



MANPOWER AND MATERIAL REQUIREMENTS FOR BUILDING SERVICES

Introduction

It is essential to have an estimate of the total cost of building prior to the start of actual construction. This may be required for seeking technical and other administrative sanctions, calculating the requirements of various materials and labour, planning and budgeting purposes, calling and justification of tenders, etc. The normal practice to achieve this is to prepare a detailed estimate of the building portion and then to add the cost of internal services on the basis of percentage of building cost. This percentage may not remain constant due to non-uniform escalation of prices of materials/labour. Hence the final estimate where the cost of services is added on percentage basis, may not be realistic. In order to overcome this discrepancy, the only alternative is to prepare a detailed estimate of services also. But it has been seen in practice that services are not generally planned and designed at such an initial stage. In such cases the only solution left with is to depend upon the percentage of cost of building to account for the cost of services which has an inherited drawback as mentioned above. Secondly, the computation of materials and labour will not be feasible in the above method which may be necessary for preplanning, budgeting, justification of tenders etc. In order to give a ready-to use information for computation of cost of services and material/labour requirements, an attempt has been made in the Institute to supply the necessary data to work out the requirements of materials and labour for internal water supply, sanitary and electrical services. This has been presented in tabular form for various types of tenements ranging from Type I to Type IV and Janta to MIG. The

information can be used for computation of requirement of materials/labour, cost of internal services, cost index, justification of tenders, etc.

Basis of Calculations

The pre-requisite of the study is to have sufficient data that can be analysed in order to know the exact quantum of inputs in different projects with varying plinth area of dwellings. For this, the analysis has been based on the final bills of completed projects. Final bills have been preferred to the original estimates because the latter is always liable to fluctuation. To find out the total quantum of different materials and labour from these final bills, the CPWD Analysis of Rates has been followed which gives fairly average material and labour constants. Final bills were collected from various construction agencies, such as, CPWD, DDA, PWD-Delhi Administration, BHEL and State Housing Boards.

Number of storeys in a building has a sizeable impact on the inputs in case of water supply and sanitary services whereas it will not make much difference in case of electrical services. So separate studies were carried out for buildings with different number of storeys in case of water supply and sanitary services whereas only one set of norms has been prepared for electrical services. Further the study regarding water supply and sanitary services has been restricted to only double and four storeyed construction because of non-availability of sufficient data for buildings with different number of storeys.

Specifications

Requirements of materials/labour depend mainly

upon the specifications, system of services, shape and height of the buildings. It was observed from the final bills that different specifications and system of services (in case of water supply and sanitary services) were adopted for the same element/item of work in different projects. To overcome this non-uniformity in specifications, a set of reference specifications was prepared based on the prevalent practices which is shown in Appendix-A. But in case of water supply and sanitary services, norms have been worked out adopting two different systems as mentioned in Appendix-A. The effect of the shape of the building has been taken care of by considering a number of plans with different configurations for the same type of tenement so as to project out a plan giving fairly average quantities. The average storey height of the buildings considered is 3.10 m and the distance of water mains from the residences has been taken between 5 and 8m.

Similarly, in case of electrical services, different types of fittings, such as, wall brackets of medium, superior, special superior quality, brass batten holder, circular ceiling fittings, bulk head fittings, stiff pendant fittings, L-type cast aluminium anodised fittings, etc., have been used in various projects. Since the type/quality of fittings is a matter of choice of the architect/engineer, it was decided not to stick to a particular system/type of fittings. So these have been grouped only into three categories, viz., wall brackets, circular ceiling fittings and bulk head fittings in order to reduce the number of items in the chart.

Analysis of Data

The CPWD Analysis of Rates has been adopted for analysing the final bills. Each and every item of work in the final bills was analysed in terms of materials and labour. Similar materials and labour were then added up in order to arrive at the total consumption of various materials and different categories of labour in a bill. Bills of the same type of dwellings were grouped together and average consumption of each material/labour was computed for various categories of tenements. For water supply and sanitary services the information regarding material/labour inputs has been worked out for

type I to type V dwellings (Government accommodation) and is given in Tables 1 and 2 for double and four storeyed construction respectively.

In case of electrical services the study was extended to MIG, LIG and Janata Houses also, in addition to type designs (Government accommodation). This is shown in Table 3. The computation for these houses has been done separately in spite of the fact that their plinth areas closely resemble those of type designs. This was carried out keeping in view the difference in standard of services and pattern of planning for private houses as compared to government accommodation. This was done only in case of electrical services and could not be done for water supply and sanitary services due to lack of availability of data. The requirement of GI pipe 20 mm and above (Tables 1 & 2) is given in terms of total consumption of the pipe. It may be mentioned that out of this requirement, major consumption is for 20mm dia. pipe. Similarly in case of S.W. pipe work the quantity given is for 100mm dia. pipe. A small quantity of 150mm dia. pipe which was sometimes used in certain buildings was also included in the above figures. Junctions, bends and holder bat clamps of various sizes and shapes are required in providing these services. All the sizes of the respective items have been grouped together in order to reduce the number of items. A lump sum may be added to account for the cost of collars, guards, M. S. stays and clamps, etc.

The material/labour requirements for internal electrical services have been given separately for different sub-heads, viz., wiring, fittings and I. C. Boards (Table 3). These may be priced based on the quality of the fittings prescribed for a particular work. The consumption of materials/labour for earthing mainly depends upon the soil resistivity of the area and grouping of residences. It was observed that these two factors vary to a large extent from place to place. So no attempt has been made to derive the quantities for this sub-head in accordance with the resistivity in the area.

order to arrive at the total cost of internal electrical works, a lump sum amount may be added to cater for the cost of earthing. The study has been further extended to know about the spread of electric points classwise i.e., short points, long points, etc., per dwelling. The details about the number of light points, fan points, plug points, etc., per tenement for various categories of residences are given in Table 4. This study has revealed that there is a good amount of variation in the prefixed norms specified by various construction organisations.

Uses

The study is useful for quick estimation of materials/labour inputs for building services which can be made use of for material budgetting, judging the reasonableness of tenders, computation of cost indices and total cost of services.

Cost of services corresponding to the particular type of dwellings/construction can be computed with the help of data on requirements of materials/labour as presented in the tables and priced with the prevalent market rates. An example to compute the cost of a Type III tenement (4 storeyed construction) is given in

Appendix-B. For judging the reasonableness of tenders, the important materials/labour may be priced with the rates taken at the estimation stage and also with the prevalent market rates. From the ratio of the two, the realistic increase/decrease in building cost may be calculated and compared with the tendered percentage 'on' or 'off' the estimated cost. Similarly the cost index of services may be computed based on the important materials/labour. This may be priced with the rates of the base year and also with those of the year for which the index is required. The ratio of the two in terms of percentage increase/decrease will be the cost index. Such computations are shown in Appendix-C which is self-explanatory.

Conclusions

The study provides fairly accurate data for estimation of materials/labour inputs for building services. The cost computation is more rational than the present practice of adding a percentage of the building cost to account for the cost of services. This will also serve as a useful guide to the owners/builders/engineers for procurement and budgetting of materials and computation of cost indices.

There is a demand for short notes summarising available information on selected building topics for the use of Engineers and Architects in India. To meet the need, this Institute is bringing out a series of Building Digests from time to time and the present one is the 145th in the series. Readers are requested to send to the Institute their experience of adopting the suggestions given in this Digest,

UDC 69003-1/007

SfB B a 7

Prepared by : G. C. Sofat, A. K. Jethi and
S. K. Jain

Published by:
Central Building Research Institute,
Roorkee, (U.P.) INDIA
May, 1981

TABLE-1

Material/Labour Requirements for Internal Water Supply and Sanitary Services
(Double Storeyed Residential Construction)

S.No.	Material/ Labour	Unit	Type-I Janta	Type-II	Type-III	Type-IV	Type-V
	Average Plinth Area		25 m ²	37 m ²	56 m ²	84 m ²	122 m ²
1	W.C. Seat*	Nos.	1	1	1	2	2
2	Wash Basin*	Nos.	Nil	Nil	1	1	2
3	Sink*	Nos.	Nil	Nil	Nil	1	1
4	Sand Cast Iron Pipe :						
	a) 100 mm \varnothing	m	3.2	4.7	5.8	7.2	8.9
	b) 50 mm \varnothing	m	2.40	3.9	8.2	8.6	18.00
5	Cement	Tonne	0.21	0.28	0.37	0.37	0.51
6	Sand	m ³	0.61	0.84	1.08	1.08	1.41
7	C. Agg.	m ³	1.03	1.41	1.78	1.78	2.24
8	Paint	Ltr.	2.00	2.70	3.70	4.90	6.90
9	Primer	Ltr.	0.08	0.14	0.21	0.25	0.43
10	Bricks	Nos.	100	135	215	215	350
11	M.S. Holder Bat Clamp	Nos.	3.5	5.0	8.5	9.5	16.5
12	Floor Trap	Nos.	1.0	2.0	3.0	4.0	5.0
13	G.I. Pipe 15 mm	m	11.44	10.70	14.00	18.65	38.50
14	G.I. Pipe 20 mm & above	m	Nil	10.43	18.65	21.53	40.00
15	Bibcock 15 mm	Nos.	2	3	3	5	6
16	Stopcock 15 mm	Nos.	Nil	3	3	5	8
17	Pig Lead	kg.	8.70	13.59	23.70	26.17	47.00
18	Spun Yarn	kg.	1.7	2.3	3.4	3.7	4.99
19	Lead Connector 30 cm	Nos.	Nil	Nil	Nil	1	1
20	Shower Rose 100 × 100mm	Nos.	1	1	1	2	2
21	Tank (RCC) 270 ltrs	Nos.	0.5	0.5	0.5	0.5	1
22	S.W. Pipe 100mm-50mm \varnothing	m	6.71	8.95	9.57	9.68	10.45
23	Gully Trap 100 × 100 mm	Nos.	1	1	1.5	1.5	2
24	Mirror 600 × 450 mm	Nos.	Nil	Nil	Nil	1	2
25	Towel Rail 750 × 20 mm	Nos.	Nil	Nil	Nil	1	2
26	Fitter	days	3.71	5.68	8.63	11.51	18.85
27	Mason	days	2.29	3.27	4.87	6.45	8.83
28	Painter	days	0.44	0.62	0.79	1.15	1.7
29	Beldar	days	8.11	11.38	16.34	20.63	30.35

* Complete with all accessories and fittings.

TABLE—2

Material/Labour Requirements for Internal Water Supply and Sanitary Services
(Four Storeyed Residential Construction)

S.No.	Material/ Labour	Unit	Type-I	Type-II	Type-III	Type-IV
	Average Plinth Area		42 m ²	60 m ²	70 m ²	112 m ²
1	W.C. Seat*	Nos	1	1	1	2
2	Wash Basin*	Nos	Nil	Nil	1	2
3	Sink*	Nos	Nil	Nil	1	1
4	Sand Cast Iron Pipe	m				
	a) 100 mm		8.10	8.30	8.90	10.40
	b) 75 mm		3.90	4.30	4.40	4.50
	c) 50 mm		2.80	3.10	3.50	3.90
5	Cement	Tonnes	0.19	0.24	0.25	0.33
6	Sand	m ³	0.55	0.67	0.74	0.95
7	C. Aggregate	"	0.79	1.12	1.13	1.16
8	Paint	Litres	4.17	4.36	4.94	5.96
9	Primer	"	0.30	0.30	0.32	0.44
10	Bricks	Nos	130	135	150	180
11	M.S. Holder Bat clamps (100 to 50 mm)	Nos	9.0	10.0	11.0	12.0
12	Trap 100 mm	Nos	2	2	3	5
13	Bands (of various sizes)	"	3.0	4.0	4.0	5.0
14	Junctions (of various sizes)	Nos	3.0	2.5	2.5	2.0
15	G.I. Pipes 15 mm	m	22.4	26.20	30.00	57.0
16	G.I. Pipe 20 mm & above	m	17.60	23.40	25.00	41.0
17	Bibcock 15 mm	Nos	3	3	4	5
18	Stopcock 15 mm	Nos	3	3	4	5
19	Stop cock 20 mm	Nos	1.0	1.0	1.0	1.0
20	Pig Lead	Kg.	22.3	23.30	25.00	29.60
21	Spun Yarn	Kg.	2.5	2.5	3.0	3.0
22	Lead Connector 30 cm	Nos	1.0	1.0	1.0	2.0
23	Shower rose 100 mm	Nos	1.0	1.0	1.0	2.0
24	Tank (RCC) 270 Ltrs.	Nos	1.0	1.0	1.0	1.0
25	S.W. Pipe 100-150 mm \varnothing	m	4.10	6.60	6.60	10.20
26	Gully Trap 100 \times 100 mm	Nos	0.50	0.50	1.0	1.0
27	Mirror 600 \times 450 mm	Nos	Nil	Nil	1.0	2.0
28	Towel Rail 750 \times 20 mm	Nos	Nil	Nil	1.0	2.0
29	Fitter	days	9.90	11.50	13.8	20.6
30	Mason	days	3.60	4.20	6.00	7.8
31	Painter	days	1.00	1.00	1.0	1.8
32	Beldar	days	17.60	22.00	24.0	34.6

*Complete with all accessories and fittings.

TABLE—3
Material & Labour Requirements for Electrical Services (internal) for Various
Categories of Residences

S. No.	Item/Material/Labour	Unit	MIG	LIG	Janata	Type IV	Type III	Type II	Type I
1	2	3	4	5	6	7	8	9	10
	Average Plinth Area	m ²	100.0	58.0	25.0	112.0	70.0	60.0	42.0
	SUB HEAD-WIRING								
1	5 Amp. Tumbler Switch (Single Pole)	Nos	28.8	17.4	9.7	23.0	17.0	14.7	10.9
2	5 Amp. Tumbler Switch (double pole)	"	1.5	1.5	1.1	1.0	Nil	0.4	0.7
3	15 Amp. Tumbler Switch	"	4.0	2.0	Nil	3.0	1.3	1.0	Nil
4	5 Amp. Socket	"	6.8	4.0	2.0	5.0	3.3	3.0	2.0
5	15 Amp. Socket	"	4.0	2.0	Nil	3.0	1.3	1.0	Nil
6	1.5 Sq. mm PVC Insulated Al. Conductor Single Core Cable	m	300.0	174.6	124.4	260.9	184.3	146.4	121.7
7	2.5 sq mm PVC insulated Al. conductor single core cable	"	Nil	12.4	2.8	8.4	18.1	17.8	18.6
8	4-6 sq. mm PVC insulated Al Conductor Single Core Cable	"	116.0	62.4	11.6	100.5	35.0	35.0	Nil
9	Conduit Heavy Gauge 19 mm	"	145.0	93.0	49.0	125.0	77.0	68.0	53.0
10	Conduit (H.G.) 25 mm	"	12.6	Nil	Nil	16.2	9.3	7.1	Nil
11	Socket for 19 mm Conduit	Nos	56.0	33.0	20.0	46.0	30.0	28.0	19.0
12	Inspection Bend 19 mm	"	38.0	24.0	12.0	32.0	20.0	17.0	13.0
13	Socket for 25 mm Conduit	"	4.0	Nil	Nil	5.0	3.0	2.0	Nil
14	Inspection Bend (25 mm)	"	1.0	Nil	Nil	1.0	1.0	1.0	Nil
15	Saddles	"	375.0	226.0	116.0	365.0	212.0	192.0	132.0
16	I. C. Box 75 mm × 75 mm × 60 mm	"	41.0	25.0	12.0	31.0	20.0	17.0	12.0
17	I. C. Box 200mm × 150mm × 100 mm	"	5.1	3.0	1.3	4.7	3.6	3.0	2.0
18	Phenolic Laminated/Bakelite sheet	m ²	0.46	0.28	0.13	0.38	0.26	0.22	0.15
19	Junction Box 1 way	Nos	23.1	14.4	7.6	19.0	14.7	11.4	8.9
20	Junction Box 2 way	"	1.5	1.5	1.1	1.0	0.4	0.4	0.7
21	Ceiling Rose 2 plate	"	24.6	15.0	8.8	20.0	14.8	12.0	9.6
22	Iron Screws 35 mm	"	739.0	436.0	231.10	656.0	401.0	352.0	249.0
23	Iron Screws 20 mm	"	387.0	214.0	93.0	279.0	161.0	153.0	101.0
24	Washers	"	184	110.0	51.0	145.0	92.0	80.0	55.0
	LABOUR								
25	Wireman	Day	18.8	11.2	6.0	16.5	10.4	9.3	6.3
26	Mason	"	26.4	17.3	8.9	24.8	15.7	13.7	9.6
27	Khallasi	"	47.4	28.5	14.9	41.4	26.0	22.7	15.9
28	Painter	"	0.3	0.2	0.1	0.2	0.2	0.1	0.1
	SUB HEAD-FITTINGS								
29	L. type Cast Al. anodized Wall Bracket & Brass Holder (complete)	Nos	13.4	8.5	6.2	8.0	8.0	5.8	5.3
30	Circular Ceiling Fitting (complete)	Nos	1.7	1.9	Nil	3.0	1.7	1.0	Nil
31	Bulk head fitting (complete)	Nos	1.2	0.8	1.3	1.7	1.3	1.8	1.8
32	Iron Screws 20 mm	Nos	49.0	33.0	20.0	38.0	34.0	25.0	24.0

1	2	3	4	5	6	7	8	9	10
LABOUR									
33	Wireman	Day	0.8	0.6	0.3	0.7	0.5	0.4	0.4
34	Khallasi	Day	0.8	0.6	0.3	0.7	0.5	0.4	0.4
SUB-HEAD-I C. BOARDS, SWITCHES & DISTRIBUTION BOARDS									
35	15 Amp. S. P. & N. Switch Fuse Unit	Nos	4.2	3.7	1.6	5.3	3.3	3.0	1.9
36	2 Way MC DB 15 Amp/Way	Nos	1.0	1.0	Nil	Nil	1.7	1.5	1.0
37	4 Way MC DB 15 Amp/Way	Nos	1.0	Nil	Nil	1.4	Nil	Nil	Nil
38	Bolts & nuts 25 mm x 3 mm	Nos	24.0	18.0	6.0	19.0	12.0	12.0	11.0
LABOUR									
39	Wireman	Day	0.5	0.4	0.1	0.4	0.3	0.3	0.2
40	Khalasi	Day	0.5	0.4	0.1	0.4	0.3	0.3	0.2

TABLE-4
Numbers of Electrical Points for Various Categories of Residences

S. No.	Item/Material/Labour	Unit	MIG	LIG	Janata	Type IV	Type III	Type II	Type I
	Average Plinth Area	m ²	100.00	58.0	25.0	112.00	70.0	60.0	42.00
1	LIGHT POINT								
	a) Short Point	Point	7.8	6.5	2.3	6.9	4.3	2.1	4.4
	b) Medium Point	do	7.9	3.7	3.3	5.0	4.6	6.2	1.8
	c) Long Point	do	1.4	0.3	0.8	1.4	1.3	0.4	0.8
	Total Per Quarter	do	17.1	10.5	6.4	13.3	10.2	8.7	7.0
2	TWIN CONTROL LIGHT POINT								
	a) Short Point	Point	Nil	0.1	0.2	0.7	Nil	0.2	0.1
	b) Medium Point	do	0.7	0.7	0.5	0.1	Nil	0.1	0.5
	c) Long Point	do	0.7	0.7	0.5	0.2	Nil	0.1	0.1
	Total Per Quarter	do	1.4	1.5	1.2	1.0	Nil	0.4	0.7
3	FAN POINTS								
	a) Short Point	Point	Nil	Nil	Nil	1.3	0.6	1.1	Nil
	b) Medium Point	do	5.0	3.0	1.0	3.4	3.0	1.9	2.0
	c) Long Point	do	Nil	Nil	0.3	Nil	Nil	Nil	Nil
	Total Per Quarter	do	5.0	3.0	1.3	4.7	3.6	3.0	2.0
4	CALL BELL POINT								
	a) Short Point	Point	Nil	0.2	Nil	Nil	Nil	Nil	Nil
	b) Medium Point	do	1.0	0.8	Nil	Nil	0.3	Nil	Nil
	c) Long Point	do	Nil	Nil	Nil	1.0	0.6	Nil	Nil
	Total Per Quarter	do	1.0	1.0	Nil	1.0	0.9	Nil	Nil
5	3 PIN 5 AMP. PLUG POINT								
	a) Short Point	Point	6.8	4.0	0.5	4.0	2.0	1.5	0.8
	b) Medium Point	do	Nil	Nil	1.5	Nil	Nil	Nil	0.4
	c) Long Point	do	Nil	Nil	Nil	1.0	1.3	1.5	0.8
	Total Per Quarter	do	6.8	4.0	2.0	5.0	3.3	3.0	2.0
6	3 PIN 15 AMP. PLUG POINT								
	a) Short Point	Point	0.4	0.5	Nil	0.3	0.9	0.5	Nil
	b) Medium Point	do	Nil	0.5	Nil	1.3	0.3	Nil	Nil
	c) Long Point	do	3.6	1.0	Nil	1.4	Nil	0.5	Nil
	Total Per Quarter	do	4.0	2.0	Nil	3.0	1.2	1.0	Nil

Specifications and Systems of Services

S.No.	Element/Item of work	Specifications/System
WATER SUPPLY & SANITARY SERVICES		
A. SPECIFICATIONS :		
1.	Water Closet	i) For smaller tenements-one Indian type W.C. complete with all accessories. ii) For bigger tenements (where two WCs are provided)—one Indian type W.C. and one European type W.C.; complete with all accessories.
2.	Soil Pipe/waste pipe/vent pipe	Sand cast iron pipe with lead caulked joined with paint of any colour over a coat of primer.
3.	Wash Basin	White vitreous china wash basin 630×450 mm with single C.P. brass pillar tap complete with all other accessories.
4.	Kitchen Sink	White glazed fire clay kitchen sink 600×450×250 mm complete with all accessories.
5.	Mirror	600×450 mm bevelled edge mirror of superior glass with 6mm thick asbestos sheet.
6.	Towel Rail	C. P. brass towel rail 750×20mm.
7.	Water Pipe	G. I. pipe work with all fittings and finished with decorative paint.
8.	Bibcock/Stopcock.	Brass bibcock/stop cock.
9.	Connection Pipe	Lead connection pipe with brass unions.
10.	Shower Rose	C. P. brass shower rose of 100mm diameter with 15 of 20 mm inlet.
11.	Storage Tank	R. C. C. storage Tank
B. SYSTEM OF SERVICES :		
1 ₁	Drainage System :	
	For four storeyed construction.	i) 100mm ϕ soil pipe vented with 50 mm ϕ vent pipe. ii) 75mm ϕ waste pipe without any vent pipe.
	For double storeyed construction.	i) 100mm ϕ soil pipe without any vent pipe and 50 ϕ waste pipe without any vent pipe.
2 ₂	Overhead Storage Tank :	
	For four storeyed construction.	Single tank-270 Ltrs. capacity for each tenement.
	For double storeyed construction.	One tank—270 Ltrs. capacity for two tenements in case of type-I to type IV quarters and single tank for each tenement in case of type V quarter.
ELECTRICAL SERVICES		
SPECIFICATIONS		
1.	Wiring	PVC insulated Aluminium Conductor in recessed conduit.
2.	Fittings	Quality and type of fittings are not selected, however material and labour have been included in the data.

Computation of Cost of Internal Water Supply and Sanitary Services for
Type-III Tenement (4 Storeyed Construction)

S. No.	Material/Labour	Quantity	Unit	Rate (Rs.)	Amount (Rs.)
1	Water Closet*	1	No	350.00	350.00
2	Wash Basin*	1	No	200.00	200.00
3	Sink*	1	No	500.00	500.00
4	Sand Cast Iron Pipe				
	100 mm ϕ	8.9	m	25.00	222.50
	75 mm ϕ	4.4	m	22.00	96.80
	50 mm ϕ	3.5	m	15.00	52.50
5	Cement	0.25	Tonne	500.00	125.00
6	Sand	0.74	m ³	25.00	18.50
7	Coarse Aggregate	1.1	m ³	70.00	77.00
8	Paint	4.9	Ltrs.	22.00	107.80
9	Primer	0.3	Ltrs.	15.00	4.50
10	Bricks	150	No.	0.25	37.50
11	M. S. Holder Bat Clamps (50-100 mm)	11	No.	3.00	33.00
12	Floor Trap	3	No	15.00	45.00
13	Bends**	4	No	15.00	60.00
14	Junctions**	2.5	No	20.00	50.00
15	G. I. Pipe—15mm	30.0	m	13.00	390.00
16	G. I. Pipe—20mm	25.0	m	16.00	400.00
17	Bibcock—15mm	4.0	No	15.00	60.00
18	Stopcock—15mm	4.0	No	15.00	60.00
19	Stopcock—20mm	1.0	No	25.00	25.00
20	Pig Lead	25.3	kg.	12.00	303.60
21	Spun Yarn	3.0	kg.	7.00	21.00
22	Lead Connector—30 cm	1.0	No	15.00	15.00
23	Shower Rose	1	No	20.00	20.00
24	R.C.C. Tank 270 Lts.	1	No	400.00	400.00
25	S. W. Pipe 100 mm—150 mm	6.6	m	10.00	66.00
26	Gulley Trap	1.0	No	20.00	20.00
27	Mirror 600 \times 450 mm	1.0	No	50.00	50.00
28	Towel Rail 750 \times 20 mm	1.0	No	15.00	15.00
29	Fitter	13.8	Mandays	16.00	220.80
30	Mason	6.0	Mandays	16.00	96.00
31	Painter	1.0	Mandays	16.00	16.00
32	Beldar	24.00	Mandays	8.00	192.00

Total 4350.50

Add for sundries & Contingencies @ 3% =

130.52

4481.02

Add for water charges @ 1% =

44.81

4525.83

Add for Contractor's Profit & O. H. @ 10% =

452.58

Total 4978.41

* Complete with all accessories and fittings.

** These are of various sizes and priced with average rates.

Computation of Cost Index for Internal Water Supply and Sanitary Services for the
Year 1980 with Respect to the Base Year 1977 at Roorkee

S. No.	Material/Labour	Quantity	Unit	Cost in the year 1977		Cost in the year 1980		
				Rate (Rs.)	Amount (Rs.)	Rate (Rs.)	Amount (Rs.)	
1	Water Closet*	1	No	200.00	200.00	350.00	350.00	
2	Wash Basin*	1	No	150.00	150.00	250.00	250.00	
3	Sink*	1	No	400.00	400.00	600.00	600.00	
4	Sand Cast Iron Pipe							
	100 mm	8.9	m	20.00	178.00	32.00	284.80	
	75 mm	4.4	m	17.00	74.80	28.00	123.20	
	50 mm	3.5	m	12.00	42.00	20.00	70.00	
5	Cement	0.25	Tonne	365.00	91.25	500.00	125.00	
6	Paint	4.9	Ltrs.	18.00	88.20	22.00	107.80	
7	G. I. Pipe							
	15 mm	30.0	m	7.00	210.00	15.00	450.00	
	20 mm	25.0	m	9.00	225.00	18.00	450.00	
8	Pig Lead	25.3	kg	9.00	227.70	12.00	303.60	
9	R. C. C. Tank	1	No.	300.00	300.00	400.00	400.00	
10	Fitter	13.8	Mandays	13.00	179.40	16.00	220.80	
11	Mason	6.0	Mandays	13.00	78.00	16.00	96.00	
12	Beldar	24.0	Mandays	7.00	168.00	8.00	192.00	
Total—							2612.35	4023.20

$$\text{COST INDEX} = \frac{4023.20}{2612.35} \times 100 = 154.00$$

NOTES : 1. The computation has been based only on the important materials/labour which consume major portion of cost.

2. The computation has been made on type-III tenement (four storeyed construction).

* Complete with all accessories and fittings.