

**Design Concept for Rural Housing
in Western India
for IAY and Other Similar Scheme**
(based on pilot study of Gujarat Region)



**Building Materials & Technology Promotion Council
Ministry of Housing & Urban Poverty Alleviation
Government of India**

Preface

As per the Report of the Working Group setup by the Government of India on Rural Housing for 11th Five Year Plan, the total rural housing shortage between 2007-2012 is estimated to be 47.3 million. Out of this 90 percent is for the BPL families. In order to facilitate this ever increasing housing shortage, the Ministry of Rural Development is operating the Indira Awas Yojna (IAY) primarily to help construction/upgradation of dwelling units for members of SC/ST, freed bonded labours and others falling below the poverty line, non SC/ST rural households by providing them a lump-sum financial assistance.

The present ceiling as grant of assistance per unit under IAY is Rs. 70,000/- in plain areas and Rs. 75,000/- for hilly difficult areas. IAY Housing Policy is strategically left open ended so that beneficiary can build house as per his/ her requirements and also similarly choose the most appropriate local materials. With varying geo climatic conditions, hazard scenario and living habits of rural masses in different parts of the country, it is important to know the pattern of housing typology, materials availability and living pattern of the people in the area under consideration.

A pilot study was made in the rural areas of Gandhinagar and Anand districts of Gujarat to understand the need of local people for planning and prevailing practices of house construction. In the pilot study, three villages namely Vadali, Anand; Antoli and Jindava, Gandhinagar were considered. Based on the study, it is understood that the basic requirement in these areas is to have atleast a pucca habitable room around which other facilities could be developed as and when finances are available. Verandah was found to be an important element and most used portion of the houses and mostly people prefer kitchen outside adjoining the main structure.

The proposed design concept has been evolved keeping in mind the above requirements within the affordable cost. The proposed design provides a pucca livable room of size 4m x 3.5m, using rat trap bond brick masonry and RCC roof. Verandah, being an important part of the dwelling unit, it is planned to give front verandah Skel-ton i.e framing and spacing element installed to enable the owner to put covering materials himself as per his ability, need and finance available.

To minimize the cost and maximize safety and size of the house, the approach adopted in the design concept is to make main pucca structure as big as possible with necessary earthquake resistant features and give spanning structure for Verandah for future expansion as and when financially feasible.

The design developed here has been prepared focusing two districts of Gujarat but will also hold good for other regions of Gujarat and other parts of Western India.

BMTPC places deep appreciation for the valuable contribution of Shri Dipan Shah, Managing Coordinator, Society for Environment Protection (SEP), Ahmedabad and his team in collecting necessary information from villages and working out detailed guidelines with BMTPC. Also efforts of Shri J.K.Prasad, Chief (BM) and Shri Dalip Kumar, SFO (DC&E), for bringing the document to comprehensible shape are acknowledged.

Dr. Shailesh Kr. Agrawal
Executive Director, BMTPC

Background

Housing, one of the basic requirements for human survival, is among the most serious challenges facing India's socio-political economy. Shelter remains beyond the reach of millions even after 50 years of independence. The problem of rural housing did not receive much attention from the Government during the first 25 years of planning. In its 37th Report (1972-73), the Estimates Committee (Fifth Lok Sabha) expressed distress at the unsatisfactory conditions of *kutcha* houses in rural areas and the apathy of the Government. In response to this assessment, the Housing-sites-cum-Construction Assistance Scheme was launched as a Central Scheme in the Fourth Five Year Plan. The scheme was later transferred to the State Sector in April 1974. Construction of houses was a major activity under the National Rural Employment Programme (NREP), which began in 1980 and the Rural Landless Employment Guarantee Programme (RLEGP), which began in 1983. However, there was no uniform policy in regard to rural housing in the States. For the first time in June 1985, a specific proportion of RLEGP funds was earmarked for construction of houses for Scheduled Castes (SCs) and Scheduled Tribes (STs) and freed bonded labour. This was the origin of the Indira Awaas Yojana (IAY), which continued as a sub-scheme of the Jawahar Rozgar Yojana (JRY).

After the JRY was restructured in January 1996, the IAY became an independent Centrally Sponsored Scheme for providing shelter in rural areas. To supplement the efforts of IAY and to address various issues of rural housing, five new Centrally Sponsored Schemes were launched from April 1999, viz. Samagra Awaas Yojana (SAY), Credit -Cum- Subsidy Scheme for Rural Housing (CCSS), Rural Building Centres (RBCs), Innovative Stream for Rural Housing and Habitat Development (ISRHHD) and Pradhan Mantri Gramodya Yojana-Gramin Awaas (PMGY-GA) which was funded under the State Plans from 1 April 2000.

According to the 1991 census, the shortage of rural housing was estimated to be 137.20 lakh units. Of these, 34.10 lakh households were without shelter and 103.10 lakh households were living in "kutcha unserviceable" houses. It had been estimated that another 107.50 lakh houses would be required to cover the population growth between 1991 to 2002, thus projecting a total requirement of 244.70 lakh houses in rural areas.

As per the report of the working group formed by Government of India; on rural housing for the 11th five year plan, the total rural housing shortage between 2007 to 2012 was 47.43m. Out of this 90% is for the BPL family i.e. 42.69 million.

Context

Housing as one of the primary need, most states are now talking about increasing allocation of resources for providing Housing to all. However, the actual observations from the field shows clearly that the resources provided by the IAY and other government funded housing are insufficient to complete the house fully. There are instances where beneficiary take loans and adopts various approaches to complete the house.

The Documentary study clearly reveals that IAY houses policy is strategically left open ended so that beneficiary can build house as per his/her wish and also similarly choose the most appropriate local material. But unfortunately, most houses happens in only conventional material like brick and RCC.

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http://saiindia.gov.in/english/home/Our_Products/Audit_Report/Government_Wise/union_audit/recent_reports/union_performance/2003/Civil/2003_3/chapter3.htm

Contrary to the above, range of cost effective and local technologies are available, which are climatically suitable and are much cost effective then conventional. Infact many of them is tagged as technologies of masses or technologies for rural housing in popular terminology.

Need of the hour is to do an extensive study on local material and technology and develop region specific design package for IAY housing. If these packages are given to the beneficiary as guidelines on how to construct house using local and cost effective technology, it can help tremendously both to achieve higher completion rate of such houses and may help beneficiary to finish his house construction without any external loan or additional resources (other then the subsidy money) or with minimum loan. This need was also highlighted as a part of presentation done by performance review Committees on Rural Housing (IAY)² during 16th and 17th July 2010 to MoRD, GoI. *It articulated as below as a part of component on “Task force for Improving Design and Quality of IAY Houses” :*

- *Efforts should be made to ensure that the IAY house is a pucca one with permanent walls and permanent roofing.*
- *Each State Government is required to finalize type designs for the IAY house along with technical and material specifications based on the above principles.*
- *For all type designs approved by the State Government, the State Government should take responsibility and train sufficient number of masons and other mechanics for execution of the house as per the type designs.*
- *Cluster approach is to be followed to facilitate better supervision, convergence of schemes and economies in purchase.*

The present study builds on the above, and aims to demonstrate a structured pilot study so as to develop a framework for larger and more comprehensive study.

Approach

The Approach of the present pilot phase work is only to develop a broad framework and establish a usefulness of a more detail study and comprehensive work. As a part of pilot study, a broad study of government funded housing at two locations in Gujarat was carried out. The data those collected is presented in the case study section. The purpose of the ground study was as below :

- To understand the present housing typology of the specific location
- To understand a broad framework of technology used in these houses
- To document what is the present (March 2013) actual costing at ground level.
- To also, observe the quality and disaster resistant features and its inclusion in houses and also how aware the community is about them.
- Where possible, see how people use spaces within the house and how they expand on their own.

It will be important to mention here that, present study is been carried out in quick limited time frame and does not aim to develop an exhaustive study document, but tries to evolve a basic framework and a quick pilot so as to capture the ground data and develop a basic design model with reference to ground data and analyze the usefulness of the intervention.

² Presentation done by Performance Review Committee on Rural Housing (IAY) during 16th and 17th July 2010 (MoRD – GoI) as downloaded from online sources.

Case Study Location 1 : Village : Vadali, Taluka : Borshad, District : Anand, State : Gujarat

About Vadali Village:

Vadali is a Village in Borsad Taluk in Anand District of Gujarat State. Vadali is 9.1 km from its Taluka Main Town Borsad and 23.6 km away from its District Main City i.e. Anand . Vadali is about 97 km away from its State Capital i.e. Gandhinagar .

Case Study Location 2 :

Village : Antoli, Taluka : Dehgam, District : Gandhinagar

About Antoli Village

Antoli village is in Dehgam Taluka of Gandhinagar District. It is about 17 kms from Dehgam and about 40kms from Gandhinagar i.e. state Capital.

Case Study Location 3

Village : Jindava, Taluka :Dehgam, District : Gandhinagar

About Jindava Village

Jindava village is in Dehgam Taluka of Gandhinagar District. It is about 19kms from Dehgam and about 42 kms from Gandhinagar i.e. State Capital.

Case Study 1 - Borshad

Name : **Ashwin D Dabhi**
 Address : Vadelli Village,
 Taluka : Borshad
 District : Anand
 Present Status of house : House under construction
 Sanctioned Amount : Rs. 45,000/-
 Estimated Expense : Rs. 1,75,000/-
 Plot Area : 519 sq ft
 Cost / sq ft. : Rs. 345 per sq ft.



Door and Window



Staircase



Bathroom and Toilet



verandah at back side

House Dimensions : 35' x 14.5' i.e 507 sq. ft. (2 rooms, kitchen and a small verandah at back and front.)
 Staircase : Yes
 Toilet - Bathroom : Yes , Attached as shown in sketch
 Footing depth : 2.5'

Footing work is done in Brickwork with 2 layers of 18" wide brickwork and then 14" wide brickwork till plinth. Above Plinth, 9" wall.

Plinth height : 6"
 Coping : Yes (about 2.5")
 Ceiling height : 9'
 Slab thickness : 4"
 Lintel : Yes (2.5")
 Lintel : Yes (2.5")

Material Survey of Village : Vadeli, Taluka : Borshad, District : Anand

Items	Required	Rate	Amount
Brick	6 tractors	5200	31200
Aggregate	1 Tractors	3800	3800
Sand	1 Truck	8000	8000
Sand	1 Tractors	3500	10500
Steel	300 kg	45	13500
Cement	60 bags	275	16500
Plaster	Pending	Pending	Pending
Binding wire	8 kg	65	520
Nails	6 kg	65	390
Door	6 (2.5' x 6')	4500	27000
window	3 (1.5' x 2.5')	1500	4500
Machine Rent for concreting			2000
Door- window frames separate			1000 Per door

Item Rates of Contractor (labour)

Masonry : 1 Brass - Rs. 1200
 RCC Slab : 1 Brass - Rs. 3000
 Bands and beam : Rs. 1000 per R. foot
 Weather shed : Rs. 30/sq foot
 Plaster : Rs. 700/Brass
 Bracket : Rs. 300/R ft.

Case Study 2 – Borshad

Name : **Gangaben Shanabhai Dabhi**
 Address : Vadelli Village,
 Taluka : Borshad,
 District : Anand
 Present Status of house : House under construction
 Sanctioned Amount : Rs. 45,000/-
 Estimated Expense : Rs. 90,000/-
 Built up Area : 200 sq ft
 Cost per sq ft : Rs. 450/-



Attach Bathroom

Weather shed and Window

Separate Toilet

House Dimensions : 20' x 10' i.e 200 sq. ft. (1 rooms, kitchen and a small verandah at front.)
 Staircase : Yes
 Toilet - Bathroom : Yes , Bathroom Attached and Separate Toilet as shown in sketch
 Footing depth : 2.5'

Footing work is done in Brickwork with 2 layers of 18" wide brickwork and then 14" wide brickwork till plinth. Above Plinth, 9" wall.

Plinth height : 6"
 Coping : Yes (about 2.5")
 Ceiling height : 9'
 Slab thickness : 4"
 Lintel : Yes (2.5")

Material Survey of Village : Vadeli, Taluka : Borshad, District : Anand

Items	Required	Rate	Amount
Brick	5 tractors	5200	26000
Aggregate	1 Tractors	3800	3800
Sand	1 Truck	8000	8000
Steel	200 kg	45	9000
Cement	50 bags	275	13750
Plaster	Pending	Pending	Pending
Binding wire	6 kg	65	390
Nails	5 kg	65	325
Door	2 (2.5' x 6')	4500	9000
window	1 (1.5' x 2.5')	1500	1500
Machine Rent for concreting			2000
Door- window frames seprate			1000 Per door

Item Rates of Contractor (*labour*)

Masonry	: 1 Brass – Rs. 1200
RCC Slab	: 1 Brass – Rs. 3000
Bands and beam	: Rs. 1000 per R. foot
Weather shed	: Rs. 30/sq foot
Plaster	: Rs. 700/Brass
Bracket	: Rs. 300/R ft.

Case Study 3 – Borshad

Name : **Prakashbhai Girdharbhai Dabhi**
Address : Vadelli Village,
Taluka : Borshad,
District : Anand.
Present Status of house : House constructed in 2005-06
Sanctioned Amount : Rs. 36,000/-
Estimated Expense : Rs. 55,000/-
Built up Area : 200 sq ft
Cost / Sq. ft : Rs. 275/-



House Dimensions : 20' x 10' i.e 200 sq. ft. *(1 room, a small verandah at front.)*
Staircase : Yes
Toilet - Bathroom : Yes , *Bathroom and Toilet separate at back side as shown in sketch.*
Footing depth : 2.5'

Footing work is done in Brickwork with 2 layers of 18" wide brickwork and then 14" wide brickwork till plinth. Above Plinth, 9" wall.

Plinth height : 6"
Coping : Yes *(about 2.5")*
Ceiling height : 9'
Slab thickness : 4"
Lintel : Yes *(2.5")*

Material Survey of Village : Vadeli, Taluka : Borshad, District : Anand.

Items	Required	Rate	Amount
Brick	6000	1400	8400
Aggregate	1 Tractors	1500	1500
Sand	1 Truck	800	8000
Steel	200 kg	35	7000
Cement	50 bags	175	8750
Binding wire	5 kg	45	225
Nails	5 kg	65	225
Door	2(2.5' x 6')	1500	3000
window	1 (1.5' x 2.5')	500	500
Door- window frames seprate			500

Item Rates of Contractor (labour)

- Not Available

Case Study 4 - Antoli

Name : **Jijiben Govindji Thakor**
 Address : Antoli,
 Taluka : Dehgam
 District : Gandhinagar
 Present Status of house : House under construction
 Sanctioned Amount : Rs 45,000/-
 Estimated Expense : Rs. 75,000/-



Hous

e Dimensions : 12' x 12' i.e 144 sq. ft. (2 rooms, 1 Kitchen and a small verandah at front.)
 Staircase : No
 Toilet – Bathroom : No
 Footing depth : 2.5'

Footing work is done in Brickwork with 2 layers of 18" wide brickwork and then 14" wide brickwork till plinth. Above Plinth, 9" wall.

Plinth height : 6"
 Coping : Yes (about 2.5")
 Ceiling height : 9'
 Slab thickness : 4"
 Lintel : Yes (2.5")

Material Survey of Village : Antoli, Ta: Dehgam Dist: Gandhinagar

Items	Required	Rate	Amount
Brick	5 tractors	6000	300000
Aggregate	1 Tractors	2000	20000
Sand	1 Truck	3000	3000
	1 Tractors	1000	1000
Steel	300 kg	41	12300
Cement	50 bags	320	16000
Plaster	Pending	Pending	Pending
Binding wire	8 kg	65	520
Nails	6 kg	65	390
Door	3 (2.5' x 6')	4500	13500
window	3 (1.5' x 2.5')	700	2100
Machine Rent for concreting			2000
Door- window frames separate			600 Per door

Item Rates of Contractor (labour)

- Not Available

Case Study 5 - Antoli

Name : **Pashiben Gobarji Thakor**
 Address : Antoli,
 Taluka : Dehgam
 District : Gandhinagar
 Present Status of house : House under construction
 Sanctioned Amount : Rs 45,000/-
 Estimated Expense : Rs. 60,000/-
 Build up Area : 144 sq.ft.
 House Dimensions : 12' x 12' i.e 144 sq. ft.
 (1 room,a small verandah at front.)
 Staircase : No
 Toilet – Bathroom : No
 Footing depth : 2.5'



Footing work is done in Brickwork with 2 layers of 18" wide brickwork and then 14" wide brickwork till plinth. Above Plinth, 9" wall.

Plinth height : 6"
 Coping : Yes (about 2.5")
 Ceiling height : 9'
 Slab thickness : 4"
 Lintel : Yes (2.5")

Material Survey of Village : Antoli, Ta: Dehgam Dist: Gandhinagar.

Items	Required	Rate	Amount
Brick	5 tractors	6000	300000
Aggregate	1 Tractors	2000	20000
Sand	1 Truck	3000	3000
Steel	200 kg	41	8200
Cement	40 bags	320	12800
Plaster	Pending	Pending	Pending
Binding wire	6 kg	65	390
Nails	5 kg	65	325
Door	1 (2.5' x 6')	4500	4500
window	2 (1.5' x 2.5')	700	1400
Machine Rent for concreting			2000
Door- window Frames separate			600 Per door

Item Rates of Contractor (labour)

- Not Available

Case Study 6 – Jindva

Name : **Bhikhaji Kadaji Thakor**
 Address : Jindva,
 Taluka : Dehgam
 District : Gandhinagar
 Present Status of house : Constructed in 2005-06
 Sanctioned Amount : Rs 43,000/-
 Estimated Expense : Rs. 65,000/-
 House Dimensions : 17' x 11' i.e 187 sq. ft.
(1 room, a small verandah at front.)
 Staircase : No
 Toilet - Bathroom : No
 Footing depth : 2.5'



Footing work is done in Brickwork with 2 layers of 18" wide brickwork and then 14" wide brickwork till plinth. Above Plinth, 9" wall.

Plinth height : 6"
 Coping : Yes (about 2.5")
 Ceiling height : 9'
 Slab thickness : 4"
 Lintel : Yes (2.5")

Material Survey of Village : Jindva, Taluka : Dehgam, District : Gandhinagar.

Items	Required	Rate	Amount
Brick	6000	1400	8400
Aggregate	1 Tractors	1500	1500
Sand	1 Truck	800	8000
Steel	200 kg	35	7000
Cement	50 bags	175	8750
Plaster	5 kg	45	225
Binding wire	5 kg	65	225
Nails	2 (2.5' x 6')	1500	3000
Door	1 (1.5' x 2.5')	500	500
window			500
Machine Rent for concreting	6000	1400	8400
Door- window frames separate	1 Tractors	1500	1500

Item Rates of Contractor (labour)

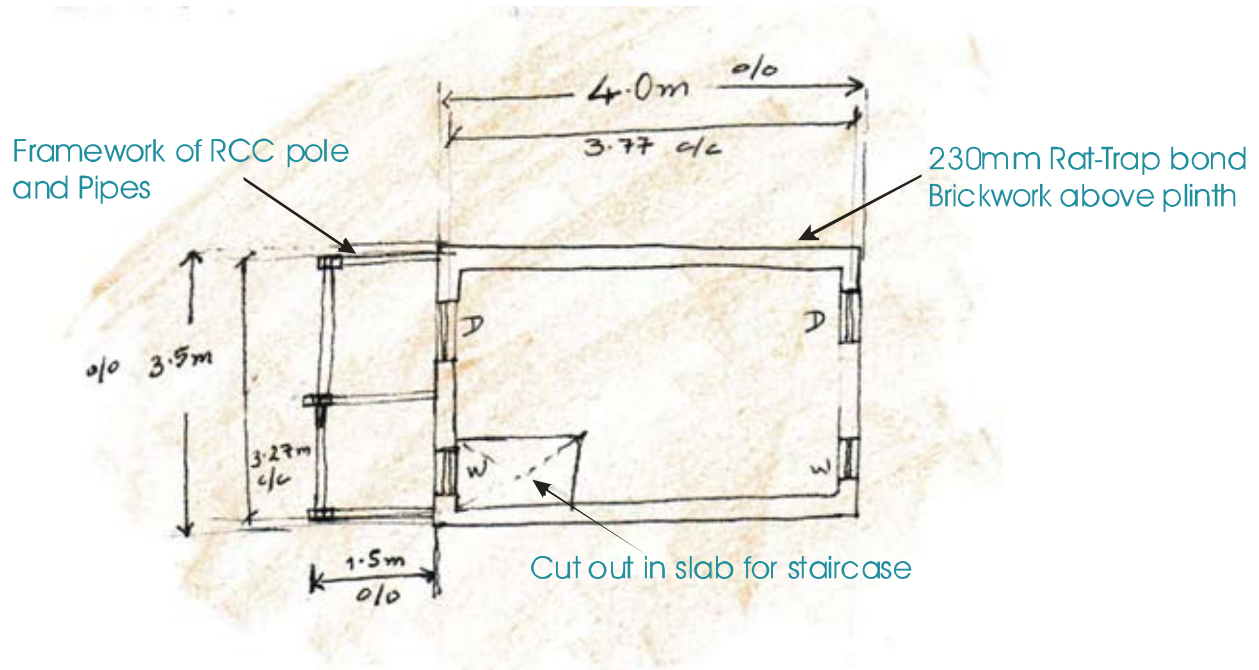
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Proposed Design :

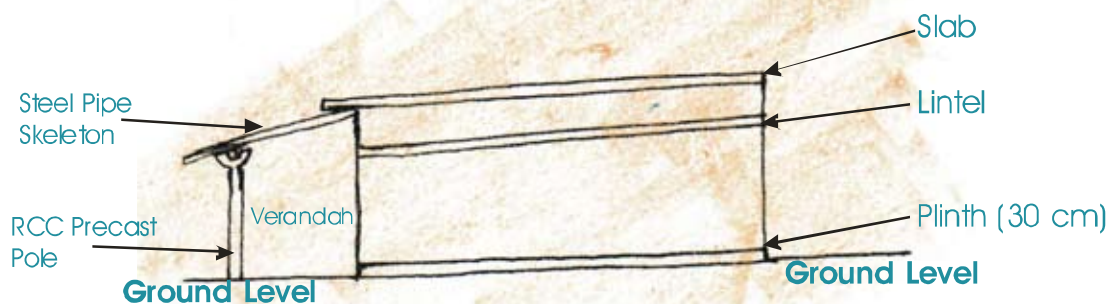
Based on the case study few important observations which can be used for standard design are as below :

- As articulated in the document too, the house assistance extended by government is for basic nucleus of the house. House owner based on his/her need mostly carries out extensions in semi-pakka fashion.
- All the observed houses didn't had staircase. But houses kept provision of cutout in slab so as to install staircase in later date.
- Verandah is an important element and most used portion of the house.
- Mostly all preferred kitchen outside in a semi-pakka fashion, either attached to the main structure or just near by towards back entry. Infected observation clearly revealed that they preferred using financial assistance available to them for main structure and felt that they will make arrangement for kitchen adjoining the main structure using their own resources and skills.
- An additional provision of Rs. 1000 is kept for Smokeless chullahs.
- Roofing was an important element, and all wanted a RCC roof to get a sense of Pakka or permanent structure.
- The costing structure was very indigenous and lumpsum basis it had no correlation to the Rate analysis or prevailing rates in the rural areas. At times, it was a lumpsum based labor contract saying about Rs. 25000 to Rs. 30000 for all labor work in a standard 200 to 225 sq ft of a house which is about Rs. 125 to Rs. 135 per sqft. This does include all labor, formwork and TEP cost/rent.
- Community did manipulated on Quality and foundation front to minimize the housing cost. All verandah and other extension had no solid foundation and they were just resting on the ground.
- To minimize the cost and maximize safety and size of the house, one of the approach adopted in design was to make main structure as big as possible and give spanning structure for verandah. A conscious decision was taken not to spend on flooring and walls at verandah level. It was seen and discuss with the community that they can manage it with available resources at their level.

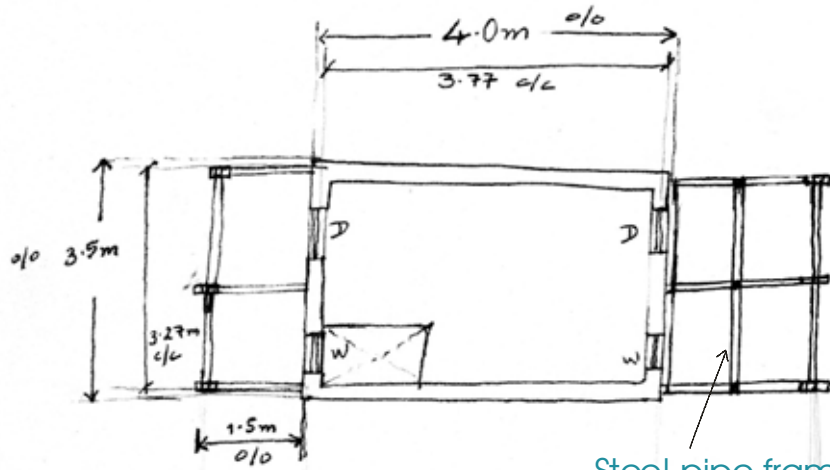
Basic Proposed Plan



Basic Proposed Elevation

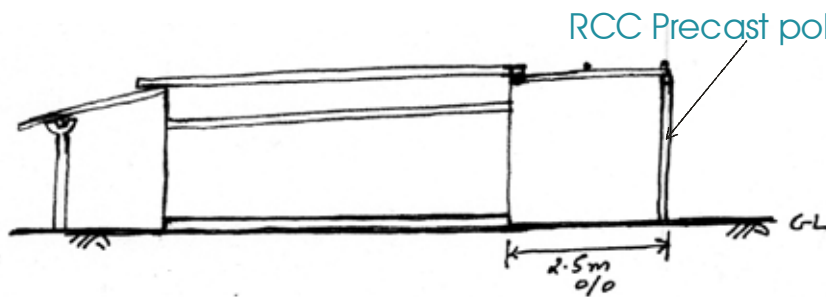
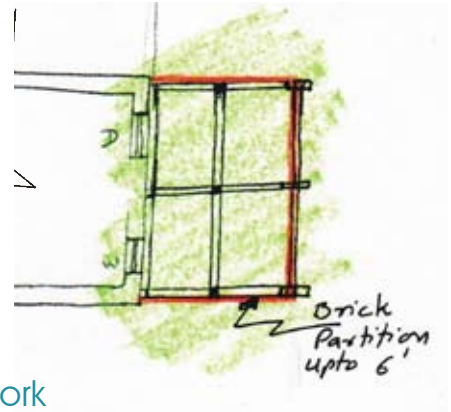


Alternative showing extensions to the basic plan



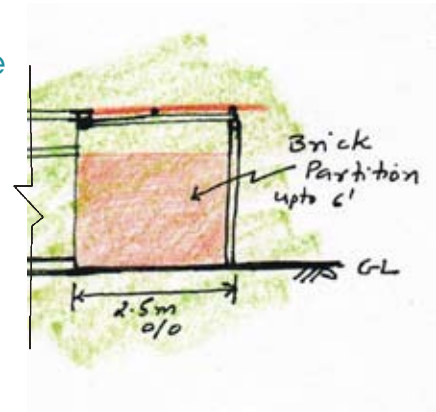
Plan

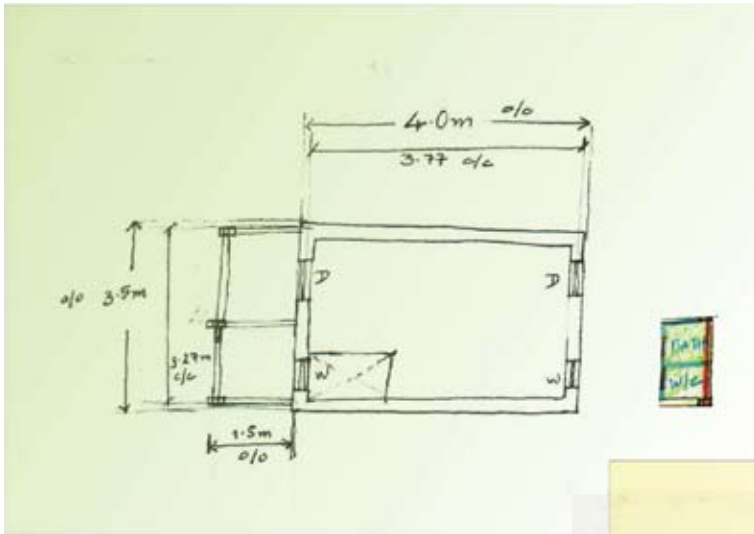
Steel pipe framework



Elevation

RCC Precast pole



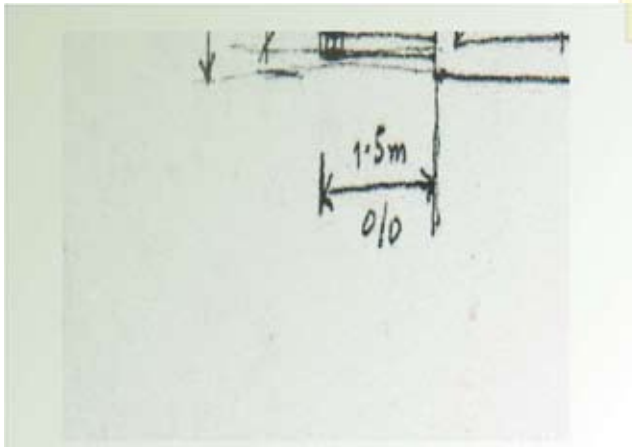
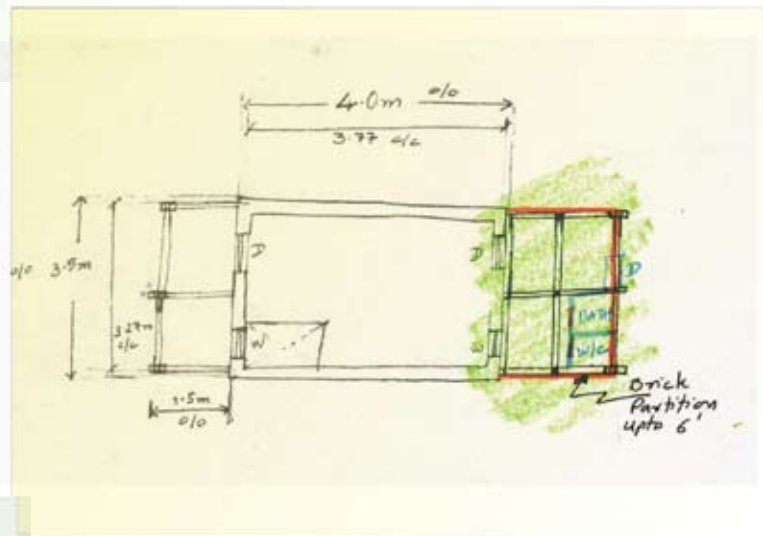


Positioning of Bath & W/c

If Back Framework
is not made by
House owner

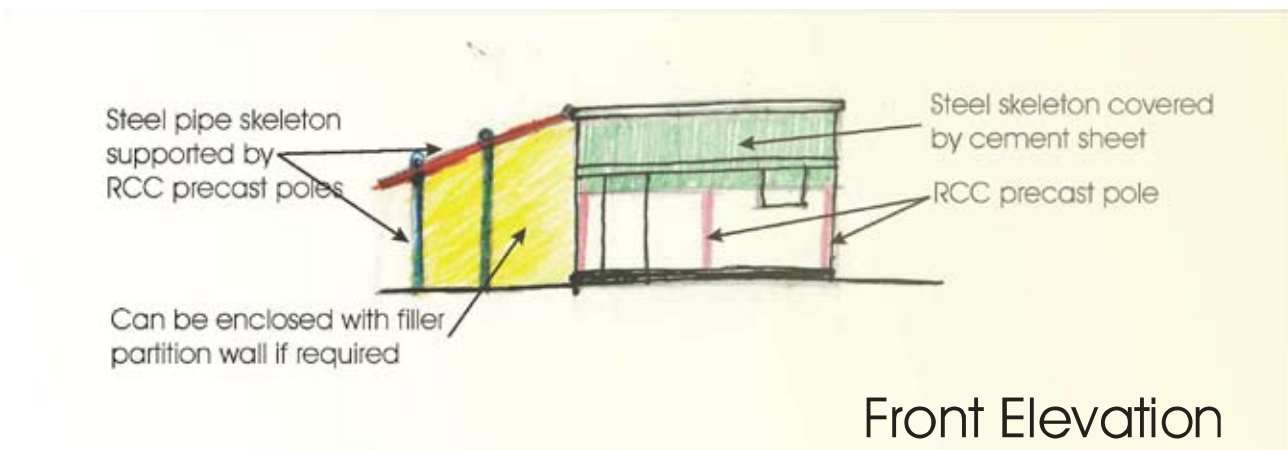
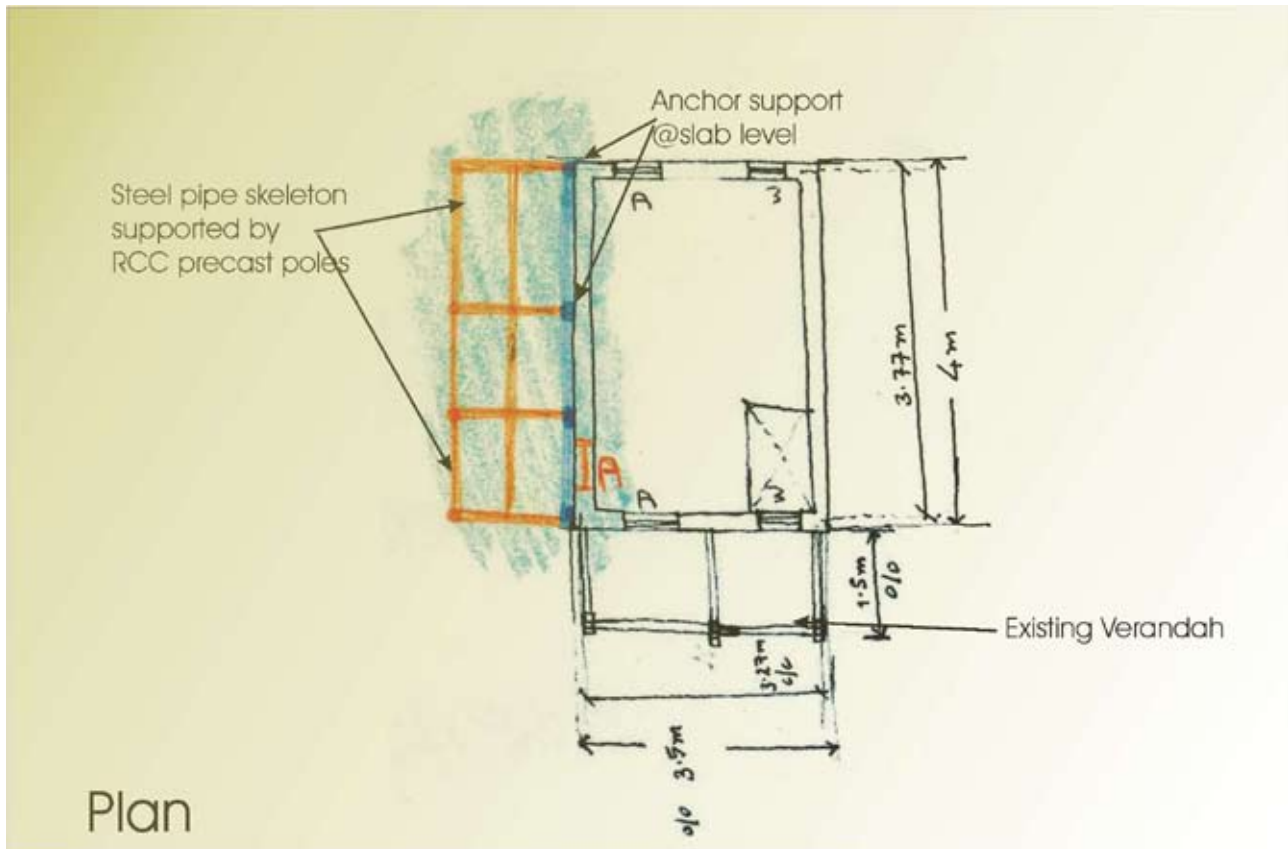
Positioning of Bath & W/c

If Back Framework
is made by
House owner



Front Verandah
Sitouts and top
covering - can be
done by house owner

Future Extensions By house owner



Estimate

Sr. No.	Particulars	Qty	unit	Rate (Rs.)	Amount (Rs.)
1	Excavation	11.4048	cum	93.84	1070.226
2	PCC	1.2672	cum	2825	3579.84
3	Brickwork (Below Ground)	5.37856	cum	4004.03	21535.94
4	Brickwork Above Ground till plinth	1.1088	cum	4004.03	4439.673
5	Backfilling	4.75904	cum		500
6	Coping (RCC)	0.24288	cum	4701.237	1141.836
7	Coping Reinforcement	23.22585	kg	79.93593	1856.58
8	Single brick masonry for coping formwork	14.08	Rm		1000
9	Brickwork till lintel level (RTB)	3.3988	cum	3469.39	11791.76
10	Lintel	0.28338	cum	4701.237	1332.236
11	Lintel reinforcement	46.4517	kg	79.93593	3713.159
12	Lintel Formwork				1000
13	Brickwork above lintel (RTB)	2.34784	cum	3469.39	8145.572
14	Slab	1.4375	cum	5000	7187.5
15	Door - window	8.6	sqm		5000
16	Flooring	10.7616	sqm	711.381	7655.597
17	Verandah Flooring	#REF!	sqm	711.381	
18	Plaster External	60.58	sqm		
19	Internal plaster	26.932	sqm	134.99	3635.416
20	Front face plaster	11.2	sqm	134.985	1511.832
21	Smokeless Chullahs		Lumpsum	1000.00	1000.00
					87,097.17

Note : Refer Annexure 1 for Rate analysis and other details

Must (minimum Addition) to the package

DRCP Features

As per code, it is compulsory to have coping and lintel level bands in a load bearing construction. We have already taken care of them in the basic design and calculations. For earthquake zone 3 and above, it is also necessary to have a corner reinforcement. Inserting a corner reinforcement, at times when the workforce is not train instead of strengthening; reduces the strength of the corner. To avoid this, we propose to have an additional Chicken mesh plate on all the four corners of the house. This will add as little as Rs. 2205 per house.

DRCP (chicken mesh Belt @ corners)	Quantity	Unit	Rate (Rs.)	Amount (Rs.)
at corners (45cm wide on either side of corner)	12.6	sqm	40	504
plaster	12.6	sqm	134.985	1700.811
				2204.811

Front Verandah Space

As per the case study and general typological study, it is found that verandah space is must for the houses. Lot of day to day activity happens in open or semi open spaces. Further, observations from case study and field visit clearly revealed that, in implementing Verandah space, most costly element for community is the framing structure. Covering material are generally available with the community or they can manage easily. Similarly for verandah flooring and side wall, people can construct themselves without much cost implication using mud or any other available construction material. So it was decided that as a part of basic design, one will give a front verandah skeleton i.e. framing and spanning elements installed. People will themselves complete it with their own covering and flooring materials.

Pipe and RCC framework (front)	Quantity	Unit	Rate (Rs.)	Amount (Rs.)
3 RCC poles	30	rft	30	900
Pipe framework	37.251	kgs	42	1564.542
				2464.542
Installation charge lumpsum				1000
				3464.542

Important Design Note :

It will be important to mention here that, the kitchen space is not specifically designated into the drawing neither calculated. It was found that, most of the time cooking happens in semi open spaces outside the main house. Community is trained and equipped with basic resources so as to use any of the available wall surfaces and create a basic kitchen setup. Appreciating these skill and available resources with the community, it was consciously decided to divert maximum resources to the main structure of house and also for additional support systems which can help house owner to expand easily and safely.

In addition to the front Verandah, it was thought that if there is a need to expand, the house owner can spend additional about Rs. 10,000 and get the skeleton structure made on the backside of the house too. He can add up as much as 87.5 sq ft of space without much effort. The alternative sketch also details out the same. For a stronger enclosed space need, a simple partition wall if constructed upto 6 feet i.e. about 1.8 m; the space can be converted into a closed room. The calculations and costing of both the alternative is shared below for reference.

Pipe and RCC framework (back)	Quantity	Unit	Rate (Rs.)	Amount (Rs.)
3 RCC poles	36	rft	30	1080
Pipe framework	160.2	kgs	42	6728.4
				7808.4
Installation charge lumpsum				1500
				9308.4

Back verandah partition wall about 1.8m high	Quantity	Unit	Rate (Rs.)	Amount (Rs.)
Excavation	3.06	cum	93.84	287.1504
PCC	0.51	cum	2825	1440.75
brickwork	2.20575	cum	4004.03	8831.898
partition wall	14.4	sqm	504.41	7263.432
				17823.23

Note : It will be important to mention here that the costing of flooring and covering is not considered since, that is done by house owner themselves using available resources and systems.

Conclusions and Way forward

The present design is a sample design for costing and is a product of couple of quick case studies done as a part of the project. It will be important to mention here that the present work is not exhaustive and does not actually builds on finer existing traditional details available at each location or geographic cluster. A study of them and including them in the design will help bring down the cost further. Also, a detail study based on the geographical clusters will change the type design of the house too. The present design is though a product of case studies in two regions of Gujarat, it can be considered generic for Gujarat and for that matter for the western region of India. Adaptation and refinement will have to be done on the present design to make it suitable for specific geoclimatic region.

The present pilot is just a humble effort so as to establish a model and a systematic approach so as to carry out detail geo-climatic, financial and technical study of IAY or government housing and come up with range of models and designs which are custom made for a particular geoclimatic region with specific local technologies.

Base Rates taken for Rate Analysis

Particulars	Rate	unit
Maruom	250	per tractor
Cement	300	bag
Sand	425	cum
aggregate	650	cum
Brick	5	nos
steel	55	kg
binding wire	65	kg

Labour Rates

Skilled : Rs. 300/day

Unskilled : Rs. 200/day

Sr. No.	Particulars	Amount (Rs.)	Unit
1	Excavation	93.84	Cum
2	Backfilling	51.2	Cum
3	PCC	2825	Cum
4	Brick work	4004	Cum
5	Coping (RCC) without formwork/reinforcement	4701	Cum
6	Lintel	4701	Cum
7	Rat Trap bond	3469.5	Cum
8	RCC Slab (inclusive of All) market rate	5000	Cum
9	Internal Plaster	135	sqm
10	Reinforcement	80	kg

EXCAVATION

Item no.	Item Description	Unit	Quantity	Rate	Amount
	for 10 cu.m				
A	Materials				
B	Labour				
	skilled				
	Unskilled	nos	4	200	800
	Total of A + B				800
C	Water and Electricity (2% of A + B)				0
D	Tools and equipments (2% of A + B)				16
E	Scaffolding (2% of A + B)				0
F	Overheads & Profits (15% of A+B+C+D+F)				122.4
TOTAL COST OF 10 cu.m of EXCAVATION =					938.4
TOTAL COST OF per cu.m of EXCAVATION =					93.84

Item no.	Item Description	Unit	Quantity	Rate	Amount
	for 10 cu.m				
A	Materials				
B	Labour				
	skilled				
	Unskilled	nos	2.1	200	420
	Total of A + B				420
C	Water and Electricity (2% of A + B)				8.4
D	Tools and equipments (2% of A + B)				8.4
E	Scaffolding (2% of A + B)				8.4
F	Overheads & Profits (15% of A+B+C+D+F)				66.78
	TOTAL COST OF 10 cu.m of BACKFILLING =				511.98
	TOTAL COST OF per cu.m of BACKFILLING =				51.198

ITEM NO	ITEM DESCRIPTION	UNIT	QUANTITY	RATE	AMOUNT	REMARKS
2.01	Providing and laying PCC in Foundation and Plinth in proportion 1:4:8 (where 1 part is cement, 4 parts is fine aggregates, 8 parts is aggregates) including curing ramming etc.					
	For 10 cu.m					
A	Materials					
	Cement	bags	34.14	300	10242	
	Sand	cu.m	5.14	425	2184.5	
	Aggregates	cu.m	10.29	650	6688.5	
B	Labour					
	Skilled	nos	1	300	300	
	Unskilled	nos	13.3	200	2660	
	Bhishti	nos	7	200	1400	
	Vibrator	nos	0.7	200	140	
	Total of A + B				23615	
C	Water & Elec. (2% of A + B)				472.3	
D	TEP (2% of A + B)				472.3	
	Total A+B+C+D				24559.6	
E	Over heads & Profits (15% of A+B+C+D)				3683.94	
	Therefore total cost in Rs 10 cu.m of PCC=				28243.54	
	THEREFORE UNIT COST OF PCC =				2825	/cu.m

Brick masonry work in 1:6 cement mortar (Flyash Bricks)				
Description of works	Unit	Qty	Rate	Amount
Details for 1 Cu.m. of brick work				
Materials				
Bricks	Nos.	450	5	2250
Cement	Bags	1.25	300	375
Sand	Cu.m	0.2675	425	113.6875
Labour				
Mason	Each	0.72	300	216
Coolie	Each	1.37	200	274
Waterman	Each	0.2	200	40
Foreman	Each	0.08	200	16
Sub-total				3284.6875
Add for water and electricity @ 2%		2%		65.69375
Add for TEP @ 2%		2%		65.69375
Add for sundries and contingencies @ 2%		2%		65.69375
Sub-total				3481.7688
Add OH & Profit @15%		15%		522.26531
Cost per Cum				4004.0341

ITEM NO	ITEM DESCRIPTION	UNIT	QUANTITY	RATE	AMOUNT	REMARKS
2.04	Providing and laying in line and level RCC LINTEL at GF level in cement concrete (M20) 1:1.5:3 (where 1 part is cement, 1.5 parts is sand and 3 parts is aggregates) etc. excluding reinforcement and formwork, including curing compaction etc. complete excluding reinforcement and formwork					
	For 10 cu.m					
A	Materials					
	Cement	bags	80.34	300	24102	
	Sand	cu.m	4.56	425	1938	
	Aggregates	cu.m	9.12	650	5928	
B	Labour*					
	Skilled	nos	2	300	600	
	Unskilled	nos	25	200	5000	
	Bhishti	nos	8	200	1600	
	Vibrator	nos	0.7	200	140	
	Total of A + B				39308	
C	Water & Elec. (2% of A + B)				786.16	
D	TEP (2% of A + B)				786.16	
	Total A+B+C+D				40880.32	
E	Over heads & Profits (15% of A+B+C+D)				6132.048	
	Therefore total cost in Rs 10 cu.m of PCC=				47012.37	
	THEREFORE UNIT COST OF PCC =				4701.237	/cu.m

Item no.	Item Description	Unit	Quantity	Rate	Amount
2.13	Providing and erecting formwork for GROUND FLOOR LINTEL, of ordinary timber planking, including applying shuttering oil, deshuttering the same etc. complete	sq.m		247.01	
	for 3.6 sq.m				
A1	Materials				
	Ply (15 reps)	sq.m	4.75	500.00	158.20
	Wooden battens (20 reps)	cu.m	0.12	28000.00	166.11
	Props (20 reps)	nos	31.96	80.00	127.84
	nails+binding wire	kgs	1.00	58.00	58.00
	Releasing agents	lts	0.81	32.00	25.82
B1	Labour				
	skilled	nos	0.46	300.00	138.35
	Unskilled	nos	0.46	150.00	69.17
	Total of A1 + B1				743.49
C1	Water and Electricity (2% of A1 + B1)				14.87
D1	Tools and equipments (2% of A1 + B1)				14.87
E1	Scaffolding (2% of A1 + B1)				0.00
F1	Overheads & Profits (15% of A1+B1+C1+D1+F1)				115.98
Total cost of 3.6 sq.m =					889.22
Total UNIT cost =					247.01

Item no.	Item Description	Unit	Quantity	Rate	Amount
2.21	Providing and laying TOR steel reinforcement for all RCC works as per the structural details and placing the rebar cage in position including cutting, bending, binding with 18 gauge GI wire etc. complete for COPING	kgs		65.03	
	For 100 KG				
A	For concrete				
	Reinforcement	kgs	102.00	45.00	4590.00
	Binding wire	kgs	1.50	65.00	97.50

B	Labour				
	skilled	nos	1.50	300.00	450.00
	Unskilled	nos	2.00	150.00	300.00
	Total of A + B				5437.50
C	Water and Electricity (2% of A + B)				108.75
D	Tools and equipments (2% of A + B)				108.75
E	Scaffolding (2% of A + B)				0.00
F	Overheads & Profits (15% of A+B+C+D+F)				848.25
TOTAL COST OF 100 kg of rebar cutting and fixing =					6503.25
TOTAL COST OF per kg of rebar cutting and fixing =					65.03

Item no.	Item Description	Unit	Quantity	Rate	Amount
2.22	Providing and laying TOR steel reinforcement for all RCC works as per the structural details and placing the rebar cage in position including cutting, bending, binding with 18 gauge GI wire etc. complete for FF LINTEL BAND	kgs		65.03	
	For 100 KG				
A	For concrete				
	Reinforcement	kgs	102.00	45.00	4590.00
	Binding wire	kgs	1.50	65.00	97.50
B	Labour				
	skilled	nos	1.50	300.00	450.00
	Unskilled	nos	2.00	150.00	300.00
	Total of A + B				5437.50
C	Water and Electricity (2% of A + B)				108.75
D	Tools and equipments (2% of A + B)				108.75
E	Scaffolding (2% of A + B)				0.00
F	Overheads & Profits (15% of A+B+C+D+F)				848.25
TOTAL COST OF 100 kg of rebar cutting and fixing =					6503.25
TOTAL COST OF per kg of rebar cutting and fixing =					65.03

Rat trap bond masonry work in 1:5 cement mortar				
Description of works	Unit	Qty	Rate	Amount
Details for 2.16 Cu.m. of brick work				
Materials				
Bricks	Nos.	832	5	4160
Cement	Bags	2.7	300	810
Sand	Cu.m	0.5778	425	245.565
Labour				
Mason	Each	1.6	300	480
Coolie	Each	1.8	200	360
Waterman	Each	0.38	200	76
Foreman	Each	0.08	200	16
Sub-total				6147.565
Add for water and electricity @ 2%		2%		122.9513
Add for TEP @ 2%		2%		122.9513
Add for sundries and contingencies @ 2%		2%		122.9513
Sub-total				6516.4189
Add OH & Profit @15%		15%		977.46284
Cost per 2.16Cum				7493.8817
cost per cum				3469.3897

DETAILS OF COST OF 10.0000 SQ.M.				
For Cement Mortar (1:4) Refer 8(2.5.14)	Cu.M.	0.2240	1954.75	437.86
Mazdoor (female)	Each.	1.0000	200.00	200.00
Mason IInd Class	Each.	1.0000	300.00	300.00
Bhisti	Each.	1.0600	200.00	212.00
For Cement Mortar (1:4) Refer 8(2.5.14)	Cu.M.	0.2240	275.01	61.60
Scaffolding and sundries	L.S.		2.00	2.00
				775.60
For Cement Mortar (1:4) Refer 8(2.5.14)	Cu.M.	0.2240	6.00	1.34
Cost of 10.0000 SQ.M.				1214.81
Add 2% for W.C. & O.H.				24.30
Add 15% for Contractor's Profit				110.74
Cost of 10.0000 SQ.M.				1349.85
Cost of 1.00 Sq.M.				134.99

Item no.	Item Description	Unit	Quantity	Rate	Amount
2.2 1	Providing and laying TOR steel reinforcement for all RCC works as per the structural details and placing the rebar cage in position including cutting, bending, binding with 18 gauge GI wire etc. complete.	kgs			
	For 100 KG				
A	For concrete				
	Reinforcement	kgs	102	55	5610
	Binding wire	kgs	1.5	65	97.5
B	Labour				
	skilled	nos	1.5	300	450
	Unskilled	nos	2	200	400
	Total of A + B				6557.5
C	Water and Electricity (2% of A + B)				131.15
D	Tools and equipments (2% of A + B)				131.15
E	Scaffolding (2% of A + B)				131.15
F	Overheads & Profits (15% of A+B+C+D+F)				1042.643
	TOTAL COST OF 100 kg of rebar cutting and fixing =				7993.593
	TOTAL COST OF per kg of rebar cutting and fixing =				79.93