

# 21

## Estimation of Fabrication Costs

- ✓ Fabrication Reports
- ✓ Unit Prices
- ✓ Material Costs

## ✓ Fabrication Reports

One of the most fascinating and the most practical sets of reports provided by “PVMange” are the reports on estimating the fabrication costs and calculating the equipment’s final price(s). If you have incorporated (into the software) the dimensional data of the equipment as well as the technical features of all the component parts, you can extract the thematical (subjective) reports of fabrication activities from the software. In addition, by defining the unit prices for each activity, you can easily access the final price of each activity and as a result, the fabrication price of each equipment and project.



Fig. 21-1 – (Tools for Cost Estimation)

These reports are provided in 17 independent headings along with an assembled report:

- Plate Cutting
- Pipe Cutting
- Plate Rolling
- Profile Bending
- Head Forming
- Edge Beveling
- Main Welding
- Orbital Welding
- Hole Drilling
- Tube Expand
- Tube Sheet Grooving
- Heat Treatment

- ND Test
- Sand Blast
- Painting Activity
- Ladder & Platform
- Self-Reinforce
- Sub. Of Fab. Costs

When you click on one of the above icons, the software will identify all the subjects related to that given activity and manages to gather data. Finally, it will provide you with a table as below:

Farnikan - Tayari Fabrication Report (Plate Cutting)(Project: HX105) - Date: 8/11/2019 12:15:04 PM							
No	Item No	Material	TH'K (mm)	Cutting Lenght (m)	Unit Price	Currenc	Total Price
1	E-5001	SA-240 304	10	0.45	10,000.00	IRRIal	4,525.48
2	E-5001	SA-285 Gr.C	14	18.19	0	---	0
3	E-5001	SA-285 Gr.C	18	2.45	0	---	0
4	E-5001	SA-516 Gr.70	4	1.22	0	---	0
5	E-5001	SA-516 Gr.70	10	10.07	0	---	0
6	E-5001	SA-516 Gr.70	12	33.69	0	---	0
7	E-5001	SA-516 Gr.70	14	8.08	0	---	0
8	E-5001	SA-516 Gr.70	15	1.27	0	---	0
9	E-5001	SA-516 Gr.70	20	1.29	0	---	0
10	E-5001	SA-516 Gr.70	25	1.99	4,000.00	IRRIal	7,942.19
11	E-5002	SA-240 304	10	0.45	10,000.00	IRRIal	4,525.48
12	E-5002	SA-516 Gr.70	4	1.22	0	---	0
13	E-5002	SA-516 Gr.70	10	8.71	0	---	0
14	E-5002	SA-516 Gr.70	12	1.46	0	---	0

Fig. 21-2 – (Sample Report for Fabrication Cost Estimation – Plate Cutting)

This report, which is an example of plate cutting, consists of the item number, the plate material, and the available thicknesses for that material. For instance, for equipment E-5001, a plate with SA-285 Gr.C and thicknesses of 14 and 18 mm has been used. Besides, the

calculated cutting length for the thicknesses are 18.19 and 2.45 respectively.

If we define the cost of cutting per each meter length of these two thicknesses, the fabrication cost for each thickness (activity) will be calculated as follows:

Farnikan - Tayari							
Fabrication Report (Plate Cutting)(Project: HX105) - Date: 8/11/2019 12:27:37 PM							
No	Item No	Material	TH'K (mm)	Cutting Length (m)	Unit Price	Currenci	Total Price
1	E-5001	SA-240 304	10	0.45	10,000.00	IRRIal	4,525.48
2	E-5001	SA-285 Gr.C	14	18.19	16,000.00	IRRIal	291,059.94
3	E-5001	SA-285 Gr.C	18	2.45	0.5	USD	1.23
4	E-5001	SA-516 Gr.70	4	1.22	0	---	0
5	E-5001	SA-516 Gr.70	10	10.07	0	---	0
6	E-5001	SA-516 Gr.70	12	33.69	0	---	0
7	E-5001	SA-516 Gr.70	14	8.08	0	---	0
8	E-5001	SA-516 Gr.70	15	1.27	0	---	0
9	E-5001	SA-516 Gr.70	20	1.29	0	---	0
10	E-5001	SA-516 Gr.70	25	1.99	4,000.00	IRRIal	7,942.19
11	E-5002	SA-240 304	10	0.45	10,000.00	IRRIal	4,525.48
12	E-5002	SA-516 Gr.70	4	1.22	0	---	0
13	E-5002	SA-516 Gr.70	10	8.71	0	---	0
14	E-5002	SA-516 Gr.70	12	1.46	0	---	0

Fig. 21-3 – (Sample Completed Report for Fabrication Cost Estimation – Plate Cutting)

It is noteworthy that base prices are set according to the user's desired currency. With this option, you can easily define the cost(s) of activities in either local or foreign workshops and estimate the costs which originate from currencies other than yours (although those activities may be performed in your workshop).

For example, costs of performing Orbital Welding, including the electrode and the machine costs, may be based on Euro. At the end

of each project, you will be able to do any sort of assembling by filtering the data of the output table.

The same procedure applies to all the 17 activities mentioned above. The important question, however, is how to define unit prices.

### ✓ Unit Prices

As you can see, the Unit Prices option exists at the top left corner of this tool bar. Clicking on this dropdown arrow, you will be provided with a list of all the fifteen aforementioned activities.

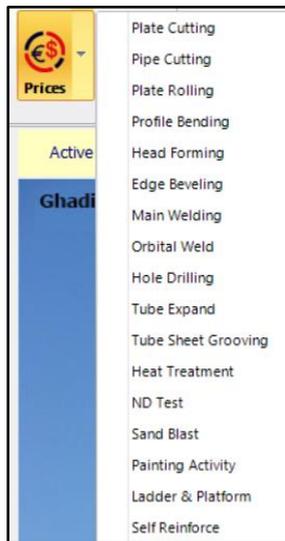


Fig. 21-4 – (Dropdown List to Define Unit Prices for Estimating Fabrication Cost)

Selecting each option will activate the related table, and if in your previous organizations or projects there exists a cost for a similar item (as in this project), the table will consider it by default. Otherwise, the unit price will appear as zero so that you can complete it.

As a case in point, suppose that you want to define unit prices for plate cutting. Selecting “Plate Cutting” from the Unit Prices dropdown list will take you to a menu as the figure below.

Fabrication Costs (Set Unit Prices) - Plate Cutting

Price:  Unit Price Per Each Meter

Currency:

Filtering Tools

No.	Material	TH'K (mm)	Price	Currency
1828		0	0	---
1829		12	40	USD
1830		32	0	---
1831	C.S.	-1	33	USD
1832	C.S.	10	33	USD
1833	C.S.	12	33	USD
1834	C.S.	25	33	USD
1835	C.S.	30	33	USD
1836	C.S.	35	33	USD
1837	C.S.	40	33	USD

Fig. 21-5 – (Defining Unit Prices for Estimating the Fabrication Cost)

Double clicking on each record (in the table) will transfer its data, including its price and current currency, to the related fields and you will be able to modify or change them.

It is noteworthy that with regard to the number of equipment in each project – the variety of the materials used as well as other technical features such as thickness, diameter, .... – a big list of materials will be formed which you must price so as to access the final price of each activity.

Considering the length and the time-consuming character of this task (if we work with one item at a time), the formation of this list does not sound reasonable. What should we do then?

- If you want to set this price for just this one record, click on **“Set for This Record Only”**.
- If you want to set this price for all records with the same material, click on **“Set for The Same Material”**.

- If you want to set this price for all records with the same subject, click on **“Set for the Same Subject”**. (For example, “Same Subject” in the Plate Cutting table means pieces with the same thicknesses regardless of their material.) In other words, this record will attribute the set price to similar items with similar features (regardless of their material).
- If you want to set this price for all categorized items, click on **“Set for the Filtered Items”**. (In this case, it is required that you first create the desired category with Filtering Tools.)
- If you want to set this price for all items in the table, click on **“Set for All”**.
- If you want to remove current prices altogether, click on **“Clean Price List”**.

Although the list of activities may first shock you with regard to completing the unit prices, you can quickly set base prices by the use of these options.

On top of all this, there is an icon on each page for downloading the Excel format as well as uploading data from the Excel file to the PVManage software.



Fig. 21-6 – (Tools for Setting Prices via Excel Software)

It would suffice to download the related format through **Download Template File** and save it after completion. Then, use **Upload Data from File** to reread it and to transfer its data to the related form.

Selecting any of the 17 options above, a subjective report on your intended project items will be available. Each of these subjective reports will provide data on the same report about the intended project’s equipment. For example, Profile Bending report presents a table as below:

PV Manage Demo Ver. - Anton Hernandez Alba							
Fabrication Cost Report (Profile Bending)(Project: ABS Rubbers Plant) - Date: 3/26/2020 10:03:03 PM							
No	Item No.	Material	Shape Typ	W (Kg)	Unit Price	Currenc	Total Price
1	80-D-3802 B	S.S. 321	I-140	10	1.00	Rials	10.00
2	80-D-3802 B	S.S. 321	IPE-140	12	2.00	Rials	24.00
3	80-D-3802 B	SA-36	I-180	40	6.00	Rials	240.00
4	80-D-3802 B	SA-36	HEA-140	8	3.00	Rials	24.00
5	80-D-3802 B	SA-36	HEM-120	409	4.00	Rials	1,636.00
6	80-D-5802 B	SA-36	I-120	92	5.00	Rials	460.00
7	88-D-9003	S.S. 321	IPE-140	12	2.00	Rials	24.00
8	88-D-9004	S.S. 321	IPE-140	31	2.00	Rials	62.00
9	Test	SA-36	I-180	358	6.00	Rials	2,148.00
10	Temp-1	SA-36	I-180	358	6.00	Rials	2,148.00

Fig. 21-7 – (A Sample for Cost Estimation Reports)

You can find 10 rows in this table, including 6 sets of equipment. Each record (row) presents Material, Related Profile, Weight, Unit price, Currency, and Total Price for that row. If you want to have the sum of all the costs of a given item (for example, 80-D-3802 B that are shown in rows 1 ~ 5), you must add up the values of rows 1 ~ 5 in column “Total Price.” This request will be done by the software and will be provided to you with each report. This report will appear on a page called “Summary” as follows:

PV Manage Demo Ver. - Anton Hernandez Alba Fabrication Cost Report (Profile Bending)(Project: ABS Rubbers Plant) - Date: 3/26/2020 10:03:03 PM			
Nc	Item No	Currenc	Total Price
1	80-D-3802 B	Rials	1,934.00
2	80-D-5802 B	Rials	460.00
3	88-D-9003	Rials	24.00
4	88-D-9004	Rials	62.00
5	Temp-1	Rials	2,148.00
6	Test	Rials	2,148.00

Fig. 21-8 – (A Sample for Assembled Subjective Reports)

As You can see, a row is specified to each item in this report. Nevertheless, the important question is that if we want to have a table per equipment – including the costs related to each activity – which enables us to add up all the costs in one shot and without summation by the user, what should we do?



Clicking on the “Sum of Fab. Costs” icon is the answer to this question. The importance of this tool will be highlighted when we consider that with every simple change which may occur in dimensional data or unit prices, the whole cost estimation process will change!

PV Manage Demo Ver. - Anton Hernandez Alba  
 Fabrication Cost Report (Sum Of Costs)(Project: ABS Rubbers Plant) - Date: 3/26/2020 10:03:03 PM

ItemNo	Currency	Pipe Cutting	Edge Beveling	Plate Cutting	Hole Drilling	Orbital Welding	Plate Rolling	Sand Blast	Total Of Item
E-101 A	IRRIal	536,216.31	33,131,192.00	5,685,606.00	813,440,000.00	40,800,000.00	12,017,000.00	26,978.69	905,636,993.00
E-101 B	IRRIal	536,216.31	33,131,192.00	5,382,017.50	813,440,000.00	40,800,000.00	11,735,000.00	24,911.10	905,049,336.91
E-102	IRRIal	497,915.16	11,091,155.00	3,270,428.50	539,600,000.00	14,400,000.00	3,878,000.00	11,626.32	572,749,124.98
E-103	IRRIal	517,065.75	34,512,500.00	5,287,251.00	725,960,000.00	34,200,000.00	13,238,000.00	26,068.03	813,740,884.78
E-111	IRRIal	268,108.16	11,442,124.00	3,700,997.25	257,780,000.00	17,000,000.00	4,165,000.00	11,859.74	294,368,089.15
E-112	IRRIal	229,807.00	10,845,315.00	3,261,228.75	253,960,000.00	13,000,000.00	3,612,000.00	9,552.96	284,917,903.71
E-113	IRRIal	229,807.00	11,159,235.00	3,604,004.50	273,660,000.00	15,000,000.00	4,095,000.00	12,005.33	307,760,051.83
E-114	IRRIal	306,409.34	13,987,732.00	4,377,925.00	284,160,000.00	30,800,000.00	6,685,000.00	18,348.08	340,335,414.42
E-115 A	IRRIal	612,818.69	28,179,582.00	7,021,784.00	2,553,440,000.00	100,000,000.00	13,888,000.00	41,639.00	2,703,183,823.69
E-115 B	IRRIal	612,818.69	28,179,582.00	6,782,576.50	2,553,440,000.00	100,000,000.00	13,888,000.00	39,620.89	2,702,942,598.08
E-116	IRRIal	651,119.81	13,843,497.00	3,891,021.75	1,294,919,936.00	54,800,000.00	5,845,000.00	17,670.93	1,373,968,245.49
E-117	IRRIal	536,216.31	18,471,350.00	4,929,796.50	1,533,840,000.00	68,000,000.00	11,571,000.00	27,835.27	1,637,376,198.08
E-160	IRRIal	268,108.16	11,786,718.00	3,829,033.25	265,496,000.00	21,200,000.00	5,565,000.00	16,421.80	308,161,281.21
E-2301	IRRIal	306,409.34	5,781,798.00	2,092,275.50	63,444,000.00	3,800,000.00	1,519,000.00	5,606.95	76,949,089.79
E-801 A	IRRIal	229,807.00	9,075,500.00	3,396,809.50	219,904,000.00	14,800,000.00	3,346,000.00	11,298.36	250,763,414.86
E-801 B	IRRIal	229,807.00	9,075,500.00	3,377,460.25	219,904,000.00	14,800,000.00	3,346,000.00	11,298.36	250,744,065.61
E-801 C	IRRIal	229,807.00	9,075,500.00	3,114,899.75	219,904,000.00	14,800,000.00	3,213,000.00	9,850.58	250,347,057.33
E-802	IRRIal	631,969.25	19,562,948.00	7,359,564.00	225,460,000.00	21,100,000.00	20,812,000.00	47,865.71	294,974,346.96
E-804	IRRIal	344,710.50	13,903,090.00	3,827,440.25	297,320,000.00	25,800,000.00	5,796,000.00	15,728.63	347,006,969.38
<b>Total =====&gt;</b>		<b>7,775,136.78</b>	<b>326,235,510.00</b>	<b>84,192,119.75</b>	<b>13,409,071,936.00</b>	<b>645,100,000.00</b>	<b>148,214,000.00</b>	<b>386,186.73</b>	<b>14,620,974,889.26</b>

Fig. 21-9 – (Sample for Assembled Subjective Reports)

As it is shown, this report is prepared base on “IRRIal” currency and consists of all the activities whose base prices are according to this currency. Each row in this table represents an equipment’s activities and each column the costs for each activity that have been summed in the last row/column.

It is noteworthy that due to the possibility of using distinct currencies in the pricing process, this report will be prepared on a separate page for each currency set in the software.

## ✓ Material Costs

The main structure and function of the software regarding estimating the net materials cost is exactly similar to what has been thoroughly explained about estimating fabrication costs.



Fig. 21-10 – (Tools for Estimating Net Materials Cost)

Here also, the reports will be prepared in the following categories:

- Plate
- Pipe
- Head
- Flange
- Forged
- Fitting
- Stud Bolt & Nut
- Profile
- Tube & Spacer
- Grating
- Gasket
- Waste

The most critical issue that needs elaboration in this part is **Waste**. When estimating the fabrication cost for a single or a set of equipment, two kinds of reports are of significance. One is a report on the net materials which are used in the fabrication of these sets of equipment and which eventually acts as the basis of you settling your account with your purchaser. This report is called “[Net Material Report](#).”

In this report, we are able to observe, measure, and document what we deliver to the purchaser, whether physically or with respect to area, volume, weight, and as a result price.

At the same time, however, there are materials supplementary to what has been delivered to the purchaser which, although measurable and documentable, are not paid for by the purchaser because he does not receive any of that physically. This report is called "[Gross Material Report](#)."

(To have a command over this issue, please refer to the explanations on Roll Margin adjustments in chapter 6).

Needless to say, it is necessary to consider an extra amount of length, depending on the limitations of the rolling machine, for fabricating a shell. That extra part, however, must be separated and identified as waste right after fabricating the shell.

Or, to fabricate a Baffle, for example, a net plate must first be prepared and then be drilled (perforated). What the purchaser will receive, in the end, is a perforated plate whose final weight will be undoubtedly less than the original one. The purchaser, thus, will pay for the perforated plate.

In effect, when and to what extent should this weight discrepancy, which is identified as waste, machining, perforating, etc., be examined in costs?

Waste report provides a set of these costs to help us estimate the final cost of an equipment.

It should be noted that since most of the material left over from the gross and net disparity is disposed of in the workshop and is sold for a low price, the base price should be considered lower than the net material price when pricing and determining Unit Price. In this way, we will not encounter a fake rise in price at the time of final cost estimation.

For example, if the unit price for fabricating a baffle has been A Rials per kilogram and we have sold its perforation waste for B Rials per kilogram, the cost for perforation waste that must be considered in calculations is  $(A-B)$  Rials.