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I.   Calculating Material List for Concrete and other construction mat

A.   Basic Data

Density of Cement...1400 Kgs/m3

River Sand...1840   ,,

Stone Aggregate.......................................2250   ,,

Pumice..700   ,,

Un reinforced Concrete.............................2300   ,,

Reinforced Concrete..................................2400   ,,

Lime..1900   ,,

Steel...7850   ,,

Cement Mortar.......................................2300   ,,

Compo Mortar.......................................1700   ,,

Basalt..2700   ,,

Trachyte..2600   ,,

Pumice Stone...950   ,,

Source –ESCP 1,1983

       Indian Practice

       Civil Engineers Hand Book

B.   General Formula

1. Concrete Mix Ratio = 1:2:4

   Let volume of concrete = Zm^3

   Then   a) Cement = 1/7 x zm^3 x 1400Kg/m^3 x 1.3 shrinkage x 1.05 Wastage

               = 273Kgs Z

               = $0.19m^3$ Z

         b) Sand   = 2/7 x Zm^3 x 1840Kg/m^3 x 1.3 shrinkage x 1.05 Wastage

               = 718Kgs Z

               = 718/1840 m^3 Z

               = $0.39m^3$ Z

         c) Gravel = 4/7 x Zm^3 x 2250Kg/m^3 x 1.3 shrinkage x 1.05 Wastage

               = 1755 Kgs Z

               = $0.95 m^3$ Z

2. Lime Mortar Mix Ratio = 1:4

   Let volume of Lime mortar = $Y m^3$

   Then   a) Lime = 1/5 x $Y m^3$ x 1900Kg/ m^3 x 1.2 shrinkage x 1.05 Wastage

               = 479Kgs Y

               = $0.25 m^3$ Y

         b) Sand   = 4/5x $Y m^3$ x 1840Kg/ m^3x 1.2 shrinkage x 1.05 Wastage

               = 1855Kgs Y

               = 1855/1840 m^3 Y

               = $1.01 m^3$ Y

3. Cement Mortar Mix Ratio = 1:4

   Let volume of Cement mortar = Wm^3

   Then   a) Cement = 1/5 x $W m^3$ x 1400Kg/ m^3 x 1.25 shrinkage x 1.05 Wastage

               = 368Kgs W

               = $0.26 m^3$ W

         b) Sand   = 4/5x Wm^3 x 1840Kg/ m^3x 1.25 shrinkage x 1.05 Wastage

               = 1932Kgs W

               = 1932/1840 m^3 W

               = $1.05 m^3$ W

4. Compo Mortar Mix Ratio = 1:2:9

    Let volume of Compo-mortar = Um^3

    Then   a) Cement = 1/12 x U m^3 x 1400Kg/ m^3 x 1.20 shrinkage x 1.05 Wastage

                                  = 147Kgs U

                                  = 0.105 m^3 U

             b) Lime   = 2/12 x U m^3 x 1900Kg/ m^3 x 1.20shrinkage x 1.05 Wastage

                                  = 399Kgs U

                                  = 0.21 m^3 U

             c) Sand   = 9/12x Um^3 x 1840Kg/ m^3x 1.20 shrinkage x 1.05 Wastage

                                  = 1739Kgs U

                                  = 1739/1840 m^3 U

                                  = 0.95 m^3 U

C.   Material list Calculation

I) <u>Concrete</u>

Assuming 30% Shrinkage

　　　　5% Wastage

For Mechanical Mix W/C = 0.4 – 0.5

　　Hand Mix W/C = 0.4 – 0.65

Note: Hand Mix shall only be allowed for class II concrete, and shall not be allowed for concrete of class c-20 and above

Item	Type of Work	Material required to produce 1m3 concrete
1	Concrete C-7 Mechanical Mix Mix ratio 1:4:8	Cement = 150kg (3bags) Sand = 773Kg (0.42m3) Gravel = 1890Kgs (0.84m3) Water = 60 liters
2	Concrete C-15 Mechanical Mix Mix ratio 1:3:6	Cement = 200kg (4bags) Sand = 754Kg (0.41m3) Gravel = 1843Kgs (0.82m3) Water = 80 liters
3	Concrete C-20 Mechanical Mix Mix ratio 1:2:4	Cement = 275kg (5.5bags) Sand = 718Kg (0.39m3) Gravel = 1755Kgs (0.78m3) Water = 110 liters
4	Concrete C-30 Mechanical Mix Mix ratio 1:2:3	Cement = 325kg (6.5bags) Sand = 837Kg (0.45m3) Gravel = 1536Kgs (0.68m3) Water = 130 litters
5	Concrete C-7 Hand Mix Mix ratio 1:3.5:8	Cement = 153kg (3.06bags) Sand = 704Kg (0.38m3) Gravel = 1966Kgs (0.87m3) Water = 92 liters
6	Concrete C-15 Hand Mix Mix ratio 1:2.5:6	Cement = 202kg (4.04bags) Sand = 661Kg (0.36m3) Gravel = 1940Kgs (0.868m3) Water = 121 liters

II. Calculating Material for Masonry

A. Basic Data

For one meter cube masonry work

- Sub Structure (foundation wall) = $1m^3$ of stone/m^3 of masonry
- Super Structure (semi dressed) = $1.25m^3$ of stone/m^3 of masonry
- Super Structure (dressed) = $1.5m^3$ of stone/m^3 of masonry

B. Stone Masonry Material Requirement

a) 50cm thick basaltic or equivalent foundation wall bedded in cement mortar 1:4

1) Stone   = $1m^3/m^3$
2) Mortar   =$0.4m^3/m^3$
    2.1) Cement   = 150Kgs/ m^3
    2.2) Sand   = $0.42m^3/m^3$

b) 50 cm thick roughly dressed super structure stone wall bedded in cement mortar 1:4

1) Stone   = $1.25m^3/m^3$
2) Mortar   =$0.4m^3/m^3$
    2.1) Cement   = 150Kgs/ m^3
    2.2) Sand   = $0.42m^3/m^3$

c) 50 cm thick dressed super structure stone wall bedded in cement mortar 1:4

1) Stone   = $1.5m^3/m^3$
2) Mortar   =$0.4m^3/m^3$
    2.1) Cement   = 150Kgs/ m^3
    2.2) Sand   = $0.42m^3/m^3$

C. Brick Masonry for Super-Structure

a) ½ brick wall bedded in compo-mortar 1:2:9 both sides left for plastering

1) Brick with 5% wastage   = $58pcs/m^2$
2) Compo – mortar (10mm joints) = $0.0353m^3/m^2$
with 15% wastage
    2.1) Cement   = $5kg/m^2$
    2.2) Lime   = $14Kgs/m^2$
    2.3) Sand   = $0.034m3/m^2$

b) one brick wall bedded in compo-mortar 1:2:9 both sides left for plastering
   1) Brick with 5% wastage   = 115pcs/m^2
   2) Compo – mortar with 15% wastage (10mm joints) = 0.085m^3/m^2
      2.1) Cement   =   12.5kg/m^2
      2.2) Lime   =   34Kgs/m^2
      2.3) Sand   =   0.081m3/m^2
c) 1 ½ brick wall bedded in compo-mortar 1:2:9 both sides left for plastering
   1) Brick with 5% wastage   = 173pcs/m^2
   2) Compo – mortar with 15% wastage (10mm joints) = 0.113m^3/m^2
      2.1) Cement   = 17kg/m^2
      2.2) Lime   = 45Kgs/m^2
      2.3) Sand   =0.11m3/m^2

D.   Hollow Block Masonry for Super Structure
   a) 10cm thick hollow concrete block wall bedded in compo-mortar 1:4
      1) Hollow block with 5% wastage   = 13pcs/m^2
      2) Mortar with 20% wastage (10mm joints) = 0.0135m^3/m^2
         2.1) Cement   =   5kg/m^2
         2.2) Sand =   0.014m3/m^2
   b) 15cm thick hollow concrete block wall bedded in compo-mortar 1:4
      1) Hollow block with 5% wastage   = 13pcs/m^2
      2) Mortar with 20% wastage (10mm joints) = 0.02m^3/m^2
         2.1) Cement   =   7.5kg/m^2
         2.2) Sand =   0.022m3/m^2
   c) 20cm thick hollow concrete block wall bedded in compo-mortar 1:4
      1) Hollow block with 5% wastage   = 13pcs/m^2
      2) Mortar with 20% wastage (10mm joints) = 0.027m^3/m^2
         2.1) Cement   =   10kg/m^2
         2.2) Sand =   0.028m3/m^2

III. Mortar
A. Cement Mortar

Assuming 25% Shrinkage and 5% wastage

Item	Types of Work	Material required to produce 1m3 mortar
1	Cement Mortar 1:3	Cement = 460kgs Sand = 0.99 m^3
2	Cement Mortar 1:4	Cement = 308kgs Sand = 1.05 m^3
3	Cement Mortar 1:5	Cement = 306kgs Sand = 1.10 m^3
4	Cement Mortar 1:6	Cement = 263kgs Sand = 1.13 m^3

B. Compo- Mortar

Assuming 20% Shrinkage and 5% wastage

Item	Types of Work	Material required to produce 1m3 Compo-mortar
1	Compo-Mortar 1:1:6	Cement = 221Kgs Lime = 300Kgs Sand = 0.95 m^3
2	Compo-Mortar 1:2:9	Cement = 147Kgs Lime = 399Kgs Sand = 0.95 m^3
3	Compo-Mortar 1/2:1:3	Cement = 195Kgs Lime = 528Kgs Sand = 0.89 m^3

C.   Light weight screed

Assuming 25% Shrinkage and 5% wastage

Item	Types of Work	Material required to produce 1m3 Compo-mortar
1	Cement Pumice 1:6	Cement = 263Kgs Pumice = 1.13 m^3
2	Cement Pumice 1:8	Cement = 205Kgs Pumice = 1.17 m^3

IV. Roofing

A. Roofing out of corrugated iron sheet nailed on wooden truss

a) Roof covering up to 15% slope

    1) Roofing sheet   = 1.38m2/corrugated iron sheet

    2) Washer   = 10pcs/corrugated iron sheet

    3) Dome Headed nail   = 10pcs/corrugated iron sheet

b) Roof ridge 33cm wide

    1) Covering of 2m length= 5pcs/9ml

    2) Dome Headed nail   = 0.05kgs/ml

c) Valley covers

    1) Covering of 2m length= 5pcs/9ml

    2) Nails 6cm   = 0.006Kgs/ml

d) Gutter

    1) Gutter with 2% wastage   = 1.02mts/ml

    2) Lead

    3) Acid

    4) Screws (Fixers)   = 3pcs/ml

    5) Metal Brackets   = 3pcs/ml

e) Down Pipe

    1) Down pipe   = 9pcs/10ml

    2) Metal Brackets   =2pcs/ml

    3) Nut & Bolt for metal Bracket = 4pcs/ml

      (Fixers)

f) Fascia board

    1) Fascia board with 10% wastage = 1.1mt/ml

    2) Nails   = 0.007Kgs/ml

B. Roofing out of corrugated Asbestos on wooden truss

a) Roof covering up to 20% slope

    1) Roofing covering= 2.25m2/Asbestos sheet

    2) Washer   = 12pcs/ Asbestos sheet

    3) "J" hooks   = 12pcs/ Asbestos sheet

b) Roof ridge up to 20% slope

    1) Roofing covering= 2.25m2/Asbestos sheet

    2) Washer   = 12pcs/ Asbestos sheet

    3) "J" hooks   = 12pcs/ Asbestos sheet

c) Gutter

    1) Gutter   =

    2) Washer   =

    3) "J" hooks   =

C.   Roofing out of EGA sheet on steel truss

    a) Roof covering

       "J" hooks

    b) Roof ridge

       1) Covering

       2) "J" hooks

    c) Valley Covers

       1) Covering

       2) "J" hooks

    d) Gutter with 2% wastage

       1) Gutter   = 1.02mts/ml

       2) Metal Brackets = 2pcs/ml

       3) Fixers   = 4pcs/ml

    e) Down pipe

       1) Down pipe   =9pcs/ml

       2) Metal Brackets =2pcs/ml

       3) Fixer   =4pcs/ml

    f) Roofing nails

      1Kg = 105pcs

      1pkt = 3Kgs = 315pcs

V.   Carpentry and Joinery

a) Eucalyptus truss for span up to 10m

    1) Ø10-12 cm upper and lower eucalyptus

       wood truss member with 50% wastage   = 1.5mt/ml

    2) Nails   =0.04Kgs/ml

    3) Band Iron   = 0.12Kgs/ml

    4) Ø8-10 cm vertical & diagonal truss

       Member with 60% wastage   =1.6mt/ml

    5) Nails   =0.06Kgs/ml

    6) Band Iron   =0.17Kgs/ml

b) Truss out of 5x10cm &15cm wood up to 10m span

    1) 5x10 cm zigba wood upper member in

       truss with 15% wastage   = 1.15mt/ml

    2) Nails   =0.03Kgs/ml

    3) Band Iron   = 0.10Kgs/ml

    4) 5x10 cm zigba wood diagonal & vertical

       member with 20% wastage   = 1.2mt/ml

    5) 2(2.5x15 cm) zigba wood lower

       member with 15% wastage   = 2.30mt/ml

    6) Nails   =0.04Kgs/ml

    7) Band Iron   =0.2Kgs/ml

c) Truss out of 5x15cm Zigba wood

    1) 2(2.5x15 cm) zigba wood upper & lower

       member with 15% wastage   = 2.30mt/ml

    2) Nails   =0.03Kgs/ml

    3) Band Iron   = 0.10Kgs/ml

    4) 2(2.5x15 cm)diagonal & vertical

       member with 20% wastage   = 1.2mt/ml

    5) 2(2.5x15 cm) zigba wood lower

       member with 20% wastage   = 2.40mt/ml

    6) Nails   =0.04Kgs/ml

      7) Band Iron   =0.2Kgs/ml

d) Purlin

   1) Ø6-8 cm eucalyptus wood purlin

     with 40% wastage   = 1.4mt/ml

   2) Nails   =0.025Kgs/ml

   3) 5x7 zigba wood purlin with 20% wastage   =1.2mt/ml

   4) Nails   =0.15kgs/ml

e) Fascia Board

   1) Zigba or Tid wood with 15% wastage   = 1.15mt/ml

   2) Nails   =0.1Kgs/ml

f) Door & window frame

   1) Wood with 15% wastage   = 1.15mt/ml

   2) Nails   =0.05Kgs/ml

g) Cheap wood ceiling nailed on 4x5 zigba wood battens placed at c/c 62.5cm.

   1) 4x5 cm zigba wood battens with 15% wastage   =4.6mts/m2

   2) Cheap wood 10% wastage   =1.10m2/m2

   3) Nails of 6cm   =0.07Kgs/m2

   4) Corner list   =1.75mts/m2

   5) Middle list of necessary with 15% wastage   =2.85mts/m2

h) Cheap wood ceiling nailed on 4x5 zigba wood battens placed at c/c 41cm.

   1) 4x5 cm zigba wood battens with 15% wastage   =6.3mts/m2

   2) Cheap wood 10% wastage   =1.10m2/m2

   3) Nails   =0.08Kgs/m2

   4) Corner list   =1.75mts/m2

   5) Middle list of necessary   =4.55mts/m2

i) Hard board ceiling nailed on 4x5cm zigba wood battens placed at c/c 61cm

   1) 4x5 cm zigba wood battens with 15% wastage   =4.6mts/m2

   2) Cheap wood 10% wastage   =1.10m2/m2

   3) Nails   =0.07Kgs/m2

   4) Corner list   =1.75mts/m2

   5) Middle list   =2.85mts/m2

j) Abujedid ceiling nailed on 4x5cm zigba wood battens placed at c/c 50cm

1) 4x5cm zigba wood battens with 10% wastage   =5.28mt/m2

2) Abujedid with 10% wastage   =1.10m2/m2

3) Nails   =0.05Kgs/m2

4) Corner list   =1.75mts/m2

5) Middle list   =3.53mt/m2

Nails

Total number of different kinds of nail per Kg

1cm nails   =950pcs

2cm nails   =826pcs

4cm nails   =546pcs

6cm nails   =235pcs

7cm nails   =180pcs

8cm nails   =127pcs

10cm nails   =63pcs

12cm nails   =44pcs

15cm nails   =29pcs

Roofing nails=105pcs

Band iron 16mm=15m

Zigba truss 4m long   =13pcs/truss

Plastic washer 1pkt   =300pcs

k) Door & Windows

Note: By writing the size of doors & windows the numbers can be given in pcs.

Door type

a) Ledged & battened door

b) Ledged, braced & battened door

c) Framed, ledged, braced and battened door

d) Framed, ledged & battened door

e) Flush door

f) Panalled door

l) <u>Size of Doors (standards)</u>

For bed rooms   = 80 x 210cm

= 90 x 210cm

For living room   = 90 x 210cm

= 120 x 210cm

	= 150 x 210cm
For w.c	= 70 x 210cm
	= 80 x 210cm
For Kitchen	= 80 x 210cm
	= 90 x 210cm

m) Windows

The window area is frequently at least equal to one – quarter of the floor area.

VI. Metal works

a) For single leaf 0.90 x 2.10m door made out of Tubular profile black iron steel 1.0m of its height covered with sheet metal
   Material required
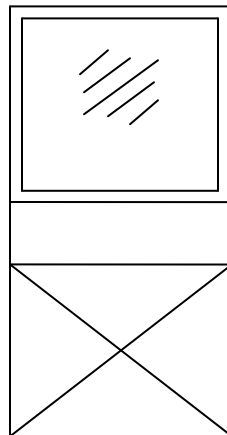
1) L tubular with 5% wastage   =6.30ml/pcs
2) Z tubular with 5% wastage   =3.26ml/pcs
3) T tubular with 5% wastage   =0.95ml/pcs
4) O tubular with 5% wastage   =4.00/pcs
5) Sheet metal tubular with 5% wastage=1.00m2/pcs
6) Lock   =1pcs/pcs
7) Hinge   = 2pcs/pcs
8) Parker screw with 10% wastage   =14pcs/pcs
9) Electrode   =
10) Flat Iron   =3.8ml/pcs

b) Ditto but for double leaf door size 1.2 x 2.1m
   1) L tubular with 5% wastage   =6.93ml/pcs
   2) Z tubular with 5% wastage   =7.88ml/pcs
   3) T tubular with 5% wastage   =3.14ml/pcs
   4) O tubular with 5% wastage   =7.46/pcs
   5) Sheet metal 5% wastage   =1.32m2/pcs
   6) Lock   =1pcs/pcs
   7) Hinge   = 4pcs/pcs
   8) Stoper   =2pcs/pcs
   9) Parker screw with 10% wastage   =33pcs/pcs
   10) Electrode   =
   11) Flat Iron   =5.46m2/pcs

c) Ditto but for door size 0.80 x 2.1msingle leaf
   1) L tubular with 5% wastage   =6.09ml/pcs
   2) Z tubular with 5% wastage   =5.25ml/pcs
   3) T tubular with 5% wastage   =0.84ml/pcs
   4) O tubular with 5% wastage   =3.99ml/pcs
   5) Sheet metal 5% wastage   =0.84m2/pcs
   6) Lock   =1pcs/pcs
   7) Hinge   = 2pcs/pcs
   8) Parker screw with 10% wastage   =14pcs/pcs
   9) Electrode   =
   10) Flat Iron   =3.78ml/pcs

d) French window size 2.00x2.10m with two window opening size 0.70x0.70m made out of Tubular profile black iron steel & 0.30m height covered with sheet metal dividers placed at c/c 70cm.

1) L tubular with 5% wastage   =8.41ml/pcs
2) Z tubular with 5% wastage   =5.88ml/pcs
3) T tubular with 5% wastage   =10.71ml/pcs
4) O tubular with 5% wastage   =24ml/pcs
5) Sheet metal 5% wastage   =0.63m2/pcs
6) Handle   =2pcs/pcs
7) Hinge   = 4pcs/pcs
8) Parker screw with 10% wastage   =80pcs/pcs
9) Electrode   =
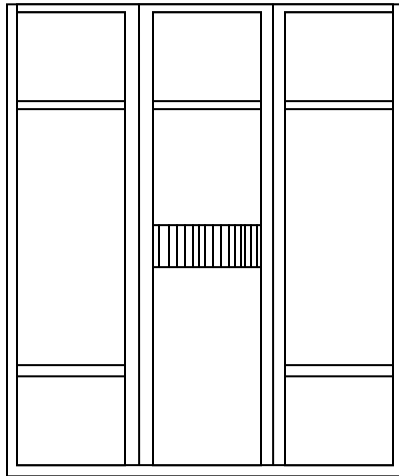10) Flat Iron   =6.10ml/pcs

e) French window size 3.00 x 2.10m with single leaf door size 0.90x2.10m & window 0.60x0.60m opening made out of profile black iron 0.30 of its height covered with sheet metal divider placed at c/c 60cm.
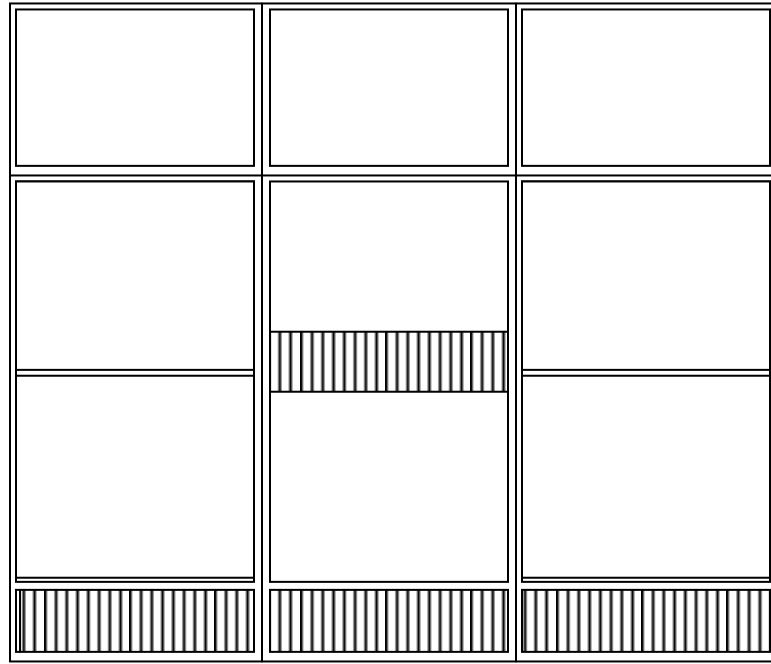
1) L tubular with 5% wastage   =10.71ml/pcs
2) Z tubular with 5% wastage   =10.92ml/pcs
3) T tubular with 5% wastage   =9.45ml/pcs
4) O tubular with 5% wastage   =37.8ml/pcs
5) Sheet metal 5% wastage   =0.945m2/pcs
6) Lock   =1pcs/pcs
7) Hinge   = 6pcs/pcs
8) Handle   =2pcs/pcs
9) Stopper   =2pcs/pcs
10) Parker screw with 10% wastage   =132pcs/pcs
11) Electrode   =
12) Flat Iron   =9.45ml/pcs

f) Window size 1.00 x1.20 made out of tubular profile black iron sheet which has one opening.
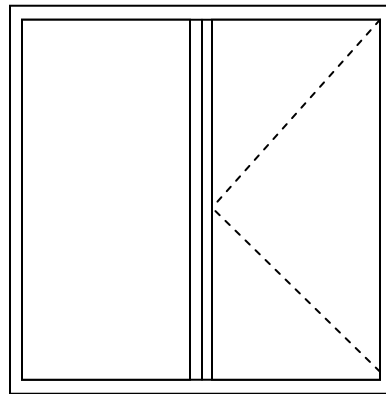
1) L tubular with 5% wastage   =4.63ml/pcs
2) Z tubular with 5% wastage   =3.57ml/pcs
3) T tubular with 5% wastage   =1.26ml/pcs
4) O tubular with 5% wastage   =7.14ml/pcs
5) Hinge   = 2pcs/pcs
6) Handle   =1pcs/pcs
7) Stopper   =1pcs/pcs
8) Parker screw with 10% wastage   =22pcs/pcs
9) Electrode   =

g) Ditto but for size 1.20 x 1.20m
1) L tubular with 5% wastage   =5.04ml/pcs
2) Z tubular with 5% wastage   =3.78ml/pcs
3) T tubular with 5% wastage   =1.26ml/pcs
4) O tubular with 5% wastage   =7.56ml/pcs
5) Hinge   = 2pcs/pcs
6) Handle   =1pcs/pcs
7) Stopper   =1pcs/pcs
8) Parker screw with 10% wastage   =22pcs/pcs
9) Electrode   =

h) Window for size 1.50 x 1.20m but two opening
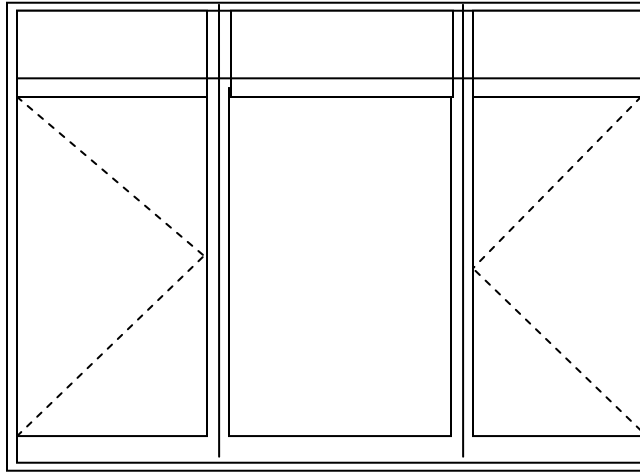
    1) L tubular with 5% wastage   =5.67ml/pcs

    2) Z tubular with 5% wastage   =7.14ml/pcs

    3) T tubular with 5% wastage   =2.52ml/pcs

    4) O tubular with 5% wastage   =10.71ml/pcs

    5) Hinge   = 4pcs/pcs

    6) Handle   =2pcs/pcs

    7) Stopper   =2pcs/pcs

    8) Parker screw with 10% wastage   =38pcs/pcs

    9) Electrode   =

i) 1000lit capacity water tank with man hole on the top

    a) Sheet metal   = 3pcs/pcs

    b) Angle iron   =4ml/pcs

    c) Hinge   = 2pcs/pcs

    d) Electrode   = 1packet/pcs

    e) Manicotti   = 2pcs/pcs

    f) Paint antirust   = 0.24lit/pcs

    g) Enamel paint   = 0.72lit/pcs

    h) Ø12 reinforcing steel   = 3ml/pcs

J) Ditto but 2000lit capacity

    a) Sheet metal   = 5pcs/pcs

    b) Angle iron   = 4ml/pcs

     c) Hinge   = 2pcs/pcs

     d) Electrode   = 1 ¾ packet/ pcs

     e) Manicotti   = 2pcs/pcs

     f) Paint antirust   = 0.4lit/pcs

     g) Enamel paint   = 1.2lit/pcs

     h) $\varnothing$12 reinforcing steel   = 4ml/pcs

VII. Pointing

a) Brick wall pointed with cement mortar 1:3 with 15% wastage per 10 square meters

    1) Mortar   =0.03m^3/10m^2

        1.1)   Cement   = 13.78Kgs

        1.2)   Sand   = 0.03m^3

b) Stone wall pointed with cement mortar 1:3 with 12% wastage per 10 square meters

    1) Mortar   = 0.06m^3/m^2

        1.1)   Cement   = 27.56Kgs

        1.2)   Sand   = 0.06m^3

c) Hollow block wall pointed with cement mortar 1:3 with 10% wastage per 10 square meters

    1) Mortar   =0.02m^3/10m^2

        1.1)   Cement   = 9.19Kgs

        1.2)   Sand   = 0.02m^3

d) Brick wall pointed with cement mortar 1:4 with 15% wastage per 10 square meters

    1) Mortar   = 0.03m^3/m^2

        1.1)   Cement   = 11.04Kgs

        1.2)   Sand   = 0.03m^3

e) Stone wall pointed with cement mortar 1:4 with 12% wastage per 10 square meters.

    1) Mortar $\qquad$ = 0.06m^3/10m^2

        1.1)   Cement $\qquad$ = 22.08 Kgs

        1.2)   Sand $\qquad$ = 0.06m^3

f) Hollow block wall pointed with cement mortar 1:4 with 10% wastage per 10 square meters.

    1) Mortar $\qquad$ = 0.02m^3/m^2

        1.1)   Cement $\qquad$ = 7.36Kgs

        1.2)   Sand $\qquad$ = 0.02m^3

VIII. Plastering

a) Cement mortar plaster on walls per 10 square meters

Proportion of Cement Mortar	12mm thick with 20% wastage mortar=0.144m^3		15mm thick with 15% wastage mortar=0.172m^3		20mm thick with 12% wastage mortar=0.22m^3		25mm thick with 10% wastage mortar=0.144m^3	
	Cement (kgs)	Sand (m^3)	Cement (kgs)	Sand (m^3)	Cement (kgs)	Sand (m^3)	Cement (kgs)	Sand (m^3)
1:3	66.15	0.14	79.10	0.17	102.9	0.22	114.84	0.25
1:4	53.00	0.15	63.80	0.18	82.43	0.24	92.00	0.26
1:5	44.10	0.16	52.68	0.19	68.60	0.25	76.56	0.27
1:6	37.80	0.16	45.15	0.19	58.80	0.25	65.62	0.28

b) Compo Mortar plastering on walls per 10 square meters.

Proportion of compo-mortar	12mm with 20% wastage mortar = 0.144m^3			15mm with 15% wastage mortar = 0.172m^3			20mm with 12% wastage mortar = 0.224m^3			25mm with 10% wastage mortar = 0.25m^3		
	Cement (kgs)	Lime (Kgs)	Sand (m^3)	Cement (kgs)	Lime (Kgs)	Sand (m^3)	Cement (kgs)	Lime (Kgs)	Sand (m^3)	Cement (kgs)	Lime (Kgs)	Sand (m^3)
1:1:6	31.75	43.09	0.14	37.93	51.47	0.16	49.39	67.03	0.21	55.13	74.81	0.24
1:1:8	25.40	34.47	0.15	30.34	41.18	0.17	39.51	53.63	0.23	44.10	59.85	0.25
1:2:9	21.17	57.46	0.14	25.28	68.63	0.16	32.93	89.38	0.21	36.75	99.75	0.24
½:2:6	14.94	81.13	0.13	17.85	96.89	0.15	23.24	126.18	0.20	25.94	140.82	0.22

c) Lime – Mortar Plastering on walls per 10 square meters

Proportion Of Lime Mortar	5mm thick with 15% wastage mortar = 0.0575m^3		10mm thick with 15% wastage mortar = 0.115m^3		12mm thick with 15% wastage mortar = 0.138m^3	
	Lime (Kgs)	Sand (m^3)	Lime (Kgs)	Sand (m^3)	Lime (Kgs)	Sand (m^3)
1:2	45.88	0.048	91.77	0.097	110.12	0.116
1:3	25.36	0.054	50.72	0.109	69.86	0.130
1:4	27.54	0.058	55.09	0.116	66.10	0.139

IX. Rendering

a) Cement mortar rendering on walls per 10 square meters with 20% wastage mix proportion 1:3

    1) Mortar   = $0.06m^3/10m^2$

        1.1)   Cement   = 27.56 Kgs

        1.2)   Sand   = $0.06m^3$

b) Cement mortar rendering on walls per 10 square meters with 20% wastage mix proportion 1:4

    1) Mortar   = $0.06m^3/10m^2$

        1.1)   Cement   = 22.08 Kgs

        1.2)   Sand   = $0.06 m^3$

X. Floor & wall tiles, skirting and window sill
A. Flooring

a) Terrazo tile (cement tile) flooring bedded in cement mortar 1:4

    1) Terrazzo tile (cement tile) with 2% wastage

        Size 20 x 20   = $26pcs/m^2$

    2) 2.5cm thick mortar with 10% wastage for laying.

        2.1) Cement   = $10.12Kgs /m^2$

        2.2) Sand   =$0.0275m3/m^2$

    3) Mortar 1:3 for grouting with 20% wastage   = $0.001m^3/m^2$

        3.1) Cement   = $0.46kgs/m^2$

        3.2) Sand   =$0.001m^3/m^2$

b) Cement screed flooring with an average thickness of 2.5cm

    1) Mortar 1:3 with 20% wastage   = $0.03m^3/m^2$

        1.1)   Cement   = $13.78kgs/m^2$

        1.2)   Sand   = $0.03m^3/m^2$

c) 2cm thick marble slate flooring bedded in cement sand screed 1:4

    1) Marble slate with 2% wastage   = $1.02m^2/m^2$

    2) 2.5cm thick mortar with 10% wastage   = $0.027m^3/m^2$

        2.1) cement   = $10.12kgs/m^2$

        2.2) Sand   =$0.029m^3/m^2$

        3) Polish   = $0.03kgs/m^2$

d) 2cm thick marble chips flooring bedded in cement mortar 1:4
- 1) Marble chips with 20% wastage $= 1.2m^2/m^2$
- 2) Mortar with 10% wastage $= 0.0275m^3/m^2$
  - 2.1) cement $= 10.12kgs/m^2$
  - 2.2) Sand $= 0.029m^3/m^2$
  - 2.3) polish $= 0.03kgs/m^2$

e) 1.5mm,2mm or 2.5mm thick plastic tile flooring.
- 1) Plastic with 5% wastage size 25x25 $= 17pcs/m^2$
- 2) Plastic with 5% wastage size 25x25 $= 12pcs/m^2$
- 3) Adhesive including wastage $= 0.3kgs/m^2$
- 4) Polish $= 0.3kgs/m^2$

f) Woira wood per-quet flooring
- 1) Woira wood with 3% wastage $=1.03m^2/m^2$
- 2) Adhesive glue including wastage $= 0.4kgs/m^2$
- 3) Polish $= 0.6kgs/m^2$

g) Wooden flooring
- 1) Boarding wastage 2% $=1.02m^2/m^2$
- 2) Nails 4-6cm length
- 3) Floor joint at 50cm apart with 5% wastage size 5x7cm $=2.05ml/m^2$
- 4) Nails for joint

h) Carpet flooring
- 1) Carpet with 5% wastage $=1.05m^2/m^2$

B.   Wall Tiles

a. Ceramic wall tile

i. Ceramic tile with 5% wastage size

15x15cm	$= 47pcs/m^2$
7 ½ x15cm	$=94pcs/m^2$
5x10cm	$=210pcs/m^2$
10x10cm	$=105pcs/m^2$

ii. Mortar 1:4 for bedding with 10% wastage = $0.001m^3/m^2$
- **1.** Cement $= 0.37kgs/m^2$
- **2.** Sand $=0.001m^3/m^2$

iii. Cement for grouting the joints $= 0.01kgs/m^2$

    b. Mosaic wall tile

        i. Mosaic tile with 2% wastage $=1.02m^2/m^2$

        ii. Mortar 1:4 for bedding with 10% wastage = $0.001m^3/m^2$

            1. Cement   = $0.37kgs/m^2$

            2. Sand $=0.001m^3/m^2$

        iii. Cement for grouting the joints   = $0.02kgs/m^2$

C.   Skirting

    a. Terrazzo tile (Cement tile) for skirting bedded in cement mortar 1:4

        i. Tile with 10% wastage size 10x20cm   = 11pcs/ml

        ii. Mortar 1:4 for bedding with 10% wastage $=0.006m^3/pcs$

            1. Cement   =0.22kgs/pcs

            2. Sand $=0.006m^3/pcs$

    b. Plastic tile skirting

        i. Plastic tile with 2% wastage   =1.02m/ml

        ii. Adhesive including wastage   =0.01kgs/ml

    c. Marble slate skirting

        i. Marble slate with 10% wastage   =1.10m/ml

        ii. Mortar with 10% wastage $=0.003m^3/ml$

            1. Cement   =1.10kgs/pcs

            2. Sand $=0.003m^3/pcs$

    d. Wooden skirting

        i. wooden with 10% wastage   =1.10m/ml

        ii. Fisher   =5pcs/ml

        iii. Screw   =5pcs/ml

D.   Window Sill

    a. Marble slate window sill width 27cm

        i. Marble 2 or 3cm thick   =1.0m/ml

        ii. Mortar with 10% wastage $=0.007m^3/ml$

            1. Cement   =2.6kgs/pcs

            2. Sand $=0.007m^3/pcs$

    b. Granilia window sill width 27cm

        i. Granilia 3cm thick   =1.0m/ml

        ii. Mortar with 10% wastage   =0.007m^3/ml

            1. Cement   =2.6kgs/pcs

            2. Sand   =0.007m^3/pcs

    c. Pre-cast concrete window sill 5cm thick 27cm wide.

        i. Concrete with 10% wasatge   =0.015m^3/ml

        ii. Mortar with 10% wastage   =0.007m^3/ml

XI. Glazing

    a. 3mm thick glass fixed on tubular profile black iron steel

        i. 3mm glass with 10% wastage   =1.10m^2/m^2

        ii. Putty   =0.20kgs/m^2

    b. 4mm thick glass fixed on tubular profile black iron steel

        i. 4mm glass with 10% wastage   =1.10m^2/m^2

        ii. Putty   =0.20kgs/m^2

    c. 5mm thick glass fixed on tubular profile black iron steel

        i. 5mm glass with 10% wastage   =1.10m^2/m^2

        ii. Putty   =0.15kgs/m^2

    d. 3mm thick glass fixed on seco profile black (galvanized iron steel)

        i. 3mm thick glass with 10% wastage   =1.10m^2/m^2

        ii. Putty   =0.25kgs/m^2

    e. 4mm thick glass fixed on seco profile black (galvanized iron steel)

        i. 4mm thick glass with 10% wastage   =1.10m^2/m^2

        ii. Putty   =0.20kgs/m^2

    f. 5mm thick glass fixed on seco profile black (galvanized iron steel)

        i. 5mm thick glass with 10% wastage   =1.10m^2/m^2

        ii. Putty   =0.15kgs/m^2

XII. Painting

    a. 2 coats of plastic emulsion paint to internal newly plastered surface

        i. Priming coat to fill the process of the surface to prepare smooth base for the 1st paint coat $= 62.5 gm/m^2$

            1. Stucco $= 50.0 gm/m^2$

            2. Animal glue or vinavil $= 12.5 gm/m^2$

        ii. 1st coat $= 0.07 lit/m^2$

            2nd coat $= 0.06 lit/m^2$

        iii. Brush for plastic paint 40x140mm $= 1 pcs/500 m^2$

        iv. Sand paper $= 0.01 m2/m^2$

        v. Gypsum $= 0.03 kgs/m^2$

    b. 3 coats of plastic emulsion paint to internal newly plastered surface

        i. Priming coat to fill the process of the surface to prepare smooth base for the 1st paint coat $= 62.5 gm/m^2$

            1. Stucco $= 50.0 gm/m^2$

            2. Animal glue or vinavil $= 12.5 gm/m^2$

        ii. 1st coat $= 0.07 lit/m^2$

            2nd coat $= 0.06 lit/m^2$

            3rd coat/Final coat $= 0.05 lit/m^2$

        iii. Brush for plastic paint 40x140mm $= 1 pcs/500 m^2$

        iv. Sand paper $= 0.01 m2/m^2$

        v. Gypsum $= 0.03 kgs/m^2$

    c. 2 coats of plastic emulsion paint to external newly plastered surface

        i. Priming coat $= 62.5 gm/m^2$

            1. Stucco $= 50.0 gm/m^2$

            2. Animal glue or vinavil $= 12.5 gm/m^2$

        ii. 1st coat $= 0.08 lit/m^2$

            2nd coat $= 0.07 lit/m^2$

        iii. Brush for plastic paint 40x140mm $= 1 pcs/500 m^2$

        iv. Sand paper $= 0.01 m^2/m^2$

        v. Cement mortar $= 0.02 kgs/m^2$

d. 3 coats of plastic emulsion paint to external newly plastered surface

    i. Priming coat $= 62.5 \text{gm/m}^2$

        1. Stucco $= 50.0 \text{gm/m}^2$

        2. Animal glue or vinavil $= 12.5 \text{gm/m}^2$

    ii. 1st coat $= 0.08 \text{lit/m}^2$

        2nd coat $= 0.07 \text{lit/m}^2$

        3rd coat $= 0.06 \text{lit/m}^2$

    iii. Brush for plastic paint 40x140mm $= 1 \text{pcs/}500 \text{m}^2$

    iv. Sand paper $= 0.01 \text{m}^2/\text{m}^2$

    v. Cement mortar $= 0.02 \text{kgs/m}^2$

e. 2 coats of plastic emulsion paint to external rendered surface

    i. 1st coat $= 0.13 \text{lit/m}^2$

    ii. 2nd coat $= 0.11 \text{lit/m}^2$

    iii. Brush 140x40mm $= 1 \text{pcs/}200 \text{m}^2$

f. 3 coats of plastic emulsion paint to external rendered surface

    i. 1st coat $= 0.13 \text{lit/m}^2$

    ii. 2nd coat $= 0.11 \text{lit/m}^2$

    iii. 3rd coat $= 0.01 \text{lit/m}^2$

    iv. Brush 140x40mm $= 1 \text{pcs/}200 \text{m}^2$

g. 2 coats of synthetic enamel paint to wooden surface

    i. 1st coat $= 0.06 \text{lit/m}^2$

    ii. 2nd coat $= 0.05 \text{lit/m}^2$

    iii. Solvent (thinner) for 1st & 2nd coat $= 0.51 \text{lit/gal}$

    iv. Brush 4" or 5" $= 1 \text{pcs/}200 \text{m}^2$

    v. Stucco $= 0.05 \text{kgs/m}^2$

    vi. Sand paper $= 0.007 \text{m}^2/\text{m}^2$

h. 3 coats of synthetic enamel paint to wooden surface

    i. 1st coat $= 0.06 \text{lit/m}^2$

    ii. 2nd coat $= 0.05 \text{lit/m}^2$

    iii. 3rd coat $= 0.04 \text{lit/m}^2$

    iv. Solvent (thinner) for 1st & 2nd coat $= 0.51 \text{lit/gal}$

    v. Brush 4" or 5" $= 1 \text{pcs/}200 \text{m}^2$

    vi. Stucco (knotting) $= 0.05 \text{kgs/m}^2$

    vii. Sand paper $= 0.007 \text{m2/m}^2$

i. 2 coats of varnish or luker paint to wooden surface
- i.   1st coat   =0.06lit/m^2
- ii. 2nd coat   =0.05lit/m^2
- iii. Brush   =1pcs/200m^2
- iv. Stucco (knotting)   =0.05kgs/m^2
- v.   Sand paper   =0.007m2/m^2

j. Cement paint to porous smooth surface
- i.   Cement paint   =0.5lit/m^2
- ii. brush   =1pcs/200m^2

k. Cement paint to porous rough surface
- i.   Cement paint   =1.25lit/m^2
- ii. brush   =1pcs/200m^2

l. 3 coats of plastic emulsion paint to chip wood ceiling
- **i.   Priming coat**   = 62.5gm/m^2
    - 1. Stucco   = 50.0gm/m^2
    - 2. Animal glue or vinavil   = 12.5gm/m^2
- ii. 1st coat plastic emulsion paint   =0.09lit/m^2
- iii. Knotting
    - 1. Stucco   =0.05kgs/m^2
    - 2. Gypsum   =0.04kgs/m^2
- iv. 2nd coat   =0.08lit/m^2
- v.   3rd coat   =0.07lit/m^2
- vi. Brush for plastic paint 40x140mm   =1pcs/400m^2
- vii. Sand paper   =0.007m2/m^2

XIII. Damp proofing and water proofing

A.   Wall dump proofing

m. one coat of bitumen for plastered wall surface
- i. bitumen emulsion for primer coat
  with 5% wastage   =0.42kgs/m^2
- ii. one coat of bitumen emulsion
  with 5% wastage   =0.79kgs/m^2

n. Ditto but two coats

i. bitumen emulsion for primer coat

with 5% wastage $=0.42 kgs/m^2$

ii. two coat of bitumen emulsion

with 5% wastage $=1.58 kgs/m^2$

B.   Slab dump proofing

a. one coat of bitumen for ground slab

  i. bitumen emulsion for primer coat

with 5% wastage $=0.42 kgs/m^2$

  ii. one coat of bitumen emulsion

with 5% wastage $=0.79 kgs/m^2$

b. Ditto but two coats

  i. bitumen emulsion for primer coat

with 5% wastage $=0.42 kgs/m^2$

  ii. two coat of bitumen emulsion

with 5% wastage $=1.58 kgs/m^2$

C.   Roof dump proofing

a. one coat of bitumen for roofing

  i. Bitumen emulsion for primer coat

with 5% wastage $=0.32 kgs/m^2$

  ii. one ply of glass fibre

with 10% wastage & overlap $=1.20 m^2/m^2$

  iii. one coat of bitumen emulsion

with 5% wastage $=2.5 kgs/m^2$

b. Ditto but two coats

  a. Bitumen emulsion for primer

Coat with 5% wastage $=0.32 kgs/m^2$

  b. Two plies of glass fibre

With 10% wastage & overlap $=2.41 m^2/m^2$

  c. Two coat of bitumen emulsion

With 5% wastage $=4.5 kgs/m^2$

  d. Two coat of reflecting

Finish with 5% wastage $=0.32 kgs/m^2$

XIV. Sanitary Work

A. Pipes

a. In villa houses for water supply ½" & ¾" galvanized water pipes are layed & these are found in pcs = 6ml

b. For swerage in villa houses 1 ¼" & 1 ½" pipes are layed & these are found in pcs =6ml

B. Sanitary Equipment

i. Enamel bath tubes size 170x70cm = pcs

ii. Shower plate size 70x70cm, 80x80cm = pcs

iii. Wash basin 60x50cm, 55x45, 40x40 & 40x30 cm= pcs

iv. Bottle trap = pcs

v. Water closet low flush or high flush = pcs

vi. Turkish water closet = pcs

vii. Bidet = pcs

viii. Urinal = pcs

ix. Sink 100x50cm, 120x50,140x50,150x50,180x50cm, single bowel 200x50cm = pcs

x. Soap holder = pcs

xi. Paper roll holder = pcs

xii. Mirror size = pcs

XV. Electrical installation / Electrical materials

a. Electrical conduits

i. Semi rigid electrical conduit

1. Conduit 11mm = ml

2. Conduit 13mm = ml

3. Conduit 14mm = ml

ii. Rigid electrical conduit

1. Conduit 11mm = ml

2. Conduit 13mm = ml

3. Conduit 14mm = ml

4. Conduit 19mm = ml

    5. Conduit 20mm   = ml

    6. Conduit 23mm   = ml

    7. Conduit 25mm   = ml

    8. Conduit 29mm   = ml

    9. Conduit 35mm   = ml

    10. Conduit 42mm   = ml

    11. Conduit 50mm   = ml

b. Electrical junction boxes

    i. Switch boxes Ø 65mm   = pcs

    ii. Junction boxes Ø85mm   = pcs

        Junction boxes 100x100mm   = pcs

        Junction boxes 100x150mm   = pcs

        Junction boxes 100x300mm   = pcs

    iii. Water proof junction boxes 70mm = pcs

c. Wires

    i. Rigid electrical wire

        1. Single rigid wire $1x1mm^2$ = ml

        2. Single rigid wire $1x1.5mm^2$ = ml

        3. Single rigid wire $1x2mm^2$ = ml

        4. Single rigid wire $1x2.5mm^2$ = ml

        5. Single rigid wire $1x4mm^2$ = ml

        6. Single rigid wire $1x6.3mm^2$ = ml

        7. Single rigid wire $1x8mm^2$ = ml

    ii. Flexible electrical wire

        1. Single flexible wire $1x1mm^2$ = ml

        2. Single flexible wire $1x1.5mm^2$ = ml

        3. Single flexible wire $1x2mm^2$ = ml

        4. Single flexible wire $1x2.5mm^2$ = ml

        5. Single flexible wire $1x4mm^2$ = ml

        6. Single flexible wire $1x8mm^2$ = ml

        7. Single flexible wire $1x10mm^2$ = ml

        8. Single flexible wire $1x16mm^2$ = ml

        9. Single flexible wire $1x25mm^2$ = ml

iii. Flat electrical wire

    1. Twin wire 2x0.25mm^2 = ml

    2. Twin wire 2x0.35mm^2 = ml

    3. Twin wire 2x0.50mm^2 = ml

    4. Twin wire 2x0.80mm^2 = ml

    5. Twin wire 2x2.00mm^2 = ml

    6. Twin wire 2x2.50mm^2 = ml

iv. Telephone wire

    1. Telephone wire 2x0.50mm^2 = ml

    2. Telephone wire 2x0.80mm^2 = ml

    3. Telephone wire 2x1.00mm^2 = ml

v. Round flexible rubber cable

    1. Rubber 2 cores cable 2x0.50mm^2 = ml

    2. Rubber 2 cores cable 2x0.80mm^2 = ml

    3. Rubber 2 cores cable 2x1.00mm^2 = ml

    4. Rubber 2 cores cable 2x1.50mm^2 = ml

    5. Rubber 2 cores cable 2x2.00mm^2 = ml

    6. Rubber 2 cores cable 2x2.50mm^2 = ml

    7. Rubber 2 cores cable 2x6.00mm^2 = ml

    8. Rubber 2 cores cable 3x0.80mm^2 = ml

    9. Rubber 2 cores cable 3x1.00mm^2 = ml

    10. Rubber 2 cores cable 3x1.50mm^2 = ml

    11. Rubber 2 cores cable 3x2.00mm^2 = ml

    12. Rubber 2 cores cable 3x2.50mm^2 = ml

    13. Rubber 2 cores cable 3x4.00mm^2 = ml

    14. Rubber 2 cores cable 3x6.30mm^2 = ml

    15. Rubber 2 cores cable 4x1.50mm^2 = ml

    16. Rubber 2 cores cable 4x2.00mm^2 = ml

    17. Rubber 2 cores cable 4x2.50mm^2 = ml

    18. Rubber 2 cores cable 4x4.00mm^2 = ml

    19. Rubber 2 cores cable 4x6.30mm^2 = ml

vi. Flat rigid cable

1. Rigid 2 cores cable 2x0.50mm^2 = ml
2. Rigid 2 cores cable 2x0.80mm^2 = ml
3. Rigid 2 cores cable 2x1.00mm^2 = ml
4. Rigid 2 cores cable 2x1.60mm^2 = ml
5. Rigid 2 cores cable 2x2.00mm^2 = ml
6. Rigid 2 cores cable 2x2.50mm^2 = ml
7. Rigid 2 cores cable 2x4.00mm^2 = ml
8. Rigid 2 cores cable 2x6.30mm^2 = ml
9. Rigid 2 cores cable 2x8.00mm^2 = ml
10. Rigid 2 cores cable 2x10.0mm^2 = ml

vii. Round rigid cable

1. Rigid 3 cores cable 3x0.50mm^2 = ml
2. Rigid 3 cores cable 3x0.80mm^2 = ml
3. Rigid 3 cores cable 3x1.00mm^2 = ml
4. Rigid 3 cores cable 3x1.60mm^2 = ml
5. Rigid 3 cores cable 3x2.00mm^2 = ml
6. Rigid 3 cores cable 3x2.50mm^2 = ml
7. Rigid 3 cores cable 3x4.00mm^2 = ml
8. Rigid 3 cores cable 3x6.30mm^2 = ml
9. Rigid 3 cores cable 4x1.60mm^2 = ml
10. Rigid 3 cores cable 4x2.50mm^2 = ml
11. Rigid 3 cores cable 4x4.00mm^2 = ml
12. Rigid 3 cores cable 4x6.00mm^2 = ml

d. Line terminal

i. Line terminal Ø5mm   = ml
ii. Line terminal Ø6.5mm   = ml
iii. Line terminal Ø8mm   = ml
iv. Line terminal Ø9mm   = ml

e. Switch

   i. Flush mounted

      1. Flash mounting normal switches   = pcs

      2. Flash mounting two way switches   = pcs

      3. Flash mounting double two way switches   = pcs

      4. Flash mounting two way + two way + two switches = pcs

      5. Flash mounting two way switches + bell push = pcs

   ii. Surface mounted

      1. Surface mounting switches   = pcs

      2. Surface mounting two switches   = pcs

      3. Surface mounting double switches   = pcs

   iii. Main switch

      1. Main switches single polo   = pcs

      2. Main switches double polo   = pcs

      3. Main switches triple polo   = pcs

f. Sockets

   i. Flush mounted socket

      1. Flash mounting normal socket 10A   = pcs

      2. Flash mounting normal socket 10A+ ground = pcs

      3. Flash mounting normal socket 15A+ ground = pcs

   ii. Surface mounted

      1. Surface mounting socket 2x15A+ ground = pcs

      2. Surface mounting socket 2x15A   = pcs

   iii. Heavy duty rubber socket

      1. Heavy duty rubber socket 2x10A+ ground = pcs

      2. Heavy duty rubber socket 2x15A+ ground = pcs

      3. Heavy duty rubber socket 3x15A+ ground = pcs

g. Bell push

   i. Flush mounted

      1. Flash mounting bell push 10Amp   = pcs

      2. Flash mounting bell push + socket   = pcs

   ii. Surface mounted

      1. Surface mounting bell push 10Amp   = pcs

h. Electrical bells

    i. Round bell 8-12 volts = pcs

    ii. Round bell 220 volts = pcs

    iii. Din don bells 8-12 volts = pcs

    iv. Din don bells 220volts = pcs

i. Bell indicators

Surface mounted and Flush mounted

    i. Bell indicators No. 6 = pcs

    ii. Bell indicators No. 8 = pcs

    iii. Bell indicators No. 10 = pcs

    iv. Bell indicators No. 12 = pcs

j. Electrical lamp

    i. Normal lamp = pcs

    ii. Globe ceiling lamp = pcs

    iii. Globe straight base for walls = pcs

    Globe slanting base for walls = pcs

    iv. Fluorescent lamp 1x10, 1x20, 2x10, 2x20 & 2x40 = pcs

k. Insulating tapes

    i. Insulating tapes = roll

l. Insulating staples

    i. Insulating staples ¾, 5/8, 7/8 = packet

m. Water heater

    i. Water heater 30lit = pcs

    ii. Water heater 50lit = pcs

    iii. Water heater 80lit = pcs

    iv. Water heater 100lit = pcs

    v. Water heater 120lit = pcs

    vi. Water heater 150lit = pcs

XVI. Site work

A. Drains

   i. concrete pipe installation in trench laid on 5cm thick red ash bed joints filled in cement mortar 1:4 per 20ml

      1. Concrete pipe Ø10cm with 5% wastage   = 21pcs/20ml

      2. Mortar with 5% wastage   = 0.06m^3/20ml

         2.1. Cement   = 22kgs/20ml

         2.2. Sand   = 0.06m^3/20ml

      3. Red ash   = 0.13m^3/20ml

  ii. Ditto but Ø15cm

      1. Concrete pipe Ø15cm with 5% wastage   = 21pcs/20ml

      2. Mortar with 5% wastage   = 0.08m^3/20ml

         2.1. Cement   = 29.44kgs/20ml

         2.2. Sand   = 0.08m^3/20ml

      3. Red ash   = 0.21m^3/20ml

 iii. Ditto but Ø20cm

      1. Concrete pipe Ø20cm with 5% wastage   = 21pcs/20ml

      2. Mortar with 5% wastage   = 0.1m^3/20ml

         2.1. Cement   = 36.80kgs/20ml

         2.2. Sand   = 0.1m^3/20ml

      3. Red ash   = 0.26m^3/20ml

 iv. Ditto but Ø30cm

      1. Concrete pipe Ø30cm with 5% wastage   = 21pcs/20ml

      2. Mortar with 5% wastage   = 0.14m^3/20ml

         2.1. Cement   = 51.52kgs/20ml

         2.2. Sand   = 0.15m^3/20ml

      3. Red ash   = 0.37m^3/20ml

v. Ditto but Ø40cm

    1. Concrete pipe Ø40cm with 5% wastage = 21pcs/20ml

    2. Mortar with 5% wastage = 0.18m^3/20ml

      2.1. Cement = 66.24kgs/20ml

      2.2. Sand = 0.20m^3/20ml

    3. Red ash = 0.47m^3/20ml

vi. Ditto but Ø50cm

    1. Concrete pipe Ø50cm with 5% wastage = 21pcs/20ml

    2. Mortar with 5% wastage = 0.22m^3/20ml

      2.1. Cement = 73.6kgs/20ml

      2.2. Sand = 0.21m^3/20ml

    3. Red ash = 0.58m^3/20ml

vii. Ditto but Ø60cm

    1. Concrete pipe Ø60cm with 10% wastage = 22pcs/20ml

    2. Mortar with 5% wastage = 0.28m^3/20ml

      2.1. Cement = 103kgs/20ml

      2.2. Sand = 0.29m^3/20ml

    3. Red ash = 0.70m^3/20ml

viii. Ditto but Ø80cm

    1. Concrete pipe Ø80cm with 10% wastage = 22pcs/20ml

    2. Mortar with 5% wastage = 0.36m^3/20ml

      2.1. Cement = 132.48kgs/20ml

      2.2. Sand = 0.38m^3/20ml

    3. Red ash = 0.94m^3/20ml

ix. Ditto but Ø100cm

    1. Concrete pipe Ø100cm with 10% wastage= 22pcs/20ml

    2. Mortar with 5% wastage = 0.38m^3/20ml

      2.1. Cement = 139.84kgs/20ml

      2.2. Sand = 0.40m^3/20ml

    3. Red ash = 1.18m^3/20ml

B.   Road construction (Flexible pavement) out of asphalt

    x.   Sub-base of basaltic or equivalent mat 25cm thick
       with 10% wastage   = 0.28m3/m2

    xi.   Base course 04 – 05 gravel 10cm thick
       with 20% wastage   = 0.12m3/m2

    xii.   Prime coat of NC-70   = 0.1.4lts/m2

    xiii.   Second layer base course of 02 gravel
       5cm thick with 15% wastage   =0.058m3/m2

    xiv.   Second prime coat type 180-200NC   = 1.5lts/m2

    xv.   Wearing surface out of 01 gravel 2cm
       Thick with15% wastage   = 0.023m3/m2

    xvi.   Final coat asphalt   = 1.6lts/m2

    xvii.   Fino crushed aggregate and dust
       1cm thick with 20% wastage   = 0.012m3/m2

C.   Man - hole

    xviii.   60x60x60cm made out of half brick wall bedded in cement mortar
       1:4

         1. Brick with 5% wastage   = 111pcs/pcs
         2. Mortar with 15% wastage   = 0.13m3/pcs
             a. Cement   = 47.84kgs/pcs
             b. Sand   = 0.14m3/pcs

    xix.   60x60x60cm made out of 15cm thick hollow - block bedded in
       cement mortar 1:4

         1. Hollow block with 5% wastage = 23pcs/pcs
         2. Mortar with 20% wastage   = 0.037m3/pcs
             a. Cement   = 13.45kgs/pcs
             b. Sand   = 0.037m3/pcs

XVII. Fence work

Material for fence works are:-

a. Barbed wire in roll   =200ml
b. U nails in packets   = 5kg
c. Galvanized fencing net in roll 1-3m   = 25ml
d. Black sd fencing net in roll   = 13ml
e. Black wire in roll   = 25kgs
f. Angle iron in pcs   = 6 or 12ml
g. Angle T iron in pcs   = 6 or 12ml
h. Eucalyptus posts in pcs   = 2.0, 2.5 or 3.0ml
i. Gabion in pcs   = 1.0ml

Calculating Labour Requirement

Item	Description	Labour Efficiencies			
		Gang	Time	Out put per 8hr	Time req. to perform one unit of work
1	Excavation				
1.1	Site clearing to remove top soil to an average depth of 20cm	1DL	8hr	10m^2	48min/m^2
1.2	Trench excavation in ordinary soil a) To depth of 1.2m b) To depth of 2.20m c) To depth of 3.00m	1DL 1DL 1DL	8hr 8hr 8hr	1.25m^3 1.00m^3 0.75m^3	6.40hr/m^3 8.00hr/m^3 10.66hr/m^3
1.3	Bulk excavation in ordinary soil a) To depth of 1.5m	1DL	8hr	1.5m^3	5.33hr/m^3
1.4	Cart Away a) To 500m away from the site b) To one km away from the site	1DL 1DL	8hr 8hr	1.5m^3 1m^3	5.33hr/m^3 8.0hr/m^3
1.5	Hard coring 25cm thick	1M+1DL	8hr	18m^2	26min/m^2
1.6	Back fill around foundation a) Loose soil b) Aggregate	1DL 1DL	8hr 8hr	2m^3 1 ½ m^3	4.0hr/m^3 5.33hr/m^3
2	Concrete work				
2.1	Lean concrete a) 5cm thick b) 8cm thick	1M+6DL 1M+6DL	8hr 8hr	20m^3 15m^3	24min/m^2 32min/m^2
2.1	Floor slab a) 8cm thick b) 10cm thick c) 15cm thick	1M+6DL 1M+6DL 1M+6DL	8hr 8hr 8hr	15m^3 12.5m^3 10m^3	32min/m^2 38min/m^2 48min/m^2

Item	Description	Labour Efficiencies			
		Gang	Time	Out put per 8hr	Time req. to perform one unit of work
2.3	Ground beam	1M+6DL	8hr	1 ½ m³	5.33hr/m³
2.4	Footing	1M+6DL	8hr	1 ½ m³	5.33hr/m³
2.5	Foundation column	1M+6DL	8hr	1 ¼ m³	6.40hr/m³
2.6	Upper tie beam	1M+6DL	8hr	1m³	8.0hr/m³
2.7	Linton	1M+6DL	8hr	1m³	8.0hr/m³
2.8	Column up to 2m	1M+6DL	8hr	1 ¼ m³	6.40hr/m³
2.9	Column above 2m	1M+6DL	8hr	1m³	8.0hr/m³
3	Masonry work				
3.1	Stone masonry sub - structure				
	a) 40cm thick	2M+6DL	8hr	5m³	1.66hr/m³
	b) 50cm thick	2M+6DL	8hr	6m³	1.33hr/m³
	c) 60cm thick	2M+6DL	8hr	7m³	1.15hr/m³
3.2	Stone masonry super - structure				
	a) 40cm thick	2M+6DL	8hr	3m³	2.66hr/m³
	b) 50cm thick	2M+6DL	8hr	4m³	2.00hr/m³
	c) 60cm thick	2M+6DL	8hr	5m³	1.60hr/m³
3.3	Brick masonry wall for plastering				
	a) 25cm thick up to 2m	2M+6DL	8hr	7m²	1.14hr/m²
	b) 12cm thick up to 2m	2M+6DL	8hr	9m²	53min/m²
	c) 25cm thick from 2-4m	2M+6DL	8hr	5m²	1.60hr/m²
	d) 12cm thick from 2-4m	2M+6DL	8hr	7m²	1.14hr/m²
3.4	Hollow block masonry wall for plastering				
	a) 20cm thick up to 2m	1M+2DL	8hr	10m²	48min/m²
	b) 15cm thick up to 2m	1M+2DL	8hr	10m²	48min/m²
	c) 10cm thick up to 2m	1M+2DL	8hr	8m²	1.00hr/m²
	d) 20cm thick from 2-4m	1M+2DL	8hr	8m²	1.00hr/m²
	e) 15cm thick from 2-4m	1M+2DL	8hr	8m²	1.00hr/m²
	f) 10cm thick from 2-4m	1M+2DL	8hr	6m²	1.33hr/m²

Item	Description	Labour Efficiencies			
		Gang	Time	Out put per 8hr	Time req. to perform one unit of work
4	Roofing Work				
4.1	Roof covering (G.C.I)	1C+2DL	8hr	40m^2	12min/m^2
4.2	Ridge cover	1C+2DL	8hr	70ml	7min/ml
4.3	Valley cover	1C+2DL	8hr	70ml	7min/ml
4.4	Gutter fixing	1C+2DL	8hr	30ml	16min/ml
4.5	Joining eucalyptus truss up to 10m span on ground	1C+2DL	8hr	4truss	2hr/truss
4.6	Down pipe fixing	1C+2DL	8hr	40ml	12min/ml
4.7	Truss erecting	1C+2DL	8hr	15truss	32min/truss
4.8	Fixing corrugated asbestos	1C+2DL	8hr	25m^2	19min/m^2
4.9	Fixing EGA sheet joining	1C+2DL	8hr	30m^2	16min/m^2
4.10	Joining zigba truss up to 10m span on ground	1C+2DL	8hr	3truss	2.66hr/truss
4.11	Zigba truss erecting	1C+8DL	8hr	15truss	32min/truss
4.12	Fascia board fixing	1C+2DL	8hr	70ml	7min/ml
5	Joinery work				
5.1	Wooden door fixing	1C+2DL	8hr	3pcs	2.66hr/pcs
5.2	Wooden window fixing	1C+2DL	8hr	4pcs	2.00hr/pcs
5.3	Chip wood ceiling fixing	1C+2DL	8hr	10m^2	48min/m^2
5.4	Hard board ceiling fixing	1C+2DL	8hr	10m^2	48min/m^2
5.5	Abujedie ceiling fixing	1C+2DL	8hr	13m^2	37min/m^2
6	Metal work				
6.1	Metal door fixing	1C+2DL	8hr	3pcs	2.66hr/pcs
6.2	Metal window fixing	1C+2DL	8hr	4pcs	2.00hr/pcs
6.3	French window fixing	1C+2DL	8hr	2pcs	4.00hr/pcs
7	Plastering & pointing				
7.1	1st coat plastering	1P+2DL	8hr	35m^2	14min/m^2
7.2	2nd coat plastering	1P+2DL	8hr	10m^2	48min/m^2
7.3	3rd coat plastering	1P+2DL	8hr	14m^2	34min/m^2
7.4	Pointing on brick wall	1P+2DL	8hr	8m^2	1hr/m^2
7.5	Pointing on hollow block	1P+2DL	8hr	14m^2	34min/m^2
7.6	Pointing on dressed stone	1P+2DL	8hr	12m^2	40min/m^2
7.7	Rendering	1P+2DL	8hr	20m^2	24min/m^2

Item	Description	Labour Efficiencies			
		Gang	Time	Out put per 8hr	Time req. to perform one unit of work
8	Flooring				
8.1	Cement screed	1M+2DL	8hr	14m^2	34min/m^2
8.2	Cement tile fixing	1M+2DL	8hr	10m^2	48min/m^2
8.3	Plastic tile fixing	1M+2DL	8hr	17m^2	28min/m^2
8.4	Par-quet flooring	1M+2DL	8hr	15m^2	32min/m^2
8.5	Wooden flooring	1M+2DL	8hr	8m^2	1hr/m^2
8.6	Ceramic wall tile	1M+2DL	8hr	7m^2	1.14hr/m^2
8.7	Plastic tile skirting	1M+1DL	8hr	40ml	12min/ml
8.8	Cement tile skirting	1M+2DL	8hr	12ml	40min/ml
8.9	Marble slate flooring	1M+2DL	8hr	12m^2	40min/m^2
8.10	Marble slate skirting	1M+2DL	8hr	16ml	30min/ml
8.11	Fixing pre-cast window sill	1M+2DL	8hr	10ml	48min/ml
8.12	Fixing un pre-cast window sill	1M+2DL	8hr	6ml	1.33hr/ml
9	Glazing				
9.1	Cutting	1C+2DL	8hr	50m^2	10min/m^2
9.2	Fixing	1C+2DL	8hr	20m^2	24min/m^2
10	painting				
	a) Plastic paint				
10.1	Painting plastered wall surface (3 coats)	1P+1DL	8hr	30m^2	16min/m^2
10.2	Painting rendered wall surface	1P+1DL	8hr	25m^2	19min/m^2
10.3	Painting abujedid ceiling	1P+1DL	8hr	20m^2	24min/m^2
10.4	Painting Hard board ceiling	1P+1DL	8hr	20m^2	24min/m^2
10.5	Painting chip wood ceiling	1P+1DL	8hr	20m^2	24min/m^2
	b) Synthetic paint				
10.6	Painting plastered wall surface in 3 coats	1P+1DL	8hr	25m^2	19min/m^2
10.7	Wooden surface	1P+1DL	8hr	25m^2	19min/m^2
10.8	Metal surface	1P+1DL	8hr	27m^2	17min/m^2

Item	Description	Labour Efficiencies			
		Gang	Time	Out put per 8hr	Time req. to perform one unit of work
11	Sanitary work				
11.1	G.I. pipe laying in ground ½"-1 ¼"	1PL+2DL	8hr	120ml	4min/ml
11.2	Fixing bath tub, shower complete, wash basin, water closet, bidet sink	1PL+1DL	8hr	1pcs	8hr/pcs
12	Electrical Installation				
12.1	Fixing conduits	1E+1DL	8hr	40ml	12min/ml
12.2	Pulling wires	1E+1DL	8hr	50ml	10min/ml
12.3	Fixing switch & out-lets	1E+1DL	8hr	20pcs	24min/pcs
12.4	Fixing fittings	1E+1DL	8hr	10pcs	48min/pcs
12.5	Fitting distribution board	1E+1DL	8hr	1pcs	8hr/pcs
13	Site work				
13.1	Drain laying				
	$\varnothing$0.10-0.30m	1M+3DL	8hr	30ml	16min/ml
	$\varnothing$0.40-0.60m	1M+3DL	8hr	20ml	24min/ml
	$\varnothing$0.80-1.00m	1M+3DL	8hr	10ml	48min/ml
13.2	Curb stone	1M+3DL	8hr	30ml	16min/ml
13.3	0.60x0.60m manhole out of brick	1M+3DL	8hr	3pcs	4hr/pcs
13.4	0.60x0.60m manhole out of hollow block	1M+3DL	8hr	2pcs	4hr/pcs
13.5	Fencing with Galvanized fencing net	1C+2DL	8hr	50m^2	10min/m^2

XVIII.   CALCULATING UNIT PRICES (ANALYSIS OF RATES)

In ordinary type of building; the cost of material is about 60% and labour cost is 40% of the total cost of the whole building.

Materials:- walling material will cost 25%, cement 13%, steel 10% and timber 12%

Labour:- Excavation will cost 1%, Mason 25%, carpenters 12% & smith 2%

The cost of separate items of works may be roughly as follows as a percentage of the total cost of the building for a single storey building.

Excavation...1%
Concrete in foundation 2%
Foundation wall up to plinth 5%
Walling (super structure) 25%
Roofing..20%
Flooring...6%
Joinery...15%
Internal finishes 6%
External...3%
Water supply & sanitary work....................................12%
Electrification 5%
Total...100%

For the purpose of calculating unit prices the details about all the operations involved in caring out the work should be available, the quantities of materials required and their costs should be known and the number of different categories of labourer and their wage per day should be known.

The rate of particular item of work depends on the following:-

- Specifications of work and materials, quality of materials, proportion of mortar and method of constructional operation.
- Quantities of material and their rates, number of different types of labourer and their rates.
- Location of the site of work and its distance from the source of materials and their rates.
- Profit, overhead expenses and miscellaneous of contractor.

Material cost:- it include:-

- The first cost (cost of origin)
- Cost of transport
- Taxes, etc.

Labour cost: it varies from place to places. However in bigger cities where standard of living is high; specialized and experienced labour is higher than small towns and country sides.

Transportation:- in the country if transportation of material is to be done the rate is:-

- On Highway = 0.02049cents/kg/km.
- On rural roads = 0.04cents/kg/km.

Overhead cost & miscellaneous:- this include general office expenses, rents, taxes, supervision and other costs which are indirect expenses and not productive expenses on the job, and this is about 5-10%

The analysis of rates of different items of work is the summation of cost of material, cost of labour, transportation, profit and overhead & miscellaneous costs.

Current rate of labour in Awassa

Labour	Rate
Unskilled labour	20
Mason	80
Plasterer	80
Steel bender	80
Carpenter & joiner	80
Painter & decorator	80
Pavior & floorer	80
Plumber (sanitary fitter)	80
Drain layer	80
Electrician	80

Current price of construction material
Material cost at

a) Material

Item No.	Description	Unit	Unit price
1	Cement	Qtl	
2	Sand	M3	
3	Gravel (02)	M3	
4	Reinforcing steel	Kg	
5	Tying wire steel (Ø6)	Kg	
6	Masonry stone	M3	
7	Barbed wire	Kg	
8	Wire mesh	Kg	
9	Corrugated iron sheet gage 28	Pcs	
10	Corrugated iron sheet gage 30	Pcs	
11	Corrugated iron sheet gage 32	Pcs	
12	Brick for walling 110cm	Pcs	
13	Cheep wood	Pcs	
14	Ply wood	Pcs	
15	Plastic pipe	Pcs	
16	Lumber	M3	
17	Angle iron	Kg	
18	Lime	Kg	
19	HCB 10cm	Pcs	
20	HCB 15cm	Pcs	
21	HCB 20cm	pcs	
22	Terrazzo tile	M2	
23	Concrete pipe Ø10	Pcs	
24	Concrete pipe Ø15	Pcs	
25	Concrete pipe Ø20	Pcs	
26	Concrete pipe Ø30	Pcs	
27	Concrete pipe Ø80	Pcs	
28	Glazing Ø3mm	M2	
29	Glazing Ø4mm	M2	
30	Stucco	kg	
31	Plastic paint	Gallon	
32	Antirust paint	Gallon	

Item No.	Description	Unit	Unit price
33	Synthetic paint	Gallon	
34	Local stucco	Kg	
35	Jesso	Kg	
36	Glue	Kg	
37	Special glue	Kg	
38	Venavil glue	Kg	
39	Plastic tile	M2	
40	Adhesive	Lts	
41	Doom headed nail	Kg	
42	Asphalt paper washer	Pack	
43	Ceramic tiles	Pcs	
44	Electrical wire 1.15	pack	
45	Electrical wire 1.25	pack	
46	Electrical wire 1.4	pack	
47	Electrical wire 1.6	pack	
48	Ackwarage	Lts	
49	Sand paper	Pcs	
50	Brush	Pcs	
51	Morale	M	
52	Morale 5x7cm	M	
53	Morale 4x5cm	M	
54	Nails	kg	

LABOUR COMPOSITION AND AVERAGE PRODUCTION RATE IN BUILDING CONSTRUCTION ACTIVITIES

Types of Activities	Unit	Labour composition	Average production rate/hour			
			Highland area	Per 8hrs	Lowland area	Arid area
Top soil excavation 20cm thick	M^2	DL=1	0.75	6	0.6	0.4
Excavation for foundation trench in normal soil a) Up to 1m depth	M^3	DL=2	0.30	2.4	0.24	0.15
b) Ditto but up to 2m depth	M^3	DL=2	0.18	1.44	0.14	0.09
c) Ditto but up to 4m depth	M^3	DL=3	0.15	1.2	0.12	0.08
Excavation in rock up to one meter depth a) Weathered or soft rock	M^3	DL=2	0.12	0.96	0.10	0.06
b) Loose rock	M^3	Semi skilled=1 DL=1	0.08	0.64	0.06	0.04
a) Hard & sound rock	M^3	Semi skilled=1 DL=1	0.03	0.24	0.02	0.015
Hard coring	M^2	Mason = 1 DL=1	1.7	13.6	1.36	1.85
Rubble stone foundation (wall) below ground level	M^3	Mason = 1 DL=4	0.25	2	0.2	0.12
Stone masonry above ground level up to 1.5mts height	M^3	Mason = 2 DL=4	0.23	1.84	0.18	0.12
Dressed stone wall (both side)	M^2	Mason = 2 Chiseller = 1 DL=4	0.15	1.2	0.12	0.08
Hollow concrete block wall (20x20x40) both sides left for plastering	M^2	Mason = 1 DL=2	0.90	7.2	0.72	0.45
Brick wall 25cm thick both sides left for plastering	M^2	Mason = 1 DL=2	0.40	3.2	0.30	0.20
Brick wall 12cm thick both sides left for plastering	M^2	Mason = 1 DL=2	0.60	4.8	0.48	0.3
Facing brick wall, 25cm thick	M^2	Mason = 1 DL=2	0.30	2.4	0.24	0.15
Formwork in zigba for column upto 3m high	M^2	Carpenter=1 Ass. Carp =1 DL=2	0.60	4.2	0.48	0.30
Formwork in zigba for ground beam	M^2	Carpenter=1 Ass. Carp =1 DL=2	0.65	5.20	0.52	0.32

Types of Activities	Unit	Labour composition	Average production rate/hour			
			Highland area	Per 8hrs	Lowland area	Arid area
Formwork in zigba for slabs	M²	Carpenter=1 Ass. Carp =1 DL=2	0.60	4.8	0.48	0.30
Formwork in steel panel for slabs	M²	Carpenter=1 Ass. Carp =1 DL=2	1.00	8	0.80	0.50
Cutting, bending and placing	Kg	Barbender=1 DL=2	10.00	80	8.00	5.00
Zigba truss fabrication 12m span with section 5x18cm	pcs	Carpenter=1 Ass. Carp =1 DL=2	1.00/day		0.8/day	0.5/day
Eucalyptus truss fabrication 8-12m span Ø10-12cm	pcs	Carpenter=1 Ass. Carp =1 DL=2	2.00/day		1.6/day	1.0/day
Eucalyptus truss fabrication 8-12m span Ø10-12cm	pcs	Carpenter=1 Ass. Carp =1 DL=2	2.50/day		2.0/day	1.0/day
Mounting of wooden truss with span ranging 8-12m	pcs	Carpenter=1 Ass. Carp =1 DL=4	8.0/day		6.0/day	4.0/day
Roof cover in G-28 C.I.S.	M²	Carpenter=1 Ass. Carp =1 DL=2	3	24	2.4	1.5
Roof cover in EGA sheet	M²	Carpenter=1 Ass. Carp =1 DL=2	4	32	3	2
Roof cover in corrugated asbestos sheet	M²	Carpenter=1 Ass. Carp =1 DL=2	2.5	20	2	1.25
Chip wood ceiling with batten	M²	Carpenter=1 Ass. Carp =1 DL=1	0.50	4	0.40	0.20
Asbestos ceiling with batten	M²	Carpenter=1 Ass. Carp =1 DL=1	0.40	3.2	0.3	0.2
Ribbed sheet ceiling including	M²	Carpenter=1 Ass. Carp =1 DL=1	0.60	4.8	0.48	0.30
Hammering on concrete surface	M²	Chisller =1	0.72	5.76	0.58	0.35
Plastering on wall (three coats)	M²	Plast. =1 DL= 1	0.80	6.4	0.60	0.40

Types of Activities	Unit	Labour composition	Average production rate/hour			
			Highland area	Per 8hrs	Lowland area	Arid area
Pointing on HCB wall	M²	Plast =1 Chisler=1 DL=1	2.00	16	1.6	1.00
Tyrolin rendering	M²	Plast. =1 DL = 1	2.50	20	2.0	1.25
Screed flooring –with out	M²	Plast. =2 DL = 2	1.50	12	1.20	0.75
Granillia tiles flooring expansion joint	M²	Mason = 1 DL = 2	1.25	10	1.00	0.63
Plastic tiles flooring	M²	Tiler = 1 DL = 2	2.00	16	1.6	1.00
Timber skirting 10cm high	Ml	Carpenter = 1 DL = 1	3.75	30	3.0	1.90
Granilia (cement) tiles skirting	Ml	Mason = 1 DL=1 Chisler=1	2.50	20	2.0	1.25
Semi-dressed stone pavement with sand bed and mortar joints	M²	Mason = 1 DL = 2	1.00	8	0.80	0.50
Plastic skirting	Ml	Tiler = 2 DL = 1	4.00	32	3.00	2.00
Ceramic wall tiles laying	M²	Mason(tiler)=1 DL = 1	0.40	3.2	0.30	0.20
Two coats oil paint	M²	Painter = 1	1.25	10	1.0	0.60
Plastic paint to wall (3 coats)	M²	Painter = 1	2.00	16	1.60	1.00
Plastic paint to ceiling	M²	Painter = 1	1.50	12	1.2	0.75
Glazing (3mm thick)	M²	Glazier = 1 DL = 1	1.00	8	0.80	0.50

LABOUR IN PUT AND PRODUCTION RATE FOR THE PRODUCTION AND CASTING OF CONCRETE WORKS

Location of work	Labour classification	Number of labourers		
		With one mixer 2 vibrators	With one mixer 2 vibrators & 1 dumper	With one mixer 2 vibrators & 1 fixed crane
Mixing area	Machine operator	1	2	2
	Labourer for cement delivery	2	2	2
	Labourer for sand gauge	4	4	4
	Labourer for gravel gauge	8	8	8
	Labourer for water supply	1	1	1
	Labourer for loading mixed fresh concrete	6	-	-
Casting area	Carpenter	1	1	1
	Carpenter helper	1	1	1
	Vibrator operator	2	2	2
	Mason helper	2	2	2
	Bar bender	1	1	1
	Bar bender helper	1	1	1
	Labourer for conveying concrete mix	14	4	-
	Bucket opener & conveyors	-	-	8
	Gang leader	1	1	1
Total		**45**	**30**	**34**
Production per day (m^3)	Footing & slabs	20	25	35
	Beams	14	16	24
	Columns	6	8	10

Note: Dire dawa and other similar regions production would be 80% of the A.A. figures/above

For Assab and other arid areas production would be 50% of the A.A. figures/above.

For one bag of cement
Minimum slump – 30mm
Maximum slump – 60mm

Concrete grade	Materials	No. of Size of boxes
C5	Sand	4 - 40x50x20
	Crushed aggregate	6 – 40x50x20
	Water	
C10	Sand	3 - 40x50x18
	Crushed aggregate	6 – 40x50x18
	Water	50lts
C15	Sand	2 - 40x50x20
	Crushed aggregate	4 – 40x50x20
	Water	40lts
C20	Sand	2 - 40x50x20
	Crushed aggregate	3 – 40x50x20
	Water	34lts
C25	Sand	2 - 40x50x18
	Crushed aggregate	3 – 40x50x18
	Water	31lts
C30	Sand	2 - 40x50x16
	Crushed aggregate	3 – 40x50x16
	Water	29lts

Notes

1. The volume of water given is for surface dry aggregates. The actual volume will be smaller or higher depending on the condition of the aggregates.
   Adjustments should be made based on the slump.
2. Concrete grades C25 and C30 requires class II workshop i.e. mixers, vibrators and qualified supervisors.

CALCULATING UNIT PRICE

Example 1

For concrete mix 1:2:4 proportion

Particulars	Quantity	Rate	Cost
Material + Transport			
Cement	275kg	46.55Birr/Qtl	128.01
Sand	0.39m3	90.00Birr/m3	35.10
Gravel	0.78m3	80.00Birr/m3	62.40
Water	100lit	1.0Birr/1000lts	0.10
		Total	**225.51**
Labour			
Mason	(1M) 5.33hr/m^3	30.00/8hr	19.99
Daily labour	(6DL)5.33hr/m^3	6.00/8hr	23.99
		Total	**43.98**

Total Material + Transport & Labour 269.49

Over head cost 5-10%: take 7%   18.86

Profit 6-8%: take 8%   21.56

Unit price for one m3 concrete 1:2:4 Proportion at Kazanches site   **309.91**