

METHODOLOGY of the @a6a5 Online Database Of Cost (NODOC)

This database contains a method of determining the budgetary amounts to design and construct industrial plants.

The method, when properly applied can produce a semi-definitive estimate with an accuracy of $\pm 10\%$.

The information required and the necessary procedures for using this method of estimating are defined in this introduction.

All equipment and material cost throughout this database are based on daily basic raw material prices obtained automatically from Stock Exchange RSS feeds.

Due to the ever-changing economic conditions, the use of the industry's knowledge and trends must be considered and applied against all equipment and material costs. This will result in a more realistic equipment and material value for a project to be designed and constructed at a future stage.

All labor man-hours are based on an average productivity of 70% of the United States productivity. The engineer/estimator must determine the labor productivity he feels he can

achieve for each project and may adjust the man-hours as required. Major items that one should consider in determining productivity are:

1. General Economy
2. Project Supervision
3. Labor Relations
4. Job Conditions
5. Construction Equipment
6. Weather

The rates for the estimated man-hours are weighted composite crew rates. This is simply the listing by craft of the various personnel required for a crew—such as general foreman, foreman, craftsmen, and apprentices/helpers—and the weighted percentage of their time that will be devoted to the crew. The weighted percentage of each classification multiplied by the hourly rate for that classification results in the weighted hourly rate for each. The sum of all weighted rates is equal to the composite crew hourly rate. The total percent of all crew personnel is to equal 100. Using the composite crews and rates, activity crews and rates formed.

Composite crew rates and the weighted percent of time each crew will be devoted to the activity are also listed. The weighted percent of each composite crew multiplied by the weighted composite crew rate results in the weighted hourly activity rate for that crew. The sum of all weighted crew rates for the activity is equal to the hourly weighted activity rate.

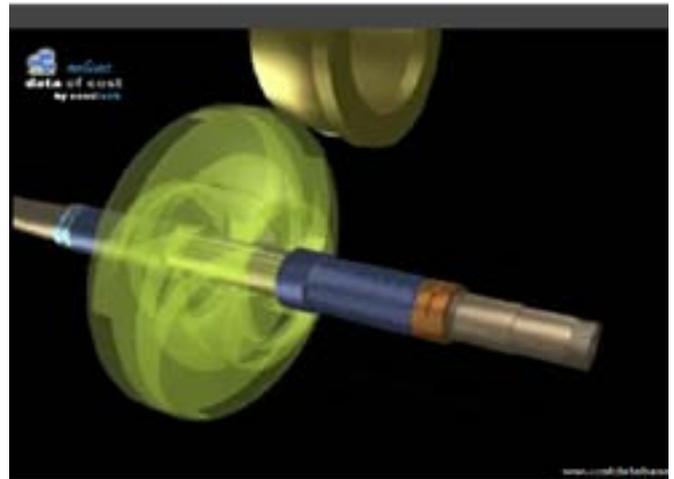
All man-hour costs include the total man-hours, based on 70% productivity, to complete the unit of work as listed.

All costs that reflect shop fabrication, packaged units, and subcontracted items include the total cost of labor, material, overhead and profit of the supplier, and the vendor or subcontractor.

If the project under consideration is to be located in an area outside the US, the engineer/estimator must consider correction factors according to project location. Additives for any or all of the following items may be required and since their costs vary widely for different parts of the world, they must be corrected individually for each project by applying correction factors as below:

1. Mobilization and demobilization of personnel and equipment

2. Foreign differential labor pay
3. Permits, licenses, fees, duties
4. Load out, tie down and material handling
5. Transportation and ocean or air freight
6. Camp, family quarters, field office, and storage facilities
7. Rest and recreation for personnel



METHOD ONE—ACCURACY LEVEL $\pm 10\%$

A method one, semi-definitive conceptual estimate, is defined as one that will produce major discipline quantities, man-hours and labor, material, subcontract and total cost. As an example, using concrete as a major discipline of work, and applying this method, the total cubic yards of concrete for equipment foundations would be the result. Based on the total cubic yards of concrete, all inclusive of foundation earthwork, forms, reinforcing steel, embedment, finishing, etc., the total man-hours and cost would be achieved. With the overall results of all major disciplines of work the project can be scheduled and fast-track cost-controlled until the time when a definitive design is available.

To achieve a degree of accuracy of $\pm 10\%$ the following information will be required.

1. Plant capacity, product form, basic process, and raw material
2. Total general specifications
3. Plant location (site conditions)
4. Preliminary soils report with foundation recommendations

5. Plot plan and equipment arrangements.
6. P. & I.D.'s. (Mechanical flow sheets)
7. Equipment list with their process and mechanical technical datasheets
8. Buildings listing type, size, and description

This same type estimate can be assembled with far less information than that listed above but the degree of accuracy, in all probability would be less than that stated.

The most important component of physical plant cost is that of process equipment. From it the prime basis can be formed for the estimation of the entire plant.

Once the production rate has been determined and a rough flow sheet presented, an equipment list can be compiled defining the type, size, capacity and material of construction. From the technical specifications, mathematical equations and logarithmic graphs, an average weight of equipment manufacturing raw material has been calculated. By having raw material unit prices from valuable resources such as London Metal Exchange, LME, an average cost of equipment and installation man-hours can be computed. In addition risk factors for each region can be applied to the top of the calculated cost in order to reach the total cost with accuracy less than $\pm 10\%$.

When you want to estimate the cost of one unit which consists of more than one material you should use Assemblies. Assemblies will help you to have a unit rate for complex equipment. Same method is used to estimate the unit cost of an assembly.

The equipment cost includes the total cost of the equipment, but does not include structural steel or miscellaneous iron such as supports, ladders, walkways, platforms, or handrails.

All installation man-hours include offloading equipment at job site, hauling up to 2,000 feet and rigging, picking, setting, and aligning of the equipment.

The shop fabricated equipment cost, as in the case of vessels, includes the total shop cost, overhead, and profit for fabricating and furnishing of all material and components required for that piece of equipment.

Packaged unit cost includes the total skid-mounted cost of the equipment and piping, electrical components and instrumentation, which may be an integral part of the package.

Sub-contract equipment cost includes the total sub-contractors cost and profit for the furnishing and installing of the equipment.

All equipment costs include an average allowance for freight cost within the continental forty-eight USA states.



METHOD TWO—ACCURACY LEVEL $\pm 30\%$

A method two, ratio conceptual estimate is defined as one that is based on the known total process equipment material cost and that applies weighted percentages against that cost to achieve the cost of all other major disciplines of work.

Once the cost of all major disciplines of work has been established, quantities and man-hours can be achieved by dividing the material cost by the pre-established unit dollar rate, as outlined in the graphs and tables, and the labor dollars by a pre-established composite activity rate.

With the established quantities and man-hours the project can be scheduled and fast track cost-controlled until a more definitive scope is available.

To achieve a degree of accuracy of $\pm 30\%$, the following information will be required:

1. Plant capacity, product form, basic process,

and raw material

2. Knowledge of general specifications

3. Plant location (site conditions)

4. Equipment list (priced out)

By developing a method one or two estimates it should be recognized that in the rounding off and averaging of material and labor cost and the application of average indices, a certain degree of accuracy is lost insofar as the individual item costs are concerned.

However, it is approved that the overall estimate is not seriously affected by this because the items tend to average each other out.

The foregoing will enable the engineer/estimator engaged in this type of work to turn out more realistic conceptual estimates and assist in the elimination of much guesswork. The estimated delivery time for fully deploying the NODOC database and customizing it on your local conditions varies from 1 to 4 months



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