

Earthwork

Hand Excavation & Backfill

Material & Operation	Avg. No.	Manhours	Avg. No.	Manhours
	Cu. Yd. per 8-Hr Day	per Cu. Yd.	Cu. M 8-Hr Day	per Cu. M
Sandy loam				
Small footings, hand.....	6	1.33	4.60	1.33
Trenches 3'-4' (.9-1.2 m) deep, hand	6	1.33	4.60	1.33
Piers 6' (1.8 m) deep, hand 1 lift	5	1.60	3.80	1.60
Piers 12' (3.7 m) deep, hand 2 lifts	3	2.66	2.30	2.66
Heavy soil and clay				
Small footings, hand.....	5	1.60	3.80	1.60
Trenches 3'-4' (.9-1.2 m) deep, hand	5	1.60	3.80	1.60
Piers 6' (1.8 m) deep, hand, 1 lift	4	2.00	3.00	2.00
Piers 12' (3.7 m) deep, hand, 2 lifts	2	4.00	1.50	4.00
Excavation with ½-cu.yd. (.40 cu. m) backhoe, casting to side				
Trench footing.....	300	-	230	-
Pier footing 6' (1.8 m) deep.....	200	-	153	-
Pier footing 12' (3.7 m) deep.....	150	-	115	-

Hand Trimming Trench, Piers And Slabs After Machine Excavation

Area	SF per 8-Hr Day	SF per Hour	Sq. M per 8-Hr Day	Sq. M per Hour
Bottom and side areas.....	240	30	22.40	2.80
Fine grade under slabs.....	600	75	56.00	7.00

Backfilling By Hand With Compaction Material From Stockpile

Ordinary Light Soils	Cu. Yd. per 8-Hr Day	Manhours per Cu. Yd.	Cu. M per per 8-Hr Day	Manhours per Cu. M
Soil distribution laborer	12	0.67	9.20	0.90
Compactor operator.....	12	0.67	9.20	0.90
No allowance for compactor equipment cost.				

Excavation Productivity**Tractor Mounted Backhoe**

Hours/100 CY	Bucket Volume (Cu. Yds.)					
	1	1 ¼	1 ½	1 ¾	2	3
SandyClay/Moist Loam	1.10	0.90	0.75	0.60	0.55	0.45
Sand/Gravel	1.20	0.95	0.80	0.70	0.60	0.45
Hard Clay	1.40	1.40	0.90	0.80	0.70	0.55
Operation Cost / Hr.	\$30.36	N/A	\$37.93	N/A	\$63.46	\$95.69

(Based on good project conditions, average operator experience, no obstructions and 60° swing)

Tractor Power Wheeled Scraper

CY/DAY	Struck Scraper Capacity (Cu. Yds.)		
Operation Cycle (Minutes)	7	14	24
3	930	1860	3200
4	700	1400	2400
5	560	1120	1920
6	465	930	1600
7	400	800	1370
8	350	700	1200
9	310	620	1070
10	280	560	960
Operation Cost/Hr	N/A	\$94.56	\$160.63

(Based on 50 min. hour, 8 hour days)

Bulldozer ProductionApproximate Hourly Production of Bulldozers
Based on an 83% Job Efficiency

Description of Work	Hp (kW)	Hp (kW)	Hp (kW)	Hp (kW)	Hp (kW)
Simple clearing, vegetation, light brush, tree saplings, in sq. ft. per hr.	50 (37)	65 (48)	75 (56)	105 (78)	200 (149)
in sq. m per hr.	900-1000	1000-1100	1150-1250	1250-1350	1450-1550
in sq. m per hr.	81-93	93-102	107-116	116-125	135-144

Moderately difficult clear- ing thick brush and tree saplings, in sq. ft. per hr.	300-350	350-400	400-450	600-650	700-750
in sq. m per hr.	28-33	33-37	37-42	56-60	65-70
Add extra for trees					

Strip top soil or shallow excavation of ordinary soil and placing in piles on premises, in cu. yds. per hr.	15-20	17-22	20-25	22-27	27-32
in cu. m per hr.	11-15	13-17	15-19	17-21	21-24

Backfill ordinary soil placed slow enough to permit compacting, in cu. yds. per hr.	33-38	37-42	43-48	50-55	60-65
in cu. m per hr.	25-29	28-32	33-37	38-42	46-50

Spread material dumped in piles by trucks or cast by other excavating equipment in cu. yds. per hr.	42-47	45-50	55-60	60-65	70-75
in cu. m per hr.	32-36	34-38	42-46	46-50	54-57

Bulldozer Operation Costs							
Horsepower	50	65	75	105	200	400	460
Hourly Cost	\$13.23	\$18.74	\$23.80	\$32.98	\$64.55	\$91.53	\$120.60

Dump Truck Operation Costs					
Capacity Struck (CY)	4	6	10	15	20
Hourly Cost	\$17.31	\$26.10	\$36.64	\$44.21	\$49.23

Compaction Production

Rate of Sheepsfoot Roller Compaction in Cu. Yds. and Cu. M per Hr.
Based on 5'-0" (1.52 m) Wide Roller, 2-1/2 mph (4 kph) Speed,
12" (300 mm) Fill Layers and 100% Job Efficiency

No. of Passes of Roller	Percentage Factor of Pay Yd. (M) to Loose Yd. (M)					
	Hard Tough Clay 70%		Medium Clay 80%		Loam 90%	
	c.y.	cu.m	c.y.	cu.m	c.y.	cu.m
1	1711	1308	1956	1495	2200	1682
2	856	654	978	748	1100	841
3	570	436	652	498	733	560
4	428	327	489	374	550	421
5	342	261	391	299	440	336
6	285	218	326	249	367	281
7	244	187	279	213	314	240
8	214	164	245	187	275	210
9	190	145	217	166	244	187
10	171	131	196	150	220	168
11	156	119	178	136	200	153
12	143	109	163	125	183	140

Grading

Placing & Compacting Fills for Floors inside Buildings (3 Laborers, 35-40 CY in 8 hour day)**0.6 Hrs/CY**

Rough Grading by Hand (1 Laborer, 800 sf in 8 hour day)**1.0 Hrs/100 SF**
(With Dozer and Laborer, 6500-7500 sf in 8 hour day) (**1.15 hrs/1000 SF each**)

Grading for Slabs on Ground (1 Laborer, 500-600 sf in 8 hour day) **1.5Hrs/100SF**

Finish Grading of Topsoil (1 Laborer, 600-700 sf in 8 hour day).**1.25 Hrs/100SF**

Grading for Footing Bottoms (1 Laborer, 200 sf ft. of Footing Bottom in 8 hour day)**4.0 Hrs/100SF**

Hand Compaction (6" to 11" lifts, Ram Tamper, 2 passes).....**130 CY/Day**

Hand Compaction (6" lifts, Vibrating Plate, 2 passes)**200 CY/Day**

Spread & Hand Tamp 4" Sand/Gravel Under Slab on Grade **1.33 Hrs/CY**

The information shown was obtained from Walker's Building Estimator's Reference Book, 1999 (among other sources), and is to be used only for classroom purposes and not a substitute for field experienced estimating techniques or actual material quotes.