVELS

Serial	Material	Output			
		Tonnes per hour		m^3 per hour	
		LWT	MWT	LWT	MWT
(a)	(b)	(c)	(d)	(e)	(f)
1	Ashes	45	80	52	92
2	Asphalt, hot	70	140	35	70
3	Clay	70	120	43	74
4	Concrete, wet	50	85	22	38
5	Gravel	100	145	46	67
6	Hardcore, bricks	60	100	46	77
7	Sand	125	150	67	80
8	Stone	80	120	62	92