

Estimation and costing - Simple estimation of the requirement of material etc., as applicable to the trade Exercise 2.8.16

Estimation is the method of calculating the various quantities and the expenditure to be incurred on a particular job or process.

In case the funds available are less than the estimated cost the work is done in part or by reducing it or specifications are altered,

The following essential details are required for preparing an estimate.

Drawings like plan, elevation and sections of important parts.

Detailed specifications about workmanship & properties of materials, etc.

Standard schedule of rates of the current year.

Estimating is the process of preparing an approximation of quantities which is a value used as input data and it is derived from the best information available.

An estimate that turns out to be incorrect will be an overestimate if the estimate exceeded the actual result, and an underestimate if the estimate fell short of the actual result.

A cost estimate contains approximate cost of a product process or operation. The cost estimate has a single total value and it is inclusive of identifiable component values.

Hand box and reference table

A hand book is a type of reference work, or other collection of instruction. That is intended to provide ready reference. The term originally applied to a small portable book containing information useful for its owner, but the oxford english dictionary defines as "any book giving information such as facts on a particular subject, guidance in some art or occupation, instruction for operating a machine etc. A handbook is sometimes referred to as a pocket reference.

Hand book may deal with any topic, and are generally having compact information in a particular field (or) technique. They are designed to be easily consulted and provides quick answer in a certain area.

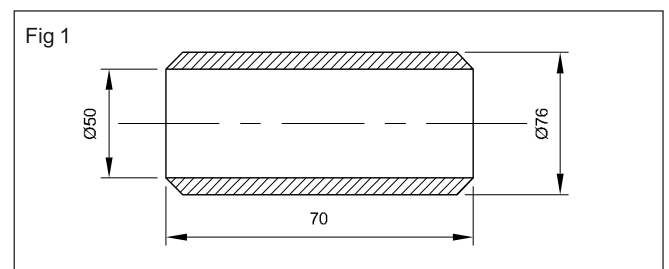
Example of engineering hand book include parry's cheorikal engineers hand book, mark standard hand book for machine engineer and the CRC hand book of chemistry and physics.

Reference table

A reference table may mean a set of references that are author may have cited (or) gained inspiration from whilst writing an article, similar to a bibliography.

It can also mean an information table that is used as a quick and easy reference for things that are difficult to remember such as comparing imperial with metric measurements. This kind of data is known as reference data.

Estimation of Bush



Raw Material Cost

$$\begin{aligned} \text{Size of Raw material} &= \phi 90 \times 80 \text{ mm} \\ &90 \text{ mm} = 9 \text{ cm} \\ &80 \text{ mm} = 8 \text{ cm} \end{aligned}$$

$$\begin{aligned} \text{Volume of Raw material} &= \pi r^2 h \text{ cm}^3 \\ &= \frac{22}{7} \times 4.5^2 \times 8 \text{ cm}^3 \\ &= 509.14 \text{ cm}^3 \end{aligned}$$

$$\text{Density of material} = 7.8 \text{ gm/cm}^3$$

$$\begin{aligned} \text{Weight of Raw material} &= \text{Volume of raw material} \times \\ &\quad \text{density of raw material} \\ &= 509.14 \times 7.8 \text{ gm/cm}^3 \\ &= 3971.3 \text{ gms say } 3.971 \text{ kg} \end{aligned}$$

$$\text{Raw material cost} = \text{Rs. } 140/\text{kg}$$

$$\begin{aligned} \text{Total raw material cost} &= 3.971 \times 140 \\ &= \text{Rs. } 555.94 \text{ say Rs. } 556 \end{aligned}$$

ESTIMATION SHEET

| Operation No. | Operation description | Lathe | Estimated time | Rate Rs.100 per hr. |
|---------------|--|----------|----------------|---|
| 01 | Setting and aligning job on lathe | - | 10 min | 16.66 |
| 02 | Set speed and feed | - | 2 min | 3.32 |
| 03 | Align cutting tool in position | - | 2 min | 3.32 |
| 04 | Turn the job | - | 50 min | 83.00 |
| 05 | Chamfer 45° angle corner | - | 8 min | 13.28 |
| 06 | Reverse the job on Lathe | - | 10 min | 16.66 |
| 07 | Turn the job | - | 20 min | 33.34 |
| 08 | Chamfer 45° on other side | - | 20 min | 33.34 |
| 09 | Centre drilling | - | 10 min | 16.66 |
| 10 | Mount drill chuck and drill using tail stock | Drilling | 3 min | 4.98 |
| 11 | Set drill rpm | Drilling | 2 min | 3.32 |
| 12 | Drill holes | Drilling | 20 min | 33.34 |
| 13 | Set the boring tool | Drilling | 15 min | 24.90 |
| 14 | Bore to the required diameter | | 8 min | 13.28 |
| 15 | Check the bore dia | | 10 min | 16.66 |
| 16 | Deburr the job and clean the machine | - | 10 min | 16.66 |
| 18 | Total estimation | | 200 min | Rs. 332.72 Rounded off Rs. 333 |

$$\text{Machining cost} = \frac{100}{60} \times 200 = \text{Rs. } 333.33 \text{ say Rs. } 333$$

$$\begin{aligned} \text{Total Cost} &= \text{Total raw material cost} + \text{Machining cost} \\ &= 556 + 333 \end{aligned}$$

Total Estimation Cost = Rs. 889/-

1 Estimating

Estimating means to determine the quantities of various items required to execute a job and to assess the cost of the execution. The estimator keeping in view the requirements arrived at during initial planning, chalk out a list of items and quantities. The cost is determined by him by consulting the price catalogue and schedule of labour rates. The various steps to form an estimate are:

- i Chalk out a list of items and quantities required.
- ii Consult the rate catalogues for pricing the various items.
- iii Assess the exact number of worker required to complete the job and after consulting the schedule of labour rates add the labour cost to the estimate under preparation. It should be noted that number of workmen required is dependent upon the time limit fixed to complete the services.
- iv Add supervision charges and executor's profit.
- v In case of Govt. organization, where the work is to be executed by the contractor, the tenders are floated only after correctly specifying the description of each item, to avoid any misunderstanding while execution.

For preparing an estimate the following are necessary.

2 Drawing : The necessary drawings of the building with dimension are required for execution of the work and also for estimation. (Fig 1) For the electrical installation the layout of the wiring should be shown on a separate drawing along with the position of the points etc.

3 Specifications of materials : Specification gives the details of materials, brand name, grade of quality, rating of current and voltage, quality certification like BIS or ISO etc. Specification helps both the wireman and the consumer to select the material according to commercial practice, cost and the requirement.

Price Catalogue

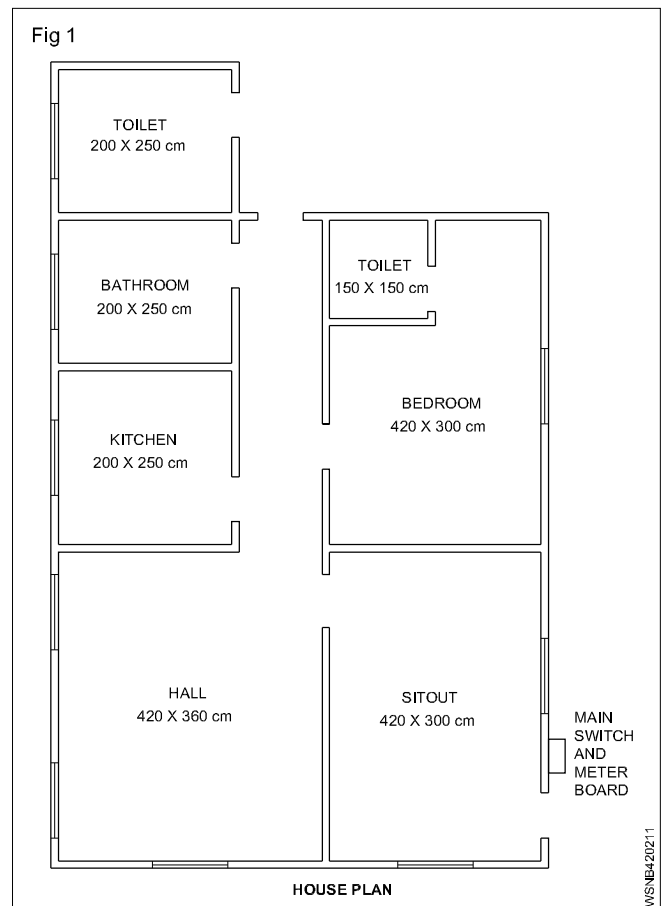
It is in the form of a booklet in which rates of various terms are indicated. The price catalogue is required to be amended as and when there is variation in the market.

Schedule of labour rates

It is also in the form of booklet indicating the labour rates.

Schedule of rates and estimating data

Almost all the Govt. departments have published schedule of rates or estimating data to facilitate the process of estimating. In these schedules or data, the estimated cost including labour charges for per meter run of wiring, overhead lines etc. With various sizes of wire, aluminium conductor, pole etc. are given. With the help of such a document, only overhead charges viz. supervision, departmental charges, etc. are required to be added after working one cost of the any services.



Determination of Conductor size

Before making an estimate it is necessary to find out the size of wire, cable or aluminium conductor. The following essential points are to be considered while calculating the size:

- a Current carrying capacity
- b Voltage drop
- c Minimum permissible size

There have been discussed separately in the following articles.

Current carrying capacity

In any circuit the value of the current will be more as compared to sub - circuits. In sub circuits as the load decreases, the current is also reduced. Thus it is very necessary to divide the services into groups in accordance with the amount of current which will flow through them. Afterwards, size of wire in each group is determined.

Voltage drop

As is known to the readers that the voltage drop is there as when the current flows through the wiring and the same should be as low as permissible and economical. The voltage drop can be determined by Ohm's law. As the resistance is inversely proportional to area, so the voltage drop will be less if the area of wire is more.

Minimum permission size

Due to mechanical reason the minimum permissible size of wire, U/G cables and conductors should be as follows:

- a Wire : The area of aluminium wire should not be less than 1.5 sq.mm and its single strand should not be less than 1.40 mm diameter.
- b U/G Cable : The area of conductor for two core cable should not be less than 6 sq.mm and for 25 sq.mm. The area of conductor for three and half cores cable should be 50 sq.mm or more.

A.C.S.R. The size of A.C.S.R should not be less than

$\frac{6}{0.83}$ inch or $\frac{6}{1 \times 21.08}$ mm having total area of cross section as 20-71 sq.mm.

Conductor size calculation for internal domestic wiring

The important point to be considered is the current carrying capacity, the voltage drop is usually of very small magnitude and will not have much effect for small domestic wiring. For multi - storeyed building, factories and industries, the voltage drop is required to be ascertained. If the voltage drop is much the house - hold appliance and motors will not work.

It should be noted that the maximum voltage drop should not be more than as given below.

- a Lighting circuit. In any circuit
 - i at 200 volt supply, voltage drop should not be more than 5 V.
 - ii at 210 volts, supply voltage drop should not be more than 5.1 volts;
 - iii at 220 volts supply, voltage drop should not be more than 5.4 volts.
 - iv at 30 volts supply, voltage drop should not be more than 5.6 volts
 - v at 250 volts supply, voltage drop should not be more than 6.0 volts.

From, the above it will be seen that the permissible voltage drop in a lighting circuit is 2% of the supply voltage plus one volt.

- b Industrial loads : The maximum voltage drop at the extreme and equipment or motor should not be more than 5% of the declared supply voltage.

In tables 1 various size of wires, current rating and voltage drop if loaded fully are given. Considering the load in amperes and voltage drop, suitable size of wire with required insulation is selected.

Table 1

Current ratings and voltage drop for vulcanised rubber PVC or polythene insulated or tough rubber PVC lead sheathed singles core aluminium wires or tables

| Size of Conductor | | 2 Cables 1c. or Single -phase a.c | | 3 or 4 cables of balanced 3 - phase | | 4 Cables d.c | |
|-------------------|-----------------------------------|-----------------------------------|---|-------------------------------------|---|---------------------------|---|
| Normal area sq.mm | Number and diameter of wire in mm | Current rating in amperes | Approx. length of run for 1 volt - drop in meters | Current rating in amperes | Approx. length of run for 1 volt - drop in meters | Current rating in amperes | Approx. length of run for 1 volt - drop in meters |
| 1.5 | 1/1.40 | 10 | 2.3 | 9 | 2.9 | 9 | 2.5 |
| 2.5 | 1/1.80 | 15 | 2.5 | 12 | 3.6 | 11 | 3.4 |
| 4.0 | 1/2.24 | 20 | 2.9 | 17 | 3.9 | 15 | 4.1 |
| 6.0 | 1/2.80 | 27 | 3.4 | 24 | 4.3 | 21 | 4.3 |
| 10.0 | 1/3.55 | 34 | 4.3 | 31 | 5.4 | 27 | 5.4 |
| 16.0 | 7/1.70 | 43 | 5.4 | 38 | 7.0 | 35 | 6.8 |
| 25.0 | 7/2.24 | 59 | 6.8 | 54 | 8.5 | 48 | 8.5 |
| 35.0 | 7/2.50 | 69 | 7.2 | 62 | 9.3 | 55 | 9.0 |
| 50.0 | 7/3.0 19/1.80 | 91 | 7.9 | 82 | 10.1 | 69 | 10.0 |

After deciding the type of wiring system the electrician has to prepare the following details as per the consumer's interest, durability of wiring accessories, cost and available work force.

- 1 Position of electrical points in each area of the house based on consumer's requirement. (Fig 2)
- 2 Prepare a layout of wiring on the building plan. (Fig 3)
- 3 Calculate total connected load and type of load to decide whether three phase or single phase supply is required.
- 4 Prepare a circuit diagram showing the connections and number of lighting and power circuits. Fig 4 shows the cubical wiring diagram model.
- 5 Prepare a list of electrical accessories to be procured.
- 6 Calculate the length of different sizes of cables required based on the load, voltage drop and number of cables in each circuit run.
- 7 Calculate the length of different sizes of batten/PVC casing and capping/PVC/metal conduit required based on the load, voltage drop and number of cables in each circuit run.
- 8 Prepare a list of hardwares like screw, nails, etc. required to execute the job.
- 9 Calculate the labour charges for entire wiring.

- 10 Calculate the cost of accessories, base materials like batten/conduit/PVC casing and capping, cables, hardware and labour charges.
- 11 Calculate the total cost of wiring including 5% contingencies for the unforeseen items and variation in prices.

In the above list, items 1 to 5,8 and 11 were dealt in various stages of skill development. Let us consider item No.6 i.e. calculation of length of different sizes of cables in the wiring.

Before selection of sizes of cable and their length we have to calculate the total load of the house and also to decide whether three phase or single phase supply to be requisitioned from local electricity board.

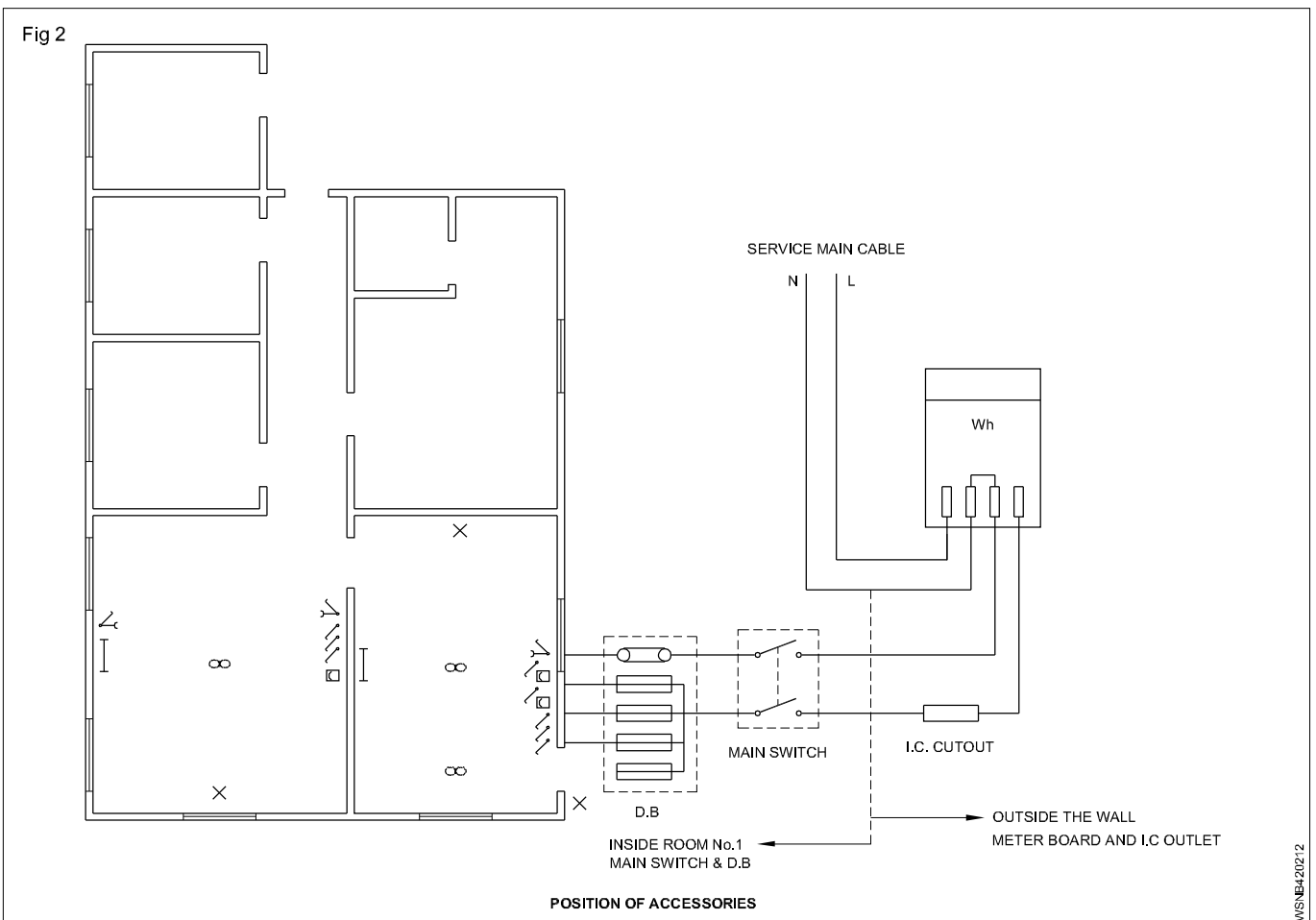
Total connected load : As this exercise is a part of cognitive skill development in 1st Year. Let us assume the total connected load to be 2400 watts.

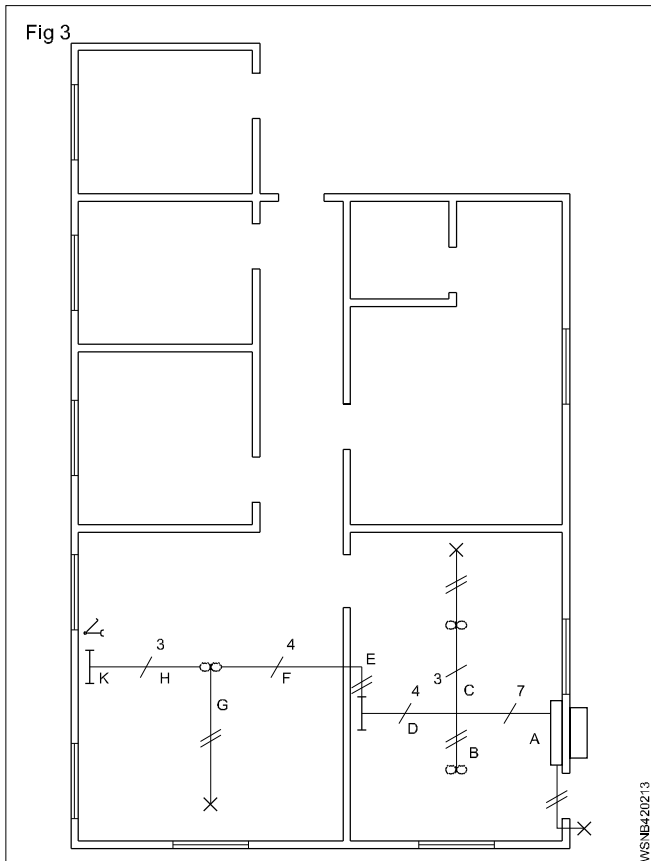
Assuming the total connected load is 2400w.

then current will be $2400w/240V = 10amp$

(Assumption PF is unity and single phase supply)

Hence copper cable 3/0.036 could be selected for main board connection which can safely carry 10 amp.





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- a one tube light point
 - b one light point
 - c two fan points
 - d one 6 amps three-pin socket
- } circuit - 1

Room No.2 should be provided with

- a one tube light point
 - b one light point
 - c one fan point
 - d two 6 amp three-pin socket
- } circuit - 2

Total connected load of Room No.1 & 2 will be

Circuit 1

| Sl. No. | Description | Quantity | Wattage rating | Total wattage |
|---------|---------------------|----------|----------------|---------------|
| 1 | Tube light (1200mm) | 1 | 50 | 50 |
| 2 | Light point | 2 | 60 | 120 |
| 3 | Fan points | 2 | 60 | 120 |
| 4 | 6A 3 pin socket | 1 | 100 | 100 |
| | | | | 390 watts |

Circuit 2

| Sl. No. | Description | Quantity | Wattage rating | Total wattage |
|---------|---------------------|----------|----------------|---------------|
| 1 | Tube light (1200mm) | 1 | 50 | 50 |
| 2 | Light point | 1 | 60 | 60 |
| 3 | Fan point | 1 | 60 | 60 |
| 4 | 6A 3 pin socket | 2 | 100 | 200 |
| | | | | 370 watts |

Total wattage = 390 + 370 = 760 watt of circuit 1 & 2

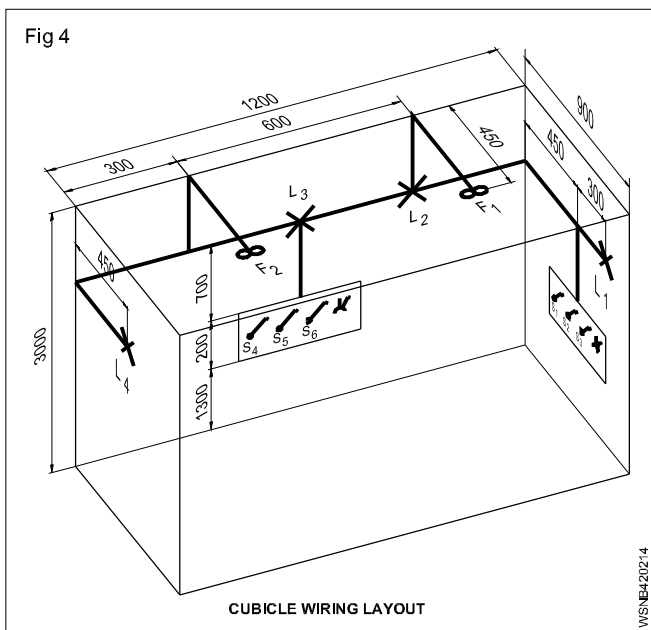
As this is well within 800 watt rating of a branch circuit we can wire up the hall and sitout in one branch circuit. Remember that each branch circuit termination should have one phase cable and one neutral cable brought to the DB.

Draw the position of switches, sockets, lamps and fans in the house plan (position of accessories shown in Fig 2)

Then draw the layout diagram for the hall and sitout keeping in view of the position of accessories. (Refer layout diagram Fig 3)

After drawing the layout diagram, draw the circuit diagram for the hall and sitout.

At this stage you may have to modify the layout diagram in most of the cases considering economical use of cables and the conduit and also considering aesthetic sense of wiring layout.



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Length of cables : Main cable say from meter board to the DB

2 x 1.5 = 3 m of size 3/0.36 copper cable

(1.5m is taken as a rough value)

At this stage we have to analyse the house plan as well as the consumer's requirement of electrical points. Only Room No.1 & 2 are taken in the following example.

According to the consumer the requirements are:

Room No.1 should be provided with

After finalising the layout and the circuit diagram, analyse the cable runs, indicate in the layout diagram the number of cables to be drawn in each section of the conduit.

In this case understudy, the total load is of lighting, fan and 3A pin sockets amounting to 760 watt which is less than 5 amp as such cable selected is 1 sq.mm (1/1.12) or (1/18) copper cable or say aluminium cable of 1.5 sq.mm (1/1.4).

Horizontal run

J -150cm 1.5m

Total of 2 to 5 25m say 25m

1/1.2 copper cable required for

| | | | | | |
|-------------|---|---|---------------------|---|-------|
| Conduit Run | J | = | (2.5 + 0.9 + 0.8)2 | = | 8.4m |
| -do- | A | = | (1.5 + 0.9 + 0.8)7 | = | 22.4m |
| -do- | B | = | 1.1 x 2 | = | 2.2m |
| -do- | C | = | 1.05 x 4 + 1.85 x 2 | = | 7.9m |
| -do- | D | = | (1.5 + 0.8 + 0.9)3 | = | 9.6m |
| -do- | F | = | (1.8 + 0.9 + 0.8)5 | = | 17.5m |
| -do- | G | = | 2.2 x 2 | = | 4.4m |
| -do- | H | = | (2.2 + 0.8)2 | = | 6.0m |
| -do- | K | = | (0.9 + 0.2)2 | = | 2.2m |
| | | | | | 80.6m |

Say 90m of cable required

As thumb rule length of cable = length of conduit x 3 = 25m x 3 = 75m. This length is more or less the same as the one calculated.

Required length of copper wire 14 SWG (For earthing)

Router K, H, F, E, D and A

0.8 + 0.9 + 1.8 + 0.9 + 0.8 + 1 + 0.8 + 0.9 + 1.5 + 1.5 + 1.5 + 0.8 + 0.9 + 1 = 15.1 m

Say 20m or 600 grams

Now prepare a complete list of accessories required, length of conduit required, length of the cable required and the required copper wire 14 SWG. Calculate the cost of the above materials. Say in this case Rs.2500/-.

Method of calculating labour charges

Work can be completed in two days by one electrician and one helper.

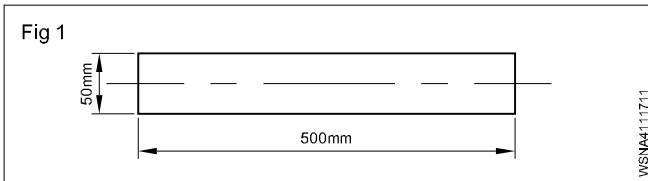
Electrician @ Rs.150/- 2 days = Rs.300

Helper @ Rs.90/- 2 days = Rs.180

Rs.480

On the other hand if the consumer wishes to give wiring on contract, based on number of points, the calculation of contract cost according to points.

- 1 What is the total estimation cost of M.S rod dia 50mm and length 500 mm, if cost of material Rs.80/kg and the density of the M.S rod is 7.8gm/cm³. Lathe time taken to complete the component is 1hr 30minutes and lathe charge is Rs. 80/hr.



M.S rod dia(d) = 50 mm or 5 cm

r = 2.5 cm, l = 500 mm = 50 cm

$$\begin{aligned} \text{Volume of M.S rod} &= \pi r^2 \times l \text{ unit}^3 \\ &= \frac{22}{7} \times 2.5 \times 2.5 \times 50 \\ &= 981.875 \text{ cm}^3 \end{aligned}$$

Weight of M.S rod = Volume x density of M.S rod

$$\text{Weight} = 981.875 \times 7.8$$

Weight of M.S rod = 7.659 kg

Cost of material = Rs.80/kg

cost of M.S. rod = 7.659 x 80

$$= \text{Rs.}612.72$$

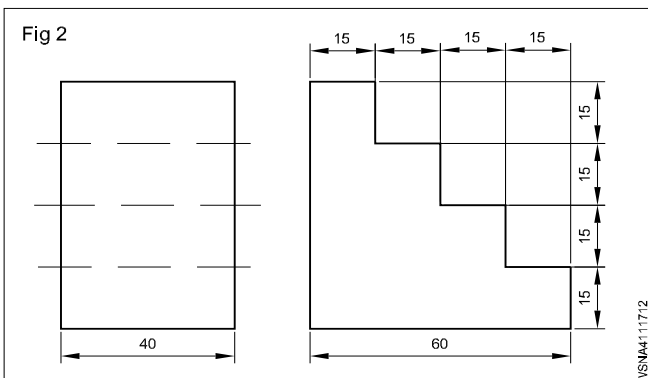
Weight of M.S rod = 7.659 kg

Cost of material M.S.rod =Rs.612.72

$$\begin{aligned} \text{Machining cost in lathe} &= \frac{80}{60} \times 90 = \text{Rs. } 120 \\ &\quad (1\text{hr } 30\text{min} = 90 \text{ mins}) \end{aligned}$$

$$\begin{aligned} \text{Total Estimation of cost} &= \text{Rs } 120 + 612.72 \\ &= \text{Rs } 732.72 \text{ say Rs. } 733 \end{aligned}$$

- 2 What is the total estimation cost of job as shown in figure the density of the material is 7.8 gm/cm³ time taken in milling machine to complete the job is 2 hours, charge for the milling machine is Rs.200/hr and material cost is Rs.60/kg.



$$\begin{aligned} \text{Area of square job} &= 60 \times 60 \text{ mm} = 6 \times 6 = 36 \text{ cm}^2 \\ \text{Area of cut sizes} &= 1.5 \times 1.5 = 2.25 \text{ cm}^2 \\ &= 1.5 \times 3 = 4.5 \text{ cm}^2 \\ &= 1.5 \times 4.5 = 6.75 \text{ cm}^2 \\ \text{Total area of cut size} &= 2.25 + 4.5 + 6.75 = 13.5 \text{ cm}^2 \end{aligned}$$

Volume = Area x Thickness

$$\text{Volume of cut size} = 13.5 \times 4 = 54 \text{ cm}^3$$

$$\text{Volume of square job} = 36 \times 4 = 144 \text{ cm}^3$$

$$\begin{aligned} \text{Volume of job} &= \text{Total volume} - \text{cut out volume} \\ &= 144 - 54 = 90 \text{ cm}^3 \end{aligned}$$

$$\begin{aligned} \text{Weight of job} &= 90 \text{ cm}^3 \times 7.8 \text{ gm/cm}^3 \\ &= 702 \text{ gms} = 0.702 \text{ kg} \end{aligned}$$

$$\text{Material cost} = 0.702 \times 60 = \text{Rs.}42.12$$

$$\text{Machining cost} = \text{Rs.}200/\text{hr}$$

$$\text{Machining cost for 2hrs} = 2 \times \text{Rs.}200/\text{hr} = \text{Rs.}400$$

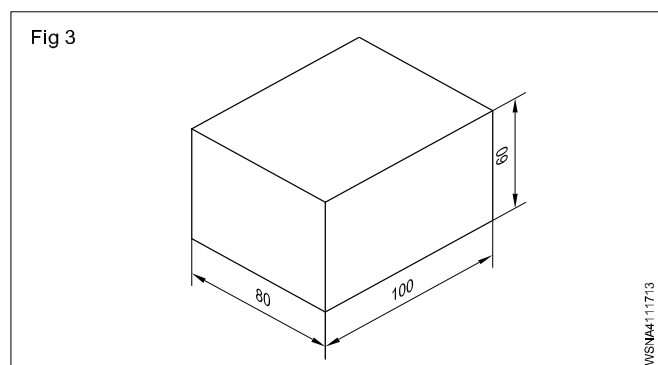
$$\text{Total cost for job} = \text{Material cost} + \text{Machining cost}$$

$$= \text{Rs. } 42.12 + \text{Rs.}400$$

$$= \text{Rs.}442.12$$

Total cost for job = Rs.442.12

- 3 What is the estimation of milling cost of a rectangular block size 100 x 80 x 60 mm, if cost of the milling is Rs.2/sq.cm.



$$\begin{aligned} \text{Rectangular block size} &= 100 \times 80 \times 60 \text{ mm} \\ &= 10 \times 8 \times 6 \text{ cm} \end{aligned}$$

$$\text{Surface area of } 6 \times 8 \times 2 = 96 \text{ cm}^2$$

$$\text{Surface area of } 6 \times 10 \times 2 = 120 \text{ cm}^2$$

$$\text{Surface area of } 8 \times 10 \times 2 = 160 \text{ cm}^2$$

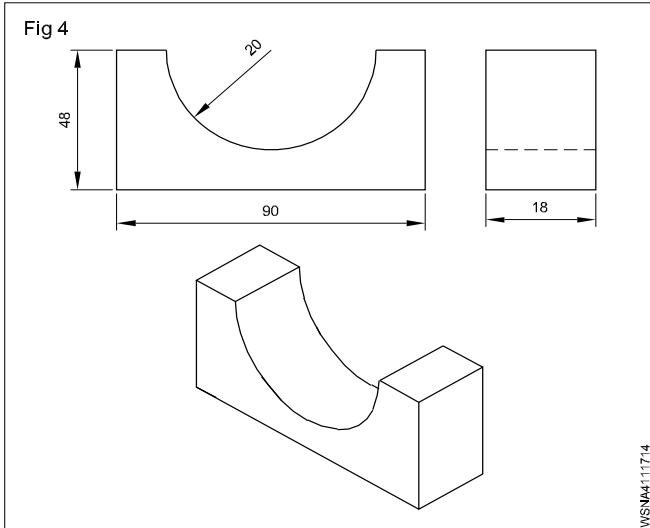
$$\begin{aligned} \text{Total surface area of} \\ \text{rectangular block} &= 96 + 120 + 160 \\ &= 376 \text{ cm}^2 \end{aligned}$$

$$\text{Milling cost} = \text{Rs.}10/\text{cm}^2$$

Milling cost of rectangular block = $376 \text{ cm}^2 \times \text{Rs.}2/\text{cm}^2$
 = Rs.752

Milling cost of rectangular block = Rs.752.

4 What is the total estimation cost of component if the filing & scraping cost is Rs.20/cm² in the block as shown in figure, the density of the material is 7.8 gm/cm³ and the cost of the material is Rs.130/kg.



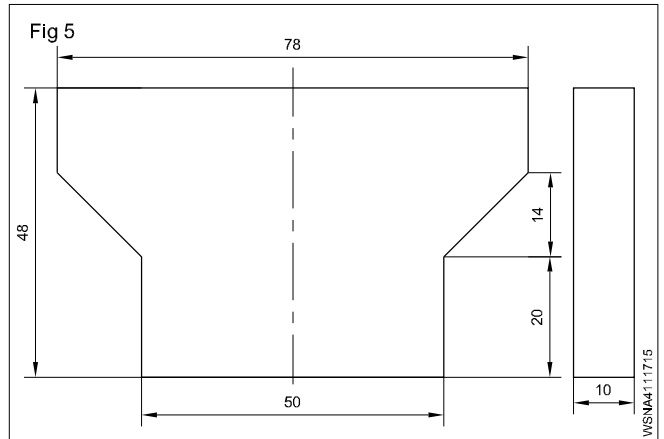
M.S block size = $90 \times 48 \times 18 \text{ mm}$
 = $9 \times 4.8 \times 1.8 \text{ cm}$
 Volume of block = $9 \times 4.8 \times 1.8 \text{ cm}^3$
 = 77.76 cm^3
 Volume of half circle = $\frac{\pi r^2}{2} \times 1.8 \text{ cm}^3 = 2.83 \text{ cm}^3$
 Area of filing & scraping = $\frac{2\pi r}{2} \times 1.8$
 = $\frac{2 \times 3.142 \times 20}{2} \times 1.8 = 113.112 \text{ cm}^2$
 Cost of filing & scraping = $113.112 \times \text{Rs.}20 = \text{Rs.}226.22$
 Volume of the block = Volume of whole size - Volume of cur piece
 Volume of block = $77.76 - 2.83 = 74.93 \text{ cm}^3$
 Weight of block = Volume x density
 = $74.93 \times 7.8 = 584.45 \text{ gms}$
 = 0.58445 kg
 Material cost = $0.58445 \text{ kg} \times \text{Rs.}130/\text{kg}$
 = Rs.75.98
 Total cost = Material cost + Filling & scraping cost
 Total cost = $75.98 + 226.22$
 = Rs.302.20

Material cost of M.S plate as per fig = Rs.75.98

Filing & scraping cost = Rs.226.22

Total cost of material = Rs.302.20

5 What is the estimation cost of the job shown in figure if the cost of material is Rs.140/kg and the density of the material is 7.8 gm/cm³. Machining time taken for milling machine 3hr 25 mins and machining charge is Rs 180/hr.



Volume of blank = $78 \times 48 \times 10 \text{ mm}$
 = $7.8 \times 4.8 \times 1 \text{ cm}$
 = 37.44 cm^3

Volume of cut-out pieces = 2 no. of triangular pieces + 1 rectangular pieces

Volume of triangular pieces = $\frac{1}{2} \times b \times h \times \text{thickness}$
 = $\frac{1}{2} \times 1.4 \times 1.4 \times 1$
 = $0.98 \times 2 \text{ pieces}$
 = 1.96 cm^3

Volume of rectangular piece = $2.8 \times 2 \times 1$
 = 5.6 cm^3

Volume of job as per fig = volume of blank size of job - (volume of 2 triangular pieces + volume of 1 rectangular piece)
 = $37.44 - (1.96 + 5.6) \text{ cm}^3$
 = $37.44 - 7.56 \text{ cm}^3$
 = 29.88 cm^3

Machining charge = $\frac{180}{60} \times 205$
 = Rs.615

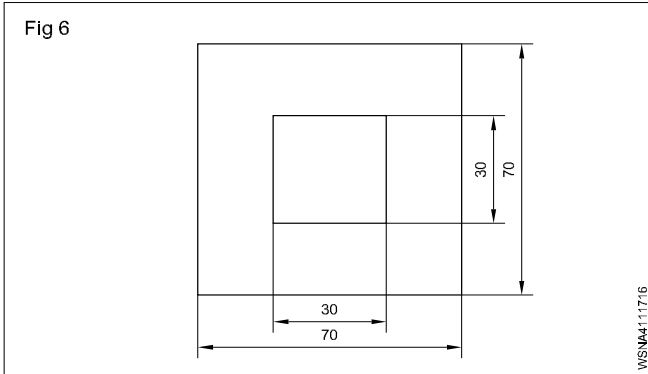
Cost of material = Rs.140 /kg

Weight of material = $29.88 \times 7.8 \text{ gm/cm}^3$
 = 233.064 gms
 = 0.233 kg

Material cost of job = $0.233 \text{ kg} \times \text{Rs.}140$
 = Rs.32.62

Estimation cost of job = Rs.32.62 + 615
 = Rs.647.62

- 6 What is the estimation of labour charge for making inside square of size 30 x 30 mm, if making charge Rs.500/10cm².



Size of square hole = 30 x 30 mm
= 3 x 3 cm = 9 cm²

Making charge = Rs.500 per 10 cm²

Labour charge for making square of 9 cm² } = $\frac{500}{10} \times 9 = \text{Rs.}450$

Labour charge for making square hole = Rs.450

- 7 What is the total estimation cost for making the component of 8 drilled hole dia 10mm and 4Nos of M6 taps in the plate, if Rs.8 per drilled holes and Rs.12 per drill & tap.

No.of drilled holes = 8 Nos

No.of tapped hloes = 4 Nos

Charge for making drilled hole = Rs.8 per hole

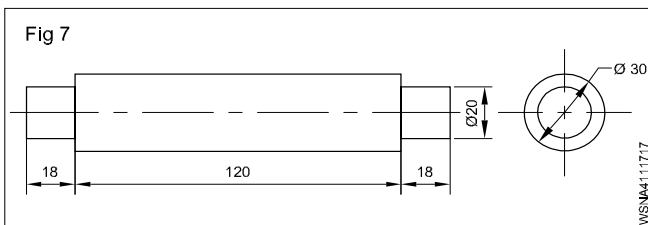
Charge for making tapped hole = Rs.12 per tapped hole

Cost for making 8 drilled holes = 8 x Rs.8 = Rs.64

Cost for making 4 tapped holes = 4 x Rs.12 = Rs.48

Total estimation cost for making 8 drilled holes and 4 tapped holes } = 64 + 48 = Rs.112

- 8 What is the total estimation cost for mandrel, as shown in figure, if density is 7.8 gm/cm³ and material cost is Rs. 240/kg.



Size of larger dia of mandrel = dia 30 mm
radius = 1.5 cm

Size of smaller dia of mandrel = dia 20 mm
radius = 1 cm

Volume of larger dia of mandrel = $\pi r^2 \times l$
= 3.142 x 1.5 x 1.5 x 12 cm
= 84.834 cm³

Volume of smaller dia of mandrel = $\pi r^2 \times l$
= 3.142 x 1 x 1 x 1.8 x 2 pieces
= 11.311 cm³

Total volume of mandrel = 84.834 + 11.311 cm³
= 96.145 cm³

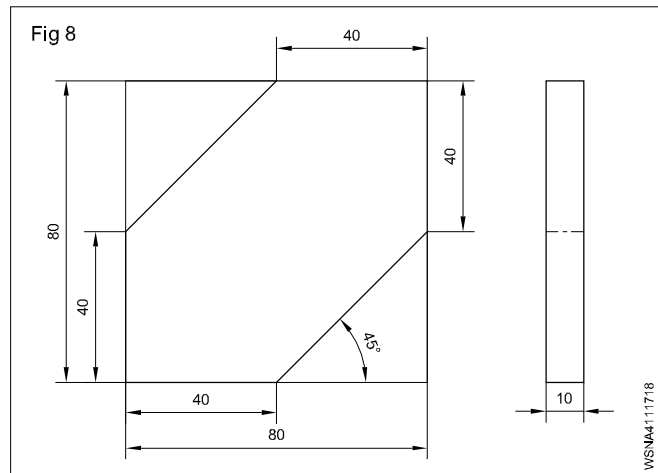
Density of mandrel = 7.8 gm/cm³

Weight of mandrel = 96.145 x 7.8 gm/cm³
= 749.931 gms = 0.750 kg

Weight of mandrel = 0.75 kg

Estimation of mandrel cost = 0.75 x 240 = Rs. 180

- 9 What is the material cost of component as shown in figure, if density of material is 7.8 gm/cm³. Material cost Rs. 180/kg.



Size of blank = 80 x 80 x 10 mm
= 8 x 8 x 1 cm = 64 cm³

Area of triangle cut = $\frac{1}{2} \times b \times h$
= $\frac{1}{2} \times 4 \times 4 \text{ cm}^2 = 8 \text{ cm}^2$

For 2 triangle pieces = 2 x 8 cm² = 16 cm²

Volume = area x thickness
= 16 x 1 = 16 cm³

Volume of material = volume of blank size – volume of 2 triangle cut-out pieces
= 64 – 16 = 48 cm³

Density of material = 7.8 gm/cm³

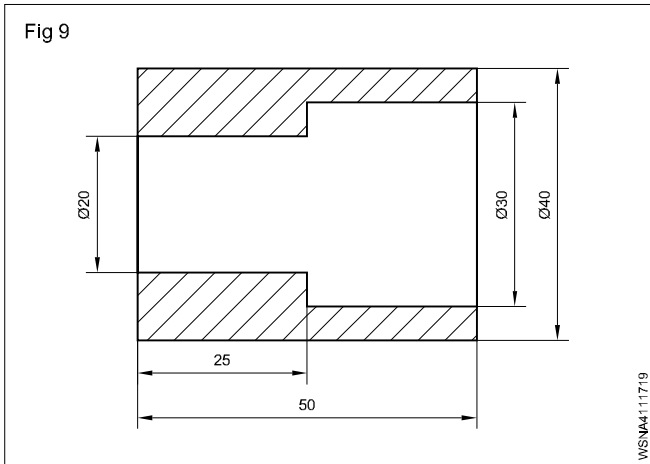
Weight of component = volume x density
= 48 x 7.8
= 374.4 gms

Weight of the component = 0.374 kg

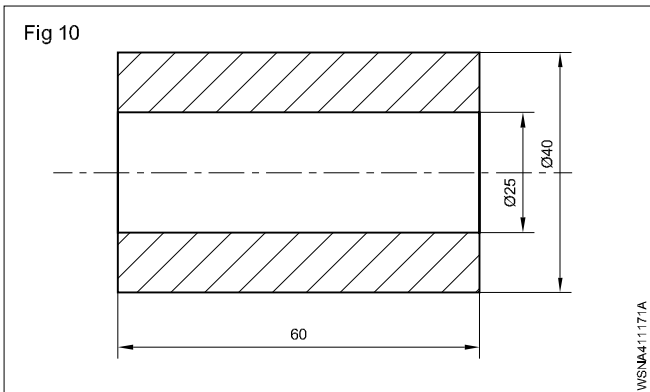
Cost of material = 0.374 x 180 = Rs. 67.32

Assignment

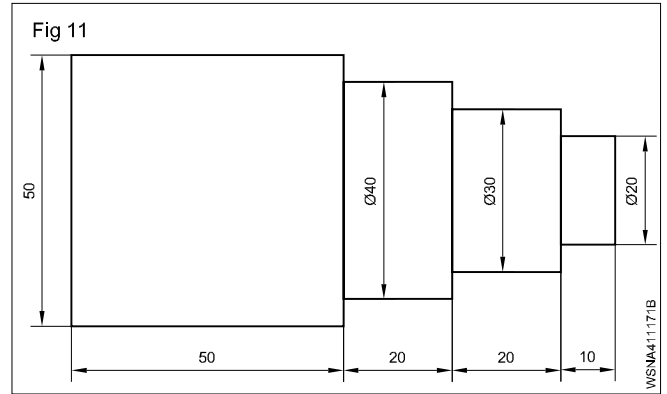
- 1 What is the material cost if cost is Rs.120/kg and density of the material is 7.8gm/cm^3 .



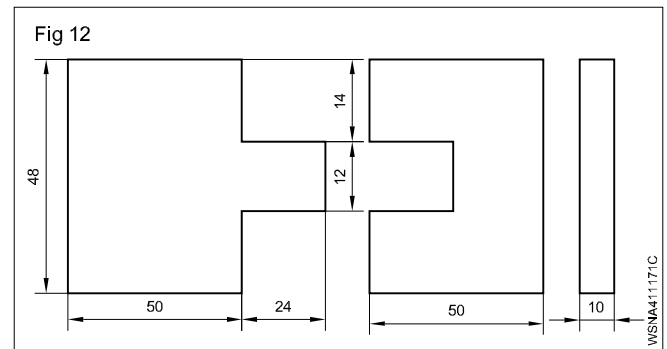
- 2 What is the total manufacturing cost of bush for turning 1 hour 20 minutes and drilling the bush 25 minutes if lathe charged for Rs.60/hr.



- 3 Find the estimation of manufacturing cost of the component, if density is 7.8 gm/cm^3 , and machining cost Rs 380/hr and machining time 4hr 15mins.



- 4 What is the material cost and machining cost for complete the job. Material density is 7.8 gm/cm^3 and material cost is Rs.90/kg. Labour time taken for complete the job $6\frac{1}{2}$ hours he charged is Rs.300 per day of 8hrs.



- 5 What is the estimation of labour charge for making 10 numbers centre gauge if each time taken for complete $2\frac{1}{2}$ hours, and labour charge is Rs.800 per 6 hrs.