Estimating production

Maintain production history files on every masonry task

By Carolyn Schierhorn

Experienced contractors rarely have trouble estimating material quantities needed for a job, but estimating labor hours can be a lot trickier. A multitude of factors affect productivity, from unit size, shape, and weight to weather conditions. What's more, all masonry tasks must be accurately measured, including the installation of flashing, anchor bolts, movement joints, and insulation.

"So many people use guesswork for productivity," observes Dan Schiffer of Holt, Mich.-based Schiffer Mason Contractors Inc., who has developed masonry estimating software and teaches classes on estimating. For example, a contractor may know that a mason can lay 200 standard lightweight block a day but have no idea how many lineal feet of sawcuts a mason can make.

"In our company, we break down everything that needs to be estimated into discrete, measurable tasks," Schiffer explains. "So if we look at plans for a block wall requiring #5 rebar at 2 feet, 8 inches on center, grouted cells, control joints, anchor bolts at the top, and sawcuts, as well as the units themselves, we have a productivity number for each task—so many lineal feet, cubic feet, or units per day."

Schiffer converts production figures into "man-day" units, which

Figure 1. Concrete masonry production curve

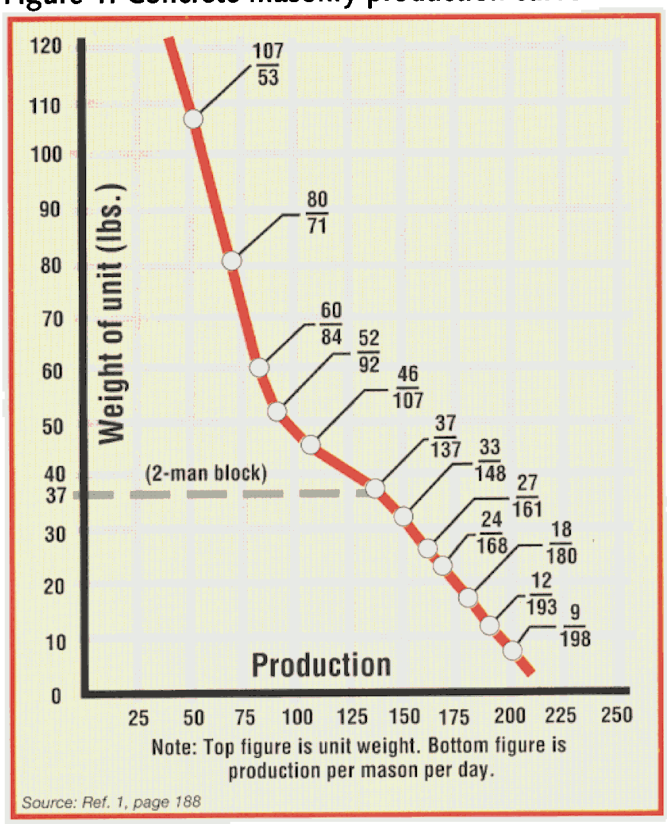

Figure 2. Face brick production curve

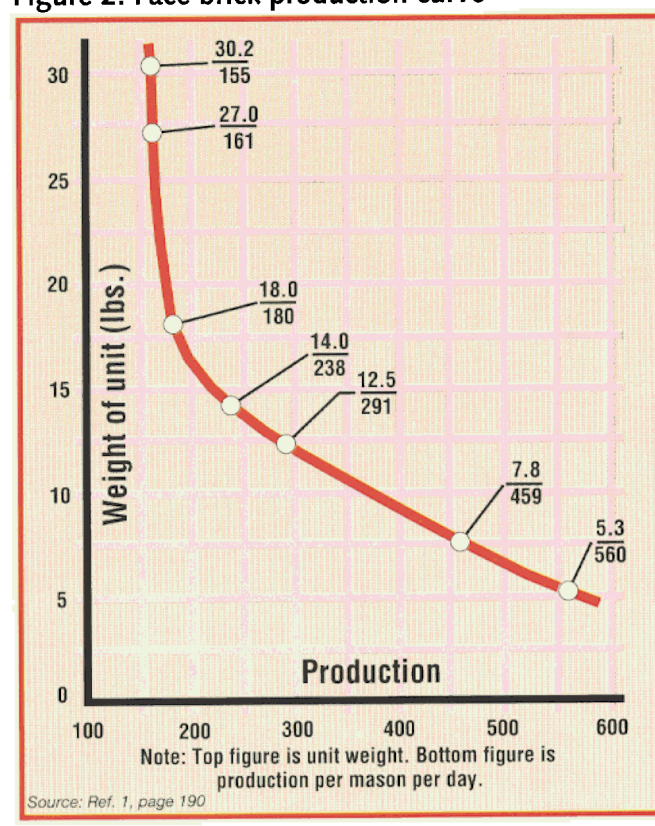

Table 1. Special block production factors

Special block	Size	Weight	Basic production	Production factor	Production special block
Scored	4x8x16	26	163	.95	155
	6x8x16	32	150	.95	143
	8x8x16	39	131	.95	125
	10x8x16	47	105	.95	100
	12x8x16	54	90	.95	86
Slump	4x4x16	13	191	.92	176
	8x4x16	20	176	.92	162
Split face	4x4x16	16	184	.89	164
	4x8x16	33	148	.89	132
	8x4x16	23	170	.89	152
	8x8x16	46	107	.89	96
	10x8x16	55	88	.89	79
Sound block	4x8x16	18	180	.80	144
	6x8x16	22	172	.80	138
	8x8x16	27	161	.80	129

Source: Ref. 1, page 192

equal the number of units or masonry accessories, or amount of material, a mason will lay on a project—divided by the average number or amount he could install in a day if he did nothing else.

For example, let's say a project requires 60,000 brick; 5,000 block; 1,000 cubic feet of grout; and 120 anchor bolts. And the average daily production counts per mason are: 600 brick; 180 block; 200 cubic feet of grout; and 400 anchor bolts. These figures yield 60,000÷600=100 man-days for bricklaying; 5,000÷180=27.7 man-days for blocklaying; 1,000÷200=5 man-days for grout placement; and 120÷400=0.3 man-days for anchor bolt installation.

Schiffer sums up the total man-days a project requires. Then, based on how soon he has to finish the job, he calculates the number of masons and laborers needed to complete the job on time. From this figure, he determines his labor costs.

Likewise, Larry Wendt, president of Benchmark Estimating Software in Lombard, Ill., tells contractors at his estimating seminars to determine separately the labor required for the installation of various masonry accessories and for tasks such as masonry cleaning. But, he notes, few masonry contractors estimate production this way.

For example, to cover the cost of installing flashing when done by the masons, some contractors just increase the price of the masonry units to be set on the flashing. Others charge a flat rate, such as $1 per lineal foot, for all flashing. These methods, according to Wendt, don't distinguish between different types of flashing such as copper vs. plastic, and don't take changing job conditions into consideration.

"You're comparing apples to oranges this way," says Schiffer. "By converting every task into man-days instead, you compare apples to apples."

Table 2. Jointing method loss factors

Jointing method	Lost time (%)
Flush cut (add)	2 to 5
Concave	0
Weathered	0 to 1
Struck	0 to 2
Raked	2 to 5
V-tooled	2 to 5
Stripped	5 to 8
Convex	8 to 12

Source: Ref. 2, page VII-6

Know where you stand on a job

To estimate future production accurately, maintain meticulous production history records, updating your counts weekly. William Pacetti, president of Pacetti Brothers and Trademen's Software in Tinley Park, Ill., provides his foremen with production charts that include a sketch of each masonry component on the job. At the end of each day (or week), the foremen count all the installed components, turning in the completed production charts weekly.

Schiffer's foremen are given forms that show the estimated average man-days for each task.

Table 3. Cutting factors

Average cuts in wall (%)	Lost time (%)
0 to 5	3 to 5
5 to 10	6 to 10
10 to 15	10 to 15
15 to 20	12 to 18
20 to 25	17 to 23
30 to 40	30 to 35
40 to 50	35 to 40
50 to 60	40 to 45
60 to 70	45 to 50
70 to 80	50 to 55
80 to 90	55 to 60
90 to 100	60 to 65

Source: Ref. 2, page VII-5

"At the end of each day, when the foreman does his counts, he knows how many man-days ahead or behind he is." Then, if necessary, the foreman can encourage his crew to work harder. If the crew falls way behind, Schiffer might replace it with one better-suited to the particular project.

"Many masonry contractors don't know where they stand on a job," Schiffer says. "We know daily on every job whether we've made or lost money."

The masonry estimating software packages developed by Schiffer, Pacetti, and Wendt allow production figures for every type of task to be updated easily.

However, to estimate a job that includes tasks or materials with which he has no experience, Schiffer must make an educated guess based upon history records for similar situations. If he wins the

What influences production?

At his estimating seminars, Larry Wendt, president of Benchmark Estimating Software in Lombard, Ill., emphasizes that many factors affect mason productivity, including:

- Crew availability: Some crews may be faster than others
- Experience of foreman
- Expected crew size: Too many masons may get in each other's way
- Masonry unit type: With brick, look closely at initial rate of absorption, texture (affects cleaning), and voids; with block, look at unit weight, the presence of hand-holds, and special shapes
- Type of mortar
- Weather conditions: Temperature, humidity, wind speed
- Current economic conditions: During good times, when there is plenty of work, production rates go down; rates go up when there are a lot of out-of-work masons
- Job type: Whether industrial, commercial, institutional, residential, or publicly funded
- Overtime work: Production rates go down with overtime
- Scheduling issues: Material availability, whether project is fast-track
- Location: Crowded site conditions, site accessibility

job, one of his first priorities is to do a time study. He'll go out to the site with a stopwatch and time a mason doing a particular task.

But if the mason lays 30 blocks in an hour, for example, Schiffer won't multiply that number by 8 hours to get a daily production rate. During that hour, the mason took no breaks and was on his best behavior. Multiplying 30 by 6.5 hours yields a more accurate estimate, Schiffer says.

Reference charts can guide

When your own records are incomplete, you can refer to tables and graphs in masonry estimating books, which are based on the authors' field experience and research. These are no substitute for experience but can serve as guides until you establish complete production history files.

Because unit weight has a significant impact on productivity, Rynold V. Kolkoski, author of *Masonry Estimating,* has created graphs relating unit weight to production rate (Ref. 1). Figure 1 shows a sample concrete block production curve. Note that increasing the unit weight from 37 to 52 pounds decreases production from 137 to 92 units. Figure 2 shows a sample face brick production curve. The average mason can lay 560 5.3-pound brick in a day but only 291 12.5-pound units, according Kolkoski's graph.

These production curves are based on standard units. Any departure from the norm adds a degree of difficulty to the task, which can be converted into a production factor. Table 1 shows production factors for special block, including scored, slump, split-face, and sound-dampening units. Less than 1, the production factor is multiplied by the basic production estimate for the same-weight standard unit to yield the production rate for special block.

Similarly, Jerry Pope, author of *Masonry Estimating for a Profit,* presents production efficiency loss factors for a variety of conditions that impair productivity, such as laying brick over the wall; the number of cuts in the wall; stop-work delays; coffee break delays; weather conditions; material finishes; and raking and pointing. Pope estimates the percentage range of time typically lost; subtracting this range from 100% yields the production factor for the particular task, special unit, or condition (Ref. 2).

Table 2 shows lost time due to type of jointing method. Concave joints entail 0% lost time, which means a 100% production factor for that task. Convex joints, in contrast, result in 8% to 12% lost time, or a production factor of 92% to 88%.

The impact of the percentage of sawcut units on lost time is shown in Table 3. Note that if 0% to 5% of the units in a wall are cuts, lost time will range from 3% to 5%. If 40% to 50% of the units are cuts, lost time will amount to 35% to 40%.

Pope breaks the production rates down into man-day production averages for special wall reinforcing, grout, loose-fill insulation, different types of concrete block, glazed brick, face brick, and stonework, and clay and concrete pavers. His average estimates for concrete block cell fills (grout), for instance, are: for 4-inch block, 55 cell fills per day; 6-inch block, 160 per day; 8-inch block, 180 per day; 10-inch block, 190 per day; and 12-inch block, 200 per day.

Estimating production can be daunting because there are thousands of masonry unit types and accessories and myriad outside factors that can have an impact. But reducing each task to man-day units makes estimating easy, Schiffer contends. Just make sure to count accurately every component of a masonry job at least weekly and update your production history files.

References

1. Rynold V. Kolkoski, *Masonry Estimating,* 1988, The Aberdeen Group, 426 S. Westgate St., Addison, IL 60101.

2. Jerry Pope, *Masonry Estimating for a Profit,* 1993, Mason Contractors Association of America, 1550 Spring Rd., Oak Brook, IL 60521.

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