प्रधान मंत्री
आवास योजना-ग्रामीण
Pradhan Mantri Awaas Yojana-Gramin

Ministry of Rural Development
Government of India

A Compendium of Rural Housing Typologies

Volume II

pahal

Prakriti Hunar Lokvidya

Pradhan Mantri Awaas Yojana - Gramin



Partners :

Indian Institute of Technology Delhi

CBRI

UNDP
Empowered lives.
Resilient nations.

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सत्यमेव जयते
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This concise book of Rural Housing technologies Volume II has been developed by UNDP. The house designs proposed are a result of a study conducted by UNDP in collaboration with Ministry of Rural Development, Government of India in thirteen states and by Indian Institute of Technology, Delhi in two states.

Special Note: An in-depth study conducted in the 18 states of India has helped in developing 130 zone specific comfortable, affordable, green and multi-hazard safe designs for the PMAY(G). This compendium contains some of these designs and technologies.

A number of region-specific technologies have been developed based on local materials and traditional construction practices, which are economical and more environment friendly than brick, cement, and steel intensive systems. While some of them are in this book, the remaining will be published shortly.

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State Designs

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Message

नरेन्द्र सिंह तोमर
NARENDRA SINGH TOMAR

ग्रामीण विकास,
पंचायती राज और खान मंत्री
भारत सरकार
कृषि भवन, नई दिल्ली

**MINISTER OF RURAL DEVELOPMENT,
PANCHAYATI RAJ AND MINES
GOVERNMENT OF INDIA
KRISHI BHAWAN, NEW DELHI**

MESSAGE

Pradhan Mantri Awaas Yojana – Gramin (PMAY-G) which came into effect from 1st April 2016 was formally launched by Hon'ble Prime Minister of India on 20th November, 2016. The immediate target is construction of one crore houses by 2018-19. The programme aims to fulfil the dreams and aspirations of the poorest of the poor, across the 6,40,867 villages of India. The programme supports poor households who are deprived of a house and are unable to build their houses due to limited financial capacity.

Achieving this target in three years is a daunting task. It will take coming together for a purpose of a kind that our nation has not seen before. Central and State Governments will work together and provide shelter to the poorest of the poor of this country. Such an endeavour will create numerous employment opportunities, see a demand for quality construction material, components and services, and boost the entrepreneurial base of our rural hinterlands. The budget allocated and resultant expenditure at the village and block levels in each State will strengthen the rural economy. As such, the PMAY-G is envisioned as a nation building exercise. Apart from the effective disbursement of funds to identified and eligible beneficiaries, this ambitious programme also is a means for skill upgradation in rural areas. The Ministry of Rural Development in partnership with State Governments and institutions like UNDP, HUDCO, CSDCI, NSDC, NIRD&PR and the IITs, has embarked upon training initiatives in each State that complement the recommendation of designs and construction technologies for each housing zone. I see this programme as significantly raising overall standards of construction in rural India.

The PMAY-G has been envisioned to go the extra mile to ensure that the rural poor get complete assistance in making their houses. Beyond the basic financial assistance, funds for the construction of a toilet in each house, and additional assistance in the form of labour wages from MGNREGA have been integrated to construct a complete home for each of the eligible and needy household. At the time of allocation of each house, beneficiaries are provided a menu of options related to the indicative housing design and construction technologies for his or her housing zone in their State developed by Ministry of Rural Development in collaboration with UNDP & IIT, Delhi. Along with this, a docket is also provided to the beneficiaries containing details of quantities of materials and detailed associated costs for each identified housing design, a list containing contact details of trained masons, location of demonstration houses/structures constructed and enabling additional institutional finance, if required. The effort is to support poor households in building houses of their choice of design and materials at affordable cost.

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The PMAY-G is also envisioned as a sustainable development platform, focussing on local and appropriate, cost effective technologies that not only boost rural economies but endeavour to leave a minimal footprint on the environment. Each house building under this scheme is mandated to have a toilet as a part of it, providing clean sanitation facility in each home. This is but a step towards ensuring a clean environment in our villages and fulfilling the dream of a clean and healthy India. The use of locally available construction materials and technologies not only meets the mandate of keeping the schemes appropriate to the region the house is being built in, but also leads to the use of lower energy and sustainable construction materials. This is reflective of an environmentally responsible nation.

As an important step towards these objectives, the Ministry of Rural Development, Government of India had published a concise compendium in 2016 called PAHAL that illustrates the various housing prototypes for 10 states. I am happy to introduce the expanded version of this compendium – PAHAL Volume 2, which now covers 18 states and 117 housing designs. This compendium captures the diversity of the built heritage of our country. I am sure this document will help all of us in ensuring improved, resilient and aesthetic housing for the rural poor.

(Narendra Singh Tomar)

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Message

राज्य मंत्री
ग्रामीण विकास
भारत सरकार

MINISTER OF STATE
FOR RURAL DEVELOPMENT
GOVERNMENT OF INDIA

राम कृपाल यादव
Ram Kripal Yadav

MESSAGE

The Pradhan Mantri Awaas Yojana - Gramin (PMAY-G) is a flagship programme of the Ministry of Rural Development which aims to achieve the objective of 'Housing for All' by 2022. To achieve the objective, the target set is to construct 2.95 crore houses by 2022. The immediate target under PMAY-G is construction of 1 Crore houses in three years from 2016-17 to 2018-19

The objective of PMAY-G is not only construction of houses but also ensuring that the houses constructed are durable, safe and of good quality. In this direction Ministry of Rural Development has conducted studies in different part of the country to identify house designs that are suitable to the geoclimatic zones and incorporate the socio-cultural aspirations of the people living in those areas.

In order to ensure that the identified house designs and technologies used in the construction are disseminated among all the stakeholders for adoption at the ground level, Ministry of Rural Development had developed a comprehensive compendium, titled "PAHAL" showcasing different house designs for different geo-climatic zones in 10 States of the country. The compendium was released by the Hon'ble Prime Minister on 20th November, 2016.

The initial publication covers house designs which have been structurally validated for10 states of the country. Since then the study has taken place in other States and more house designs have been identified and structurally validated. Hence the need for publishing a revised publication through which the newly identified house designs could be disseminated among stakeholders was felt.

PAHAL – Volume 2, is being brought out which showcases the diversity in house designs in 18 states of the country. The current compendium provides a snapshot view of the house designs that can be adopted in different states of the country as per their geo-climatic zones and socio-cultural aspects.

I am confident that this revised compendium of sustainable housing technologies, will provide all stakeholders in the States with the necessary information to guide PMAY-G beneficiaries in building homes that are secure and that they are proud of.

Ram Kripal Yadav

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Foreword

Pradhan Mantri Awaas Yojana – Gramin, (PMAY-G), a flagship programme of the Ministry of Rural Development aims to fulfil the vision of providing "Housing for All" by 2022. In order to ensure that houses constructed under the scheme are appropriate to the regional context, the Government of India iscommitted to provide the best possible technical assistance and support to State Government and beneficiaries in making informed choices on house construction. PAHAL, the compendium on sustainable housing technologies published last year was a testimony to that commitment.

The Ministry of Rural Development, Government of India had initiated a detailed study for the development of housing prototypes for each housing zone within a state based on the climatic conditions, disaster risk factors, local construction materials and traditional skills. These housing designs based on sustainability principles and thorough stakeholder consultations have been developed in partnership with the United Nations Development Programme (UNDP) in 13 states and with the Indian Institute of Technology (IIT) Delhi in 5 states. After the 10 states which were covered in the previous volume of PAHAL, the Ministry, in partnership with UNDP and IIT Delhi, has undertaken detailed exercise in another 8 states, to provide a menu of technically validated options for house design, construction materials and technologies to the beneficiaries. The house prototypes covered in this updated compendium, PAHAL Volume 2, showcase building technologies that are disaster resilient so as to handle the vagaries of nature specific to the housing zones and reduce the carbon footprint/ adverse environmental impacts that result through construction. As in the previous edition of PAHAL published last year, detailed cost estimates have been drawn up for each prototype along with options of specifications. Structural validation for the house designs have been done by the Central Building Research Institute (CBRI), which is a doyen in the sphere of civil engineering.

State specific recommendations on design and construction technologies have been compiled in Zonal Rural Housing Manuals and have been made available to the stakeholders of PMAY-G. The Ministry of Rural Development, Government of India, in coordination with State Governments is currently in the process of constructing demonstration structures at the block level with locally availableskill-sets and the use of locally sourced materials.We express our sincere gratitude to UNDP, IIT Delhi and CBRI for collaborating in development of the design typologies. We further thank UNDP for the compilation of this document. I am aware that the previous version of PAHAL has already created significant learning for multiple stakeholders regarding creative ways to construct functional houses for the rural poor. I am sure that the second volume will further reinforce this interest by providing more options in terms of designs, materials and technologies at the state level.

Amarjeet Sinha
Secretary, Rural Development, Ministry of Rural Development

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Preface

A major difference between the Pradhan Mantri Awaas Yojana – Gramin (PMAY-G) and previous rural housing programmes promoted by the Government of India is the significant techno-managerial support which PMAY-G provides to poor, beneficiary households. This support is in the form of improved design options, ensuring availability of skilled masons in rural areas, enhanced access to affordable and quality construction materials, and better funds flow. Such comprehensive support however, requires collaborative efforts with regards to capacity building, promotion of local enterprises, technical handholding and strong institutional systems.

A thorough understanding of the larger ecosystem issues impacting construction of houses in rural areas, especially through public programmes is certainly an essential pre-requisite to building strong, sustainable strategies which can ensure that poor households are able to aspire for and achieve quality housing. Affordability, functionality, durability and disaster-resilience are some of the important parameters which need to be kept in mind while developing solutions to the challenges faced by poor households aspiring for a better house. PAHAL, published by the Ministry of Rural Development in 2016, is an important initiative towards this end. Since its release, it has served as an important tool to enhance the perspectives and capacities of key stakeholders engaged with implementation of PMAY-G, including engineers, district/block level government officials and most of all beneficiaries themselves. While capturing the diversity of housing construction practices across the country, PAHAL, very sensitively builds on this knowledge to propose improved construction practices which are in tune with local environments. The designs very creatively bring together the strengths of conventional construction materials/technologies such as cement and bricks, and traditional materials/technologies based on timber, bamboo, mud, etc. Importantly, PAHAL has provided PMAY-G implementers, a credible basis to highlight different technical options through demonstration houses constructed in different parts of the country.

I am sure that the revised version of this document in the form of PAHAL Volume 2, will contribute even more in raising overall standards of rural housing in the country. The wider range of technical options presented in this revised version, the increase in number of states covered, and improved presentation, will make this document an extremely valuable resource for every individual and agency involved with rural housing construction in the country.

I would like to appreciate here the immensely important role of each of the 18 State Governments which were closely involved in development of this document. I also take this opportunity to extend my appreciation to the different agencies engaged in developing PAHAL Volume 2 especially UNDP, IIT Delhi and CSIR-CBRI. I am sure that in the coming future, we will be able to further improve upon this document and include even more innovative practices and ideas which could contribute to strengthening implementation of PMAY-G implementation.

Nagesh Singh
Additional Secretary, Rural Development, Ministry of Rural Development

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Introduction

The Pradhan Mantri Awaas Yojana – Gramin (PMAY-G) came into effect from 1st April, 2016. The PMAY-G aims to construct four crore houses in rural areas by the year 2022. Ministry of Rural Development, Government of India has put together a bouquet of locally appropriate housing designs to ensure that sensible housing decisions are made while constructing houses under PMAY-G.

In its continued efforts in generating the housing options for each state, Ministry of Rural Development in collaboration with United Nations Development Programme (UNDP) and the Indian Institute of Technology (IIT) Delhi, undertook an exercise conducting detailed studies, state level consultations for the development of housing prototypes in the various housing zones of the state. An initial publication titled "Pahal" consisting of identified house designs was released by Hob'ble Prime Minister of India on 20th November, 2017. Now Ministry of Rural Development has come up with second volume of PAHAL, wherein house designs of 18 states are covered. Following the process established in the studies conducted in the first set of 10 states, these housing designs were developed through a consultative process with rural communities, government stakeholders at different levels and civil society representatives. Housing zones in each of the selected states were identified on the basis of local materials and technologies, vulnerability to disasters/hazards, livelihood aspects linked to housing designs, and existing community skills. Other considerations were available knowledge, skills and crafts, culture and building traditions, local built character and building fabric. The designs incorporated the disaster mitigating features of traditional housing and improved on them through modern day introductions like reinforcement in masonry, better joints, termite and borer treatment of bamboo and timber, cement and lime stabilisation of earthen technologies.

117 design typologies have now been developed ; sometimes more than one housing prototype was developed for each housing zone. For PAHAL Volume 2, a more rigorous validation of the range of materials and technologies proposed through the housing typologies, was undertaken by the Central Building Research Institute (CBRI), Roorkee. All the housing designs developed for the various housing zones across the 18 states covered through these studies, have been vetted for both structural and resilience to the vagaries of local climatic conditions. This time CBRI has given special importance to traditional building systems; improvements on the traditional technologies suggested for the housing prototypes have been scrutinised thoroughly and have been incorporated with modifications where necessary. As a result, an array of options from the foundation to the roof have been finalised for these housing designs.

Under the guidance of MoRD, UNDP had taken the assistance of the School of Planning and Architecture (SPA) to develop modular components for these housing prototypes for ease of construction and reduction of costs. This exercise has simplified various parts of the structure of these housing designs to produce a kit of parts that can aid easy replication. This modularity aids in scaling up of PMAY-G endeavour. The outputs of this exercise have also now been included in this second volume of the housing designs compendium.

The designs included in this revised version of the compendium, PAHAL Volume 2, may work as a ready reckoner for government decision makers, engineers engaged in PMAY-G implementation, panchayats, masons and potential beneficiary households with a wider range of options related to designs, materials and technologies for implementation of PMAY-G. As in the first edition of PAHAL, each housing design in the second volume is accompanied by detailed costs of construction. The detailed drawings and specifications illustrating each housing design in this compendium incorporate the recommendations of CBRI. One can also access detailed information pertaining to these housing prototypes from the Zonal Rural Housing Manuals uploaded on the Rural Housing Knowledge Network Portal (www.ruralhousingnetwork.in).

The objective of this effort is to enable PMAY-G beneficiaries and other state agencies involved to make informed decisions related to the size, layout, materials and technologies for construction of the house to be built under PMAY-G. We foresee that this process would ensure the construction of a PMAY-G house is appropriate, affordable, disaster-resilient, and have an aesthetic that reflects the context of the specific region.

Prasant Kumar
Joint Secretary (Rural Housing), Ministry of Rural Development

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Rural Housing Typologies

How to read this document

UP-01

This represents the housing typology in a particular state

The code to the housing typology proposed

UP - 01

Typology Number

State Initial in this case - Uttar Pradesh

State MAP for example Uttar Pradesh with housing zonations marked/coloured

STATE

State name

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Assam

Assam contains three physiographic divisions (out of the six in India)- The Northern Himalayas (Eastern Hills), The Northern Plains (Brahmaputra plain) and Deccan Plateau (Karbi Anglong). Plains in the 20-120 metre elevation range occupy most of the upper and lower Assam valley , covering almost 72% of the state's total area and constituting the most flood prone regions of Assam.

The chief criteria for these designs are the geographical constraints – namely plains, hilly areas and flood affected areas – and consequently, the availability of building materials for house construction. One important criterion which must be considered is the cultural preferences of people in different parts of the state and, as a result, the variety of spatial designs of houses. This factor has traditionally not been taken into account by the proposed type designs for PMAY-G houses.

The following three have been identified as the main criteria for design of PMAY-G houses for Assam and the state has been divided in to five housing zones –

1. Vulnerability to natural hazards
2. Physiography and access to building materials
3. Cultural Compatibility

Zone A

High vulnerability to floods- 50-75% flood hazard area and likelihood of flood inundation for more than 24 hours almost every year. Marigaon, Nalbari and Darang are most vulnerable, Medium vulnerability to cyclonic storms, and mostly low vulnerability to river bank erosion. This zone lies entirely in the alluvial plains of the Brahmaputra valley, with the average elevation in the range of 25m-50m. There is negligible forest cover in this zone.

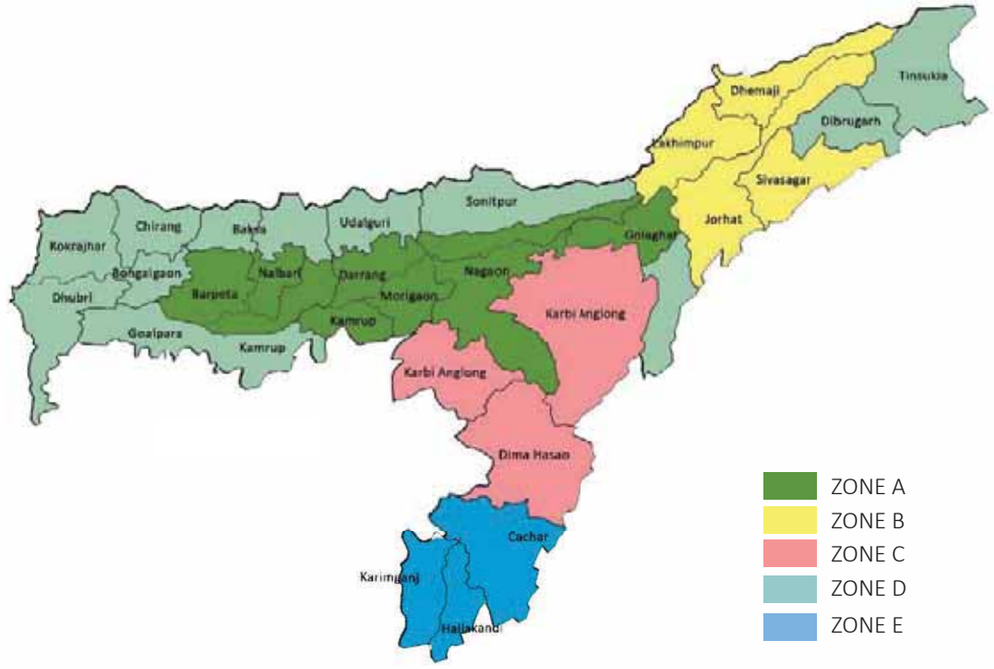
Zone B

High vulnerability to floods- 50-75% flood hazard area and likelihood of flood inundation for more than 24 hours almost every year, Medium to high vulnerability to cyclonic storms, Medium to high vulnerability to river bank erosion. Housing in the river island areas such as Majuli are highly vulnerable to river bank erosion,high incidence of post flood silt deposition. This zone lies entirely in the alluvial plains of the Brahmaputra valley, with the average elevation in the range of 75m-125m. There is negligible forest cover in this zone

Zone C

Low vulnerability to flooding and erosion, medium to high vulnerability to cyclonic wind storms, High vulnerability to landslides .This zone has the highest forest cover in the state, with more than 3/4th of the zone covered with a mix of moist semi-evergreen, mixed deciduous and bamboo forests. Access to bricks for house construction is difficult in the zone.

ASSAM



Zone D

Majority of the zone has low to medium vulnerability to flooding. Most areas in the zone face threat of severe floods once in about 10 years. High vulnerability to the northern part of the zone to flash floods in rivers flowing from Bhutan. High vulnerability to cyclonic wind storms with wind speeds reaching above 50 m/s in large parts of the zone. High vulnerability to river bank erosion and loss of land to erosion – this happens in Char areas are present in many parts of the zone Goalpara, Kamrup, Darrang, Bongaigaon, Barpeta, Tinsukia. This is a predominantly plain zone with the average elevation of 25-50 metres for the most part. The northern part of the zone has pockets of higher elevation of 125-150m. Bricks are easily available in most parts of the zone.

Zone E

Low vulnerability to floods – about 25% of the zone area is vulnerable to floods with a frequency of about 1 or 2 floods in 10 years. High vulnerability to cyclonic wind storms due to proximity to the Bay of Bengal. Predominantly plains and wetlands with an elevation of 25-50m, interspersed with hills. Karimganj has about 30% forest area Bricks, sand, aggregate are easily available in most parts of the zone. The zone is rich in bamboo- with a good stock of species suitable for good quality bamboo construction.

ASSAM HOUSING TYPOLGIES AT A GLANCE

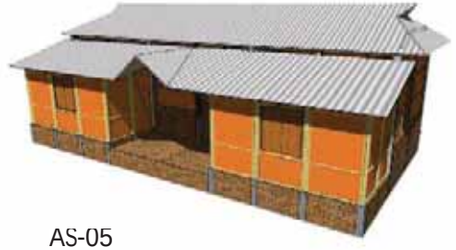
TYPOLOGY	APPLICABLE HOUSING ZONES	TOTAL AREA Sq.m/Sq.ft	
AS-01	Zone A	52.05 Sq.m	560.27 Sq.ft
AS-02	Zone B	53.74 Sq.m	578.46 Sq.ft
AS-03	Zone C	79.53 Sq.m	856.06 Sq.ft
AS-04	Zone D	72.26 Sq.m	777.80 Sq.ft
AS-05	Zone E	94.35 Sq.m	1015.58 Sq.ft
AS-06	Zone C	29.32 Sq.m	315.60 Sq.ft

AS-01

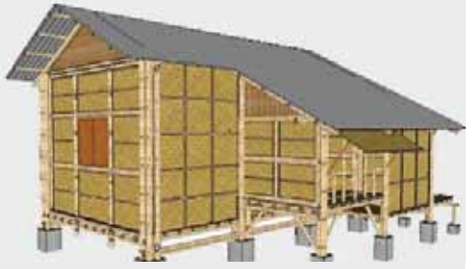
AS-02

AS-03

AS-04



AS-05



AS-06

ASSAM

AS-01

Applicable to Zone A

Zone A comprises of the following districts:

Barpeta, Nalbari, Darrang, Morigaon, some parts of Kamrup, Nagaon, Golaghat and south of Sonitpur.

Zone A highlights:
High vulnerability to floods- 50-75% flood hazard area and likelihood of flood inundation for more than 24 hours almost every year.

Resources Available
There is high concentration of brick kilns- bricks

- Flyash bricks are also a viable alternative due to presence of thermal power plants.
- Bamboo is also used extensively for verandah roof posts, internal partition walls of mud plastered bamboo splits and bamboo jaali in gable portions of walls.

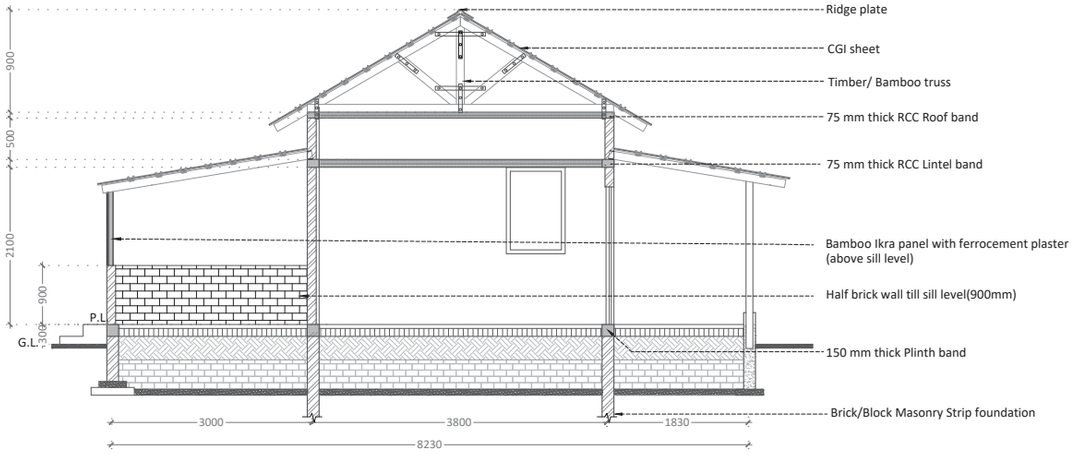
AS-01

Side view

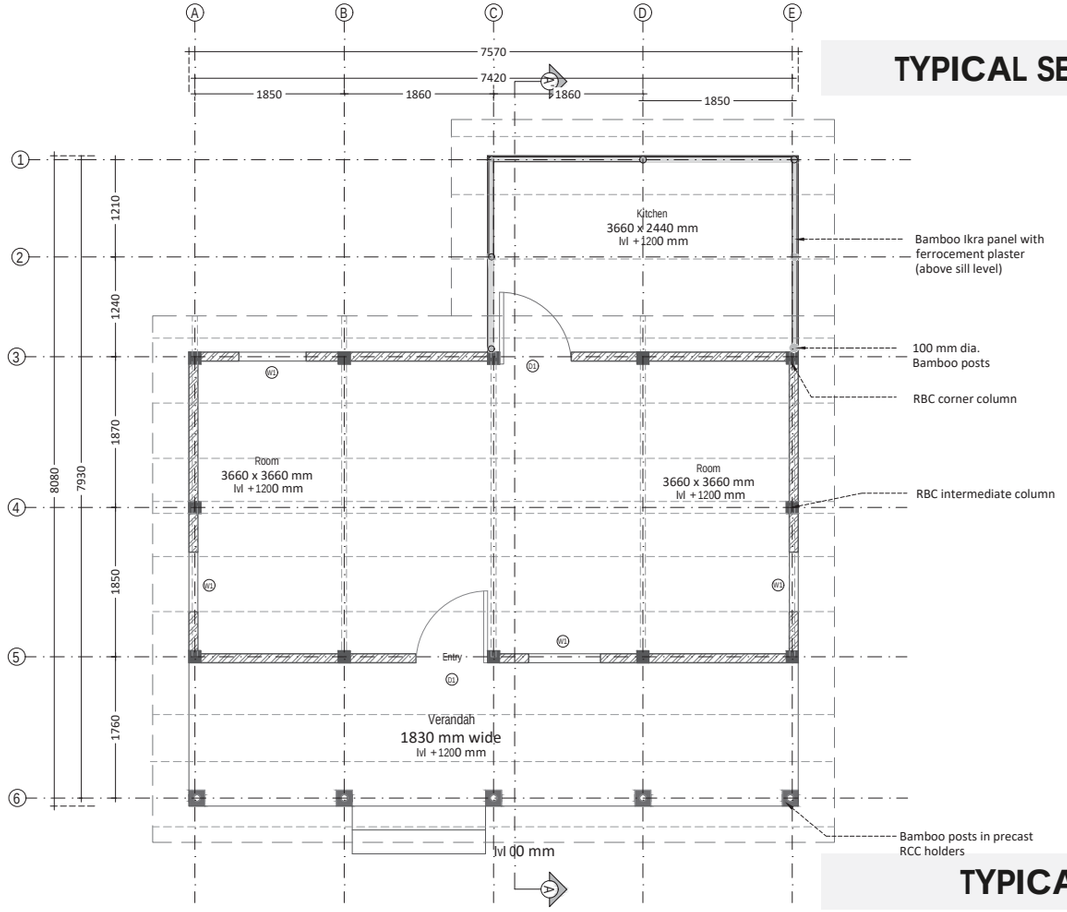
- This design responds to the brick masonry houses with 3” walls which are the most common PMAY-G design followed in plains area of the Brahmaputra valley.

Recommendations for construction systems	
Components	**Recommended Specifications**
Foundations	• Strip foundation where flood level is not more than 300 mm and stilted foundations where flood levels are more than 450 mm.
Plinth	• The Plinth height to be above HFL and in cases of stilts more than 1200 mm diagonal bracings must be used. • A plinth beam has been introduced to connect the RBC posts
Wall	• Brick wall in Rat trap bond in the core area. • Brick wall upto sill height and Wattle & daub above sill level in Kitchen area
Wall Finish	• Exposed Brick work and ferrocement plastering on wattle & daub panels
Roof Structure	• Sloping roof with Bamboo understructure/ Gable roof
Floor	• Cement flooring

AS-01



TYPICAL SECTION-AA'



TYPICAL PLAN

Area Statement:

Item	Area	
	Sq.m	Sq.ft
Room 1+2	26.84	288.91
Kitchen	8.76	94.29
Verandah	13.7	147.7
Carpet Area	**35.6**	**383.2**
Built up Area	**52.05**	**560.27**

ASSAM

6

AS-01
Cost estimate

Cost breakup

Item	Cost (INR)
Room	₹ 127,172.16
Kitchen	₹ 17,991.10
Verandah	₹ 22,105.02
Total	**₹ 167,268.28**

SR. NO.	ITEM OF WORK	Room				Kitchen				Vernandah			
		Quantity	Unit	Rate per unit (Rs)	Cost	Quantity	Unit	Rate per unit (Rs)	Cost	Quantity	Unit	Rate per unit (Rs)	Cost
1	**Excavation**												
	Wall	262.50	cft	3.08	808.50	90.00	cft	3.08	277.20	108.00	cft	3.08	332.64
	RCC post, 6 No.	72.00	cft	3.08	221.76								
2	**Brick Soling**												
	Wall	87.50	cft	35.00	3062.50	30.00	sft	35.00	945.00	15.10	cft	139.21	1894.37
	RCC post, 6 No.	9.00	cft	35.00	315.00								
3	**PCC 1:4:8**												
	Wall	55.10	cft	110.17	5465.80	18.90	cft	110.17	1874.00	22.70	cft	110.17	2248.79
	RCC post, 6 No.	3.80	cft	110.17	374.80								
4	**Brickwork foundation**												
	half brick wall	29.40	cft	165.96	4391.30	10.10	cft	165.96	1505.60	12.10	cft	165.96	1806.71
	brick stubs 10"x10"	1.70	cft	165.96	252.90	1.40	cft	165.96	210.80				
5	**Brickwork above plinth**									concrete 1:2:4 foundation for bamboo posts			
	half brick wall	272.20				12.60	cft	170.68	1935.50	8.58	cft	170.68	1463.58
	deduction for openings	30.00											
	total brickwork	242.20	cft	170.68	37198.70					min 3" dia bamboo posts			
	Brick pier, 6 No.	19.10	cft	170.68	2926.50					40.00	R.ft	20.83	833.20
6	**Concrete 1:1.5:3**												
	Plinth beam	30.60	cft	171.70	4732.50	3.80	cft	171.70	579.50				
	Lintel and roof band	18.00	cft	171.70	2781.50	concrete 1:2:4 for embedding bamboo							
	Post	17.60	cft	171.70	2712.00	2.50	cft	155.65	351.80				
7	**Reinforcement steel**									steel in concrete foundation for bamboo post			
	Plinth beam	117.00	kg	60.27	6346.43	15.00	kg	60.27	813.65	10.00	kg	60.27	542.43
	Lintel and roof band	112.00	kg	60.27	6075.22								
	Post	95.00	kg	60.27	5153.09								
8	**Bamboo Truss**					min 3" bamboo post							
	Bamboo members 10' long	25.00	pieces	320.00	8000.00	8.00	pieces	320.00	2560.00	10.00	pieces	320.00	3200.00
	Tools, hardware				1000								
	Labour				2500								
9	**GCI sheet (0.45 mm thick)**												
	with fitting complete	500.00	sq.ft	41.85	18832.50	120.00	sq.ft	41.85	4519.80	217.00	sq.ft	41.85	8173.31
10	**Door (With 2nd class treated timber)**					bamboo rafter, 3"-4"dia				bamboo understructure, 3"-4"dia			
	wooden frame, section 4"x3"	2.80	cft	700.00	1963.50	30.00	R.ft	12.00	360.00	67.50	Rft	12.00	810.00
	Window (With 2nd class treated timber)					bamboo purlin, 2"-3"dia				bamboo understructure, 2"-3"dia			
	wooden frame, section 4"x3"	8.60	cft	700.00	6006.00	50.00	Rft	8.00	400.00	100.00	Rft	8.00	800.00
11	**Cement-sand plaster 1:6 (15 mm thick)**					bamboo mud plastered wall 4' high							
	internal wall	648.00				165.00	sq.ft	10.05	1658.25				
	minus openings	82.00											
	total plaster	566.00	sft	11.88	6051.67								
				Total	**127172.16**	**Total**			**17991.10**	**Total**			**22105.02**

ASSAM

AS-02

AS-02

Side view

Top view

Applicable to Zone A

Zone A comprises of the following districts: Dhemaji, Lakhimpur, Jorhat, Sivasagar

Zone B highlights:
High vulnerability to floods- 50-75% flood hazard area and likelihood of flood inundation for more than 24 hours almost every year, Medium to high vulnerability to cyclonic storms, Medium to high vulnerability to river bank erosion.

Resources Available

- There is high degree of skill in bamboo in house construction for structural frames, roof trusses and floors.

Recommendations for Built Form		
Plan Layout	**Plinth/Floor**	**Roof Profile**
This design responds to the custom of stilted houses in parts of Assam.	Stilt Floor Design	Sloped roof

Recommendations for construction systems	
Components	**Recommended Specifications**
Foundations	• UR pile foundation • RCC columns of 8”x8” section below plinth and 6”x6” section above plinth; RCC plinth beam of 6”x6” cross section
Plinth	• Raised platform/ stilted in nature • 250 x 250 mm RCC posts supporting the structure at 1200 mm above the ground level.
Wall	• Half brick wall upto sill level- 900 mm • Ikra walling above sill level with ferrocement plaster
Roofing	• Sloping roof with timber/ bamboo under structure covered with CGI sheets
Floor	• bamboo split floor on bamboo primary and secondary understructure; part of the floor is 2” cement concrete with nominal 6mm reinforcement in both directions
Floor Finish	• A part of the bamboo floor has been made solid with cement plaster to increase its functionality

ASSAM

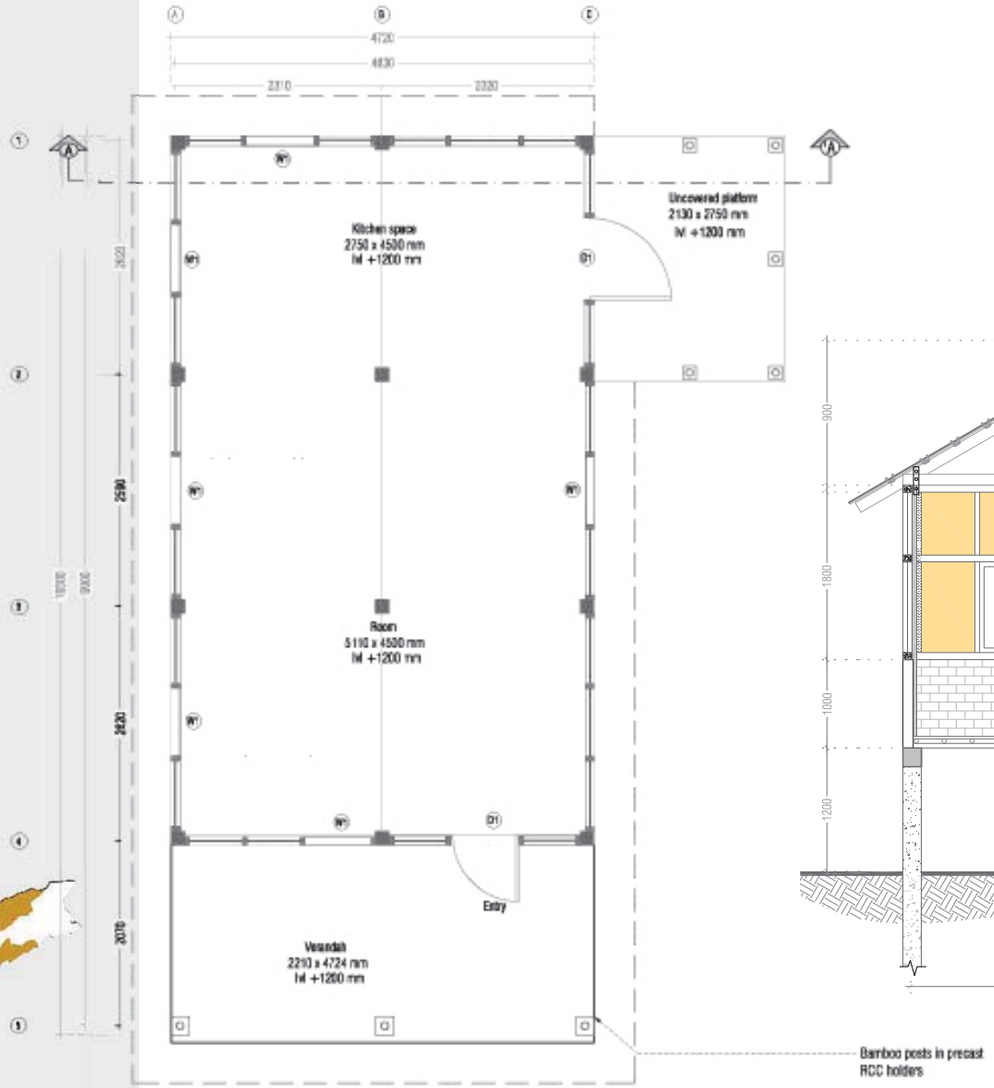
8

AS-02

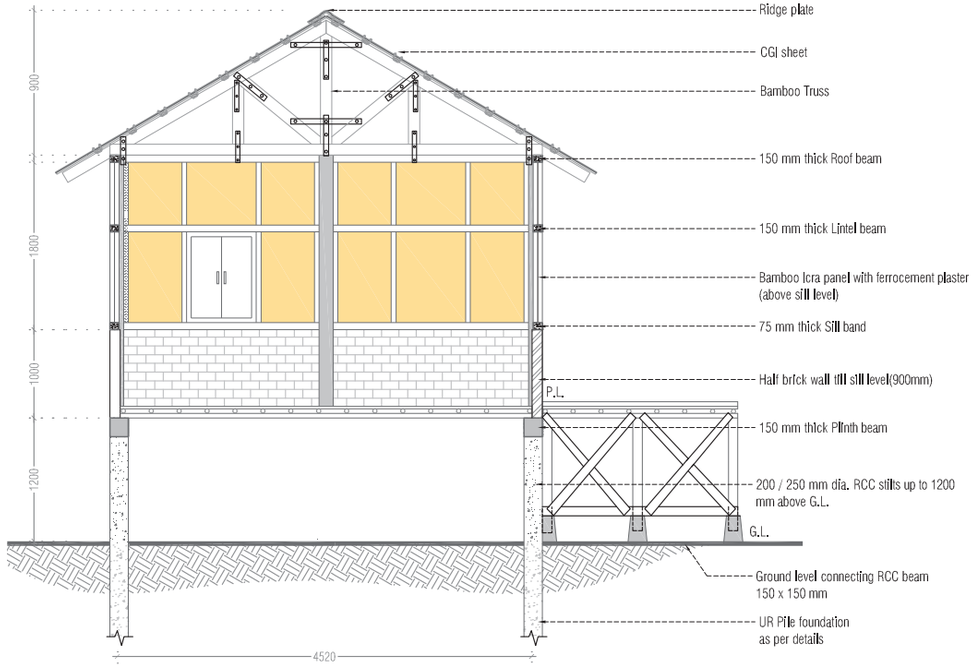
Area Statement:

Item	Area	
	Sq.m	Sq.ft
Room + Kitchen	35.85	385.89
Uncovered platform	5.86	63.08
Verandah	10.44	122.38
Carpet Area	**35.85**	**385.89**
Built up Area	**53.74**	**578.46**

ASSAM



TYPICAL PLAN



TYPICAL SECTION-AA'

Design: 02							Zone B		
SR. NO.	ITEM OF WORK	Room				open platform			
		Quantity	Unit	Rate per unit (Rs)	Cost	Quantity	Unit	Rate per unit (Rs)	Cost
1	**Excavation**								
	RCC stub	42	cft	3.08	129.36	49	cft	3.08	150.92
	RCC post	168	cft	3.08	517.44				
2	**Brick Soling**								
	RCC stub	0	sft	35	0		cft	139.21	0
	RCC post	56	sft	35	1960				
3	**PCC 1:4:8**								
	RCC stub	10	cft	110.17	991.53	14	cft	110.17	1388.15
	RCC post	19.8	cft	110.17	1967.7				
5	**Brickwork above plinth (1:4)**								
	half brick wall	107.1							
	deduciton for openings	6.9							
	total brickwork	100.2	cft	170.68	15387.3				
6	**Wooden frame**								
	Horizontal member 3"x4"	21	cft	750	15778.12				
	Vertical member 2"x4"	15.8	cft	750	11880				
7	**Bamboo split wall 3" thick with cement plaster**					min 3" dia bamboo posts			
	1:4	467.5	sft			40	R.ft	8	320
	deduction for openings	61.2	sft						
	total wall	406.3	sft	30.76	11248.35				
8	**Concrete 1:1.5:3**								
	Plinth beam long,1 bracket	28.6	cft	171.7	4413.4	concrete 1:2:4 foundation for bamboo posts			
	Plinth beam long,2 brackets	19.6	cft	171.7	3034.2	14	cft	155.65	2179.2
	Plinth beam, transverse	10.5	cft	171.7	1622.6				
	Full Post below plinth	34.3	cft	171.7	5300.4				
	Full Post above plinth	17.5	cft	171.7	2704.3				
	Post till plinth	13.7	cft	171.7	2120.2				
	Stub	10	cft	171.7	1545.3				
9	**Reinforcement steel**					steel in concrete foundation for bamboo post			
	Plinth beam with 1 bracket	120	kg	60.27	6509.16	10	kg	60.27	542.43
	Plinth beam with 2 brackets	72	kg	60.27	3905.5				
	Plinth beam without bracket	16	kg	60.27	868				
	Full Post	194	kg	60.27	10523.15				
	Post till plinth	24	kg	60.27	1301.8				
10	**Bamboo Truss**								
	Bamboo members 10' long	60	piece	320	4900				
	Tools, hardware				1000				
	Labor				2500				
11	**GCI sheet (0.45 mm thick)**								
	with fitting complete	650	sq.ft	41.85	24482.25	Bamboo for floor			
12	**Door (With 2nd class treated timber)**					bamboo understructure, 3"-4"dia			
	wooden frame, section 4"x3"	2.5	cft	700	1732.5	27	Rft	12	324
	Window (With 2nd class treated timber)					bamboo understructure, 2"-3"dia			
	wooden frame, section 4"x3"	5.7	cft	700	3984.75	70	Rft	8	560
13	**Bamboo for floor**								
	4" primary bamboo	195	Rft	12	2340				
	3" secondary bamboo	312	Rft	8	2496				
	Flooring bamboo	400	Rft	8	3200				
	TOTAL AMOUNT				**150343.31**				**5464.7**

AS-02
Cost estimate

Cost breakup

Item	Cost (INR)
House	₹ 150,343.31
Open platform	**₹ 5,464.70**
Total	**₹ 155,808.01**

ASSAM

AS-03

This typology is applicable to Housing Zone C

Zone C comprises of the following districts:
Karbi Anglong, Dima Hasao

Zone C:
Low vulnerability to flooding and erosion, medium to high vulnerability to cyclonic wind storms, High vulnerability to landslides.

Resources Available

- Access to bricks for house construction is difficult in the zone.
- There is abundance of forest resources of timber, bamboo and stone.
- Majority of the houses have traditionally been built with natural materials like timber and bamboo.
- Wooden posts using secondary timber are most commonly used for structural framing of houses. Interwoven bamboo mats are the most common wall material.

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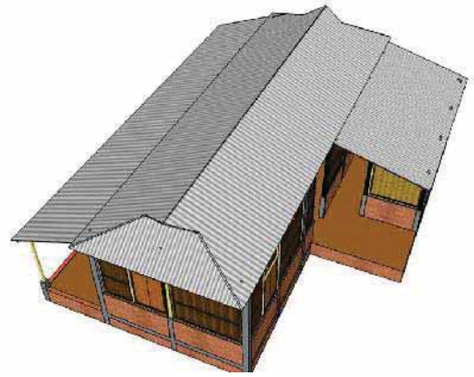
AS-03

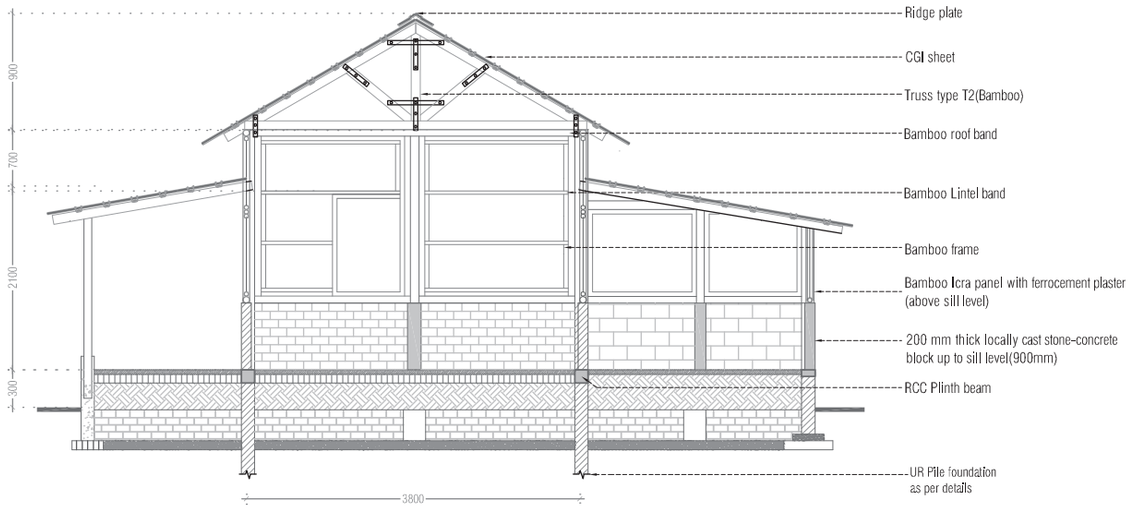
Side view



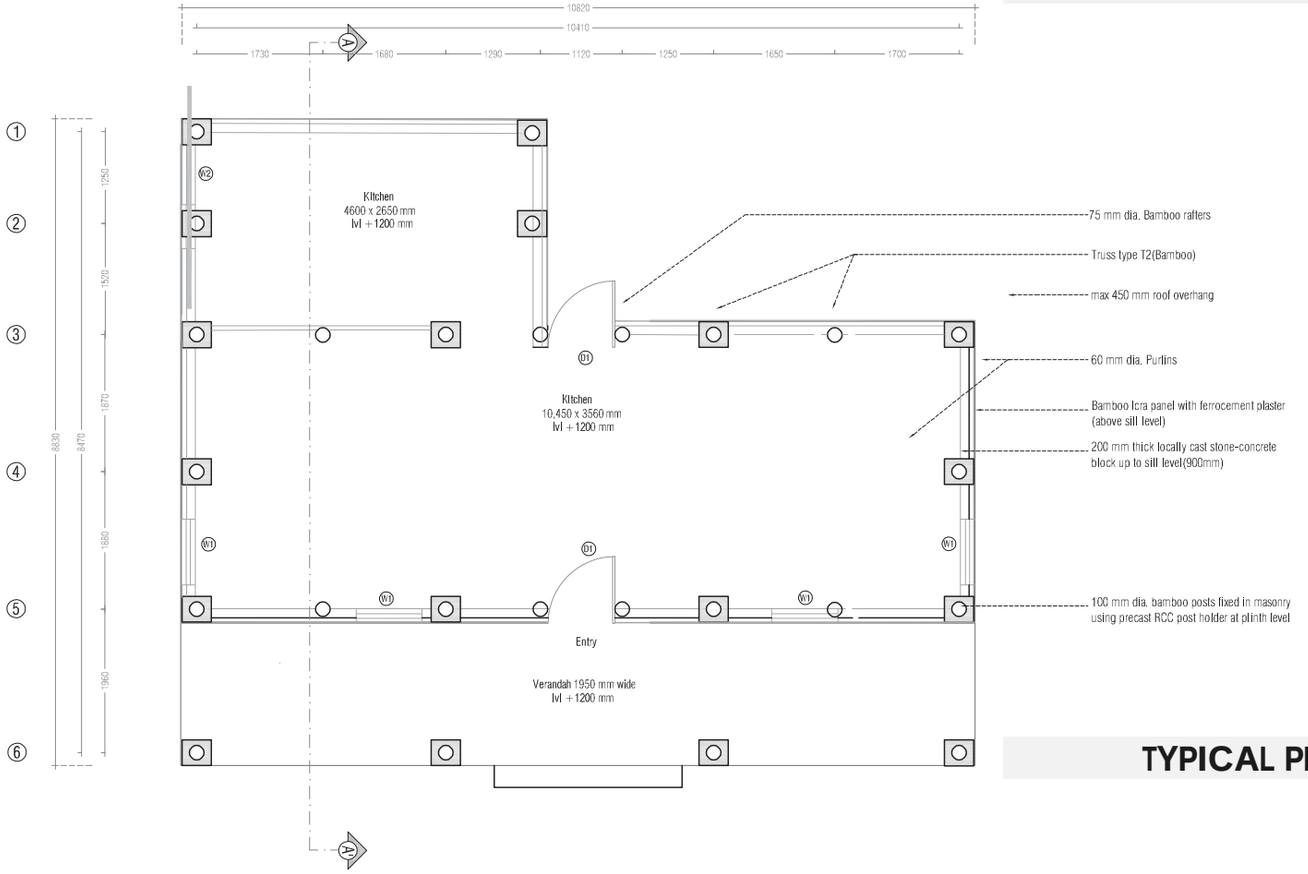
Top view

Recommendations for Built Form		
Plan Layout	**Plinth/Floor**	**Roof Profile**
This plan type includes a larger area with three rooms and a front verandah and kitchen at the rear.		Sloped roof

Recommendations for construction systems		
Components	**Recommended Specifications**	**Specific Comments**
Foundations	• Isolated footing in brick & cement/as per soil conditions	
Plinth	• Plinth area extended for additional rooms for incremental construction	
Wall Wall Finish	• Ikra walling with bamboo framing • Ferrocement plaster	• Treatment of bamboo is proposed for durable construction • The practice of tying large spans of bamboo mat to the structure makes the wall weak and decreases the durability of the enclosure.
Roof Structure	• Gable roof on bamboo truss, additionally anchored with bamboo on top tied to truss rafter in areas of high winds/ cyclones	
Roof Cover	• GCI sheet	
Floor	• Room- Cement concrete floor 2” thick on brick flat soling; Kitchen- cement stabilized earthen floor	



TYPICAL SECTION-AA'

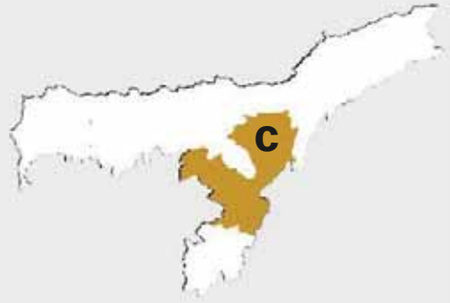


TYPICAL PLAN

AS-03

Area Statement:

Item	Area	
	Sq.m	Sq.ft
Room	39.10	420.87
Kitchen	11.79	126.91
Verandah	21.24	228.63
Carpet Area	**50.89**	**547.78**
Built up Area	**79.53**	**856.06**



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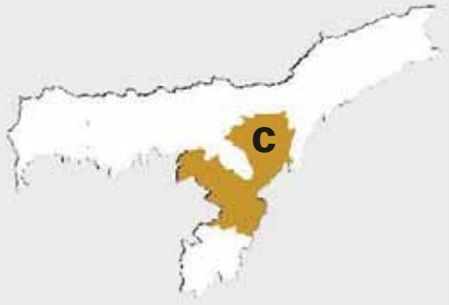
AS-03
Cost estimate

Cost breakup

Item	Cost (INR)
Room	₹ 118,973.30
Kitchen	₹ 25,098.60
Verandah	₹ 32,877.50
Total	**₹ 176,949.40**



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S NO.	ITEM OF WORK	Room				Kitchen+store				Verandah+ additional room			
		Quantity	Unit	Rate per unit (Rs)	Cost	Quantity	Unit	Rate per unit (Rs)	Cost	Quantity	Unit	Rate per unit (Rs)	Cost
1	**Excavation**												
	Wall	231	cft	3.1	711.5	90	cft	3.1	277.2	156	cft	3.1	480.5
	RCC post, 10 No.	120	cft	3.1	369.6								
2	**Brick Soling**												
	Wall	77	sft	32	2464	12.6	cft	139.2	1754	21.8	cft	139.2	3040.3
	RCC post, 10 No.	15	sft	32	480								
3	**PCC 1:4:8**												
	Wall	28.9	cft	110.2	2863	11.3	cft	110.2	1115.5	32.8	cft	110.2	3248.3
	RCC post, 10 No.	3.8	cft	110.2	371.8								
4	**Brickwork foundation (1:4)**												
	half brick wall	25.9	cft	166	3864.3	10.1	cft	166	1505.6	17.5	cft	166	2609.7
	brick stubs 10"x10"				0	1.4	cft		0				
5	**Brickwork above plinth (1:4)**									concrete 1:2:4 foundation for bamboo posts			
	half brick wall	97	cft	170.7	14903.4	12.6	cft	170.7	1935.5	8.6	cft	155.7	1334.7
6	**Wooden frame**												
	Horizontal member 3"x4"	16.5	cft	750	12375	concrete 1:2:4 foundation for bamboo posts							
	Vertical member 2"x4"	14.2	cft	750	10642.5	3.4	cft	155.7	533.9				
7	**Bamboo split wall 3" thick with cement plaster 1:4**	462				concrete 1:2:4 for embedding bamboo				min 3" dia bamboo posts			
	deduction for openings	86.5				1.9	cft	155.7	293.7	35	R.ft	10	350
	total wall	375.5	sq.ft	30.8	11550.4								
6	**Concrete 1:1.5:3**												
	Plinth beam	19.3	cft	171.7	2974.7	4	cft	171.7	618.1	3.1	cft	171.7	536.6
	Post, 10 No.	29.3	cft	176.7	4652.7								
7	**Reinforcement steel**												
	Plinth beam	96.7	kg	60.3	5244.2	21.3	kg	60.3	1156.9	32	kg	60.3	1735.8
	Post	146.9	kg	60.3	7967.2	steel in concrete foundation for bamboo post				22.5	kg	60.3	1220.5
						4	kg	60.3	217	steel in concrete foundation for bamboo post			
8	**Bamboo Truss**					min 3" bamboo post				9	kg	60.3	488.2
	Bamboo members 10' long	32	pieces	320	10240	8	pieces	320	2560	20	pieces	320	6400
	Tools, hardware				1000								
	Labour				2500								
9	**GCI sheet (0.45 mm thick)**					GCI sheet				GCI sheet			
	with fitting complete	500	sq.ft	41.9	18832.5	260	sq.ft	41.9	9792.9	260	sq.ft	41.9	9792.9
10	**Door (With 2nd class treated timber)**					bamboo rafter, 3"-4"dia				bamboo rafter, 3"-4"dia			
	wooden frame, section 4"x3"	2.8	cft	700	1963.5	60	R.ft	12	720	70	Rft	12	840
11	**Window (With 2nd class treated timber)**					bamboo purlin, 2"-3"dia							
	wooden frame, section 4"x3"	4.3	cft	700	3003	120	Rft	8	960	100	Rft	8	800
						bamboo mud plastered wall 4' high							
						165	sq.ft	10.1	1658.3				
				Total	**118973.3**			**Total**	**25098.6**			**Total**	**32877.5**

AS-04

AS-04

Side view

Top view

Recommendations for Built Form		
Plan Layout	**Plinth/Floor**	**Roof Profile**
This design incorporates the traditional 'Assam' type construction of wooden frames with infill bamboo plastered walls. . It is currently being used with bamboo splits which have replaced traditional ekra.	High Plinth Design	Sloped roof.

Recommendations for construction systems		
Components	**Recommended Specifications**	**Specific Comments**
Foundations	• Isolated footings of 6"x6" RCC column with a 6"x6" plinth beam; half brick masonry in 1:4 cement mortar till plinth beam and in verandah perimeter or as per soil conditions	
Plinth	• Plinth at 300 mm from the ground level	
Wall	• A core space constructed using a combination of half brick masonry and wooden frame construction – this has high resistance to earthquake forces. • Auxillary spaces are enclosed with Ikra wall panel finished with Ferrocement plaster	
Wall Finish	• The external surface of the wall has a cement-sand plaster to increase its weather resistance and durability • ferrocement plaster on wattle & daub walls.	
Roof Structure	• Sloping roofs with timber/bamboo understructure covered with CGI sheets.	
Floor	• Cement flooring	

This Typology is applicable to Zone D

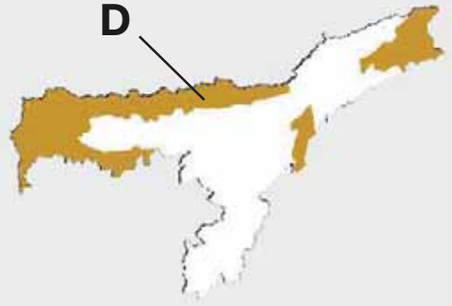
Zone D comprises of teh following districts: Kokrajhar, Chirang, Baksa, Udalguri, Sonitpur, Bongaigaon, Dhubri, Goalpara, Kamrup & south Golaghat

Zone D highlights:

Majority of the zone has low to medium vulnerability to flooding. Most areas in the zone face threat of severe floods once in about 10 years. High vulnerability to the northern part of the zone to flash floods in rivers flowing from Bhutan. High vulnerability to cyclonic wind storms with wind speeds reaching above 50 m/s in large parts of the zone. High vulnerability to river bank erosion and loss of land to erosion

Resources Available

- Due to presence of thermal power plant in both Bongaigaon and Tinsukia, flyash is also a feasible material

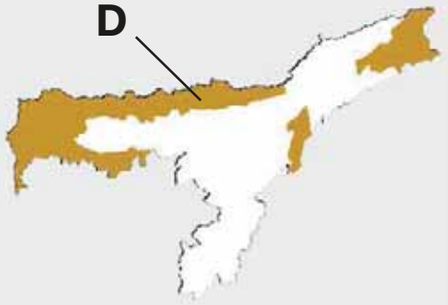


ASSAM

AS-04

Area Statement:

Item	Area	
	Sq.m	Sq.ft
Room 1	28.45	306.24
Room 2	6.13	65.98
Kitchen	10.12	108.93
Verandah 1	**13.42**	**144.45**
Verandah 2	**9.03**	**97.20**
Carpet Area	**45.02**	**484.60**
Built up Area	**72.26**	**777.80**



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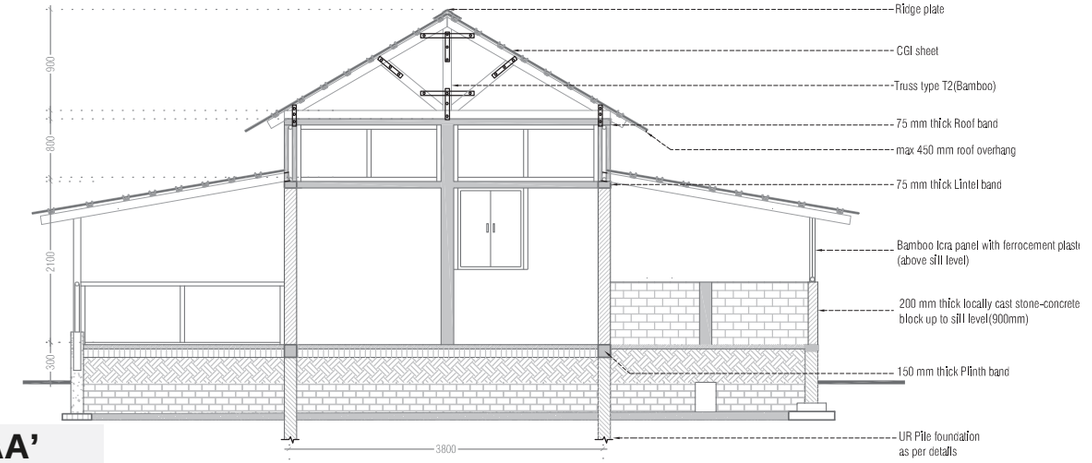
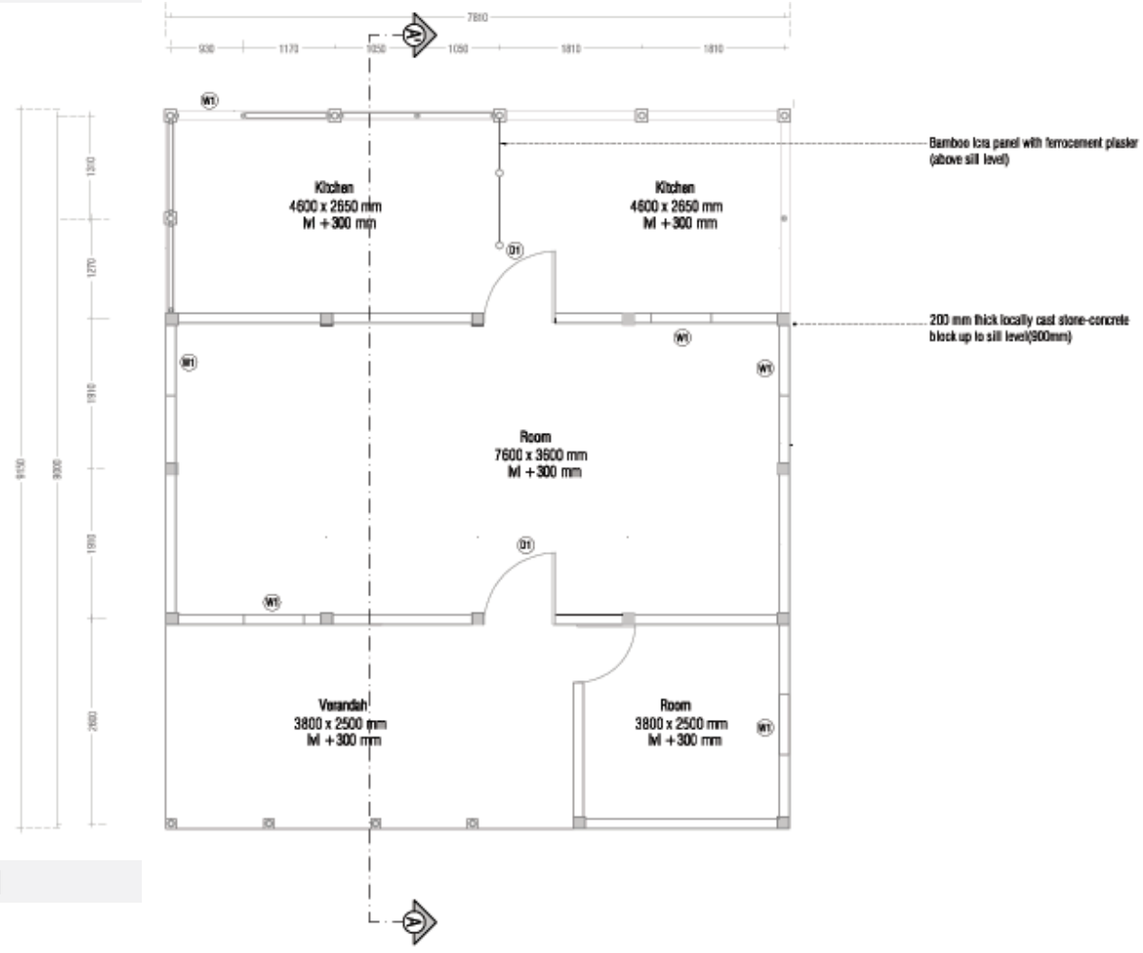


TYPICAL SECTION - AA'



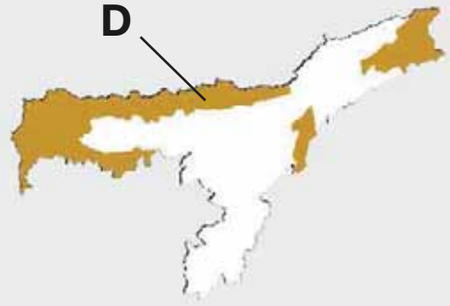
TYPICAL PLAN

AS-04
Cost estimate

SR. NO.	ITEM OF WORK	Room				Kitchen+store				Verandah+additional room			
		Quantity	Unit	Rate per unit (Rs)	Cost	Quantity	Unit	Rate per unit (Rs)	Cost	Quantity	Unit	Rate per unit (Rs)	Cost
1	**Excavation**												
	Wall	376	cft	3.08	1158.08	128	cft	3.08	394.24	200	cft	3.08	616
	RCC post	96	cft	3.08	295.68								
2	**Brick Soling**												
	Wall												
	RCC post	32	cft	35	1120								
3	**PCC 1:4:8**												
	Wall	59.22	cft	110.17	5871.84	20.16	cft	110.17	1998.92	31.5	cft	110	3123.32
	RCC post	15.12	cft	110.17	1499.19								
4	**Brickwork foundation (1:4)**												
	half brick wall	136.3	cft	165.96	20358.31	36.8	cft	165.96	5496.6	24.15	cft	165.96	3607
	brick stubs 10"x10"	5.64	cft	165.96	843.13	2.82	cft	165.96	421.56				
5	**Brickwork above plinth (1:4)**												
	half brick wall	118.44				20.16	cft	170.68	3096.82	27.3	cft	170.68	4193.61
	deduction for openings	7.56											
	Total brickwork	110.88	cft	170.68	17032.5								
6	**Bamboo split wall in bamboo frame with mud plaster**	517	Sft			160	Sft	12	1728	390	Sft	12	4680
		60.25	Sft										
		456.75	Sft	12	4932.9	4" dia bamboo verticals				4" dia bamboo verticals			
	4" bamboo verticals	160	Rft	12	1728	60	Rft	12	648	90	R.ft	12	1080
	Labour				1500								
7	**Concrete 1:1.5:3**									concrete 1:2:4 foundation for bamboo posts			
	Plinth beam	23.5	cft	171.7	3631.46	4	cft	171.7	618.12	6.5	cft	155.65	1011.73
		0	cft	171.7	0	concrete 1:2:4 for embedding bamboo							
	Post	26	cft	171.7	4017.78	3.9	cft	155.65	546.33				
8	**Reinforcement steel**					steel in concrete foundation for bamboo post				steel in concrete foundation for bamboo post			
	Plinth beam	108.68	kg	60.27	5895.13	12.65	kg	60.27	686.07	25.3	kg	60.27	1372.13
	Post	133.12	kg	60.27	7220.83								
9	**Treated bamboo truss**												
	Bamboo members 10' long	25	pieces	320	8000	10	pieces	320	3200	10	pieces	320	3200
	Tools, hardware				1000								
	Labour				2500								
10	**GCI sheet (0.45 mm thick)**					GCI sheet				GCI sheet			
	with fitting complete	685	sq.ft	41.85	25800.53	240	sq.ft	41.85	9039.6	280	sq.ft	41.8	10546.2
11	**Door (With 2nd class treated timber)**	4.95	cft	700	3465	bamboo rafter, 3"-4"dia				bamboo understructure, 3"-4"dia			
	wooden frame, section 4"x3"					30	R.ft	12	360	67.5	Rft	12	810
12	**Window (With 2nd class treated timber)**	6.6	cft	700	4620	bamboo purlin, 2"-3"dia				bamboo understructure, 2"-3"dia			
	wooden frame, section 4"x3"					80	Rft	8	640	100	Rft	8	800
	Total				**122490.36**				**28874.26**				**35039.99**

Cost breakup

Item	Cost (INR)
Room	₹ 122,490.36
Kitchen	₹ 28,874.26
Verandah	₹ 35,039.99
Total	**₹ 186,404.61**



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AS-05

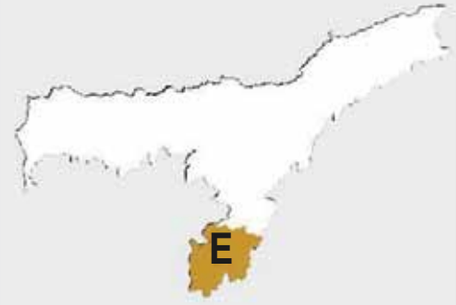
This typology is applicable to housing zone E

Zone E comprises of the following districts:
Cachar, Karimganj, Hailakandi

Zone E highlights:
Low vulnerability to floods – about 25% of the zone area is vulnerable to floods with a frequency of about 1 or 2 floods in 10 years. High vulnerability to cyclonic wind storms due to proximity to the Bay of Bengal.

Resources Available

- Bricks are feasible option for major part of this zone
- Negligible forest cover in this zone



ASSAM

AS-05

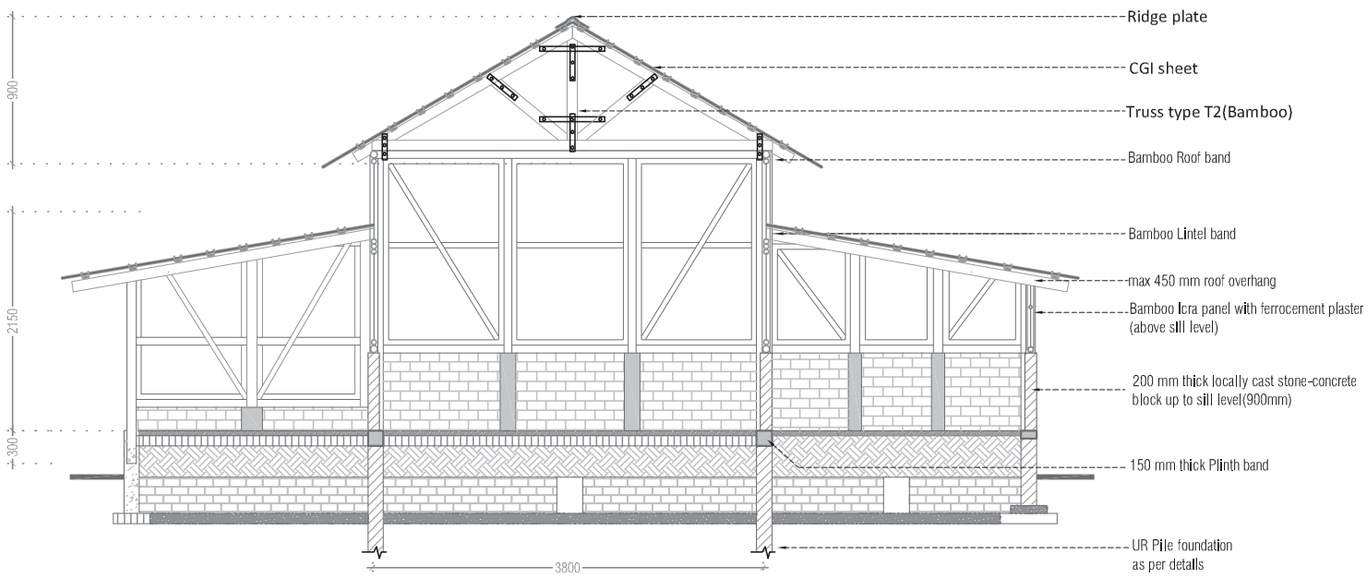
Side view

Top view

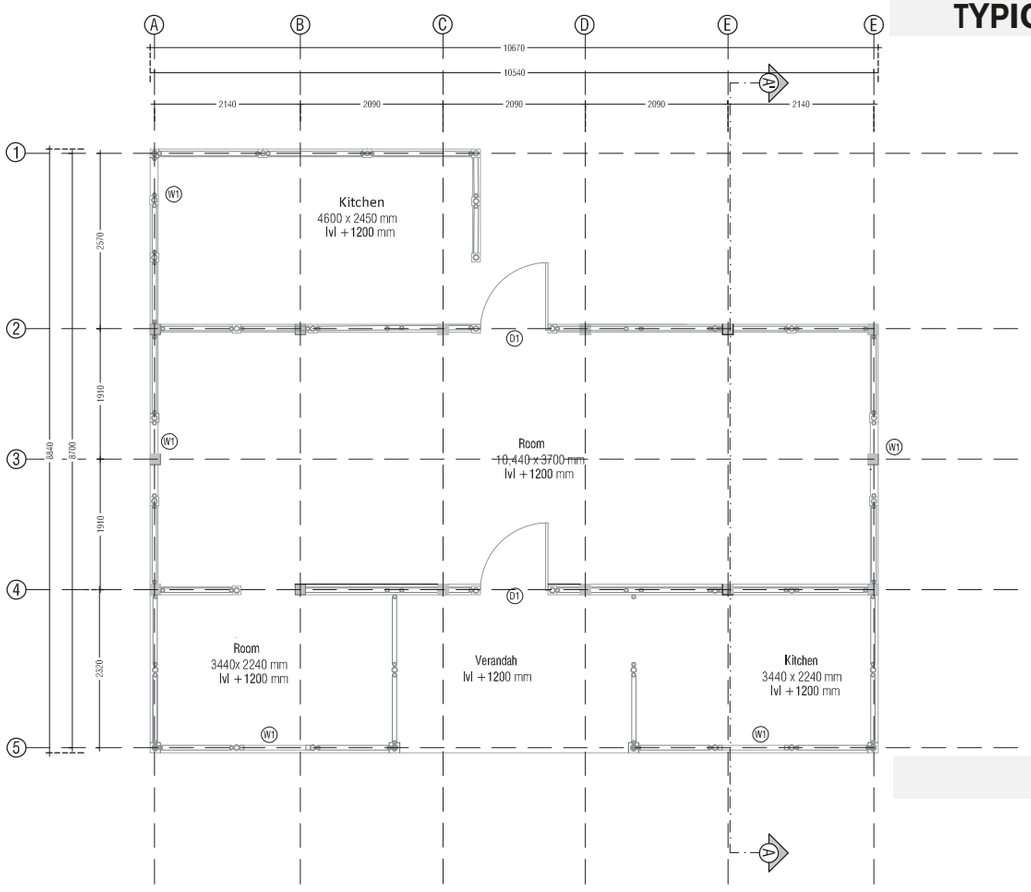
Recommendations for Built Form		
Plan Layout	**Plinth/Floor**	**Roof Profile**
This is the most common traditional construction in plain areas. These houses are generally larger in size with three rooms and a front verandah. Deterioration of structural bamboo directly supported on ground is a common problem.	High Plinth Design	Sloped roof

Recommendations for construction systems	
Components	**Recommended Specifications**
Foundations	• Isolated footings of RCC columns of 6”6” section below plinth and plinth beam of 6”x6” section; half brick masonry with 10”x10” brick stubs in 1:4 cement mortar till plinth beam
Plinth	• Plinth area extended for additional rooms for incremental construction Treatment of bamboois proposed for durable construction.
Wall	• 200 mm thick locally cast concrete block upto sill level • Ikra wall panelling with bamboo/ timber frames
Roof	• CGI sheet gable roof on bamboo truss, additionally anchored with bamboo on top tied to truss rafter in areas of high winds/ cyclones
Floor	• Room- Cement concrete floor 2” thick on brick flat soling; Kitchen- cement stabilized earthen floor

AS-05



TYPICAL SECTION - AA'



TYPICAL PLAN

Area Statement:

Item	Area	
	Sq.m	Sq.ft
Room 1	7.69	82.78
Room 2	39.21	422.05
Kitchen 1	7.66	82.45
Kitchen 2	**11.40**	**122.70**
Verandah 1	**7.87**	**84.71**
Verandah 2	**14.95**	**160.92**
Carpet Area	**65.96**	**709.99**
Built up Area	**94.35**	**1015.58**

ASSAM

AS-05
Cost estimate

Cost breakup

Item	Cost (INR)
Room	₹ 136,246.52
Kitchen	₹ 30,617.28
Verandah	₹ 30,383.52
Total	**₹ 197,247.32**

ASSAM

SR. NO.	ITEM OF WORK	Room				Kicthen				Verandah+2 additional rooms			
		Quantity	Unit	Rate per unit (Rs)	Cost	Quantity	Unit	Rate per unit (Rs)	Cost	Quantity	Unit	Rate per unit (Rs)	Cost
1	**Excavation**												
	Wall	376	cft	3.08	1158.08	128	cft	3.08	394.24	200	cft	3.08	616
	RCC post	96	cft	3.08	295.68								
2	**Brick Soling**												
	Wall												
	RCC post	32	cft	35	1120								
3	**PCC 1:4:8**												
	Wall	59.22	cft	110.17	5871.84	20.16	cft	110.17	1998.92	31.5	cft	110	3123.32
	RCC post	15.12	cft	110.17	1499.19								
4	**Concrete block masonry in foundation (1:6)**												
	6" thick wall	136.3	cft	155	19014	36.8	cft	155	5133	50	cft	155	7750
	Concrete block stubs	7	cft	155	1085	2.82	cft	155	469				
5	**Concrete block masonry in superstructure 1:6 mortar**												
	6" thick wall	141				24	cft	165	3564				
	deduction for openings	9											
	Total wall	132	cft	165	19602								
6	**Bamboo mat wall in bamboo frame**	517	Sft			176	Sft	25	3960				
	Deduction for opening	60.25	Sft			4" dia bamboo verticals				4" dia bamboo verticals			
	Bamboo mat	457	Sft	25	10276	60	Rft	12	648	45	R.ft	12	540
	Bamboo frame												
	4" bamboo	174	Rft	12	1880								
	3" bamboo	270	Rft	8	1994								
	Labour				1500								
7	**Concrete 1:1.5:3**									concrete 1:2:4 foundation for bamboo posts			
	Plinth beam	23.5	cft	171.7	3631.46	4	cft	171.7	618.12	3.25	cft	155.6	506
		0	cft	171.7	0	concrete 1:2:4 for embedding bamboo							
	Post	26	cft	171.7	4017.78	3.9	cft	155.65	546.33				
8	**Reinforcement steel**					steel in concrete foundation for bamboo post				steel in concrete foundation for bamboo post			
	Plinth beam	108.68	kg	60.27	5895.13	12.65	kg	60.27	686.07	10.55	kg	60.3	572
	Post	133.12	kg	60.27	7220.83								
9	**Treated bamboo truss**												
	Bamboo members 10' long	40	pieces	320	12800	8	pieces	320	2560	16	pieces	320	5120
	Tools, hardware				1000								
	Labour				2500								
10	**GCI sheet (0.45 mm thick)**					GCI sheet				GCI sheet			
	with fitting complete	685	sq.ft	41.85	25800.53	240	sq.ft	41.85	9039.6	280	sq.ft	41.8	10546.2
11	**Door (With 2nd class treated timber)**	4.95	cft	700	3465	bamboo rafter, 3"-4"dia				bamboo understructure, 3"-4"dia			
	wooden frame, section 4"x3"					30	R.ft	12	360	67.5	Rft	12	810
12	**Window (With 2nd class treated timber)**	6.6	cft	700	4620	bamboo purlin, 2"-3"dia				bamboo understructure, 2"-3"dia			
	wooden frame, section 4"x3"					80	Rft	8	640	100	Rft	8	800
	Total				**136246.52**				**30617.28**				**30383.52**

AS-06

AS-06

Side view

Top view

This typology is applicable to Housing Zone C

Zone C comprises of the following districts:
Karbi Anglong, Dima Hasao

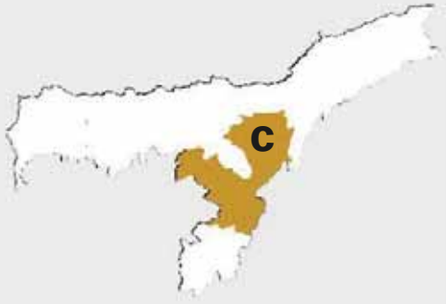
Zone C:
Low vulnerability to flooding and erosion, medium to high vulnerability to cyclonic wind storms, High vulnerability to landslides .This zone has the highest forest cover in the state, with more than 3/4th of the zone covered with a mix of moist semi-evergreen, mixed deciduous and bamboo forests. Access to bricks for house construction is difficult in the zone.

Recommendations for Built Form		
Plan Layout	**Plinth/Floor**	**Roof Profile**
The layout of this proposed typology responds to the traditional ways of planning practised by the Karbi tribe in Assam	raised platform design	Sloped roof

Recommendations for construction systems		
Components	**Recommended Specifications**	**Specific Comments**
Foundations	• 14" x 14" Concrete Stub foundation to support improvised bamboo column encased in the concrete stub.	
Plinth	• Raised platform, raised on concrete stubs and bamboo columns	
Wall	• interwoven bamboo mat/Ikra in bamboo/timber framing • ferrocement plaster	• Treatment of bamboo is proposed for durable construction • The practice of tying large spans of bamboo mat to the structure makes the wall weak and decreases the durability of the enclosure.
Wall Finish		
Roof Structure	• sloping roof with bamboo trusses	
Roof Cover	• CGI sheet	
Floor	• flattened bamboo/ split bamboo flooring	

Resources Available

- Access to bricks for house construction is difficult in the zone.
- There is abundance of forest resources of timber, bamboo and stone.
- Majority of the houses have traditionally been built with natural materials like timber and bamboo.
- Wooden posts using secondary timber are most commonly used for structural framing of houses. Interwoven bamboo mats are the most common wall material.

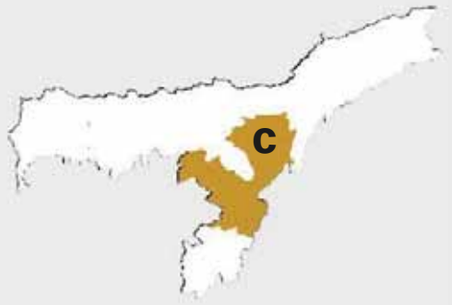


ASSAM

AS-06

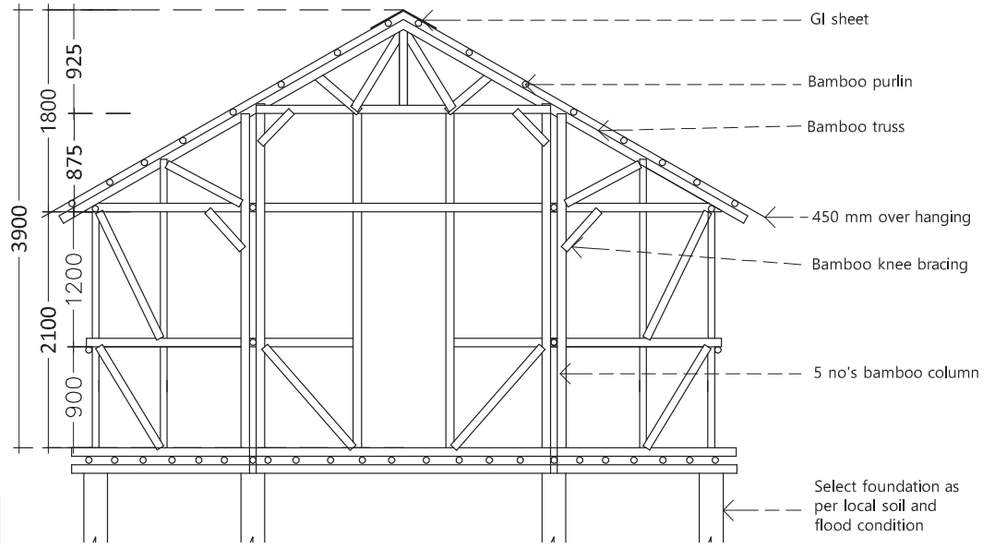
Area Statement:

Item	Area	
	Sq.m	Sq.ft
Room 1	2.14	23.03
Room 2 + Sitting area	10.84	116.68
Kitchen + Sitting area	8.57	92.24
Verandah (bamboo platform)	**6.46**	**69.53**
Carpet Area	**21.55**	**23.96**
Built up Area	**29.32**	**315.60**

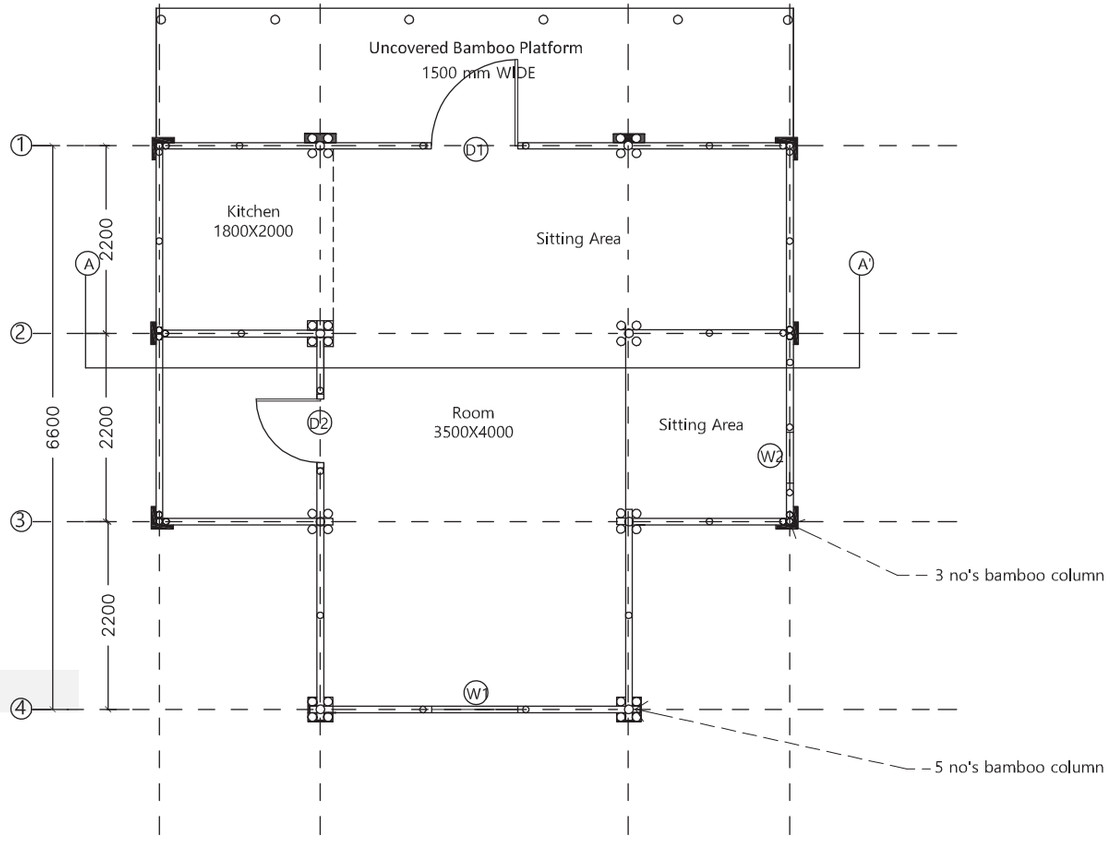


ASSAM

TYPICAL SECTION-AA'



TYPICAL PLAN

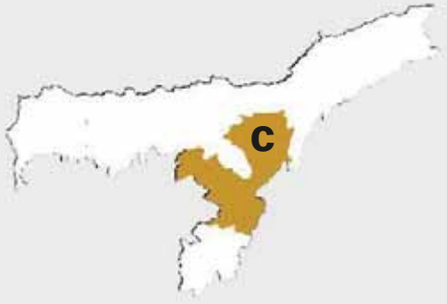


S.no	Item of work	quantity	unit	rate	amount
1	**Excavation**				
	14"x14" concrete stub	256	cft	3.08	788.48
	10"x10" concrete stub	234	cft	3.08	720.72
2	**PCC 1:4:8**				
	14"x14" concrete stub	16	cft	99.15	1586.45
	10"x10" concrete stub	14.63	cft	99.15	1450.11
3	**Concrete 1:1.5:3 mix**				
	14"x14" concrete stub	54	cft	154.53	8344.62
	10"x10" concrete stub	31.59	cft	154.53	4881.6
4	**Bamboo**				
4a	**Vertical Posts - above plinth**				
	4" dia bamboo	415	R.ft	12	4980
	3" dia bamboo	54	R.ft	8	432
4b	**Vertical Posts -below plinth**				
	4" bamboo	60	R.ft	12	720
4c	**Wall frame**				
	3" dia bamboo - vertical	160	R.ft	8	1280
	3" dia bamboo horizontal	300	R.ft	8	2400
4e	**Floor understructure**				
	Primary bundled beam of 2 bamboo - 3" dia	150	R.ft	8	1200
	Secondary bamboo 3" dia	225	R.ft	8	1800
	Tertiary 2"-3" bamboo	400	R.ft	8	3200
	Flattened bamboo floor - 3" dia bamboo	520	RFt	8	4160
4f	**Truss**				
	Upper chord 4" dia	120	Rft	12	1440
	3" dia twin collar for each truss	150	Rft	8	1200
	Diagonal strut on each side of main bamboo columns	80	Rft	8	640
	Purlin 2" dia	250	Rft	8	2000
	Tools, hardware				5000
4g	Manpower for bamboo structure				
	Manpower- carpenter	35	mandays	500	17500
	Unskilled labour	70	mandays	250	17500
4h	**Bamboo mat wall(incl. labour)**				
	3" dia bamboo	450	Sq.ft	30	13500
5	**GCI sheet**				
	with fitting complete	650	sq.ft	37.67	24482.25
6	**Door (With 2nd class treated timber)**				
	wooden frame, section 4"x3"	5.78	cft	700	4042.5
	Window (With 2nd class treated timber)				
	wooden frame, section 4"x3"	4.95	cft	700	3465
	TOTAL AMOUNT				**128714**

AS-06

Cost breakup

Item	Cost (INR)
Room	₹ 128,714.00
Total	**₹ 128,714.00**



ASSAM

pahal
Prakriti Hunar Lokvidya

Bihar

Bihar has composite climate and is affected by monsoons. Most of the area is plain with some hilly areas in the narrow northern belt. The Tarai region is the foothills of the Himalayan ranges that receive heavy rains and plenty of water is brought by the Himalayan rivers during monsoons flooding huge areas almost every year. South of the Tarai is the wide Gangetic plain built up by the alluvium brought by the rivers like the Ganga and many other smaller rivers and their tributaries. The region is warm to hot in summers, humid during monsoons and cold in winters. The alluvial soil is a good resource for making burnt clay bricks, which is the main building material of the region.

The State of Bihar can be divided in three major building zones viz:

Zone A

Northern zone that is prone to long duration major floods, high winds, high monsoon rains and earthquake zone IV and V. Mud, bamboo, thatching grasses, timber, bricks form the main building materials.

Zone B

Central alluvial plains that are also prone to floods (low to medium intensity), earthquake zone II and IV, monsoonal rains and winds. Mud, bamboo, thatching grasses, timber, bricks, cement+flyash bricks, RCC form the main building materials.

Zone C

The southern hills (not more than 700 m) are not so prone to floods except near river beds, earthquake zone III and receive monsoonal rains and high winds. Stone is locally available.

BIHAR

BIHAR HOUSING TYPOLGIES AT A GLANCE

TYPOLOGY	APPLICABLE HOUSING ZONES	TOTAL AREA Sq.m/Sq.ft	
BR-01	Zone A	**33.18 Sq.m**	**357.14 Sq. ft**
BR-02	Zone A	**33.18 Sq.m**	**357.14 Sq. ft**
BR-03	Zone B	**30.4 Sq.m**	**327 Sq. ft**
BR-04	Zone B	**33.18 Sq.m**	**357.14 Sq. ft**
BR-05	Zone G	**33.18 Sq.m**	**357.14 Sq. ft**
BR-06	Zone C	**33.18 Sq.m**	**357.14 Sq. ft**

BR-01

BR-02

BR-03

BR-04

BR-05

BR-06

BR-01

This typology is applicable to Housing Zone A & B

Zone A& B highlights:
Northern zone that is prone to long duration major floods, high winds, high monsoon rains and earthquake zone IV and V.

Central alluvial plains that are also prone to floods (low to medium intensity), earthquake zone II and IV, monsoonal rains and winds.

Zone A comprises of the following districts:
Paschim Champaran, Purba Champaram, Gopalganj, Siwan, Muzzaffarpur, Saran, Hajipur, Samastipur, Darbhanga, Madhubani, Sitamarhi

Zone B comprises of the following districts:
Supalu, Araria
Kishanganj,Madhepura, Koshi, Madhepura, Khagaria, Begusarai, Purnia, Katihar

Resources Available
- Timber And Bamboo
- Fired Bricks
- Thatch

BIHAR

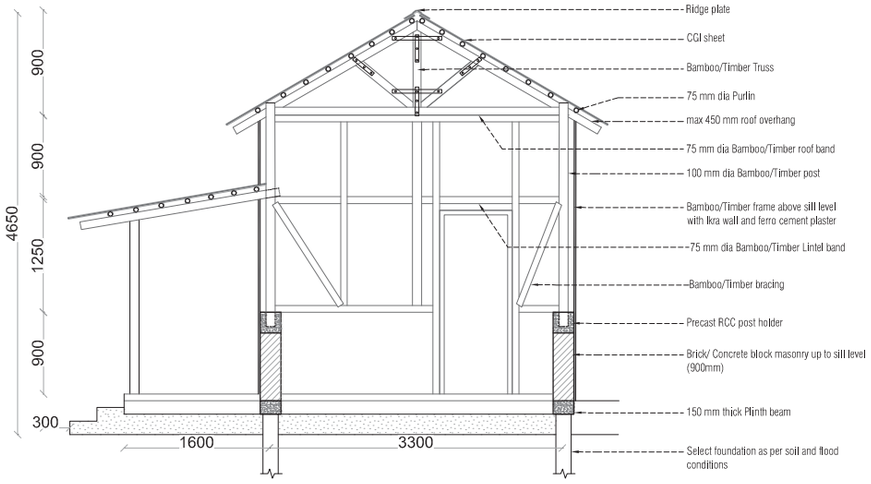
BR-01

- Considering the material vulnerability of zone I and II to floods, in North Bihar it would be important to ensure that the plinth is raised and is constructed on non--- erode able material.
- The superstructure should thus rest on a brick plinth of two feet or two feet six inches height.
- All dwelling units must be equipped with loft spaces for storage of materials and refuge during floods

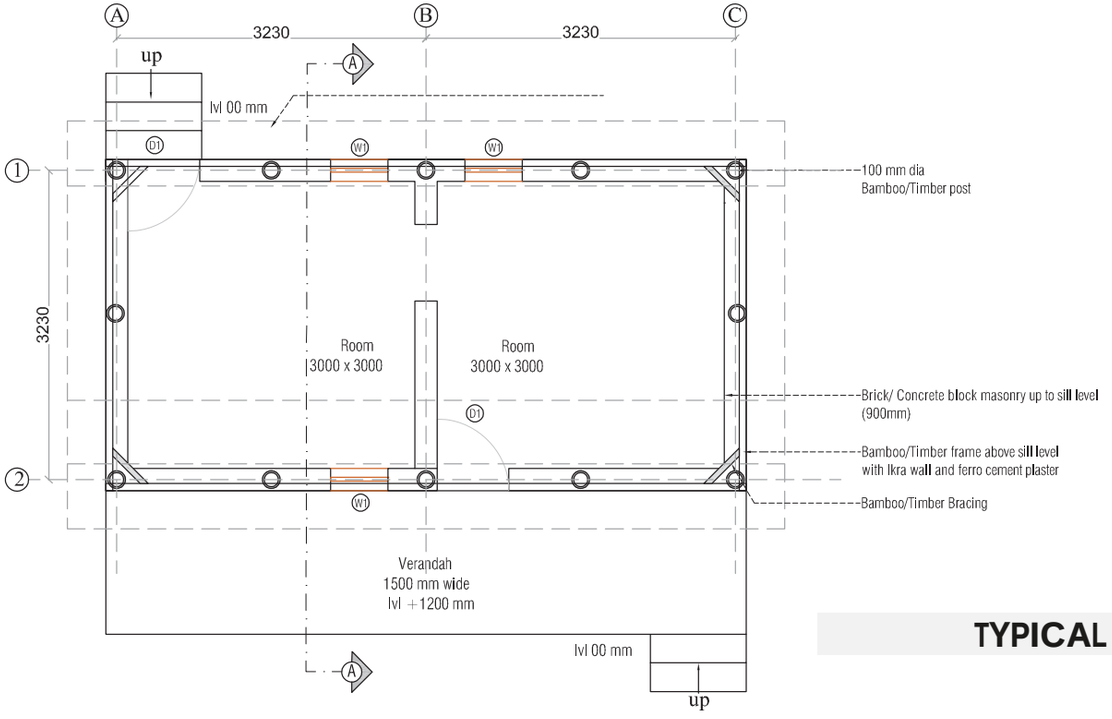
Recommendations for Built Form		
Plan Layout	**Plinth/Floor**	**Roof Profile**
This plan type includes two room with a two way pitch roof extended over the open verandah in the front	High plinth design.	Sloped roof.

Recommendations for construction systems		
Components	**Recommended Specifications**	**Specific Comments**
Foundations	• Stub or strip foundations depending on the soil and sometimes pile foundation could be used depending on the region.	
Plinth	• minimum 30 cm high plinth level	
Wall	• Brick wall upto to sill leve. • Upper walls are finished with Ikra walling systems with horizontal bracings	• Wall plates should take loads of rafters and beams to further distribute the load on the cob walls.
Wall Finish	• ferrocement plaster	
Roof Structure	• Roof slope angle – Min 25 & Max 33. • Covered with sheet & has treated bamboo or timber under structure	• Rigid connections between all roof members to increase stability.
Roof Cover	• GI sheet with proper bolting and use of J hooks etc.	• Woven reed mats can be used below the tiles as false ceiling for thermal insulation.
Floor	• PCC flooring	

BR-01



TYPICAL SECTION AA'



TYPICAL PLAN

Area Statement:

Item	Area	
	Sq.m	Sq.ft
Room 1	9.17	98.70
Room 2	9.35	100.64
Verandah	10.03	107.96
Carpet Area	**18.52**	**199.34**
Built up Area	**33.18**	**357.14**

BIHAR

BR-01
Cost estimate

Item	Cost (INR)
Building material cost	₹ 96,043.00
Labour cost	₹ 44,500.00
Total	**₹ 140,543.00**

BIHAR

SR. NO.	ITEM OF WORK	Quantity	Unit	Rate per unit (Rs)	Cost
	BUILDING MATERIAL COST				
1	Brick	7033	pieces	₹ 7.00	₹ 49,231.00
2	Silver sand for filling	10	cu.m	₹ 70.00	₹ 700.00
3	Sand	6	cu.m	₹ 70.00	₹ 420.00
4	Cement	30	bags	₹ 400.00	₹ 12,000.00
5	Chips - 12mm	0.6	cu.m	₹ 86.00	₹ 51.60
6	Chips - 40mm metal	0.6	cu.m	₹ 86.00	₹ 51.60
7	stee 10mm dia	0.3	quintals	₹ 4,510.00	₹ 1,353.00
8	steel 6mm dia	0.08	quintals	₹ 4,510.00	₹ 360.80
9	Rod binding wire	5	kg	₹ 75.00	₹ 375.00
10	shuttering material		lumpsum		₹ 3,000.00
11	whitewash		lumpsum		₹ 3,000.00
12	Hardware-binding wire, nails, lashes, ropes		lumpsum		₹ 4,000.00
13	Doors and windows with steel frame and Ply ventilator (1' x 2')		lumpsum		₹ 8,000.000
14	Bamboo 3" dia and 20' long for truss,wall and attic	30	pieces	₹ 200.00	₹ 6,000.00
15	Thatch roofing		lumpsum		₹ 7,500.00
X	**TOTAL**				**₹ 96,043.00**
	LABOUR COST				
1	Skilled spl. Mason	5	no.s	₹ 500.00	₹ 2,500.00
2	Skilled mason	40	no.s	₹ 450.00	₹ 18,000.00
3	Unskilled mason	60	no.s	₹ 400.00	₹ 24,000.00
Y	**TOTAL**				**₹ 44,500.00**
	X + Y				**₹ 140,543.00**
	GRAND TOTAL		**₹ 140,543.00**		
	AREA (sqm)		**22**		
	RATE OF CONSTRUCTION (per sqm)		**₹ 6,388.32**		
	AREA (sqft)		**235.4**		
	RATE OF CONSTRUCTION (per sqft)		**₹ 597.04**		

BR-02

BR-02

This typology is applicable to Housing Zone A & B

Zone A& B highlights:
Northern zone that is prone to long duration major floods, high winds, high monsoon rains and earthquake zone IV and V.

Central alluvial plains that are also prone to floods (low to medium intensity), earthquake zone II and IV, monsoonal rains and winds.

Zone A comprises of the following districts:
Paschim Champaran, Purba Champaram, Gopalganj, Siwan, Muzzaffarpur, Saran, Hajipur, Samastipur, Darbhanga, Madhubani, Sitamarhi

Zone B comprises of the following districts:
Supalu, Araria
Kishanganj,Madhepura, Koshi, Madhepura, Khagaria, Begusarai, Purnia, Katihar

Resources Available
- Timber And Bamboo
- Fired Bricks
- Thatch

BIHAR

- Considering the material vulnerability of zone I and II to floods, in North Bihar it would be important to ensure that the plinth is raised and is constructed on non--- erode able material.
- The superstructure should thus rest on a brick plinth of two feet or two feet six inches height.
- All dwelling units must be equipped with loft spaces for storage of materials and refuge during floods

Recommendations for Built Form		
Plan Layout	**Plinth/Floor**	**Roof Profile**
This plan type includes two room with a two way pitch roof extended over the open verandah in the front	High plinth design.	Sloped roof.

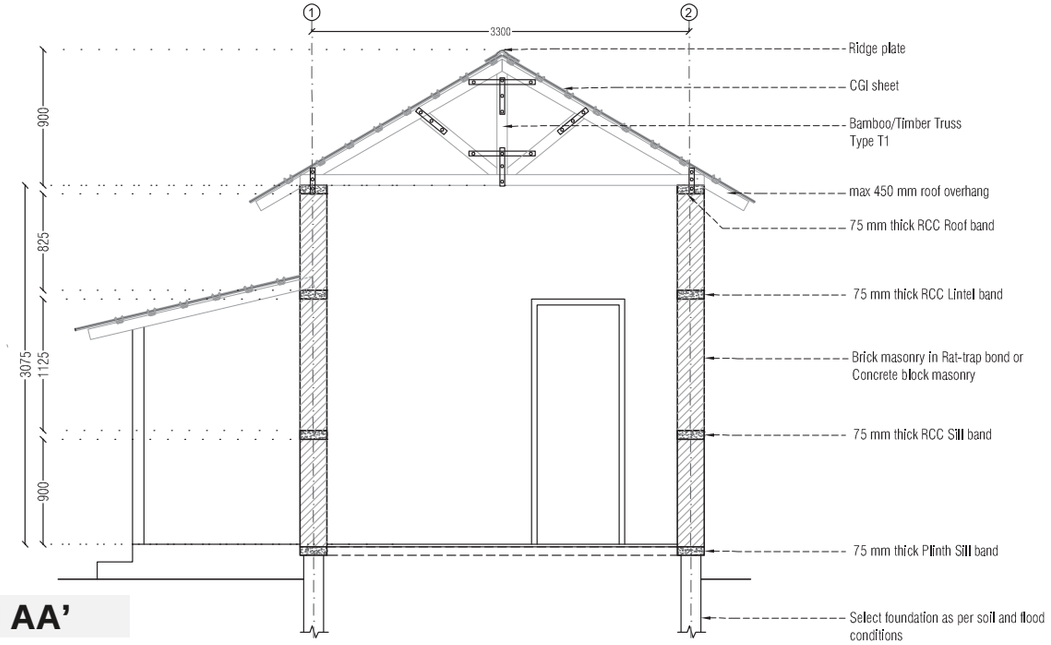
Recommendations for construction systems		
Components	**Recommended Specifications**	**Specific Comments**
Foundations	• Stub or strip foundations depending on the soil and sometimes pile foundation could be used depending on the region.	
Plinth	• Minimum 30 cm high plinth level	
Wall	• Brick wall upto to sill leve. • Upper walls are finished with Ikra walling systems with horizontal bracings	• Wall plates should take loads of rafters and beams to further distribute the load on the cob walls.
Wall Finish	• ferrocement plaster	
Roof Structure	• Roof slope angle – Min 25 & Max 33. • Covered with sheet & has treated bamboo or timber under structure	• Rigid connections between all roof members to increase stability.
Roof Cover	• GI sheet with proper bolting and use of J hooks etc.	
Floor	• PCC flooring	

BR-02

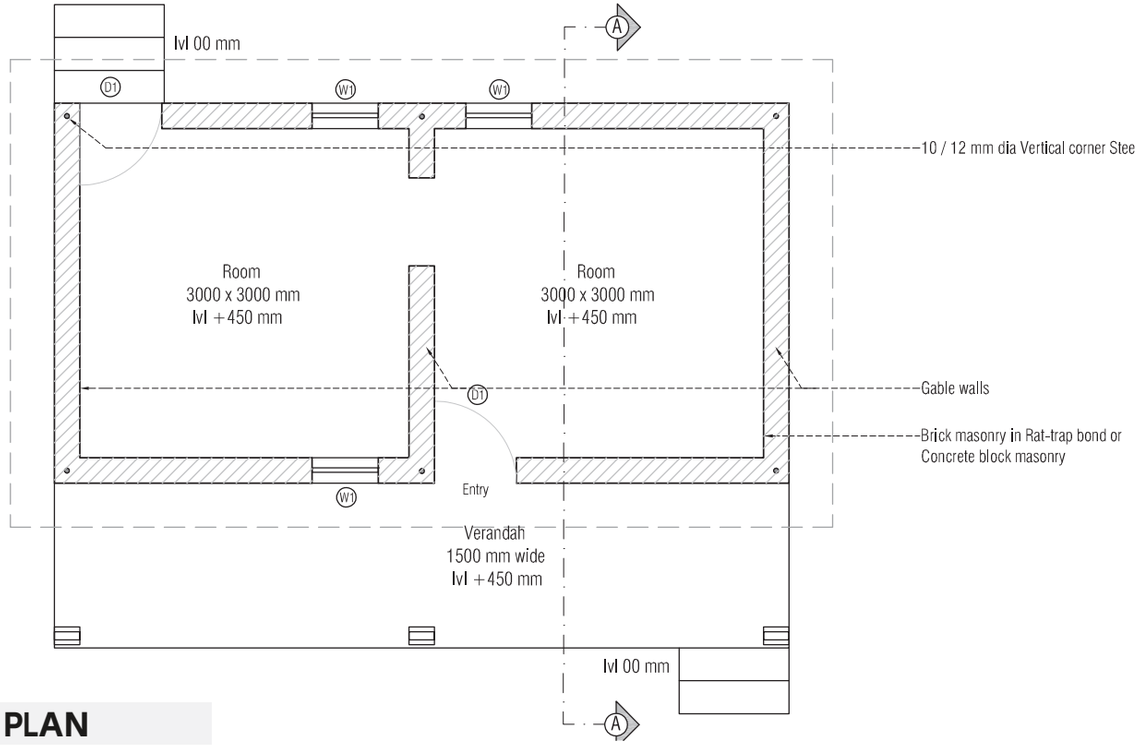
Area Statement:

Item	Area	
	Sq.m	Sq.ft
Room 1	9.17	98.70
Room 2	9.35	100.64
Verandah	10.03	107.96
Carpet Area	**18.52**	**199.34**
Built up Area	**33.18**	**357.14**

BIHAR

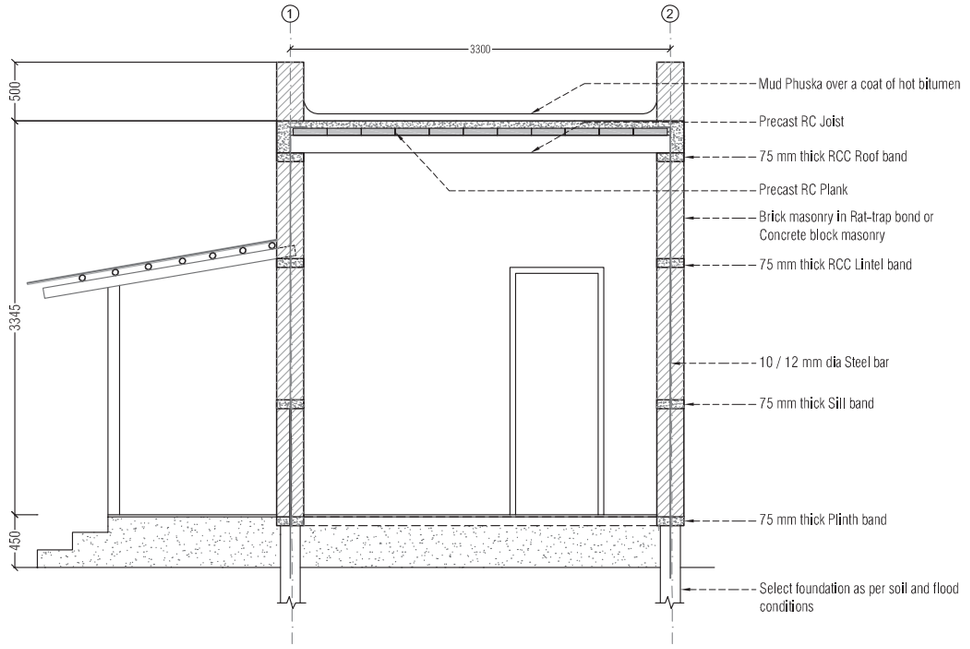


TYPICAL SECTION AA'

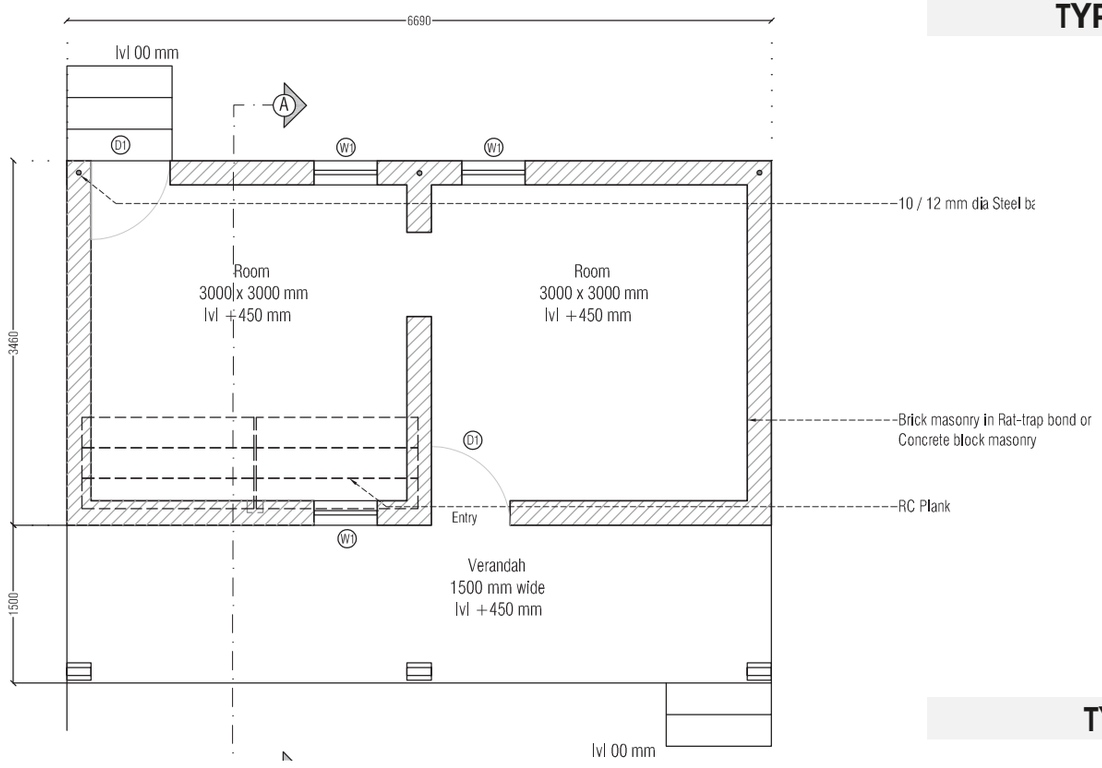


TYPICAL PLAN

BR-02
Alternative roofing



TYPICAL SECTION



TYPICAL PLAN

BIHAR

BR-02
Cost estimate

Item	Cost (INR)
Building material cost	₹ 150,286.60
Labour cost	₹ 53,000.00
Total	**₹ 203,286.60**

BIHAR

SR. NO.	ITEM OF WORK	Quantity	Unit	Rate per unit (Rs)
	BUILDING MATERIAL COST			
1	Brick	12787	pieces	₹ 7.00
2	Silver sand for filling	10	cu.m	₹ 70.00
3	Sand	6	cu.m	₹ 70.00
4	Cement	40	bags	₹ 400.00
5	Chips - 12mm	0.6	cu.m	₹ 86.00
6	Chips - 40mm metal	0.2	cu.m	₹ 86.00
7	stee 10mm dia	0.3	quintals	₹ 4,510.00
8	steel 6mm dia	0.08	quintals	₹ 4,510.00
9	Rod binding wire	5	kg	₹ 75.00
10	shuttering material		lumpsum	
11	whitewash		lumpsum	
12	Hardware-binding wire, nails, lashes, ropes		lumpsum	
13	Doors and windows with steel frame and Ply ventilator (1' x 2')		lumpsum	
14	Bamboo 3" dia and 20' long for truss,wall and attic	30	pieces	₹ 200.00
15	CGI Roofing (12' X 4')	25	no.s	₹ 700.00
X	**TOTAL**			
	LABOUR COST			
1	Skilled spl. Mason	5	no.s	₹ 500.00
2	Skilled mason	50	no.s	₹ 450.00
3	Unskilled mason	70	no.s	₹ 400.00
Y	**TOTAL**			
	X + Y			
	GRAND TOTAL		**₹ 203,286.60**	
	AREA (sqm)		**22**	
	RATE OF CONSTRUCTION (per sqm)		**₹ 9,240.30**	
	AREA (sqft)		**235.4**	
	RATE OF CONSTRUCTION (per sqft)		**₹ 863.58**	

BR-03

BR-03

- Considering the material vulnerability of zone I and II to floods, in North Bihar it would be important to ensure that the plinth is raised and is constructed on non--- erode able material.
- The superstructure should thus rest on a brick plinth of two feet or two feet six inches height.
- All dwelling units must be equipped with loft spaces for storage of materials and refuge during floods

Recommendations for Built Form		
Plan Layout	**Plinth/Floor**	**Roof Profile**
This plan type includes two staggered rooms. With a sloping roof	Normal plinth design.	Sloped roof.

Recommendations for construction systems		
Components	**Recommended Specifications**	**Specific Comments**
Foundations	• Foundations as per local conditions.	
Plinth	• Minimum 30 cm high plinth level	
Wall	• Brick/block masonry till sill level with Ikra walling. • precast post and MS sections	• Thick adobe wall acts as thermal barrier
Wall Finish	• Stabilized Mud Plaster	
Roof Structure	• Roof slope angle – Min 25 & Max 33. • timber/bamboo understructure sloping roof	• Rigid connections between all roof members to increase stability.
Roof Cover	• GI sheets	
Floor	• PCC flooring	

This typology is applicable to Housing Zone A & B

Zone A& B highlights:
Northern zone that is prone to long duration major floods, high winds, high monsoon rains and earthquake zone IV and V.

Central alluvial plains that are also prone to floods (low to medium intensity), earthquake zone II and IV, monsoonal rains and winds.

Zone A comprises of the following districts:
Paschim Champaran, Purba Champaram, Gopalganj, Siwan, Muzzaffarpur, Saran, Hajipur, Samastipur, Darbhanga, Madhubani, Sitamarhi

Zone B comprises of the following districts:
Supalu, Araria
Kishanganj,Madhepura, Koshi, Madhepura, Khagaria, Begusarai, Purnia, Katihar

Resources Available
- Timber And Bamboo
- Fired Bricks
- Thatch

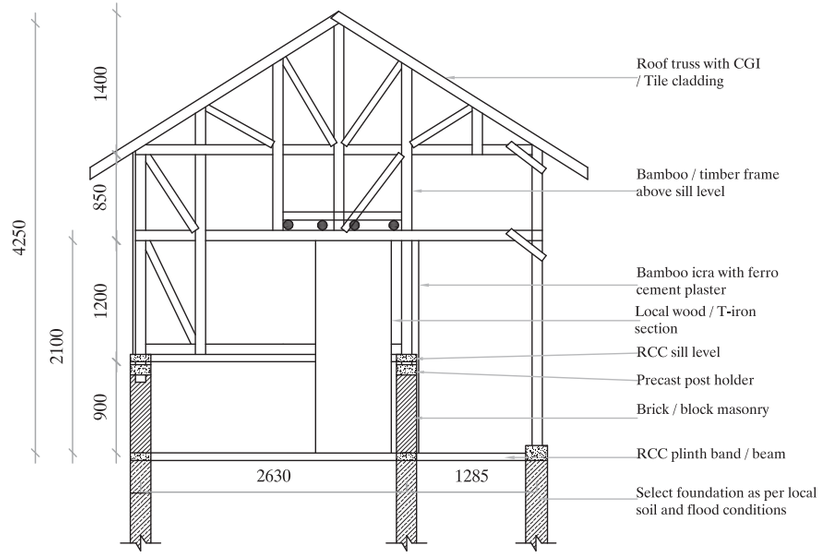
BIHAR

BR-03

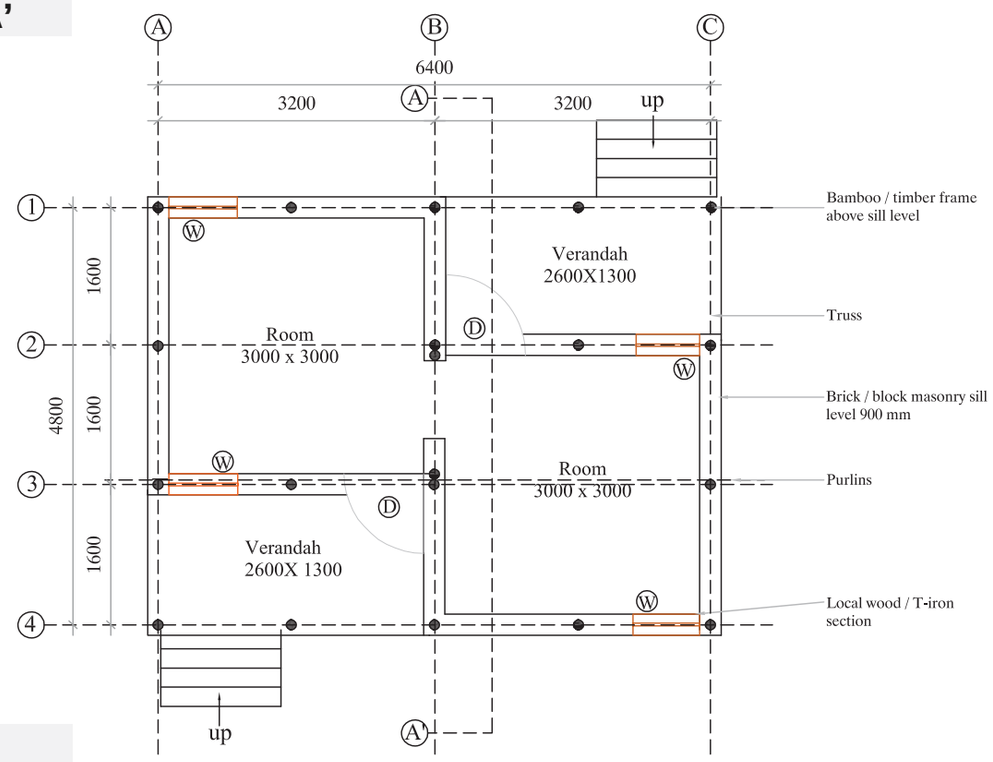
Area Statement:

Item	Area	
	Sq.m	Sq.ft
Room 1	5.83	62.75
Room 2	5.77	62.11
Verandah 1	3.35	36.06
Verandah 2	**3.42**	**36.81**
Carpet Area	**12.03**	**129.49**
Built up Area	**30.4**	**327**

BIHAR

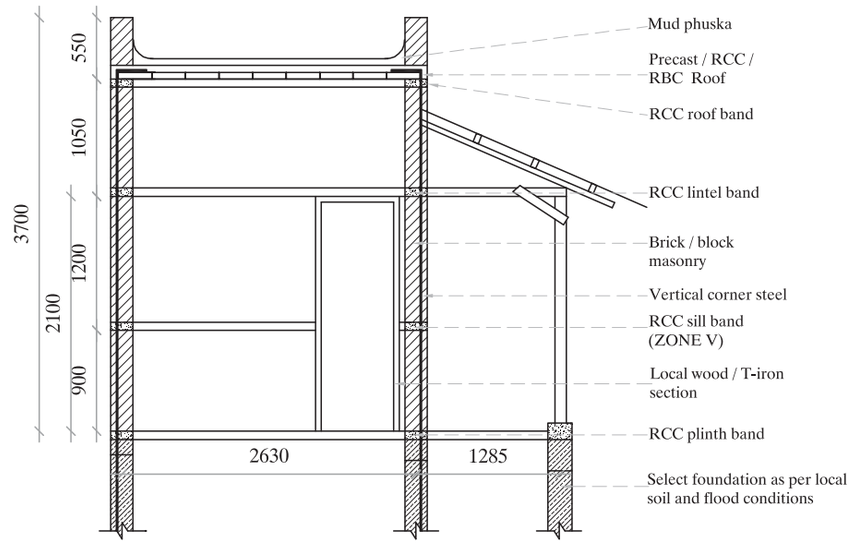


TYPICAL SECTION AA'

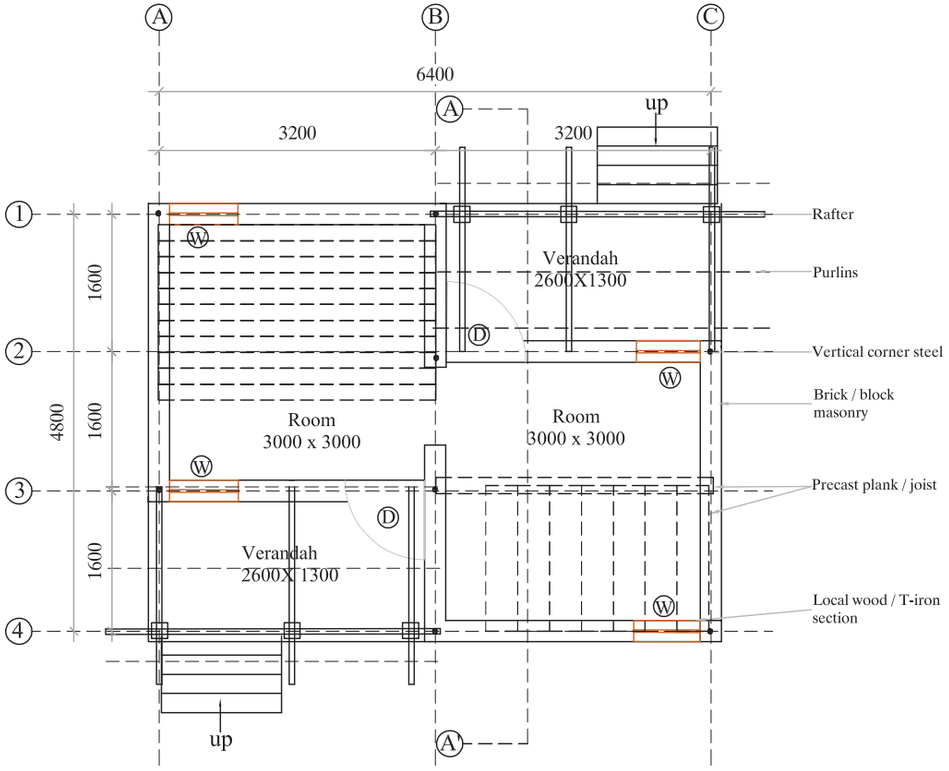


TYPICAL PLAN

BR-03
Alternative roofing



TYPICAL SECTION AA'



TYPICAL PLAN

BIHAR

BR-03
Cost estimate

Item	Cost (INR)
Building material cost	₹ 99,527.60
Labour cost	₹ 55,000.00
Total	**₹ 154,527.60**

BIHAR

SR. NO.	ITEM OF WORK	Quantity	Unit	Rate per unit (Rs)
	BUILDING MATERIAL COST			
1	Brick	5250	pieces	₹ 7.00
2	Silver sand for filling	10	cu.m	₹ 70.00
3	Sand	6	cu.m	₹ 70.00
4	Cement	45	bags	₹ 400.00
5	Chips - 12mm	0.6	cu.m	₹ 86.00
6	Chips - 40mm metal	0.2	cu.m	₹ 86.00
7	stee 10mm dia	0.3	quintals	₹ 4,510.00
8	steel 6mm dia	0.08	quintals	₹ 4,510.00
9	Rod binding wire	5	kg	₹ 75.00
10	shuttering material		lumpsum	
11	whitewash		lumpsum	
12	Hardware-binding wire, nails, lashes, ropes		lumpsum	
13	Doors and windows with steel frame and Ply ventilator (1' x 2')		lumpsum	
14	Bamboo 3" dia and 20' long for truss,wall and attic	30	pieces	₹ 200.00
15	CGI Roofing (12' X 4')	25	no.s	₹ 700.00
X	**TOTAL**			
	LABOUR COST			
1	Skilled spl. Mason	5	no.s	₹ 500.00
2	Skilled mason	50	no.s	₹ 450.00
3	Unskilled mason	75	no.s	₹ 400.00
Y	**TOTAL**			
	X + Y			
	GRAND TOTAL		**₹ 154,527.60**	
	AREA (sqm)		**22**	
	RATE OF CONSTRUCTION (per sqm)		**₹ 7,023.98**	
	AREA (sqft)		**235.4**	
	RATE OF CONSTRUCTION (per sqft)		**₹ 656.45**	

BR-04

BR-04

- Since zone III is primarily drought prone water ingress is not a problem.
- Structural bamboo is not available in zone III areas and workmen are also familiar only with brick and concrete construction.
- Good quality bricks are also easily available within a radius of 2 km of most villages.
- Loft areas for refuge during flood is not required in these structures in Zone C, hence flat roofs can be considered for this zone.

Recommendations for Built Form		
Plan Layout	**Plinth/Floor**	**Roof Profile**
Two rooms opening out to a verandah	Normal plinth design.	Filler slab flat roof

Recommendations for construction systems		
Components	**Recommended Specifications**	**Specific Comments**
Foundations	• Strip footing in brick with cement mortar or as per the soil conditions	
Plinth	• Minimum 30 cm high plinth level	
Wall	• 200 mm thk stone concrete block masonry	• Thick adobe wall acts as thermal barrier
Wall Finish	• ferrocement plaster	
Roof Structure	• Filler slab flat roof	• Rigid connections between all roof members to increase stability.
Roof Cover	• RCC	
Floor	• IPC flooring	

This typology is applicable to Housing Zone C

Zone C highlights: The southern hills (not more than 700 m) are not so prone to floods except near river beds, earthquake zone III and receive monsoonal rains and high winds.

Zone C comprises of the following districts:
Buxar, Bhojpur, Patna, Jahanabad, Rohtas, Bhabhua, Aurangabad, Gaya, Nawada, Nalanda, Jamui, Shekhpura, Munger, Bhagalpur, Banka

Resources Available
- Bamboo, stone, mud

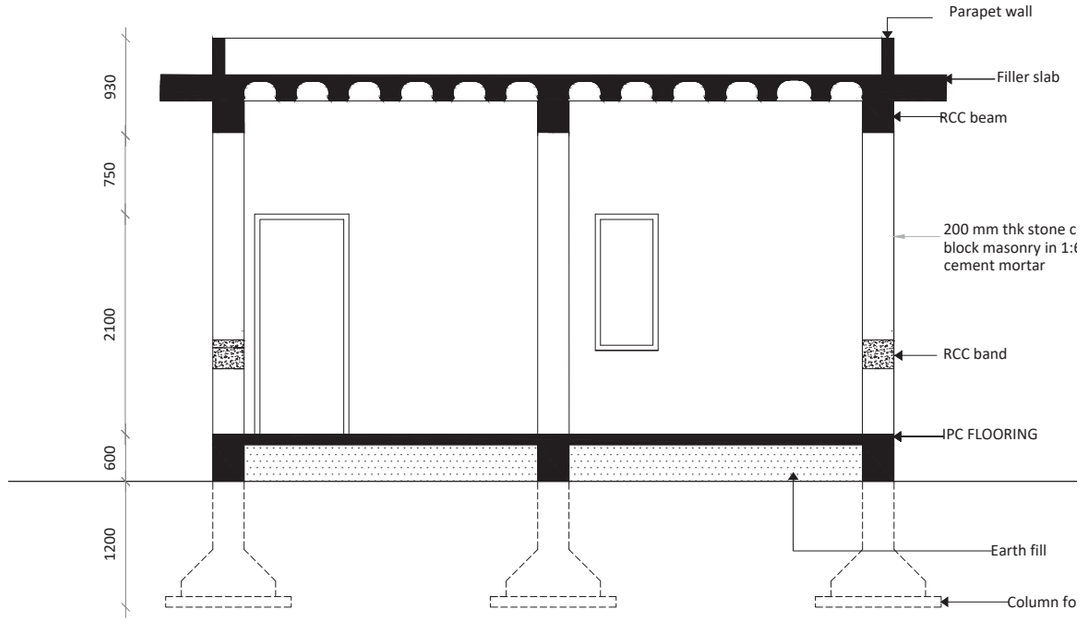
BIHAR

BR-04

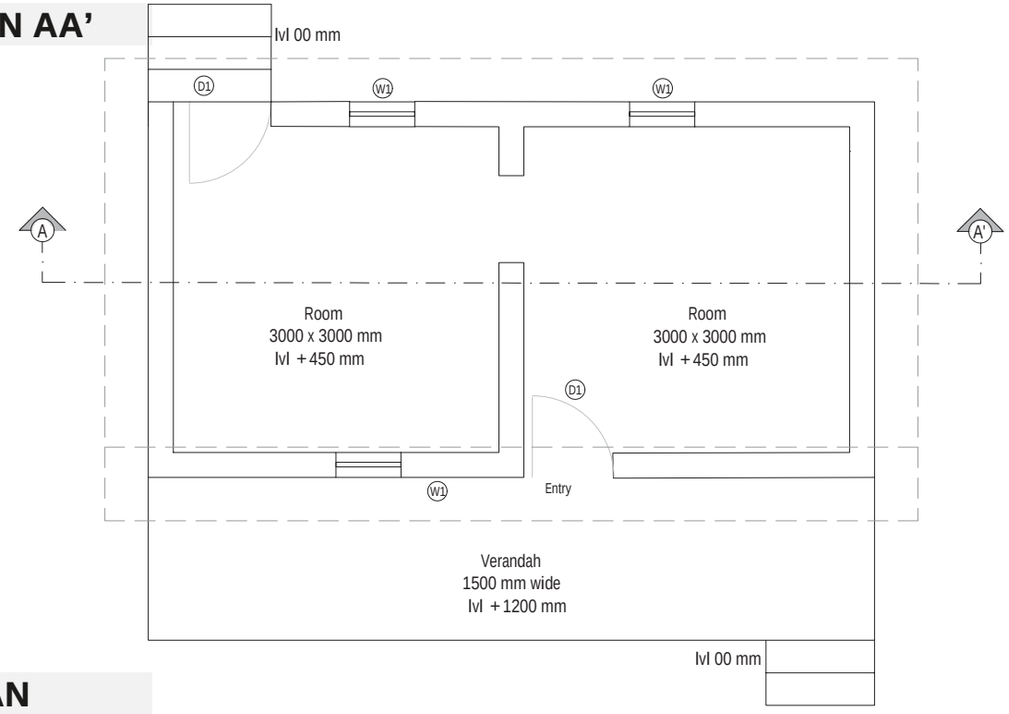
Area Statement:

Item	Area	
	Sq.m	Sq.ft
Room 1	9.17	98.70
Room 2	9.35	100.64
Verandah	10.03	107.96
Carpet Area	**18.52**	**199.34**
Built up Area	**33.18**	**357.14**

BIHAR



TYPICAL SECTION AA'



TYPICAL PLAN

SR. NO.	ITEM OF WORK	Quantity	Unit	Rate per unit (Rs)	Cost
	RCC Foundation and column				
	Excavation	12.96	cu.m	₹ 383.00	₹ 4,963.68
	Cement concrete 1:4:8	1.3	cu.m	₹ 6,770.00	₹ 8,801.00
	Steel reinforcement	288.07	kg	₹ 47.00	₹ 13,539.29
	Wooden formwork	45.54	sq.m	₹ 332.00	₹ 15,119.28
	R.C.C. 1:2:4	5.93	cu.m	₹ 6,770.00	₹ 40,146.10
	R.C.C. Plinth Beam				
	Excavation	1.62	cu.m	₹ 383.00	₹ 620.46
	Steel reinforcement	1180	kg	₹ 47.00	₹ 55,460.00
	Wooden formwork	28.35	sq.m	₹ 332.00	₹ 9,412.20
	R.C.C. 1:2:4	2.03	cu.m	₹ 6,770.00	₹ 13,743.10
	R.C.C. Ground floor beam				
	Steel reinforcement	1180	kg	₹ 47.00	₹ 55,460.00
	Wooden formwork	28.35	sq.m	₹ 332.00	₹ 9,412.20
	R.C.C. 1:2:4	3.54	cu.m	₹ 6,770.00	₹ 23,965.80
	R.C.C. Slab				
	Steel reinforcement	218.6	kg	₹ 47.00	₹ 10,274.20
	Wooden formwork	32	sq.m	₹ 332.00	₹ 10,624.00
	R.C.C. 1:2:4	3.01	cu.m	₹ 6,770.00	₹ 20,377.70
	Terracotta pots as filler	300	no.s	₹ 10.00	₹ 3,000.00
	Brick on edge Flooring	12.15	sq.m	₹ 650.00	₹ 7,897.50
	Walling				
	Bamboo wall				₹ 11,598.00
	C channel sections				₹ 23,932.00
	Plastering 1:4 double layer				₹ 43,032.00
	Doors and windows				₹ 10,000.00
	Plastering - Ceiling				₹ 8,150.00
	Whitewashing				₹ 10,000.00
	TOTAL				**₹ 409,528.51**
					₹ 409,528.51
	GRAND TOTAL		**₹ 409,528.51**		
	AREA (sqm)		**22**		
	RATE OF CONSTRUCTION (per sqm)		**₹ 18,614.93**		
	AREA (sqft)		**235.4**		
	RATE OF CONSTRUCTION (per sqft)		**₹ 1,739.71**		

BR-04
Cost estimate

Cost breakup

Item	Cost (INR)
Total	**₹ 409,528.51**

BIHAR

BR-05

This typology is applicable to Housing Zone C

Zone C highlights: The southern hills (not more than 700 m) are not so prone to floods except near river beds, earthquake zone III and receive monsoonal rains and high winds.

Zone C comprises of the following districts:

Buxar, Bhojpur, Patna, Jahanabad, Rohtas, Bhabhua, Aurangabad, Gaya, Nawada, Nalanda, Jamui, Shekhpura, Munger, Bhagalpur, Banka

Resources Available

- Bamboo, stone, mud

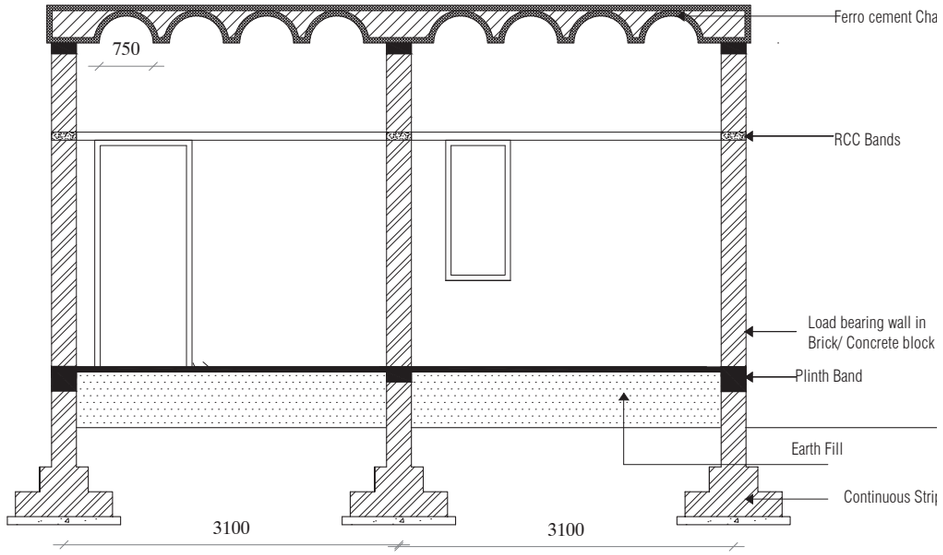
BIHAR

BR-05

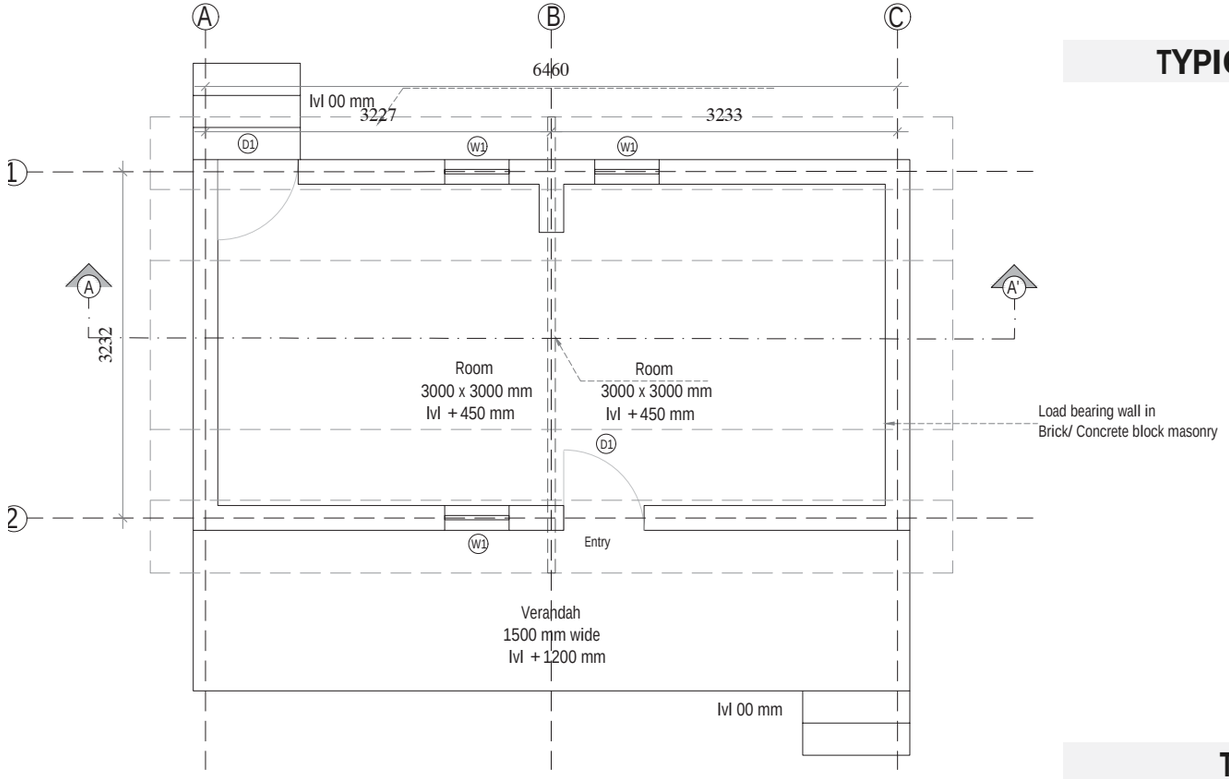
- Since zone III is primarily drought prone water ingress is not a problem.
- Structural bamboo is not available in zone III areas and workmen are also familiar only with brick and concrete construction.
- Good quality bricks are also easily available within a radius of 2 km of most villages.
- Loft areas for refuge during flood is not required in these structures in Zone C, hence flat roofs can be considered for this zone.

Recommendations for Built Form		
Plan Layout	**Plinth/Floor**	**Roof Profile**
Two rooms opening out to a verandah	High plinth design.	Ferrocement channel roofing

Recommendations for construction systems		
Components	**Recommended Specifications**	**Specific Comments**
Foundations	• Continous strip foundation	
Plinth	• Minimum 30 cm plinth height	
Wall	• Load bearing wall in Brick and Cement complete with horizontal RCC bands	
Wall Finish	• exposed brick/ cement plaster	
Roof Structure	• ferrocement channel roofing	
Roof Cover	• RCC	
Floor	• IPC flooring	



TYPICAL SECTION AA'



TYPICAL PLAN

BR-05

Area Statement:

Item	Area	
	Sq.m	Sq.ft
Room 1	9.17	98.70
Room 2	9.35	100.64
Verandah	10.03	107.96
Carpet Area	**18.52**	**199.34**
Built up Area	**33.18**	**357.14**

BIHAR

BR-05
Cost estimate

Cost breakup

Item	Cost (INR)
Building material cost	₹ 208,801.40
Labour cost	₹ 63,250.00
Total	**₹ 272,051.40**

BIHAR

SR. NO.	ITEM OF WORK	Quantity	Unit	Rate per unit (Rs)	Cost
	BUILDING MATERIAL COST				
1	Brick	15000	pieces	₹ 6.50	₹ 97,500.00
2	Coarse sand	4.01		₹ 1,200.00	₹ 4,812.00
3	Fine sand	15.48	cu.m	₹ 700.00	₹ 10,836.00
4	Cement	100	bags	₹ 350.00	₹ 35,000.00
5	Chips - 12mm	0.6	cu.m	₹ 1,175.00	₹ 705.00
6	Chips - 40mm metal	0.2	cu.m	₹ 1,175.00	₹ 235.00
7	stee 10mm dia	2	quintals	₹ 4,600.00	₹ 9,200.00
8	steel 6mm dia	0.3	quintals	₹ 4,510.00	₹ 1,353.00
9	Rod binding wire	5	kg	₹ 80.00	₹ 400.00
10	shuttering material		lumpsum		₹ 3,000.00
11	whitewash		lumpsum		₹ 10,000.00
12	Hardware-binding wire, nails, lashes, ropes		lumpsum		₹ 3,000.00
13	Doors and windows with steel frame and Ply ventilator (1' x 2')		lumpsum		₹ 10,000.000
14	Ferrocement Roof channels For 1 roof channel 3.6mx 4.5m				
	Cement	10	bags	₹ 500.00	₹ 5,000.00
	Coarse sand	0.75	cu.m	₹ 150.00	₹ 112.50
	Chicken mesh	35	sq.m	₹ 260.00	₹ 9,100.00
	20mm aggregate	0.15	cu.m	₹ 1,176.00	₹ 176.40
	16mm reinforcement	0.6	quintal	₹ 4,400.00	₹ 2,640.00
	Binding wire	1.5	kg	₹ 53.00	₹ 79.50
	Welding mesh	7	kg	₹ 66.00	₹ 462.00
	Masons	2	man days	₹ 450.00	₹ 900.00
	Labour	12	man days	₹ 320.00	₹ 3,840.00
	Bar benders	1	man days	₹ 450.00	₹ 450.00
X	**TOTAL**				**₹ 208,801.40**
	LABOUR COST				
1	Skilled spl. Mason	5	no.s	₹ 500.00	₹ 2,500.00
2	Skilled mason	65	no.s	₹ 450.00	₹ 29,250.00
3	Unskilled mason	90	no.s	₹ 350.00	₹ 31,500.00
Y	**TOTAL**				**₹ 63,250.00**
	X + Y				**₹ 272,051.40**
	GRAND TOTAL		**₹ 272,051.40**		
	AREA (sqm)		**22**		
	RATE OF CONSTRUCTION (per sqm)		**₹ 12,365.97**		
	AREA (sqft)		**235.4**		
	RATE OF CONSTRUCTION (per sqft)		**₹ 1,155.70**		

BR-06

BR-06

This typology is applicable to Housing Zone C

Zone C highlights: The southern hills (not more than 700 m) are not so prone to floods except near river beds, earthquake zone III and receive monsoonal rains and high winds.

Zone C comprises of the following districts:
Buxar, Bhojpur, Patna, Jahanabad, Rohtas, Bhabhua, Aurangabad, Gaya, Nawada, Nalanda, Jamui, Shekhpura, Munger, Bhagalpur, Banka

Resources Available

- Bamboo, stone, mud

- Since zone III is primarily drought prone water ingress is not a problem.
- Structural bamboo is not available in zone III areas and workmen are also familiar only with brick and concrete construction.
- Good quality bricks are also easily available within a radius of 2 km of most villages.
- Loft areas for refuge during flood is not required in these structures in Zone C, hence flat roofs can be considered for this zone.

Recommendations for Built Form		
Plan Layout	**Plinth/Floor**	**Roof Profile**
Two rooms opening out to a verandah	High plinth design.	GI Sheet Sloping roof

Recommendations for construction systems		
Components	**Recommended Specifications**	**Specific Comments**
Foundations	• Continuous strip foundation/ as per the soil condition	
Plinth	• Minimum 30 cm high plinth level	
Wall	• Wall in Rat trap Brick and Cement complete with horizontal RCC bands	
Wall Finish	• exposed brick/ cement plaster	
Roof Structure	• Sloping roof with Bamboo/timber understructure	
Roof Cover	• GI sheet	
Floor	• IPC flooring	

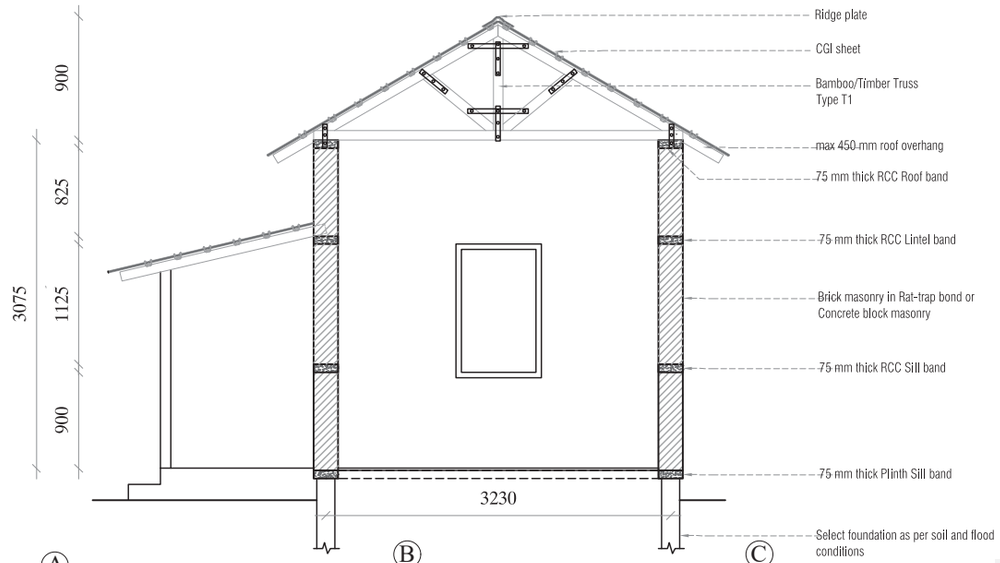
BIHAR

BR-06

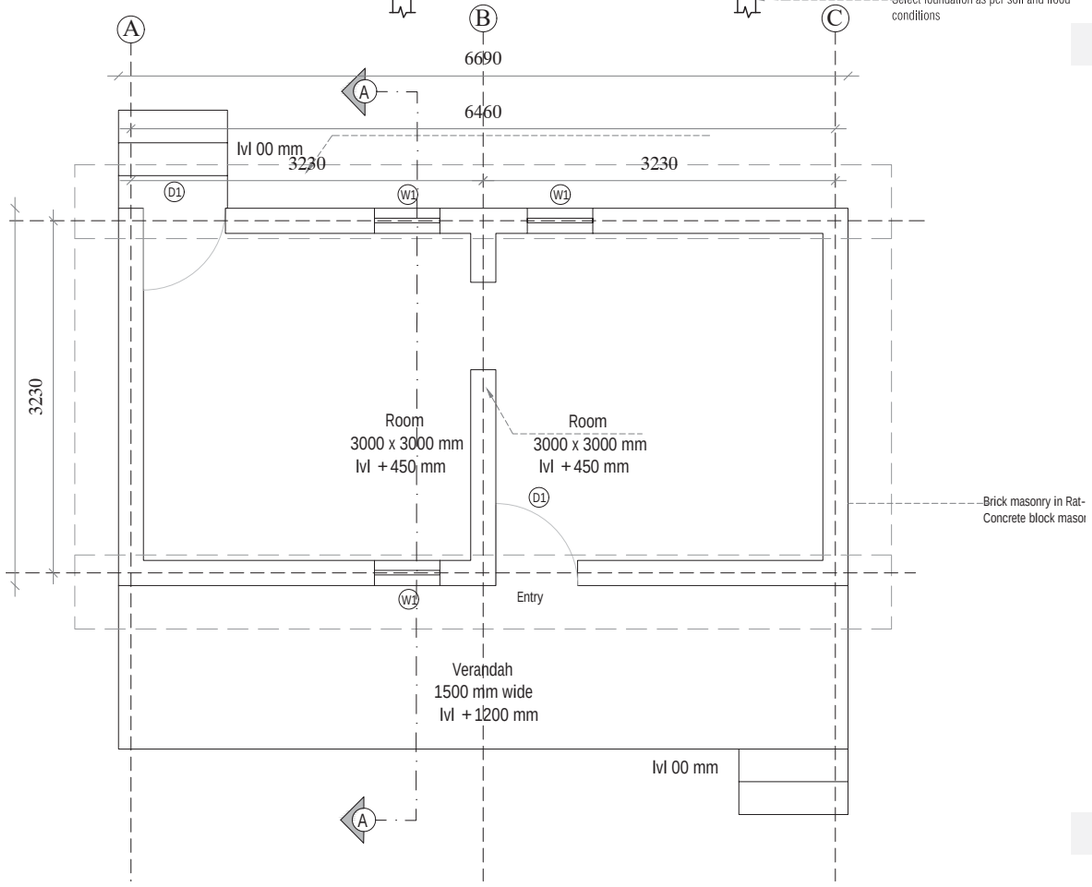
Area Statement:

Item	Area	
	Sq.m	Sq.ft
Room 1	9.17	98.70
Room 2	9.35	100.64
Verandah	10.03	107.96
Carpet Area	**18.52**	**199.34**
Built up Area	**33.18**	**357.14**

BIHAR



TYPICAL SECTION AA'



TYPICAL PLAN

SR. NO.	ITEM OF WORK	Quantity	Unit	Rate per unit (Rs)	Cost
	BUILDING MATERIAL COST				
1	Brick in foundation	5375	pieces	₹ 6.50	₹ 34,937.50
2	Brick in rattrap walls	6986	pieces	₹ 6.50	₹ 45,409.00
3	Coarse sand	3	cu.m	₹ 1,200.00	₹ 3,600.00
4	Fine sand	12	cu.m	₹ 700.00	₹ 8,400.00
5	Cement	85	bags	₹ 350.00	₹ 29,750.00
6	Chips - 12mm	0.6	cu.m	₹ 1,175.00	₹ 705.00
7	Chips - 40mm metal	0.2	cu.m	₹ 1,175.00	₹ 235.00
8	stee 10mm dia	2	quintals	₹ 4,600.00	₹ 9,200.00
9	steel 6mm dia	0.3	quintals	₹ 4,510.00	₹ 1,353.00
10	Rod binding wire	5	kg	₹ 75.00	₹ 375.00
11	shuttering material		lumpsum		₹ 3,000.00
12	whitewash		lumpsum		₹ 5,000.00
13	Hardware-binding wire, nails, lashes, ropes		lumpsum		₹ 3,000.00
14	Doors and windows with steel frame and Ply ventilator (1' x 2')		lumpsum		₹ 10,000.000
15	CGI Sheet roof with bamboo bamboo king post / fink roof truss				
	Bamboo 12 ft 3 inch dia	50	no.s	₹ 300.00	₹ 15,000.00
	Nails and rubber/nylon straps		lumpsum		₹ 3,000.000
	CGI sheets (10 sheets 10' long 750mm wide .3mm- 2 bundles	110	kg	₹ 58.00	₹ 6,380.00
	Masons	2	man days	₹ 450.00	₹ 900.000
	Labor	12	man days	₹ 320.00	₹ 3,840.000
	Blacksmith	1	man days	₹ 450.00	₹ 450.000
X	**TOTAL**				**₹ 184,534.50**
	LABOUR COST				
1	Skilled spl. Mason	5	no.s	₹ 500.00	₹ 2,500.00
2	Skilled mason	60	no.s	₹ 450.00	₹ 27,000.00
3	Unskilled mason	80	no.s	₹ 350.00	₹ 28,000.00
Y	**TOTAL**				**₹ 57,500.00**
	X + Y				**₹ 242,034.50**
	GRAND TOTAL		**₹ 242,034.50**		
	AREA (sqm)		**22**		
	RATE OF CONSTRUCTION (per sqm)		**₹ 11,001.57**		
	AREA (sqft)		**235.4**		
	RATE OF CONSTRUCTION (per sqft)		**₹ 1,028.18**		

BR-06
Cost estimate

Cost breakup

Item	Cost (INR)
Building material cost	₹ 184,534.50
Labour cost	₹ 57,500.00
Total	**₹ 242,034.50**

BIHAR

pahal
Prakriti Hunar Lokvidya

Chhattisgarh

CHHATTISGARH

Chhattisgarh is located in the middle eastern part of India. As a result, the state has a Tropical Monsoon climate or Dry Sub-humid climate, similar to the rest of the country.

The northern and southern parts of the state are hilly, while the central part is fertile plains. Self-sustaining culture of several communities around the regions of Jashpur, Ambikapur, Bastar and other areas with its unique geography and land features, that use the locally generated resources for most of its building needs, is very much alive. This is also clearly reflected in many of the housing that is constructed under PMAY-G; houses being spacious, built with traditional materials that are locally procured.

House designs are based on traditional use of space, with dark interiors, with minimum windows and large verandah spaces, around a courtyard in most places, also addressing the need for incremental housing.

The total forest area of the state is approximately 45%. Various building materials are used for house construction in the state ranging from mud, bamboo, wood, stone, concrete, bricks, metal sheets, cement sheets, etc. At some places thatch, leaves, jute reeds are also used.

Though state of Chhattisgarh is not under any high-risk zones of natural disaster it is enriched with natural resources, which led to high amount of extraction and consumption of resources.

Zone A
Zone A is classified with its vast array of industries and mineral deposits. Bauxite and coal deposits are abound in the district of Surguja. The falling of temperatures to close to zero degrees Celsius has resulted in the larger widths of walls for optimal thermal comfort.

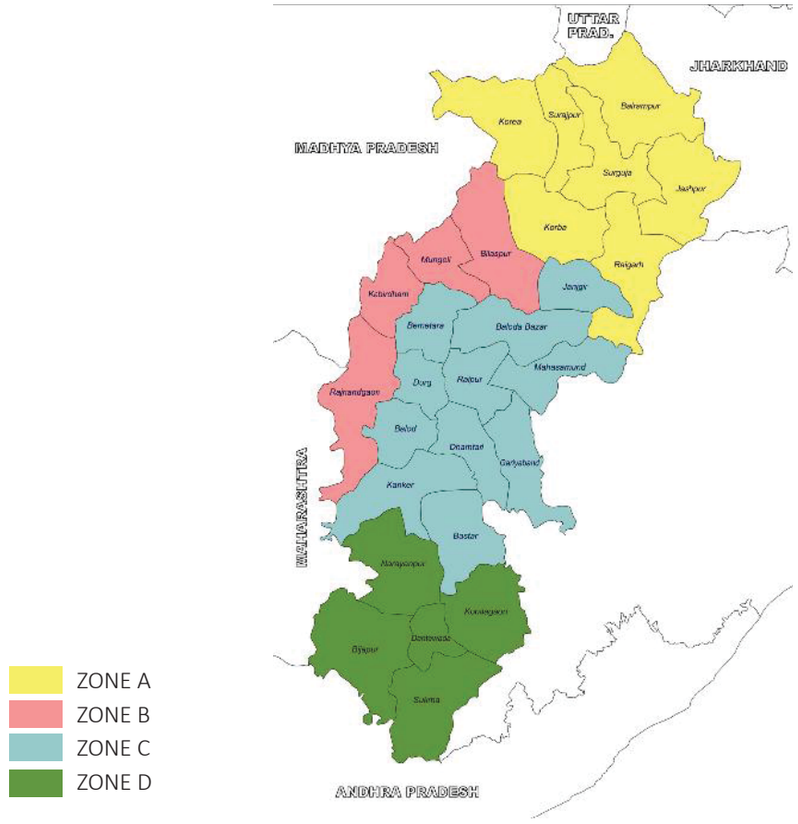
Building typology Zone A is characterized by tribal cultural associations. Large parts of the zone have dense deciduous forest, which makes accessibility of certain forest resources easier. People generally have large courtyard houses.

Most of the zone falls under Seismic Zone II except for 3 districts, which are under Seismic Zone III.

Zone B
Zone B comprises of the foothills of the Maikal-Satpura mountain range and plains of Mahanadi river system geographically. The western half of the zone is mainly forest in the foothills and the eastern half is the Mahanadi river basin plains with more urban areas.

A large population harvests a single crop annually. The eastern part of the zone is highly urbanized comprising of urban centers like Bilaspur and Rajnandgaon. The region has influences from both the abutting zones of A and C.

Zone C
Building typology Zone C is the largest zone of the state, both area wise and population wise. The zone is formed by the fertile plains of Mahanadi river system basin. Soil for making bricks and mud walls is



easily available. It has humid subtropical composite climate. The temperature ranges between 5°C to 48 °C annually.

The zone is the most urbanized and connected area of the state. Aspirations are high and influenced by the urban areas. People making brick houses with mud mortar, also lot of people hire masons for the construction. Self help component is still high in most of the areas.

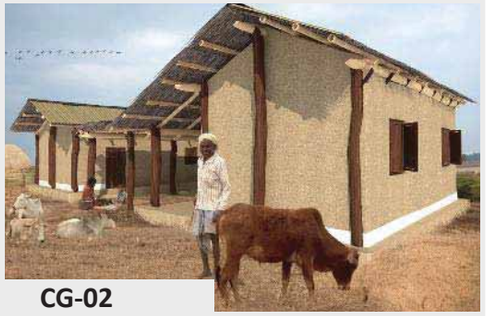
Zone D
Building typology Zone D is the southernmost zone of the state. The Indravati-Dantewada-Gollapal plateau forms the zone. It also comprises of Bastar and Albaka hills. The zone is rich in natural resources and minerals. Stone is easily available and is the most prevalent building material. Bricks are relatively expensive and difficult to access in remote locations as connectively is relatively poor. Mud mortar is extensively used.

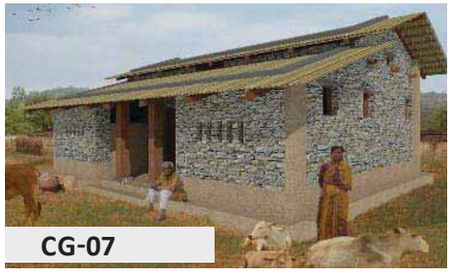
Timber It has dense forest in most of its region. Due to dense forests the zone is sparsely populated. It is one of the poorest regions of the country.

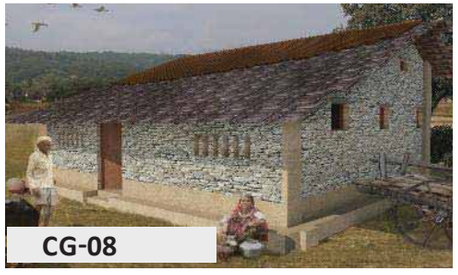
CHHATTISGARH HOUSING TYPOLOGIES AT A GLANCE

TYPOLOGY	APPLICABLE HOUSING ZONES	TOTAL AREA Sq.m/Sq.ft	
CG-01	Zone A	29.79 Sq.m	320.66 Sq.ft
CG-02	Zone A	45.67 Sq.m	491.59 Sq.ft
CG-03	Zone B	24.09 Sq.m	259.30 Sq.ft
CG-04	Zone B	31.08 Sq.m	334.55 Sq.ft
CG-05	Zone C	37.57 Sq.m	404.40 Sq.ft
CG-06	Zone C	52.61 Sq.m	566.29 Sq.ft
CG-07	Zone D	32.11 Sq.m	345.63 Sq.ft
CG-08	Zone D	44.80 Sq.m	482.23 Sq.ft
CG-09	Zone A,B,C & D	44.89 Sq.m	483.20 Sq.ft

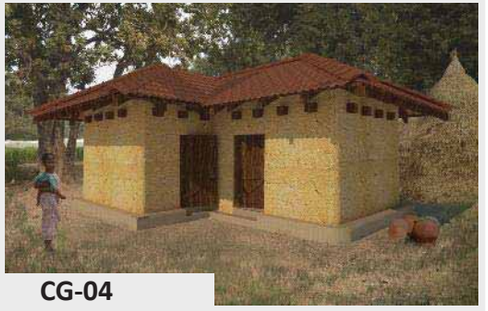

CG-01


CG-02


CG-07


CG-08


CG-03


CG-04


CG-09


CG-05


CG-06

CHHATTISGARH

CG-01

This typology is applicable to Housing Zone A

Zone A highlights:
Most of the zone falls under Seismic Zone II partially some districts falling under Seismic Zone III

Zone A comprise 7 districts

1. Surguja
2. Korba
3. Raigarh
4. Korea
5. Surajpur
6. Balrampur
7. Jashpur

Resources Available

- Timber And Bamboo
- Fired Brick, Fly Ash Brick
- Thatch

CHHATTISGARH

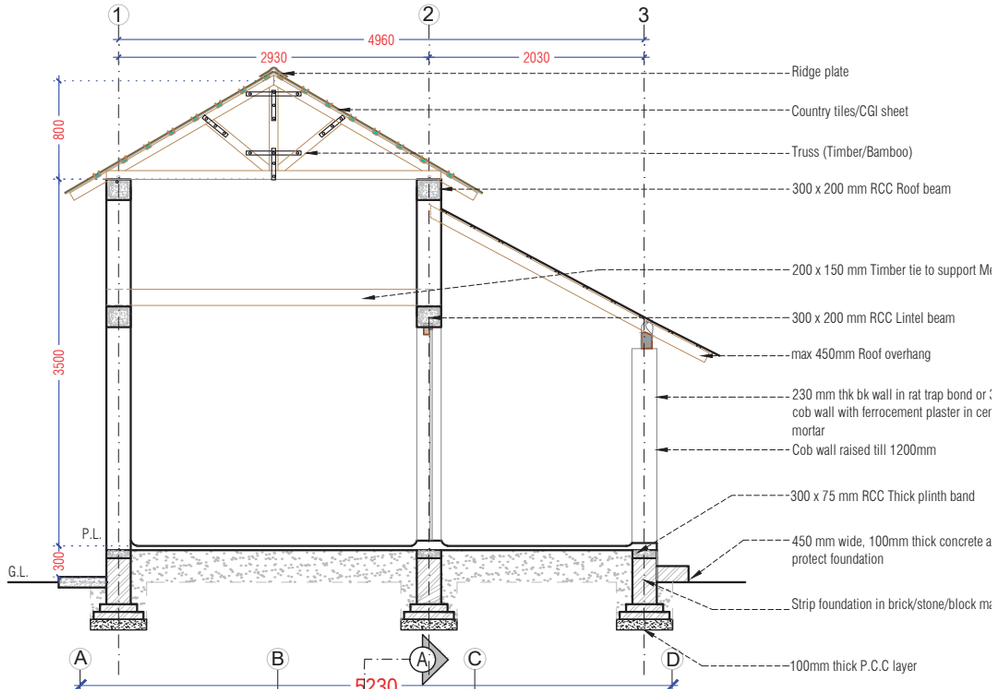
CG-01

DESIGN HIGHLIGHTS

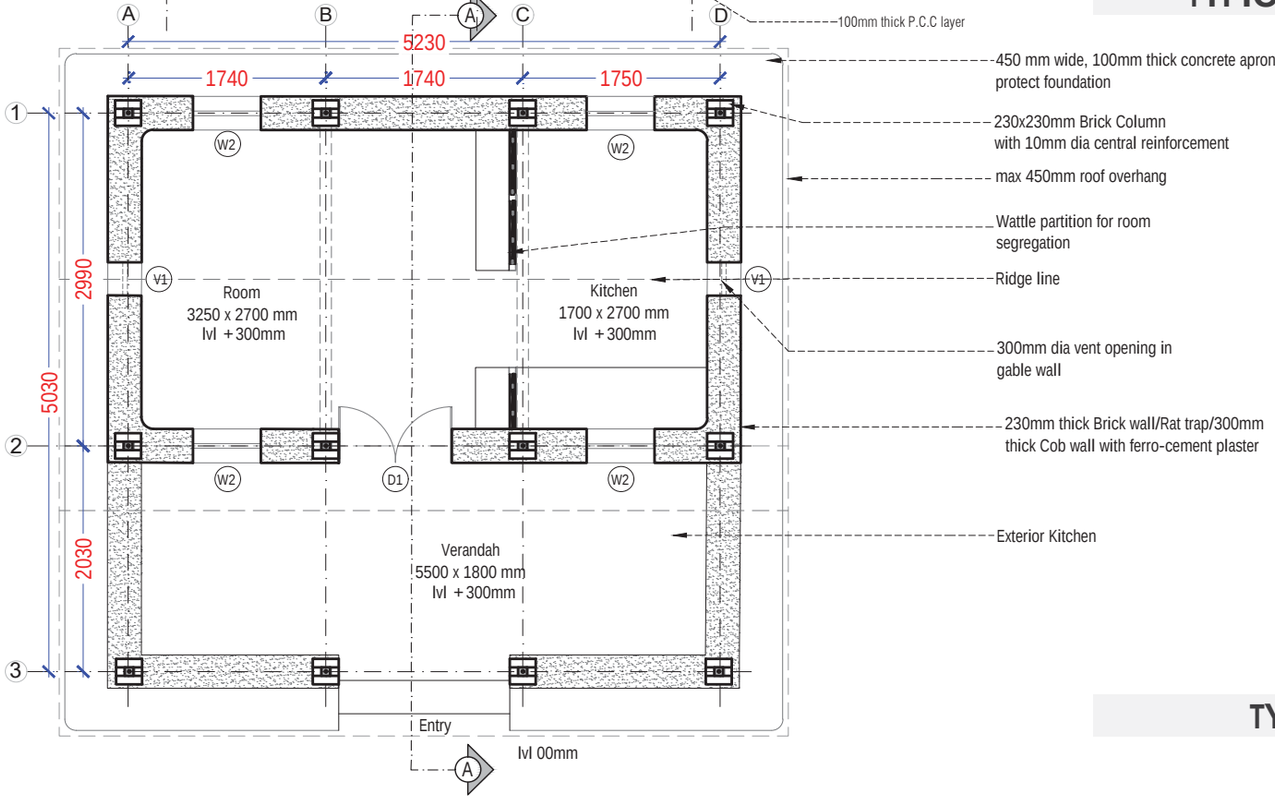
- Suitable for families which can afford only very small houses that can be incremented later.
- It is a single storey load bearing structure built in 230 mm thk brick wall or 300 mm thk cob walls, finished with ferrocement plaster.
- The roofing material locally is terra-cotta country tiles but CGI sheets could be introduced, with locally available timber with bamboo as under-structure.

Recommendations for Built Form		
Plan Layout	**Plinth/Floor**	**Roof Profile**
This plan type includes a single room with a two way pitch roof extended over the open verandah in the front	Normal plinth design.	Sloped roof.

Recommendations for construction systems		
Components	**Recommended Specifications**	**Specific Comments**
Foundations	• Strip foundation in Brick/block/stone masonry	
Plinth	• Minimum 30 cm high plinth level	
Wall	• 230 mm Thick rat trap brick/ cob wall 300 mm thick	• Wall plates should take loads of rafters and beams to further distribute the load on the cob walls.
Wall Finish	• Ferrocement plaster	
Roof Structure	• Roof slope angle – Min 25 & Max 33. • Covered with sheet & has treated bamboo under structure	• Rigid connections between all roof members to increase stability.
Roof Cover	• Country Tiles/ CGI sheet with Timber Under structure.	• Woven reed mats can be used below the tiles as false ceiling for thermal insulation.
Floor	• IPS flooring	



TYPICAL SECTION AA'



TYPICAL PLAN

CG-01

Area Statement:

Item	Area	
	Sq.m	Sq.ft
Room	8.74	97.52
Kitchen	4.57	49.62
Verandah	8.63	92.89
Carpet Area	**13.66**	**147.04**
Built up Area	**29.79**	**320.66**

CHHATTISGARH

CG-01
Cost estimate

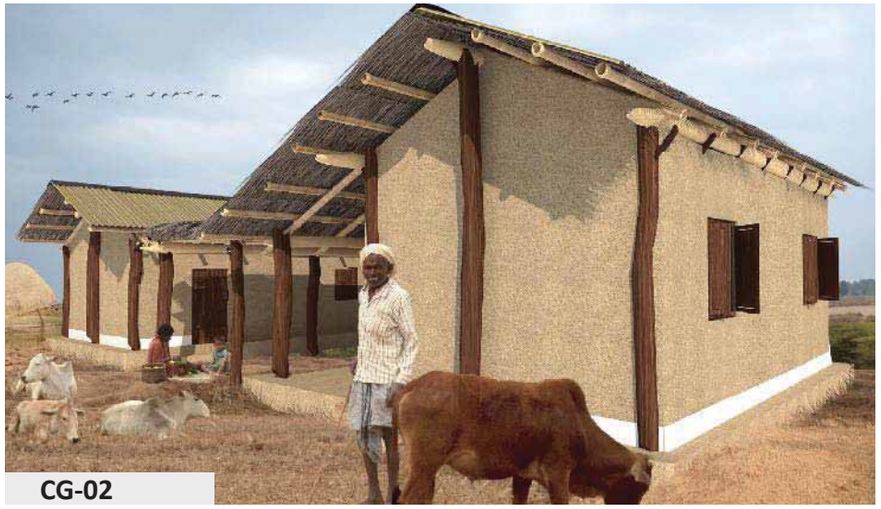
Cost breakup

Item	Cost (INR)
Foundation	₹ 28,581.30
Wall	₹ 80,878.00
Roof	₹ 32,800.00
Door window	**₹ 3,000.00**
Total	**₹ 145,259.30**

CHHATTISGARH

SR. NO.	ITEM OF WORK	Quantity	Unit	Rate per unit (Rs)	Cost
1	**FOUNDATION**				
	P.C.C.	1.019	cu.m	₹ 2,700.00	₹ 2,751.30
	Brickwork	3220	pieces	₹ 4.00	₹ 12,880.00
	R.C.C. Plinth Beam	0.35	cu.m	₹ 7,000.00	₹ 2,450.00
	Labour				₹ 10,500.00
W	**TOTAL**				**₹ 28,581.30**
2	**WALLS**				
	Bamboo Screen	4	sq.m	₹ 250.00	₹ 1,000.00
	Brickwork	13744	pieces	₹ 4.00	₹ 54,976.00
	Doors	1	per unit	₹ 1,000.00	₹ 1,000.00
	RBC Columns	12	per unit	₹ 750.00	₹ 9,000.00
	Windows	4	per unit	₹ 500.00	₹ 2,000.00
	R.C.C Lintel Beam	0.986	cu.m	₹ 7,000.00	₹ 6,902.00
	Labour				₹ 9,000.00
X	**TOTAL**				**₹ 83,878.00**
3	**STRUCTURE ROOF**				
	Timber Truss	5.29	cu.ft	₹ 500.00	₹ 2,645.00
	Distributer Purlins (bamboo slits)	8	piece	₹ 320.00	₹ 2,560.00
	Metal Ties	6	per kg	₹ 55.00	₹ 330.00
	Timber roof for Verandah	1.65	cu.ft	₹ 500.00	₹ 825.00
	Bamboo split Purlins For Verandah	4.5	piece	₹ 320.00	₹ 1,440.00
	Labour				₹ 15,000.00
Y	**TOTAL**				**₹ 22,800.00**
4	**ROOF**				
	Country tiles	5100	per unit	₹ 1.65	₹ 5,000.00
	Labour				₹ 5,000.00
Z	**TOTAL**				**₹ 10,000.00**
	W+X+Y+Z				**₹ 145,259.30**
	GRAND TOTAL		**₹ 145,259.30**		
	AREA (sqm)		**32**		
	RATE OF CONSTRUCTION (per sqm)		**₹ 4,539.35**		
	AREA (sqft)		**342.4**		
	RATE OF CONSTRUCTION (per sqft)		**₹ 424.24**		

CG-02



CG-02

This typology is applicable to Housing Zone A

Zone A highlights:
Most of the zone falls under Seismic Zone II partially some districts falling under Seismic Zone III

Zone A comprise 7 districts

1. Surguja
2. Korba
3. Raigarh
4. Korea
5. Surajpur
6. Balrampur
7. Jashpur

Resources Available

- Timber And Bamboo
- Fired Brick, Fly Ash Brick
- Thatch

CHHATTISGARH

DESIGN HIGHLIGHTS

- The advantage of this type of structure is that the roof comes before the walls.
- This plan type includes two individual structures with a shaded court between. Each structure has 2 rooms.
- It is a single storey framed structure built in timber frame and wattle and daub walls. The roofing material is compressed bamboo mat corrugated sheets with timber and bamboo under-structure.
- The open area in between 2 structures is used for livelihood and social activities.

Recommendations for Built Form		
Plan Layout	**Plinth/Floor**	**Roof Profile**
This plan type proposes two structures, two room each enclosing a courtyard in the middle	Normal plinth design.	Sloped roof.

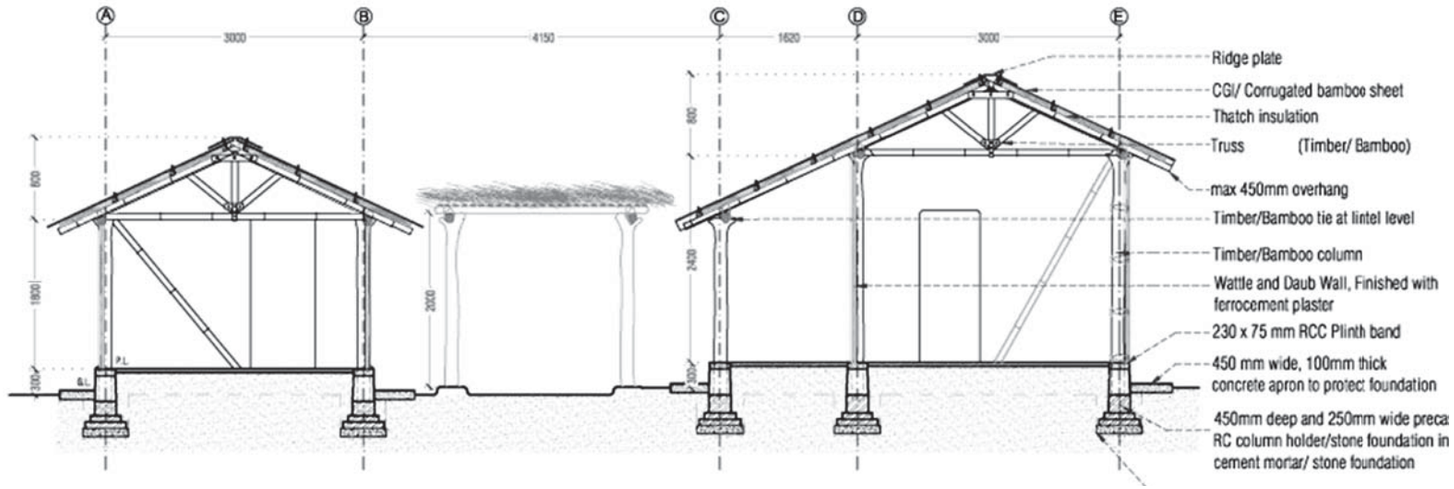
Recommendations for construction systems		
Components	**Recommended Specifications**	**Specific Comments**
Foundations	• Brick / stone foundation in cement mortar.	
Plinth	• Minimum 30 cm high plinth with details to protect the walls	
Wall	• Wattle & Daub wall finished with Ferrocement plaster	• Wall plates should take loads of rafters and beams to further distribute the load on the cob walls.
Wall Finish	• Ferrocement plaster	
Roof Structure	• Roof slope angle – Min 25 & Max 33. • Covered with sheet & has treated bamboo under structure	• Rigid connections between all roof members to increase stability.
Roof Cover	• Country Tiles with Timber Under structure.	• Woven reed mats can be used below the tiles as false ceiling for thermal insulation.
Floor	• Mud Floor with cow dung	

CG-02

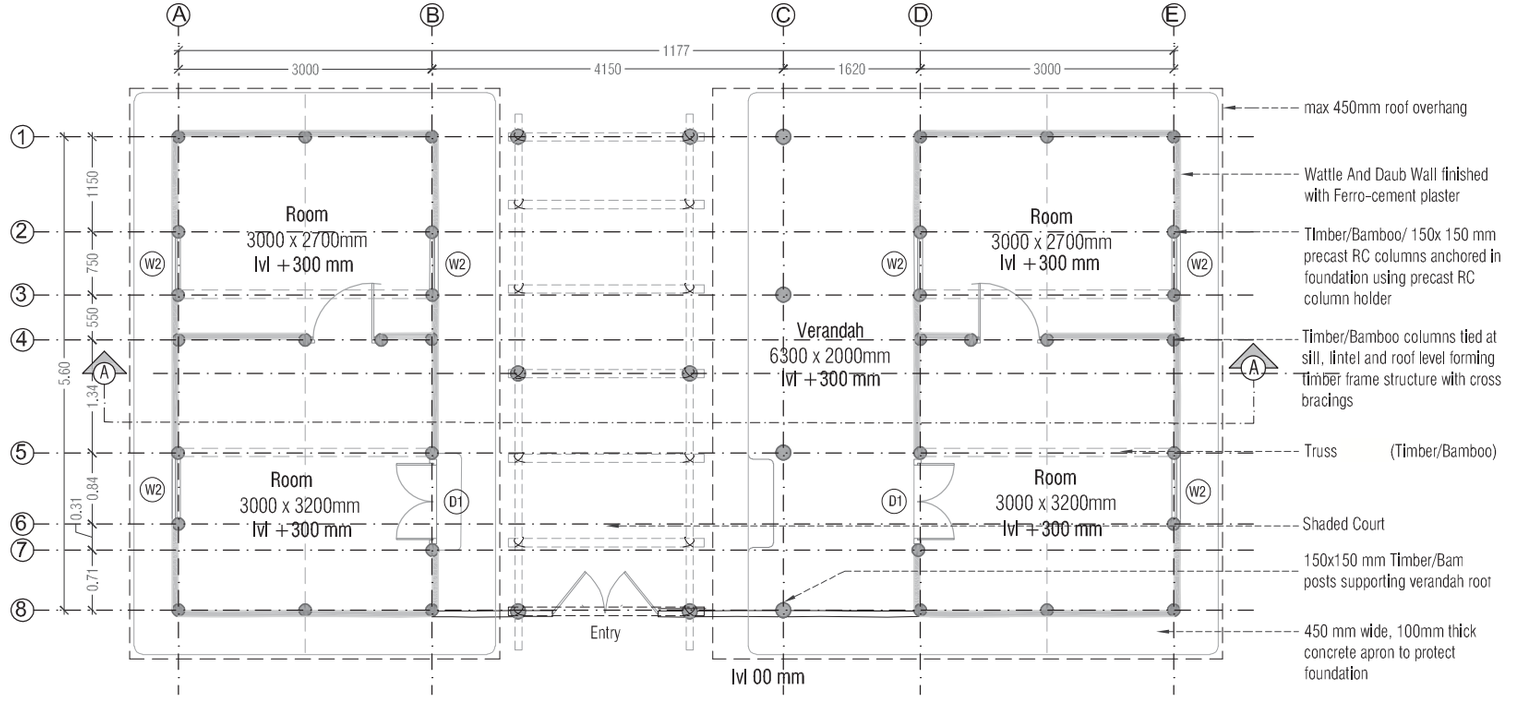
Area Statement:

Item	Area	
	Sq.m	Sq.ft
Room 1	9.69	104.30
Room 2	7.03	75.67
Room 3	9.69	104.30
Room 4	**7.03**	**75.67**
Verandah	**9.44**	**101.61**
Carpet Area	**33.44**	**359.95**
Built up Area	**45.67**	**491.59**

CHHATTISGARH



TYPICAL SECTION AA'



TYPICAL PLAN

SR. NO.		Quantity	Unit	Rate	Cost
1	**FOUNDATION**				
	P.C.C.	2.14	cum	₹ 2,700.00	₹ 5,778.00
	Brickwork	4444	pieces	₹ 4.00	₹ 17,776.00
	Precast R.C.C. Column holder	2.83	cum	₹ 7,000.00	₹ 19,810.00
	R.C.C. Lintel Beam	0.69	cum	₹ 7,000.00	₹ 4,830.00
W	**TOTAL**				**48194**
2	**WALLS**				
	Wattle and Daub	135	sqm	₹ 170.00	₹ 22,950.00
	Doors	4	per unit	₹ 1,000.00	₹ 4,000.00
	Windows	6	per unit	₹ 500.00	₹ 3,000.00
	Labour cost				₹ 9,000.00
X	**TOTAL**				**₹ 38,950.00**
3	**STRUCTURE Column, Cross bracings and Roof**				
	Timber Column	278.8	cubic ft	500	₹ 139,400.00
	Bamboo Roof truss	20	per unit	320	₹ 6,400.00
	Bamboo Ties	10	per unit	320	₹ 3,200.00
	Bamboo Purlins	15	per unit	320	₹ 4,800.00
	Bamboo purlins for shaded court	6	per unit	320	₹ 1,920.00
	Bamboo rafters for shaded court	4	per unit	320	₹ 1,280.00
Y	**TOTAL**				**₹ 157,000.00**
4	**ROOF**				
	Bamboo Sheets	26	per sheet	1000	₹ 26,000.00
	Labour Cost				₹ 5,000.00
Z	**TOTAL**				**₹ 31,000.00**
	GRAND TOTAL (W+X+Y+Z)	**₹ 275,144.00**			
	AREA (sqm)	**53**			
	RATE OF CONSTRUCTION (per sqm)	**₹ 5,191.40**			
	AREA (sqft)	**567.1**			
	RATE OF CONSTRUCTION (per sqft)	**₹ 485.18**			

CG-02
Cost estimate

Cost breakup

Item	Cost (INR)
Foundation	₹ 48,194.00
Wall	₹ 31,950.00
Roof	₹ 188,000.00
Door window	₹ 7,000.00
Total	**₹ 275,144.00**

CHHATTISGARH

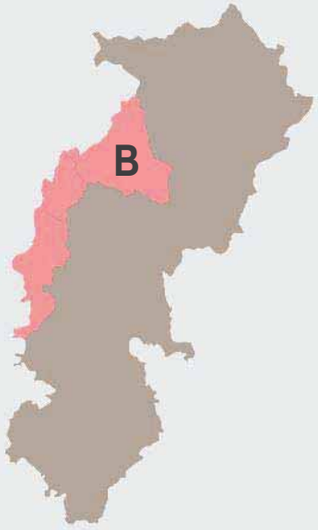
CG-03

This typology is applicable to Housing Zone B

Zone B highlights:
Parts of this zone has rainfall and strong winds across the year. Most of this zone falls under humid sub tropical climate.Heavy rains during monsoon.

Zone B comprise 4 districts :
1. Rajnandgaon
2. Kabirdham
3. Mungeli
4. Bilaspur.

Resources Available
- Stone, Cob, Fired Clay



CHHATTISGARH

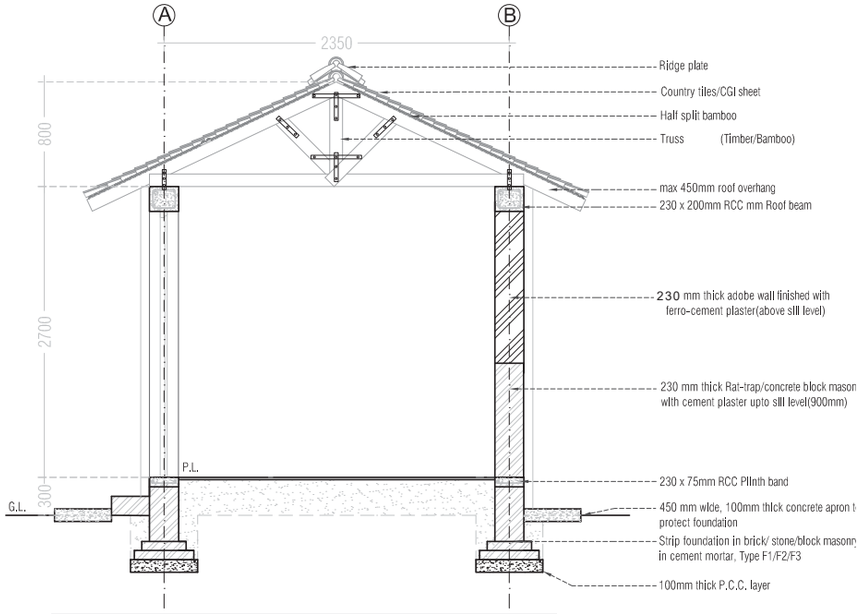
CG-03

DESIGN HIGHLIGHTS

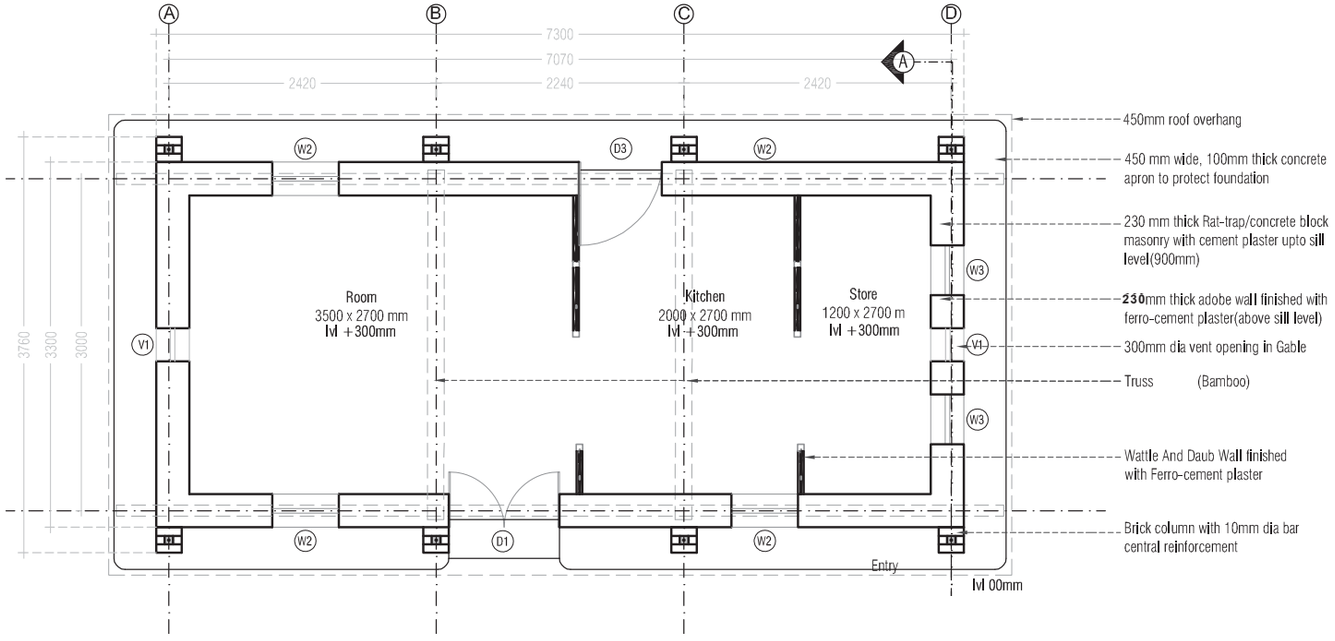
- Suitable for families who can afford only very small houses that can be incremented later. The roof come before the walls.
- It is a single storey framed structure built with a combination of brick and Cob
- The roofing material is terra-cotta country tiles with locally available timber with bamboo as under-structure.

Recommendations for Built Form		
Plan Layout	**Plinth/Floor**	**Roof Profile**
This plan type includes a long single room with a two way pitch roof. Suitable for families who can afford only very small houses that can be incremented later.	Normal plinth design.	Sloped roof.

Recommendations for construction systems		
Components	**Recommended Specifications**	**Specific Comments**
Foundations	• Brick/stone foundation in cement mortar.	
Plinth	• Minimum 30 cm high plinth.	
Wall	• 230 mm thk cob walls built on 230 mm thk brick walls which terminates at sill level.	• Thick adobe wall acts as thermal barrier
Wall Finish	• Ferrocement plaster	
Roof Structure	• Roof slope angle – Min 25 & Max 33. • Covered with sheet & has treated bamboo under structure	• Rigid connections between all roof members to increase stability.
Roof Cover	• Country Tiles/ CGI sheet with Timber Under structure.	• Woven reed mats can be used below the tiles as false ceiling for thermal insulation.
Floor	• Plain cement flooring or paved bricks	



TYPICAL SECTION

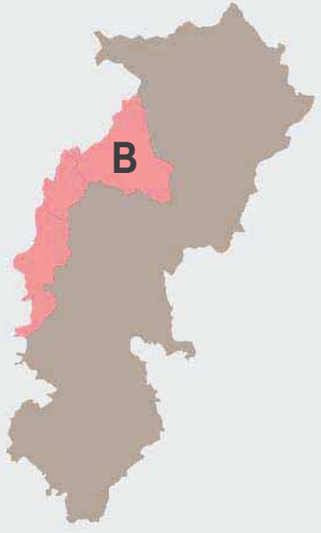


TYPICAL PLAN

CG-03

Area Statement:

Item	Area	
	Sq.m	Sq.ft
Room	9.60	103.33
Kitchen	5.57	60.00
Store	3.15	33.90
Carpet Area	**18.32**	**197.20**
Built up Area	**24.09**	**259.30**

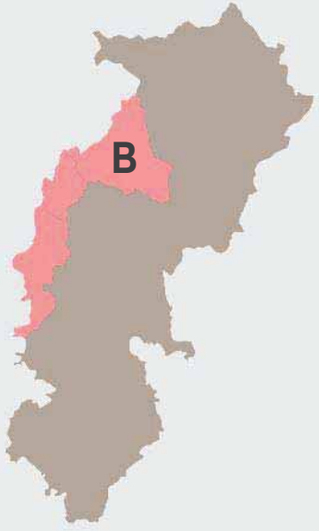


CHHATTISGARH

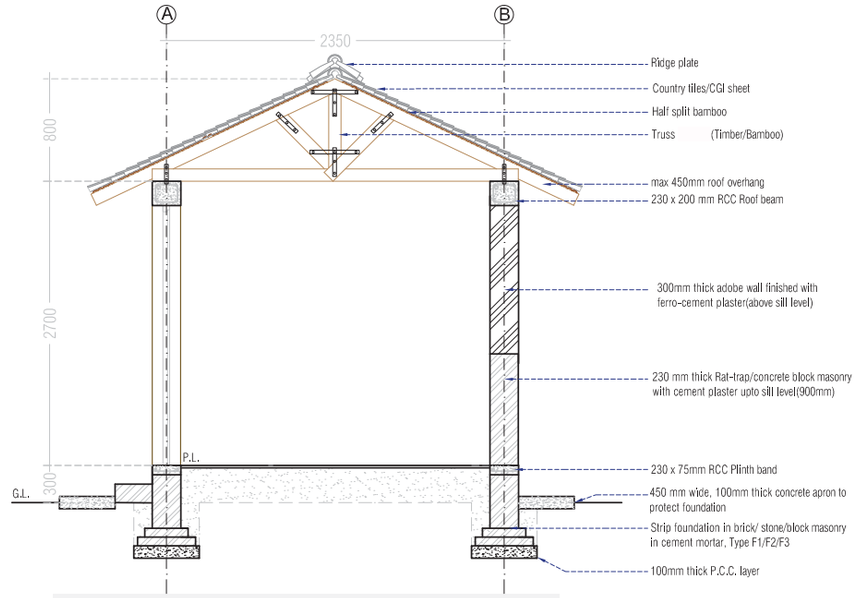
CG-03
Alternate design

Area Statement:

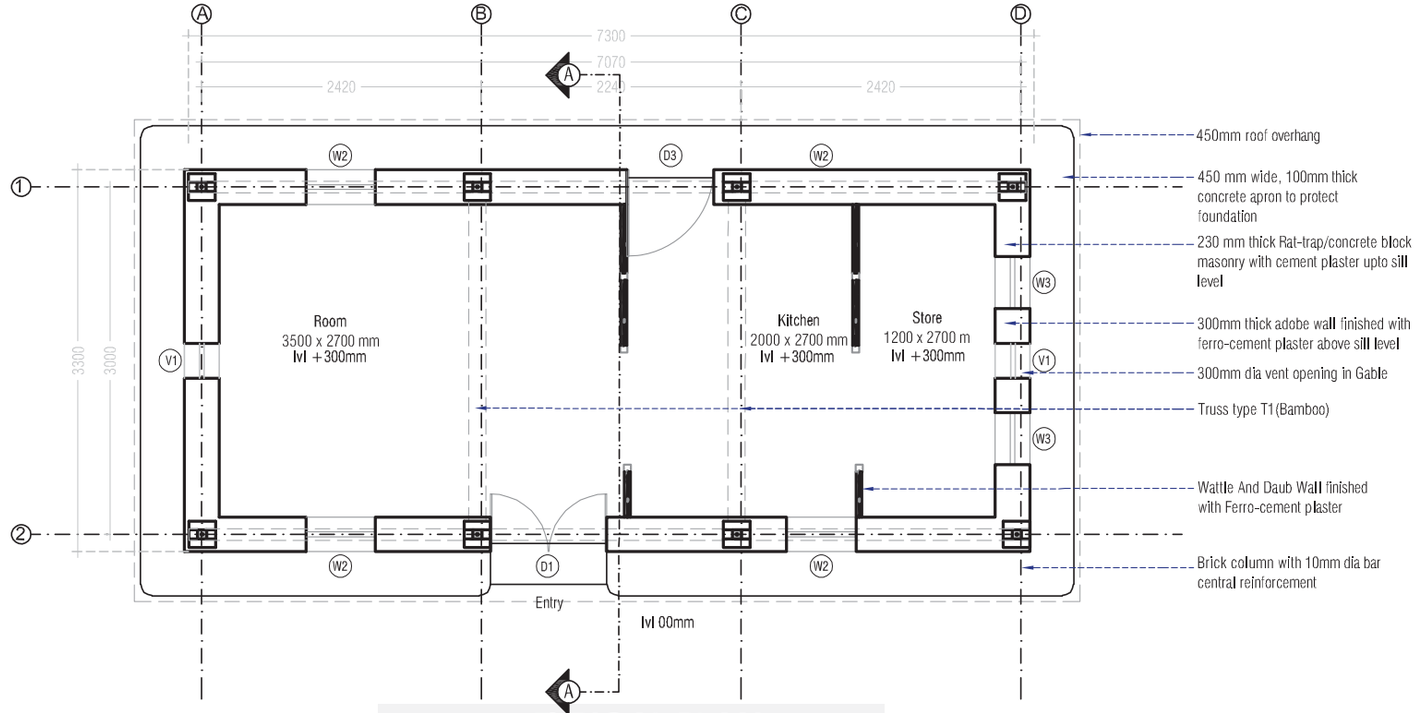
Item	Area	
	Sq.m	Sq.ft
Room	9.60	103.33
Kitchen	5.57	60.00
Store	3.15	33.90
Carpet Area	**18.32**	**197.20**
Built up Area	**24.09**	**259.30**



CHHATTISGARH



TYPICAL SECTION



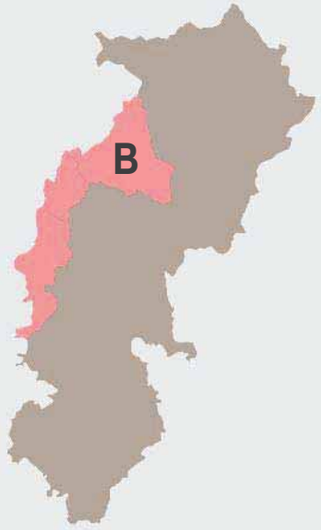
TYPICAL PLAN

SR. NO.	ITEM OF WORK	Quantity	Unit	Rate (Rs)	Cost
1	**FOUNDATION**				
	P.C.C.	1.06	cu.m	2700	₹ 2,862.00
	Brickwork	3220	pieces	4	₹ 12,880.00
	R.C.C. Plinth Beam	0.34	cu.m	7000	₹ 2,380.00
W	**TOTAL**				**18122**
2	**WALLS**				
	230mm Brick/Rattrap wall	3730	pieces	4	₹ 14,920.00
	Adobe wall	5.67	cu.m	1000	₹ 5,670.00
	Bamboo Screen	8	sqm	250	₹ 2,000.00
	Doors	2	per unit	1000	₹ 2,000.00
	Window 1	3	per unit	500	₹ 1,500.00
	Window 2	2	per unit	250	₹ 500.00
	Labour				₹ 9,050.00
X	**TOTAL**				**₹ 35,640.00**
3	**STRUCTURE ROOF**				
	Roof Beam	0.9063	cu.m	7000	₹ 6,344.10
	Timber truss	5.29	cu ft	500	₹ 2,645.00
	RBC Columns	8	unit	750	₹ 6,000.00
	Half split Bamboo	24	per piece	320	₹ 7,680.00
	Labour				15000
Y	**TOTAL**				**₹ 37,669.10**
4	**ROOF**				
	Country tiles (80 tiles per sq m)	2816	per unit	1.8	₹ 5,068.80
	Labour cost				₹ 5,000.00
Z	**TOTAL**				**₹ 10,068.80**
	GRAND TOTAL (W+X+Y+Z)	**₹ 101,499.90**			
	AREA (sqm)	**22.4**			
	RATE OF CONSTRUCTION (per sqm)	**₹ 4,531.25**			
	AREA (sqft)	**239.68**			
	RATE OF CONSTRUCTION (per sqft)	**₹ 423.48**			

CG-03
Cost estimate

Cost breakup

Item	Cost (INR)
Foundation	18122
Wall	₹ 31,640.00
Roof	₹ 47,737.90
Door window	**₹ 4,000.00**
Total	**101499.9**



CHHATTISGARH

CG-04

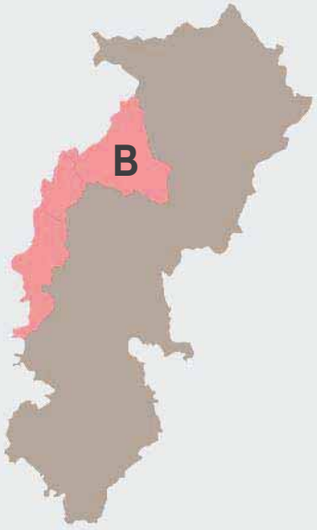
This typology is applicable to Housing Zone B

Zone B comprise 4 districts :

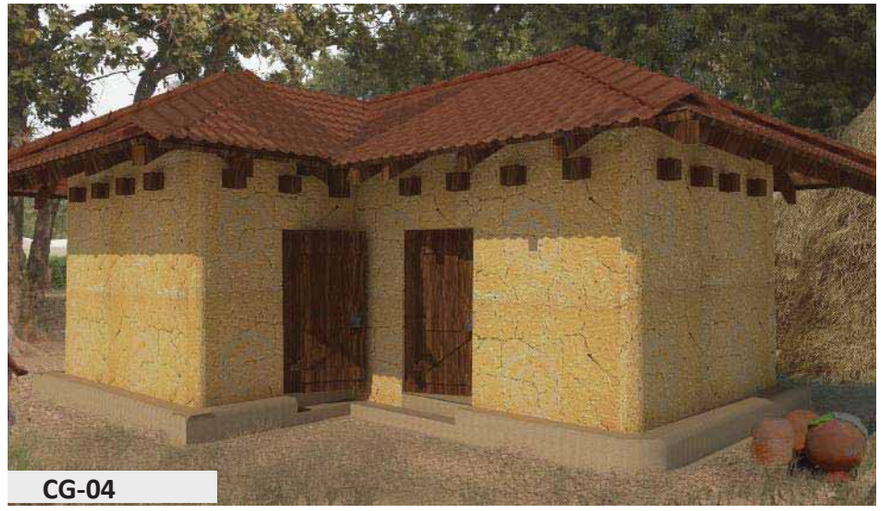
1. Rajnandgaon
2. Kabirdham
3. Mungeli
4. Bilaspur.

Resources Available

- Stone, Cob, Fired Clay



CHHATTISGARH



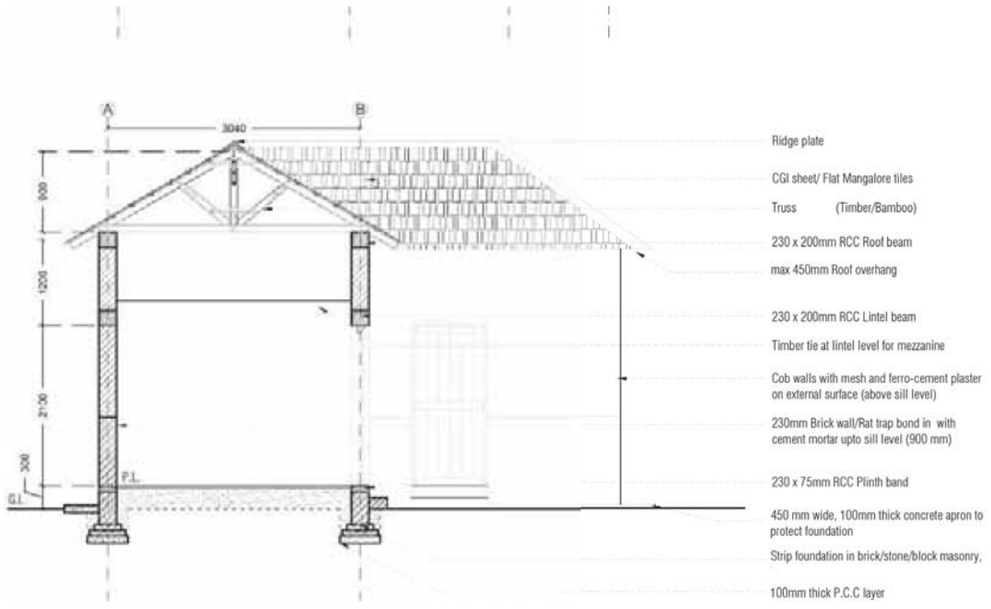
CG-04

DESIGN HIGHLIGHTS

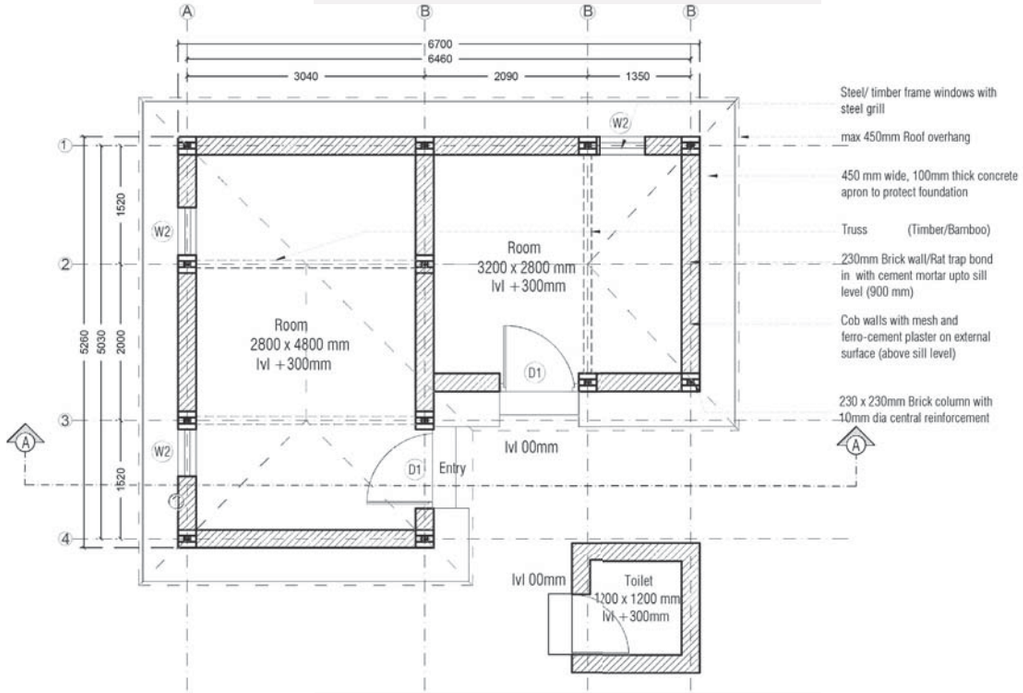
- Suitable for families who can afford only very small houses that can be incremented later.
- It is a single storey load bearing structure built partly in rat trap brick masonry & cob.
- The roofing material locally is terra-cotta Mangalore tiles with locally available timber with bamboo as under-structure

Recommendations for Built Form		
Plan Layout	**Plinth/Floor**	**Roof Profile**
It is an 'L' type plan, Suitable for families who can afford only very small houses that can be incremented later.	Normal plinth design.	Sloped roof.

Recommendations for construction systems		
Components	**Recommended Specifications**	**Specific Comments**
Foundations	• Brick/stone foundation in cement mortar.	
Plinth	• Minimum 30 cm high plinth	
Wall	• 230 mm thick rat trap masonry wall in bricks and cement till sill level and 230 mm thick cob walls above sill level	• Thick adobe wall acts as thermal barrier
Wall Finish	• Ferrocement plaster	
Roof Structure	• Roof slope angle – Min 25 & Max 33. • Covered with sheet & has treated bamboo under structure	• Rigid connections between all roof members to increase stability.
Roof Cover	• Country Tiles/ CGI sheet with Timber Under structure.	• Woven reed mats can be used below the tiles as false ceiling for thermal insulation.
Floor	• Cement flooring	



TYPICAL SECTION AA'

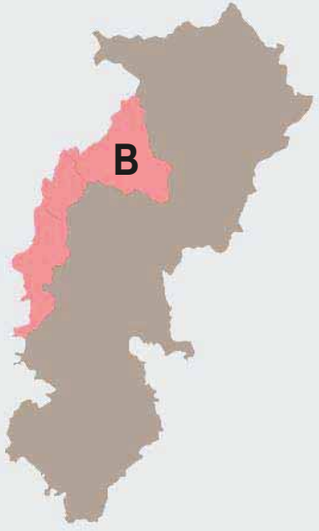


TYPICAL PLAN

CG-04

Area Statement:

Item	Area	
	Sq.m	Sq.ft
Room 1	13.67	147.14
Room 2	9.19	98.92
Toilet	1.61	17.33
Carpet Area	**22.86**	**246.07**
Built up Area	**31.08**	**334.55**

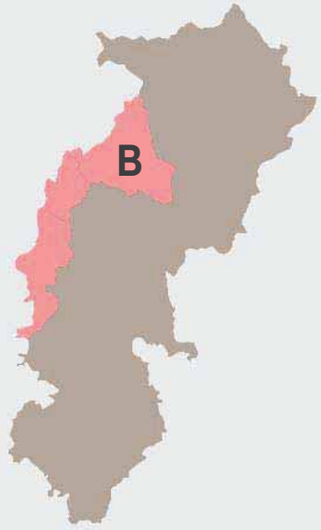


CHHATTISGARH

CG-04
Cost estimate

Cost breakup

Item	Cost (INR)
Foundation	₹ 20,602.00
Wall	₹ 36,651.00
Roof	₹ 40,413.80
Door window	**₹ 3,500.00**
Total	**₹ 101,166.80**



CHHATTISGARH

SR. NO.	ITEM OF WORK	Quantity	Unit	Rate per unit (Rs)	Cost
1	**FOUNDATION**				
	P.C.C.	1.06	cu.m	2700	₹ 2,862.00
	Brickwork	3840	pieces	4	₹ 15,360.00
	R.C.C. Plinth Beam	0.34	cu.m	7000	₹ 2,380.00
	Labour				₹ 5,000.00
W	**TOTAL**				**20602**
2	**WALLS**				
	230mm Brick/Rattrap wall	3726	pieces	4	₹ 14,904.00
	Cob Wall	8.38	cu.m	650	₹ 5,447.00
	Doors	2	per unit	1000	₹ 2,000.00
	Window 1	3	per unit	500	₹ 1,500.00
	Labour Cost				₹ 10,000.00
	Lintel Beam	0.9	cu.m	7000	₹ 6,300.00
X	**TOTAL**				**₹ 40,151.00**
3	**STRUCTURE ROOF**				
	Roof Beam	0.9	cu.m	7000	₹ 6,300.00
	Timber truss	5.29	cu ft	500	₹ 2,645.00
	RBC Columns	12	unit	750	₹ 9,000.00
	Half split Bamboo	12	per piece	320	₹ 3,840.00
	Bamboo Rafters	8	per piece	320	₹ 2,560.00
	Labour				7000
Y	**TOTAL**				**₹ 31,345.00**
4	**ROOF**				
	Country tiles (80 tiles per sq m)	2816	per unit	1.8	₹ 5,068.80
	Labour cost				₹ 4,000.00
Z	**TOTAL**				**₹ 9,068.80**
	GRAND TOTAL (W+X+Y+Z)	**₹ 101,166.80**			
	AREA (sqm)	**33**			
	RATE OF CONSTRUCTION (per sqm)	**₹ 3,065.66**			
	AREA (sqft)	**353.1**			
	RATE OF CONSTRUCTION (per sqft)	**₹ 286.51**			

CG-05

CG-05

DESIGN HIGHLIGHTS

- Incrementality is in built in the design. Evolves into a courtyard house.
- It is a single storey load bearing structure built in adobe. Thick adobe wall acts as thermal barrier. The roofing material is compressed corrugated bamboo mat sheets with locally available timber with bamboo as under-structure.

Recommendations for Built Form		
Plan Layout	**Plinth/Floor**	**Roof Profile**
This plan type includes two rooms with a long parchi in the front having kitchen on one end.	Normal plinth design.	Sloped roof.

Recommendations for construction systems		
Components	**Recommended Specifications**	**Specific Comments**
Foundations	• Strip footing in brick with cement mortar	
Plinth	• Minimum 30 cm high	
Wall	• wall in Brick and Cement till sill level + adobe wall above sill level	• Thick adobe wall acts as thermal barrier
Wall Finish	• ferrocement plaster	
Roof Structure	• Roof slope angle – min 25 & max 33.	• Rigid connections between all roof members to increase stability.
Roof Cover	• Compressed corrugated bamboo mat sheets/ CGI sheets with locally available timber with bamboo as under-structure.	• Woven reed mats can be used below the tiles as false ceiling for thermal insulation.
Floor	• cement flooring	

This typology is applicable to Housing Zone C

Zone C highlights: the zone falls under Zone II with no risks of earthquake. Average rainfall is around 1300 mm.

Zone C comprise 11 districts :

1. Kanker
2. Bastar
3. Dhamtari
4. Balod
5. Durg
6. Raipur
7. Mahasamund
8. Janjgir Champa
9. Baloda Bazar
10. Bametara
11. Gariyband

Resources Available

- Burnt Clay/Fly ash

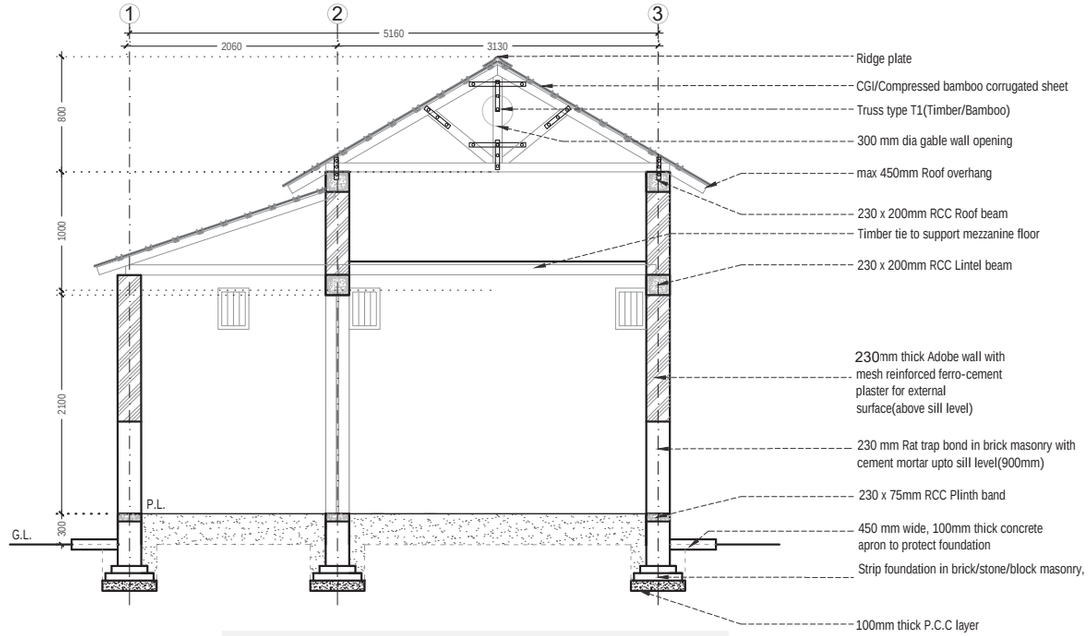
CHHATTISGARH

CG-05

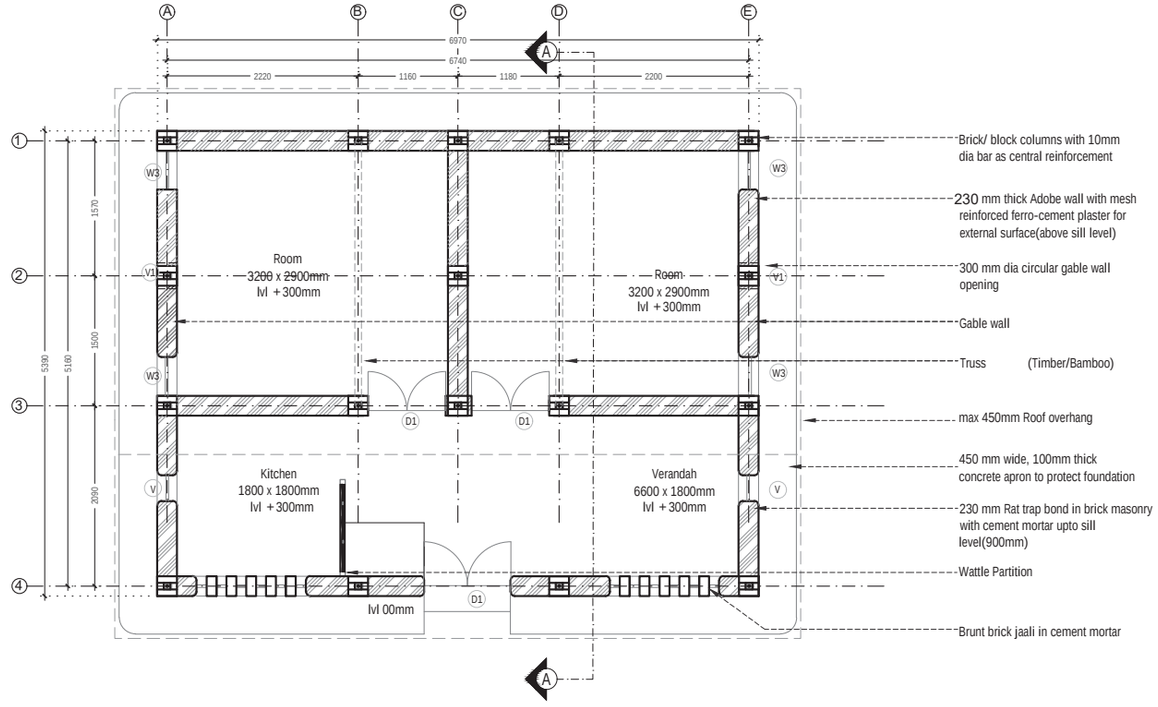
Area Statement:

Item	Area	
	Sq.m	Sq.ft
Room 1	9.12	98.16
Room 2	9.12	98.16
Kitchen	3.56	38.32
Verandah	**8.48**	**91.28**
Carpet Area	**21.8**	**234.66**
Built up Area	**37.57**	**404.40**

CHHATTISGARH



TYPICAL SECTION AA'



TYPICAL PLAN

SR. NO.		Unit	Quantity	Rate per unit (Rs)	Cost
1	**FOUNDATION**				
	P.C.C.	cum	1.961	₹ 2,700.00	₹ 5,294.70
	Brickwork	pieces	5856	₹ 4.00	₹ 23,424.00
	R.C.C. Plinth Beam	cum	0.6475	₹ 7,000.00	₹ 4,532.50
	Labour				₹ 3,150.00
W	**TOTAL**				**₹ 36,401.20**
2	**WALLS**				
	Mud Plaster Stabalized with chicken mesh	per sqm	70	₹ 200.00	₹ 14,000.00
	Brickwork	pieces	6373	₹ 4.00	₹ 25,492.00
	Adobe wall	cu.m	11.74	₹ 1,000.00	₹ 11,740.00
	Doors	per unit	3	₹ 1,000.00	₹ 3,000.00
	RBC Columns	per unit	17	₹ 750.00	
	Windows	per unit	6	₹ 500.00	₹ 3,000.00
	R.C.C Lintel Beam	cu.m	3.024	₹ 7,000.00	₹ 21,168.00
	Labour				₹ 9,000.00
X	**TOTAL**				**₹ 87,400.00**
3	**STRUCTURE ROOF**				
	Timber Truss	per cu ft	5.29	₹ 500.00	₹ 2,645.00
	Distributer Purlins (bamboo slits)	per piece	8	₹ 320.00	₹ 2,560.00
	Metal Ties	per kg	6	₹ 55.00	₹ 330.00
	Timber roof for Verandah	per cu ft	1.3	₹ 500.00	₹ 650.00
	Bamboo split Purlins For Verandah	per piece	4.5	₹ 320.00	₹ 1,440.00
	Labour				₹ 9,000.00
Y	**TOTAL**				**₹ 16,625.00**
4	**ROOF**				
	Country tiles	per unit	5100	₹ 1.65	₹ 5,000.00
	Labour				₹ 5,000.00
Z	**TOTAL**				**₹ 10,000.00**
	W+X+Y+Z				**₹ 150,426.20**
	GRAND TOTAL	**₹ 150,426.20**			
	AREA (sqm)	**32**			
	RATE OF CONSTRUCTION (per sqm)	**₹ 4,700.82**			
	AREA (sqft)	**342.4**			
	RATE OF CONSTRUCTION (per sqft)	**₹ 439.33**			

CG-05
Cost estimate

Cost breakup

Item	Cost (INR)
Foundation	₹ 36,401.20
Wall	₹ 81,400.00
Roof	₹ 26,625.00
Door window	**₹ 6,000.00**
Total	**₹ 150,426.20**

CHHATTISGARH

CG-06

This typology is applicable to Housing Zone C

Zone C highlights: the zone falls under Zone II with no risks of earthquake. Average rainfall is around 1300 mm.

Zone C comprise 11 districts :

1. Kanker
2. Bastar
3. Dhamtari
4. Balod
5. Durg
6. Raipur
7. Mahasamund
8. Janjgir Champa
9. Baloda Bazar
10. Bametara
11. Gariyband

Resources Available

- Burnt Clay/Fly ash

CHHATTISGARH


CG-06

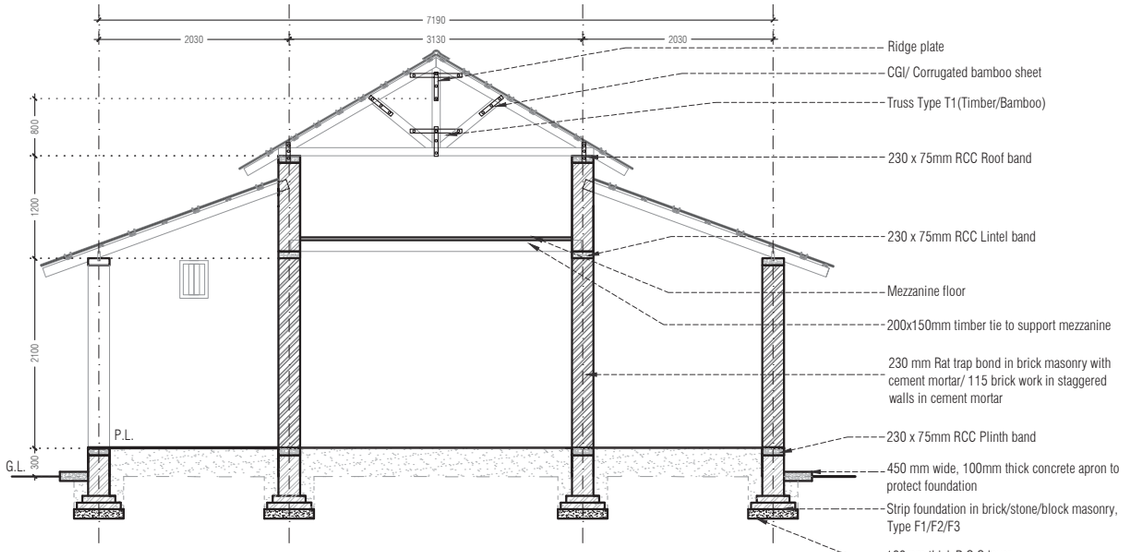
DESIGN HIGHLIGHTS

- Incrementality is in built in the design. Evolves into a house locally known as chaukhandi. Most prevalent housing typology across the state.
- It is a single storey load bearing structure built in burnt bricks. It has brick foundation, walling material is brick with mud mortar with provision for stabilized reinforced mud plaster thick cob wall acts as thermal barrier.

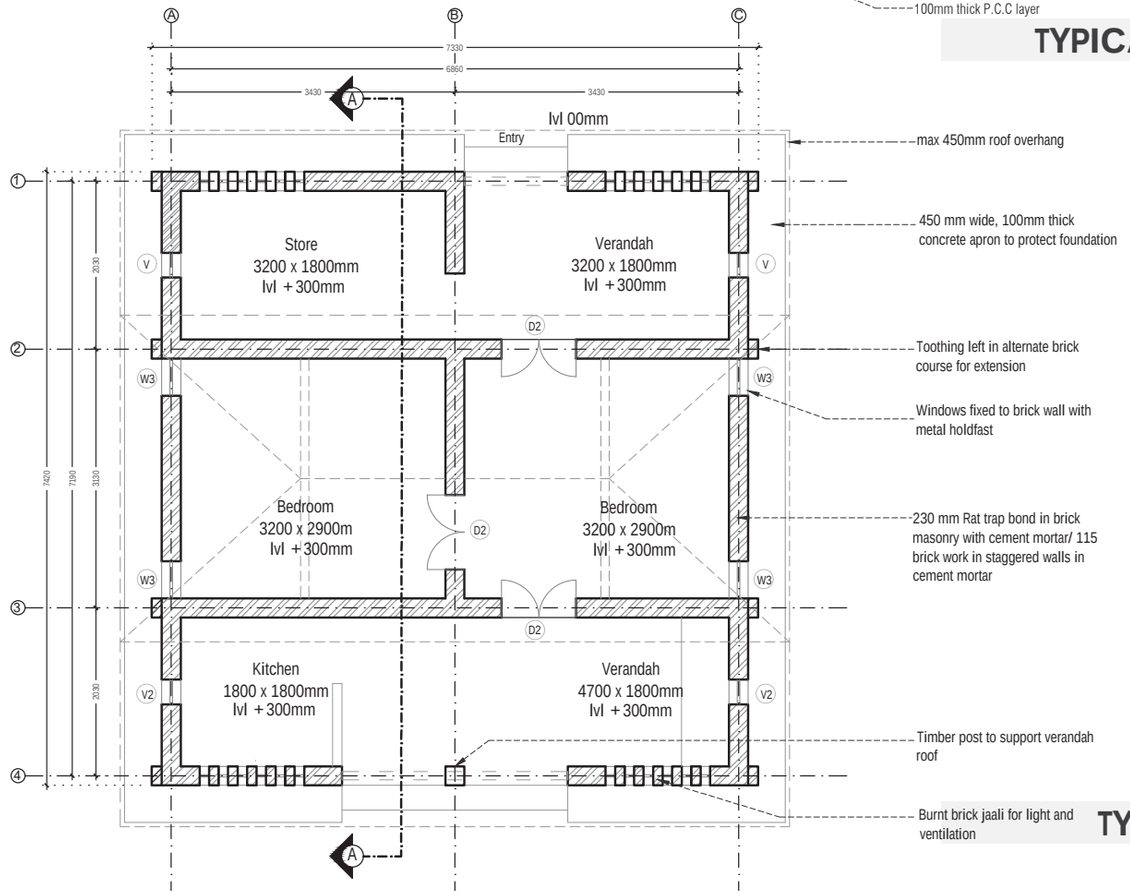
Recommendations for Built Form		
Plan Layout	**Plinth/Floor**	**Roof Profile**
This plan type includes two rooms with a long parchi in the front having kitchen on one end.	Normal plinth design.	Sloped roof.

Recommendations for construction systems		
Components	**Recommended Specifications**	**Specific Comments**
Foundations	• Strip footing in brick with cement mortar	
Plinth	• Minimum 30 cm and 30 cm projected from the walls to protect the foundation and provide stability to the structure.	
Wall	• wall in Brick and Cement	• Thick adobe wall acts as thermal barrier
Wall Finish	• ferrocement plaster	
Roof Structure	• Roof slope angle – min 25 & max 33.	• Rigid connections between all roof members to increase stability.
Roof Cover	• Compressed corrugated bamboo mat sheets/ CGI sheets with locally available timber with bamboo as under-structure.	• Woven reed mats can be used below the tiles as false ceiling for thermal insulation.
Floor	• Cement flooring	

CG-06



TYPICAL SECTION AA'



TYPICAL PLAN

Area Statement:

Item	Area	
	Sq.m	Sq.ft
Room 1	9.69	104.30
Room 2	9.49	102.15
Kitchen	3.39	36.49
Store	**5.94**	**63.94**
Verandah 1	**6.05**	**65.12**
Verandah 2	**8.42**	**90.63**
Carpet Area	**28.52**	**307.00**
Built up Area	**52.61**	**566.29**

CHHATTISGARH

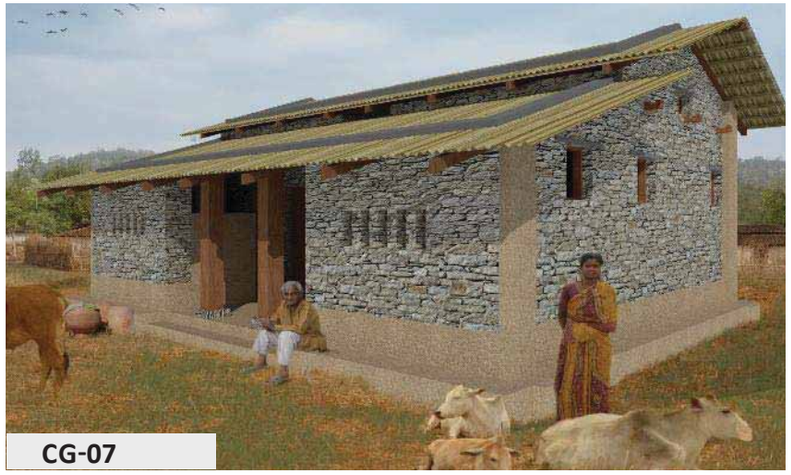
CG-06
Cost estimate

Cost breakup

Item	Cost (INR)
Foundation	₹ 46,043.60
Wall	₹ 123,846.00
Roof	₹ 45,395.00
Door window	**₹ 7,000.00**
Total	**₹ 222,284.60**

CHHATTISGARH

SR. NO.	ITEM OF WORK	Unit	Quantity	Rate per unit (Rs)	Cost
1	**FOUNDATION**				
	P.C.C.	cu.m	2.428	₹ 2,700.00	₹ 6,555.60
	Brickwork	pieces	7222	₹ 4.00	₹ 28,888.00
	R.C.C. Plinth Beam	cu.m	0.8	₹ 7,000.00	₹ 5,600.00
	Labour				₹ 5,000.00
W	**TOTAL**				**₹ 46,043.60**
2	**WALLS**				
	Mud Plaster Stabalized with chicken mes	per sqm	80	₹ 200.00	₹ 16,000.00
	Brickwork	pieces	22754	₹ 4.00	₹ 91,016.00
	Doors	per unit	3	₹ 1,000.00	₹ 3,000.00
	Windows	per unit	8	₹ 500.00	₹ 4,000.00
	R.C.C Lintel Beam	cu.m	1.19	₹ 7,000.00	₹ 8,330.00
	Labour				₹ 8,500.00
X	**TOTAL**				**₹ 130,846.00**
3	**STRUCTURE ROOF**				
	Timber Truss	per cu ft	5.29	₹ 500.00	₹ 2,645.00
	Distributer Purlins (bamboo slits)	per piece	8	₹ 320.00	₹ 2,560.00
	Metal Ties	per kg	6	₹ 55.00	₹ 330.00
	Timber roof for Verandah	per cu ft	2.6	₹ 500.00	₹ 1,300.00
	Bamboo split Purlins For Verandah	per piece	8	₹ 320.00	₹ 2,560.00
	Labour				₹ 5,000.00
Y	**TOTAL**				**₹ 14,395.00**
4	**ROOF**				
	Bamboo corrugated sheet	per unit	26	₹ 1,000.00	₹ 26,000.00
	Labour				₹ 5,000.00
Z	**TOTAL**				**₹ 31,000.00**
	W+X+Y+Z				**₹ 222,284.60**
	GRAND TOTAL	**₹ 222,284.60**			
	AREA (sqm)	**50**			
	RATE OF CONSTRUCTION (per sqm)	**₹ 4,445.69**			
	AREA (sqft)	**535**			
	RATE OF CONSTRUCTION (per sqft)	**₹ 415.49**			


CG-07

CG-07

This typology is applicable to Housing Zone D

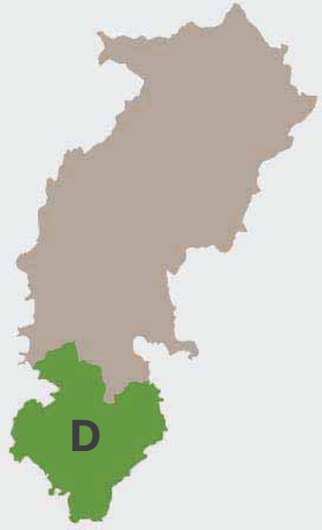
Zone D highlights: monhtly mean temperatures are above 18 degree celcius. Average rainfall is around 1500 mm

Zone D comprise 5 districts :

1. Sukhma
2. Bijapur
3. Dantewada
4. KondagTaon
5. Narayanpur

Resources Available

- Bamboo, stone, mud



CHHATTISGARH

DESIGN HIGHLIGHTS

- It is a single storey load bearing structure built in stone concrete block. Provision for storage loft above the rooms is there. It has stone rubble masonry, walling material is stone rubble with mud mortar with provision for stabilized reinforced mud plaster.
- Incrementality is in built in the design. Evolves into a cluster of structures for the extended family.

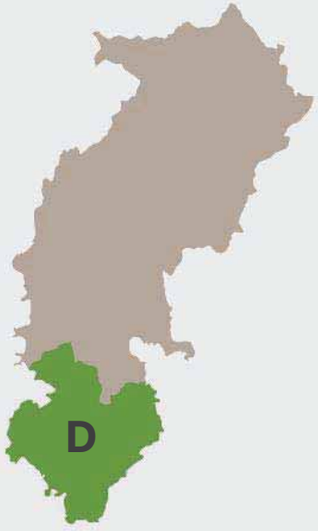
Recommendations for Built Form		
Plan Layout	**Plinth/Floor**	**Roof Profile**
Evolves into a house locally known as chaukhandi. This plan type includes two rooms with a long parchi in the rear. Later having kitchen on one end as chaukhandi.	Normal plinth design.	Sloped roof.

Recommendations for construction systems		
Components	**Recommended Specifications**	**Specific Comments**
Foundation	• strip foundation with brick and cement mortar	• In case of black cotton soil should go to 60 cm, else minimum 45 cm.
Plinth	• Minimum 30 cm high plinth	
Wall	• stone concrete block masonry in cement mortar	
Wall Finish	• ferrocement mud plaster	
Roof Structure	• Roof slope angle – min 25 & max 33.	• Rigid connections between all roof members to increase stability.
Roof Cover	• Compressed corrugated bamboo mat sheets/ CGI sheets with locally available timber with bamboo as under-structure.	• Woven reed mats can be used below the tiles as false ceiling for thermal insulation.
Floor	• cement flooring	

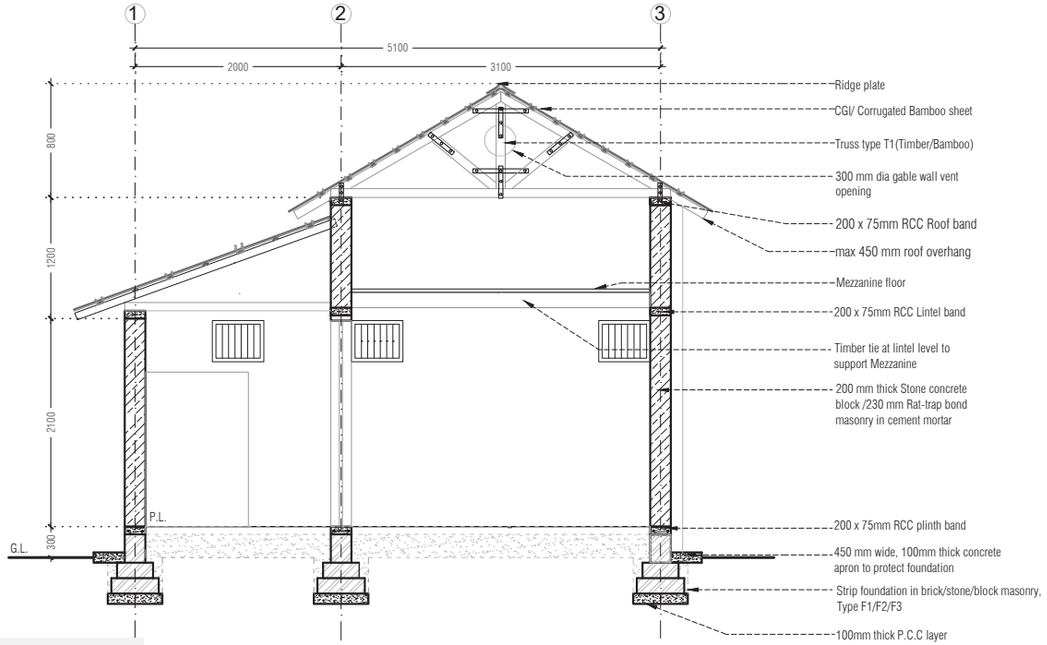
CG-07

Area Statement:

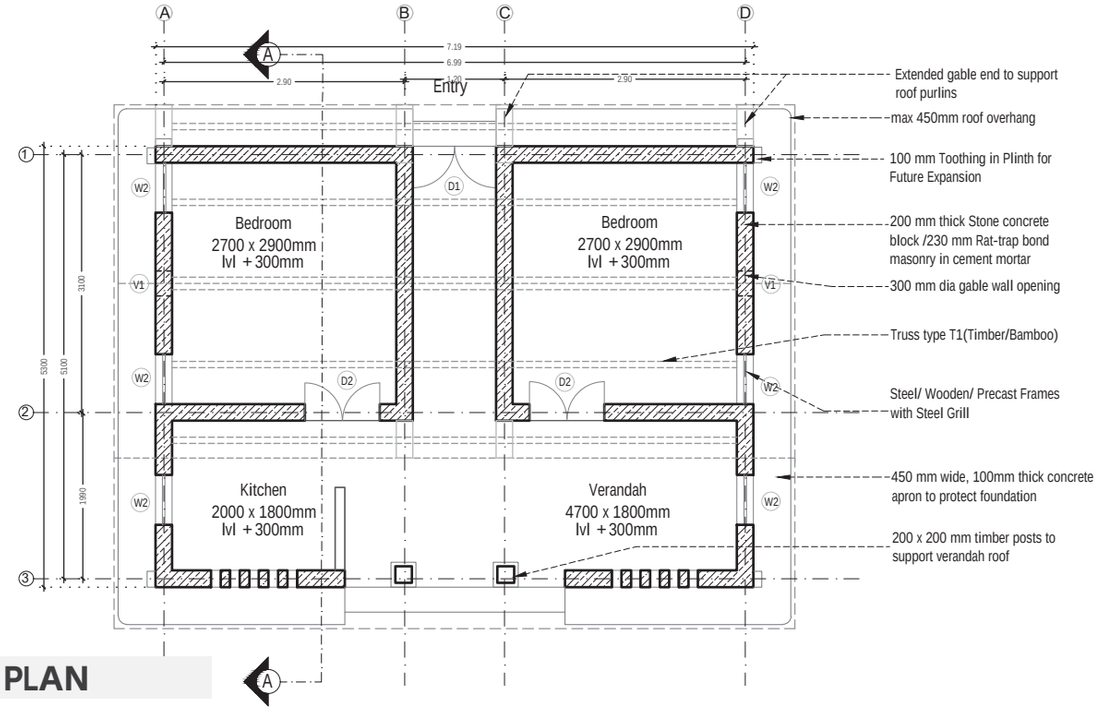
Item	Area	
	Sq.m	Sq.ft
Room 1	8.00	86.11
Room 2	8.00	86.11
Kitchen	3.62	38.96
Passage	**3.30**	**35.52**
Verandah	**8.49**	**91.39**
Carpet Area	**22.91**	**246.60**
Built up Area	**32.11**	**345.63**



CHHATTISGARH



TYPICAL SECTION AA'



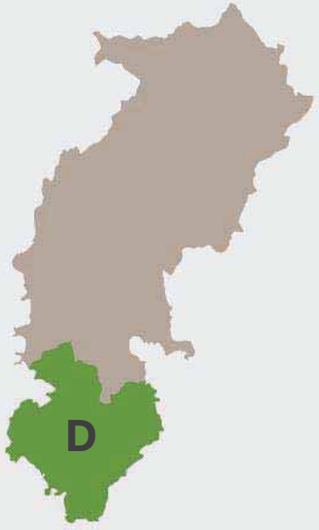
TYPICAL PLAN

SR. NO.		Unit	Quantity	Rate per unit (Rs)	Cost
1	**FOUNDATION**				
	P.C.C.	cu.m	2	₹ 2,700.00	₹ 5,400.00
	Brickwork	pieces	7200	₹ 4.00	₹ 28,800.00
	R.C.C. Plinth Beam	cu.m	0.4	₹ 7,000.00	₹ 2,800.00
	Labour				₹ 5,000.00
W	**TOTAL**				**₹ 42,000.00**
2	**WALLS**				
	Mud Plaster Stabalized with chicken me	per sqm	23	₹ 200.00	₹ 4,600.00
	Brickwork	pieces	18044	₹ 4.00	₹ 72,176.00
	Doors	per unit	3	₹ 1,000.00	₹ 3,000.00
	Windows	per unit	8	₹ 500.00	₹ 4,000.00
	R.C.C Lintel Beam	cu.m	0.564	₹ 7,000.00	₹ 3,948.00
	Labour				₹ 7,000.00
X	**TOTAL**				**₹ 94,724.00**
3	**STRUCTURE ROOF**				
	Timber Truss	per cu ft	5.29	₹ 500.00	₹ 2,645.00
	Distributer Purlins (bamboo slits)	per piece	8	₹ 320.00	₹ 2,560.00
	Metal Ties	per kg	6	₹ 55.00	₹ 330.00
	Timber roof for Verandah	per cu ft	1.3	₹ 500.00	₹ 650.00
	Bamboo split Purlins For Verandah	per piece	4	₹ 320.00	₹ 1,280.00
	Labour				₹ 4,000.00
Y	**TOTAL**				**₹ 11,465.00**
4	**ROOF**				
	Bamboo corrugated sheet	per unit	24	₹ 1,000.00	₹ 24,000.00
	Labour				₹ 5,000.00
Z	**TOTAL**				**₹ 29,000.00**
	W+X+Y+Z				**₹ 177,189.00**
	GRAND TOTAL	**₹ 177,189.00**			
	AREA (sqm)	**44**			
	RATE OF CONSTRUCTION (per sqm)	**₹ 4,027.02**			
	AREA (sqft)	**470.8**			
	RATE OF CONSTRUCTION (per sqft)	**₹ 376.36**			

CG-07
Cost estimate

Cost breakup

Item	Cost (INR)
Foundation	₹ 42,000.00
Wall	₹ 87,724.00
Roof	₹ 40,465.00
Door window	**₹ 7,000.00**
Total	**₹ 177,189.00**



CHHATTISGARH

CG-08

This typology is applicable to Housing Zone D

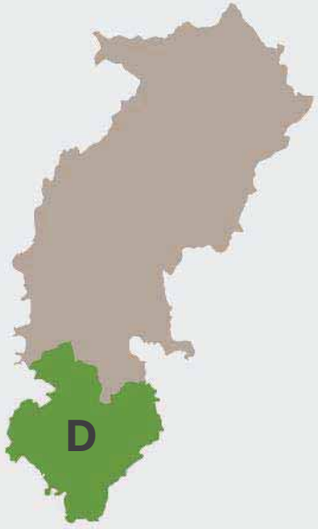
Zone D highlights: monhtly mean temperatures are above 18 degree celcius. Average rainfall is around 1500 mm

Zone D comprise 5 districts :

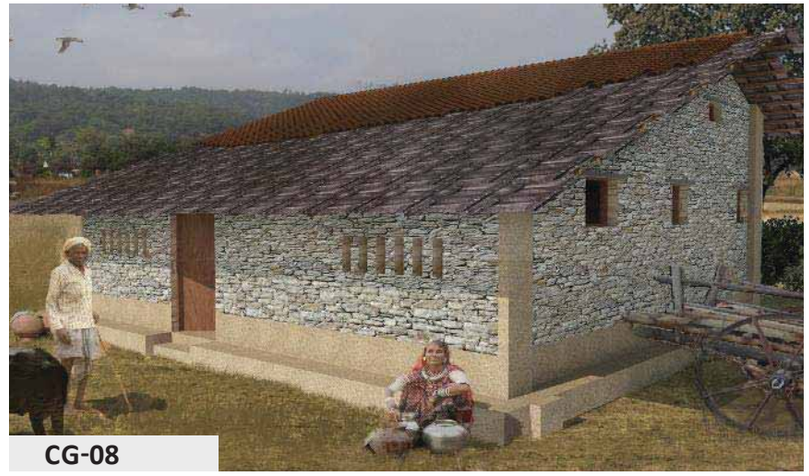
1. Sukhma
2. Bijapur
3. Dantewada
4. KondagTaon
5. Narayanpur

Resources Available

- Bamboo, stone, mud



CHHATTISGARH



CG-08

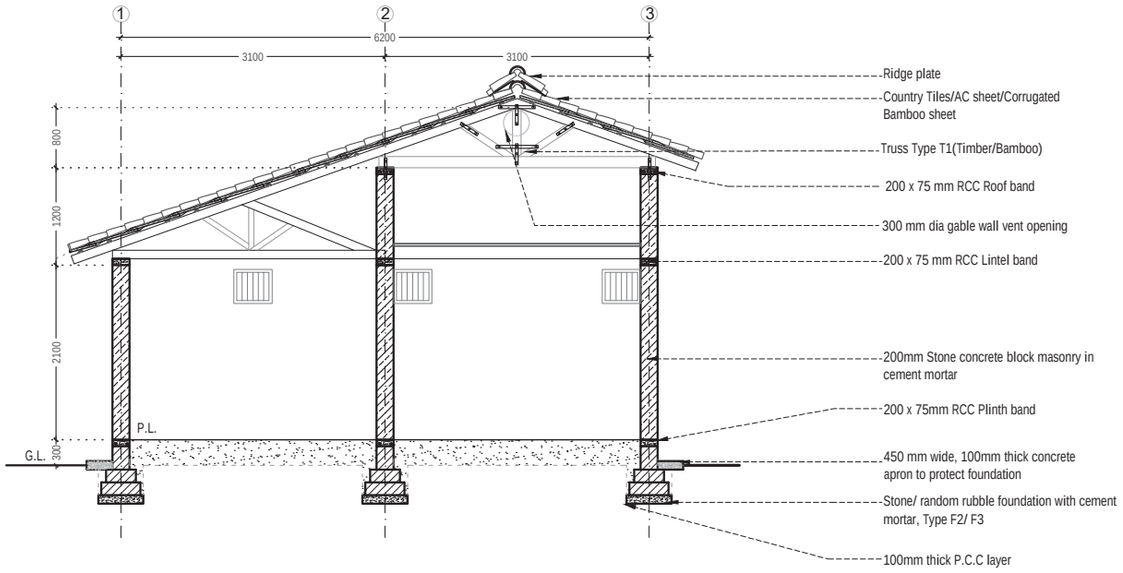
DESIGN HIGHLIGHTS

- Incrementality is in built in the design. Evolves into a cluster of structures for the extended family.
- It is a single storey load bearing structure built in stone block masonry.
- The roofing material is locally available country tiles with timber or bamboo rafters and beams as under-structure.

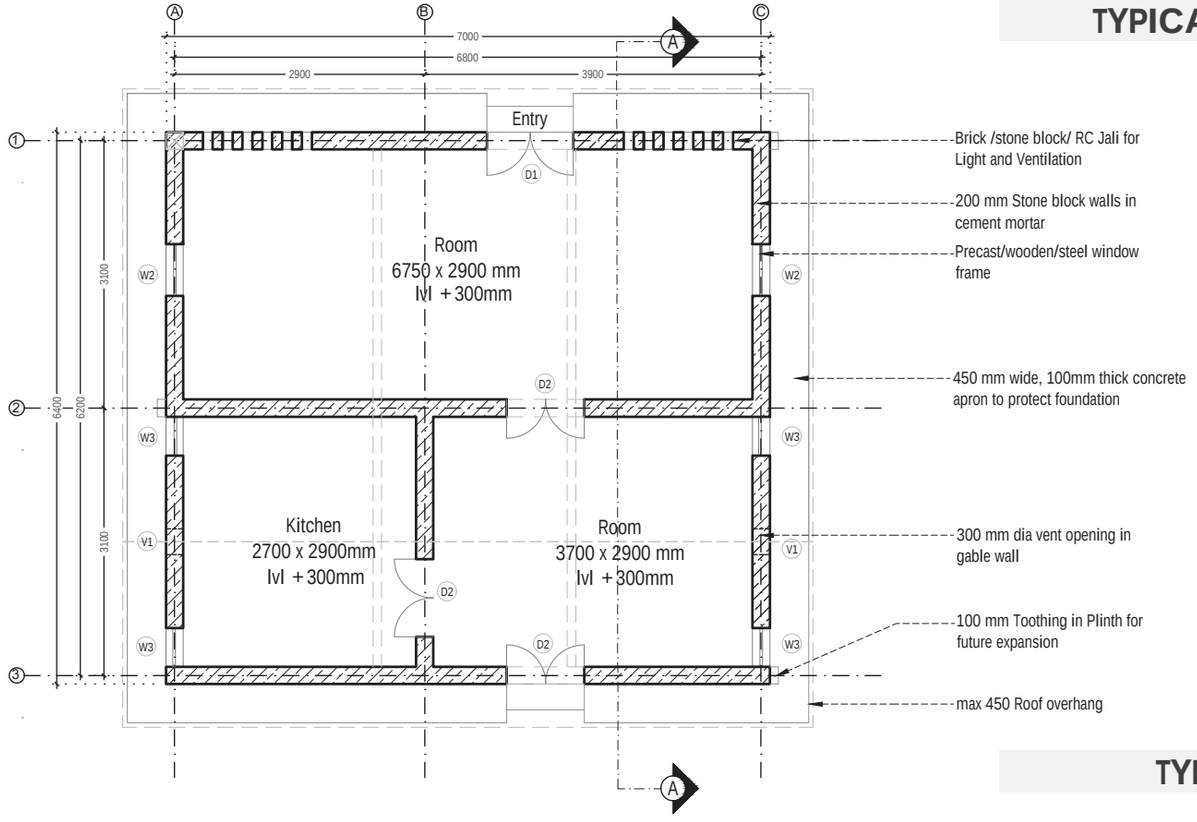
Recommendations for Built Form		
Plan Layout	**Plinth/Floor**	**Roof Profile**
layout- Two rooms and a kitchen.	Normal plinth design.	Sloped roof.

Recommendations for construction systems		
Components	**Recommended Specifications**	**Specific Comments**
Foundation	• strip foundation with brick and cement mortar	• In case of black cotton soil should go to 60 cm, else minimum 45 cm.
Plinth	• Minimum 30 cm high plinth	
Wall	• stone concrete block masonry in cement mortar	• Thick adobe wall acts as thermal barrier
Wall Finish	• exposed or cement plaster	
Roof Structure	• Roof slope angle – min 25 & max 33.	• Rigid connections between all roof members to increase stability.
Roof Cover	• Compressed corrugated bamboo mat sheets/ CGI sheets with locally available timber with bamboo as under-structure.	• Woven reed mats can be used below the tiles as false ceiling for thermal insulation.
Floor	• cement flooring	

CG-08



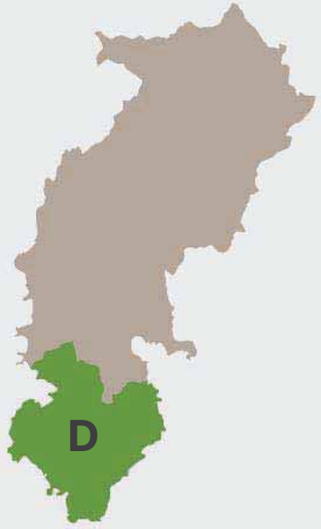
TYPICAL SECTION AA'



TYPICAL PLAN

Area Statement:

Item	Area	
	Sq.m	Sq.ft
Room 1	19.34	208.18
Room 2	11.09	119.37
Kitchen	8.01	86.22
Carpet Area	**38.44**	**413.77**
Built up Area	**44.80**	**482.23**

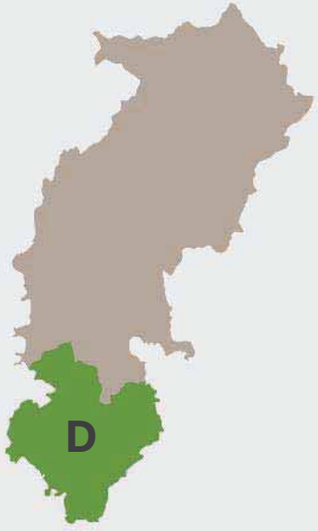


CHHATTISGARH

CG-08
Cost estimate

Cost breakup

Item	Cost (INR)
Foundation	₹ 42,000.00
Wall	₹ 89,590.00
Roof	₹ 47,900.00
Door window	**₹ 7,000.00**
Total	**₹ 186,490.00**



CHHATTISGARH

SR. NO.	ITEM OF WORK	Unit	Quantity	Rate per unit (Rs)	Cost
1	**FOUNDATION**				
	P.C.C.	cu.m	2	₹ 2,700.00	₹ 5,400.00
	Brickwork	pieces	7200	₹ 4.00	₹ 28,800.00
	R.C.C. Plinth Beam	cu.m	0.4	₹ 7,000.00	₹ 2,800.00
	Labour				₹ 5,000.00
W	**TOTAL**				**₹ 42,000.00**
2	**WALLS**				
	Mud Plaster Stabalized with chicken mes	per sqm	24	₹ 200.00	₹ 4,800.00
	Brickwork	pieces	18401	₹ 4.00	₹ 73,604.00
	Doors	per unit	4	₹ 1,000.00	₹ 4,000.00
	Windows	per unit	6	₹ 500.00	₹ 3,000.00
	R.C.C Lintel Beam	cu.m	0.598	₹ 7,000.00	₹ 4,186.00
	Labour				₹ 7,000.00
X	**TOTAL**				**₹ 96,590.00**
3	**STRUCTURE ROOF**				
	Timber Truss	per cu ft	18.1	₹ 500.00	₹ 9,050.00
	Metal Ties	per kg	6	₹ 55.00	₹ 330.00
	Bamboo split Purlins For Verandah	per piece	11	₹ 320.00	₹ 3,520.00
	Labour				₹ 4,000.00
Y	**TOTAL**				**₹ 16,900.00**
4	**ROOF**				
	Bamboo corrugated sheet	per unit	28	₹ 1,000.00	₹ 28,000.00
	Labour				₹ 3,000.00
Z	**TOTAL**				**₹ 31,000.00**
	W+X+Y+Z				**₹ 186,490.00**
	GRAND TOTAL	**₹ 186,490.00**			
	AREA (sqm)	**51**			
	RATE OF CONSTRUCTION (per sqm)	**₹ 3,656.67**			
	AREA (sqft)	**545.7**			
	RATE OF CONSTRUCTION (per sqft)	**₹ 341.74**			

CG-09

This typology is applicable to all the housing zones.

Common Design proposal for all the zones identified for the state.

Design for All Zones

Bamboo , mud

CG-09

DESIGN HIGHLIGHTS

- Incrementality is inbuilt in the design. Evolves into a house locally known as chaukhandi. Most prevalent housing typology across the state.
- This plan type includes two rooms with a long parchi both in the front, a kitchen in the side accessible from the parchi and a store or cattle room.

Recommendations for construction systems		
Components	**Recommended Specifications**	**Specific Comments**
Foundation	• strip foundation with brick and cement mortar	• In case of black cotton soil should go to 60 cm, else minimum 45 cm.
Plinth	• Minimum 30 cm high plinth	
Wall	• 230 mm unburnt clay brick wall with mesh reinforcement.	• Thick adobe wall acts as thermal barrier
Wall Finish	• Ferrocement plaster	
Roof Structure	• Roof slope angle – min 25 & max 33.	• Rigid connections between all roof members to increase stability.
Roof Cover	• Compressed corrugated bamboo mat sheets/ CGI sheets/ country tiles with locally available timber with bamboo as under-structure.	• Woven reed mats can be used below the tiles as false ceiling for thermal insulation.
Floor	• cement flooring	

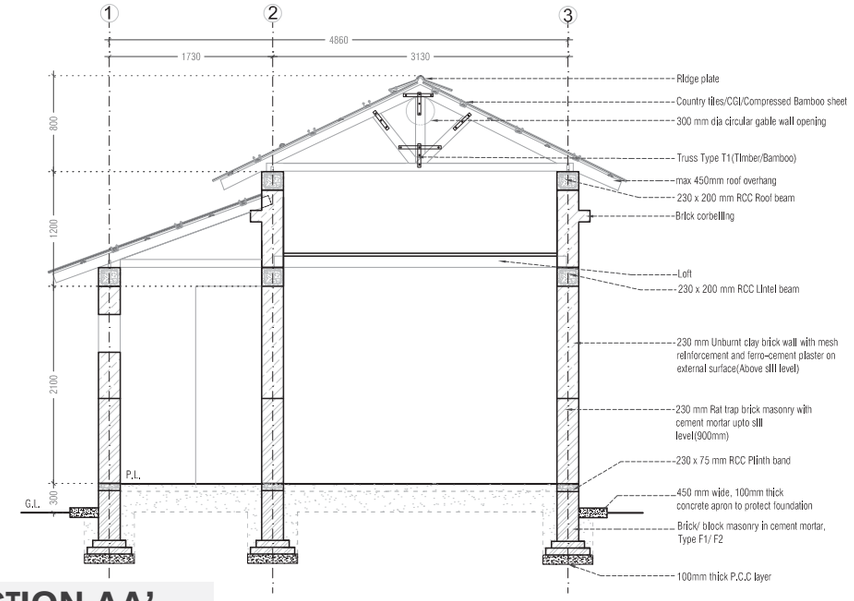
CHHATTISGARH

CG-09

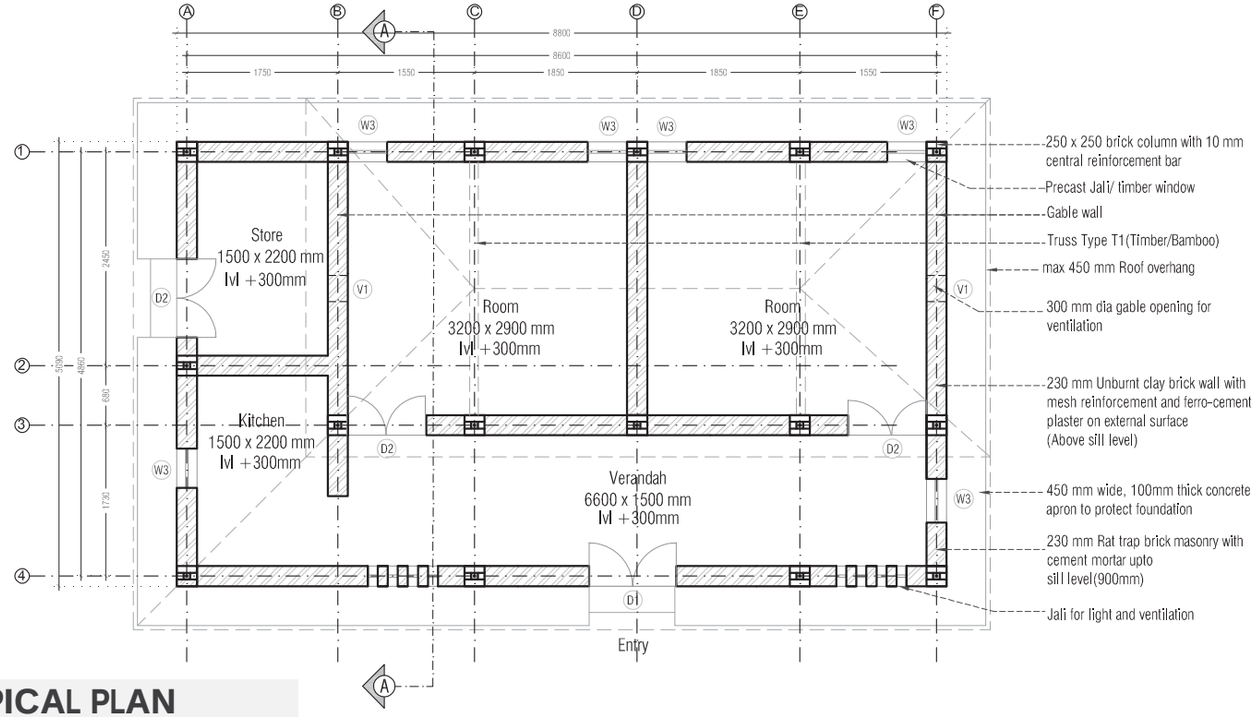
Area Statement:

Item	Area	
	Sq.m	Sq.ft
Room 1	9.48	102.04
Room 2	9.48	102.04
Kitchen	3.45	37.13
Store	**3.53**	**38.00**
Carpet Area	**25.96**	**279.43**
Built up Area	**44.89**	**483.20**

CHHATTISGARH



TYPICAL SECTION AA'



TYPICAL PLAN

SR. NO.	ITEM OF WORK	Unit	Quantity	Rate per unit (Rs)	Cost
1	**FOUNDATION**				
	P.C.C.	cu.m	2.35	₹ 2,700.00	₹ 6,345.00
	Brickwork	pieces	7992	₹ 4.00	₹ 31,968.00
	R.C.C. Plinth Beam	cu.m	0.75	₹ 7,000.00	₹ 5,250.00
	Labour				₹ 5,000.00
W	**TOTAL**				**₹ 48,563.00**
2	**WALLS**				
	Adobe	cu.m	14.8	₹ 1,000.00	₹ 14,800.00
	Brickwork	pieces	8362	₹ 4.00	₹ 33,448.00
	Doors	per unit	3	₹ 1,000.00	₹ 3,000.00
	Windows	per unit	6	₹ 500.00	₹ 3,000.00
	R.C.C Lintel Beam	cu.m	3.161	₹ 7,000.00	₹ 22,127.00
	Labour				₹ 11,500.00
X	**TOTAL**				**₹ 87,875.00**
3	**STRUCTURE ROOF**				
	Timber Truss	per cu ft	7.93	₹ 500.00	₹ 3,965.00
	Distributer Purlins (bamboo slits)	per piece	8	₹ 320.00	₹ 2,560.00
	Metal Ties	per kg	6	₹ 55.00	₹ 330.00
	Timber roof for Verandah	per cu ft	1.95	₹ 500.00	₹ 975.00
	Bamboo split Purlins For Verandah	per piece	3	₹ 320.00	₹ 960.00
	Labour				₹ 5,000.00
Y	**TOTAL**				**₹ 13,790.00**
4	**ROOF**				
	Bamboo corrugated sheet	per unit	26	₹ 1,000.00	₹ 26,000.00
	Labour				₹ 5,000.00
Z	**TOTAL**				**₹ 31,000.00**
	W+X+Y+Z				**₹ 181,228.00**
	GRAND TOTAL	**₹ 181,228.00**			
	AREA (sqm)	**45**			
	RATE OF CONSTRUCTION (per sqm)	**₹ 4,027.29**			
	AREA (sqft)	**481.5**			
	RATE OF CONSTRUCTION (per sqft)	**₹ 376.38**			

CG-09
Cost estimate

Cost breakup

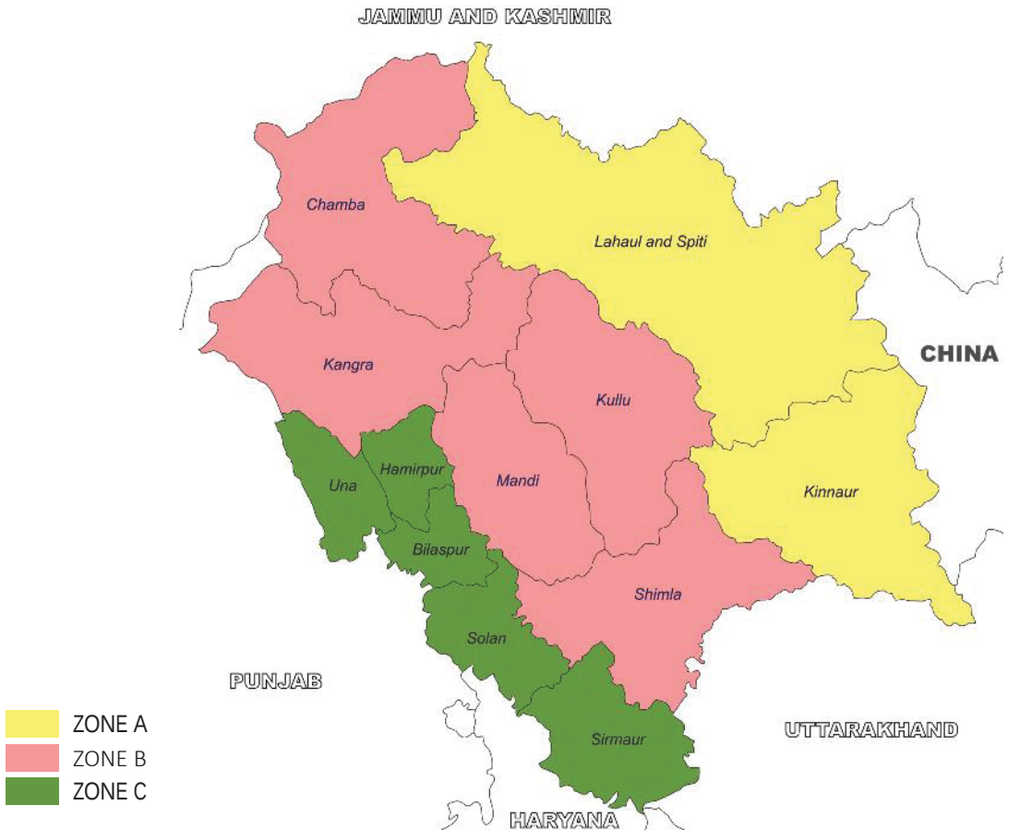
Item	Cost (INR)
Foundation	₹ 48,563.00
Wall	₹ 81,875.00
Roof	₹ 44,790.00
Door window	**₹ 6,000.00**
Total	**₹ 181,228.00**

CHHATTISGARH

pahal
Prakriti Hunar Lokvidya

Himachal Pradesh

CG-01



Himachal Pradesh is a State in North India. Its area is 55,673 km2 (21,495 sq mi), and is bordered by Jammu and Kashmir on the North, Punjab on the West, Haryana on the South-West, Uttarakhand on the South-East and by the Tibet Autonomous Region on the East.

There are several valleys in the state with more than 90% of the population living in rural areas.However, 100% hygiene has been achieved in the state and practically all houses have a toilet.The villages have good connectivity with roads, public health centres, and now with Lokmitra Kendra using high-speed broadband.

Shimla district has maximum urban population of 25%. Successfully imposed environmental protection and tourism development with ban on the use of polyethylene and tobacco products by the Government has led to a boost in tourism.

The rural housing typology in the state has a lot of variation based on the local conditions and availability of resources with people. Defining the rural housing typologies for state therefore needs to consider simple criteria that can be considered across the state and can be evaluated based on the purpose of supporting the need for defining these typologies at its basic level.

Zone A

Zone A has a square layout with covered verandah and an attached toilet. As per the climatic comfort requirement of the zone the type design focuses to reduce air-infiltration to have minimal heat loss. In addition, Trombone wall is introduced on southern facade to trap solar heat.

Since the heat loss is maximum through the roof, therefore, insulation is required in the form of false ceiling with the help of thermocol or any other local material. Incorporating usage of Bamboo as roof under-structure in the type design reduces the dependency on timber. The 350 mm thick coursed rubble wall with smaller size openings and low roof height also prevents the heat loss and maintain the interior climatic comfort.It covers districts Lahaul & Spiti and Kinnaur under it.

Zone B

The recommended type design has a rectangular layout with a covered verandah on both sides and a toilet. The verandah acts as a buffer space and can be used as a sitting space for visitors and family members. The rear verandah also serves as a service area for kitchen. The kitchen is provided on the ground floor but in case of using the kitchen as bedroom or in case of future extension kitchen space can be shifted to attic space.

The preferable orientation for house is front verandah facing the southern face since it's the larger face, so as to maximize the heat gain. Proper anchorage is provided to tie the roof to the main structure as there is high wind in this zone. It covers districts Chamba, Kangra, Kullu and Shimla.

Zone C

The prototype design for this zone has a rectangular layout with an integrated kitchen. A semi-covered verandah acting as a buffer space is proposed in the front of the house. The prototype design includes a room, semi-covered verandah, a room and attached toilet & bath. The kitchen can be accessed from the room and also has an alternate access from the rear of the house which might be used as washing area. Compressed Earth Blocks (CSEB) are used for 230 mm thick walls. Also, CSEB posts are made to support the verandah roof. The toilet is attached with the house but only can be accessed from outside of the house. It covers districts Sirmaur, Solan, Bilaspur, Hamirpur and Una

HIMACHAL PRADESH

HP-01

The type designs recommended for the Zone A of the State responds to different physical & socia-economic factors among which livelihood is one such factor.

Zone A includes 2 Districts
- Lahaul and Spiti
- Kinnaur

Resources Available
- Stone, CGI sheet

One typology
HP-A-01

HIMACHAL PRADESH

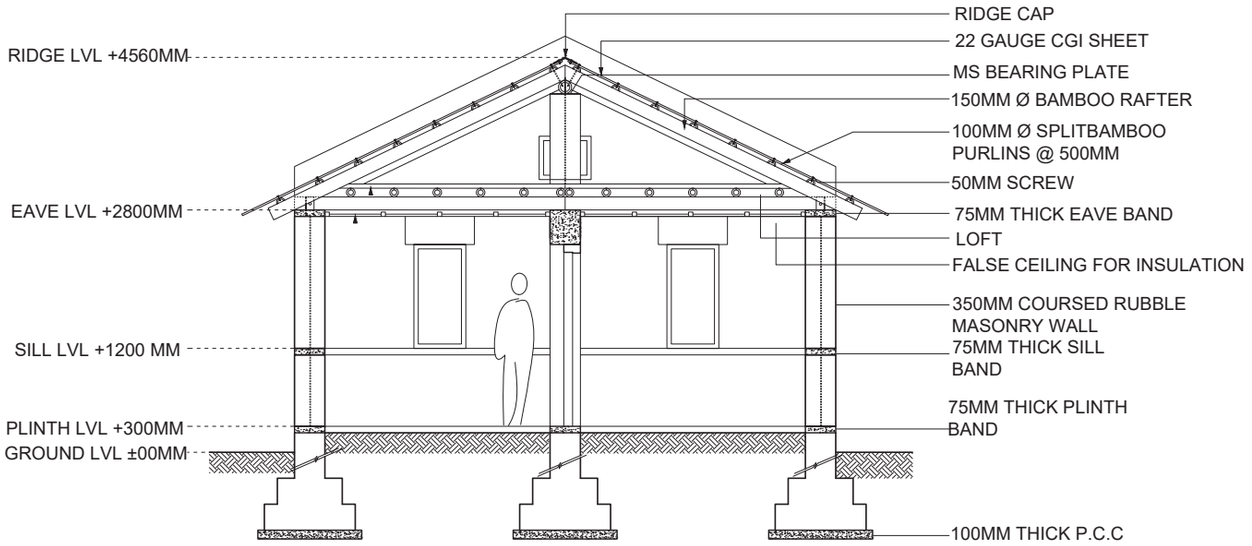
HP-A-01

Recommendations for Built Form		
Plan Layout	**Plinth/Floor**	**Roof Profile**
Zone A has a square layout with covered verandah and an attached toilet. As per the climatic comfort requirement of the zone the type design focuses to reduce air-infiltration to have minimal heat loss.	Normal Plinth design	Sloped roof

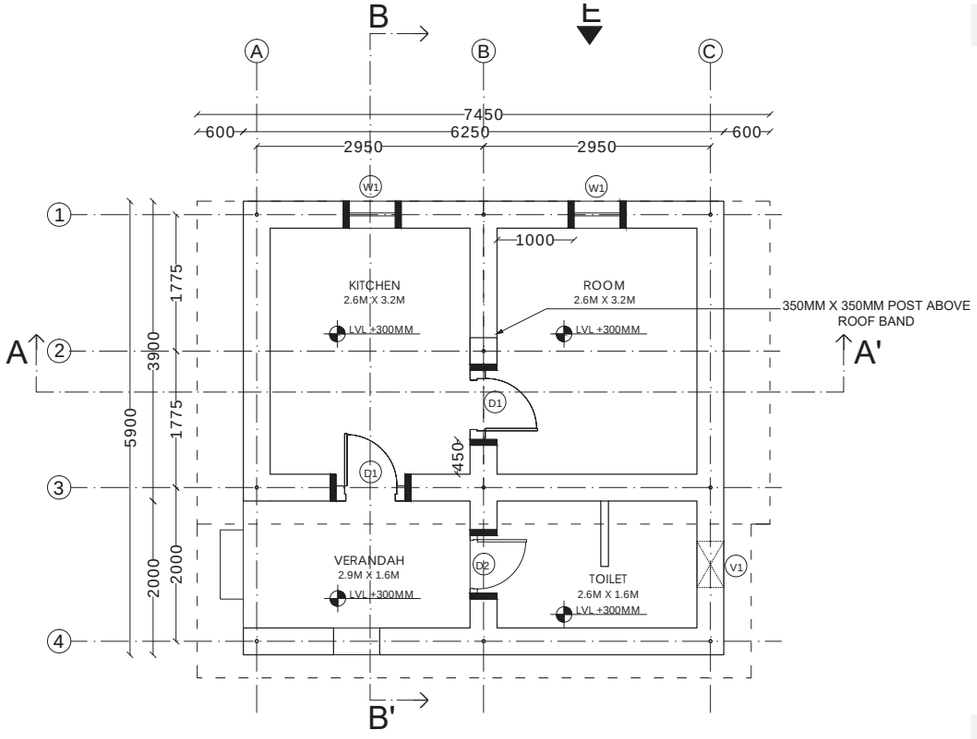
Recommendations for construction systems		
Components	**Recommended Specifications**	**Specific Comments**
Foundation	• Continuous Coursed rubble foundation with cement mortar.	
Plinth	• Crushed stone with sand filling with 75 mm Plinth band provided at plinth level	
Wall	• 350 mm thick coursed rubble wall.	
Wall Finish	• Cement plaster with pointing.	
Roof Structure	• It consists of three parts. Roof with Bamboo under structure, Bamboo loft, false ceiling with thermocol insulation.	
Roof Cover	• Roof Cover 0.63 mm CGI sheet	
Floor	• Mud Flooring	
Door and Windows	• Wooden shutter door and window.	
Trombe Wall	• Proposed on the southern facade.	

HP-01

Total Cost ` 1,71,377/-



TYPICAL SECTION



TYPICAL PLAN

HIMACHAL PRADESH

HP-01

HIMACHAL PRADESH

Cost Estimation of the Core House for Zone A, HP-A-01		
S. No.	**Components**	**Amount (₹)**
1.	Excavation	2,403.38
2	Filling	401.11
3	Foundation and Plinth masonry	34,593.38
4	Flooring Finish	100
5	Superstructure	40,716.63
6	Bands	9,432.45
7	Roofing including false ceiling	23,856.95
8	Wood work(D/W) & D/W painting	8,020.6
9	Pointing & Plastering	4,451.45
10	Plinth protection	1,021.7
11	Trombe wall	6,830.6
	Total	1,31,828/-
Cost Indexing 30% extra with respect to HP SOR 2009		39,548.48
Total cost of core house(approx.)*		**1,71,377/-**

HP-02A

The type designs recommended for the Zone B of the state responds to different physical & socio-economic factors among which livelihood is one such factor.

Zone B includes 5 Districts

- Chamba
- Kangra
- Kullu
- Mandi
- Shimla

Resources Available

- Stone, Bamboo Cement

Two typologies
HP-B-01

HP-B-01

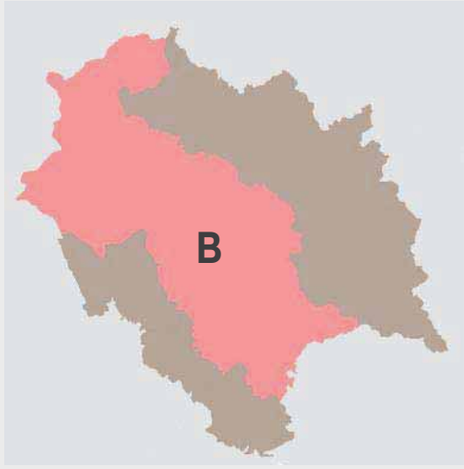
Recommendations for Built Form		
Plan Layout	**Plinth/Floor**	**Roof Profile**
It has a rectangular layout with a covered verandah on both sides and a toilet. The verandah acts as a buffer space and can be used as a sitting space for visitors and family members.	Normal Plinth design	Sloped roof

Recommendations for construction systems		
Components	**Recommended Specifications**	**Specific Comments**
Foundation	• Continuous Coursed rubble foundation with cement mortar.	
Plinth	• Crushed stone with sand filling with 75 mm Plinth band provided at plinth level	
Wall	• 350 mm thick coursed rubble wall.	
Wall Finsih	• Cement plaster with pointing.	
Roof Structure	• It consists of three parts. Roof with Bamboo under structure, Bamboo loft, false ceiling with thermocol insulation.	
Roof Cover	• Roof Cover 0.63 mm CGI sheet	
Floor	• Mud Flooring	
Door and Windows	• Mild steel door and window	

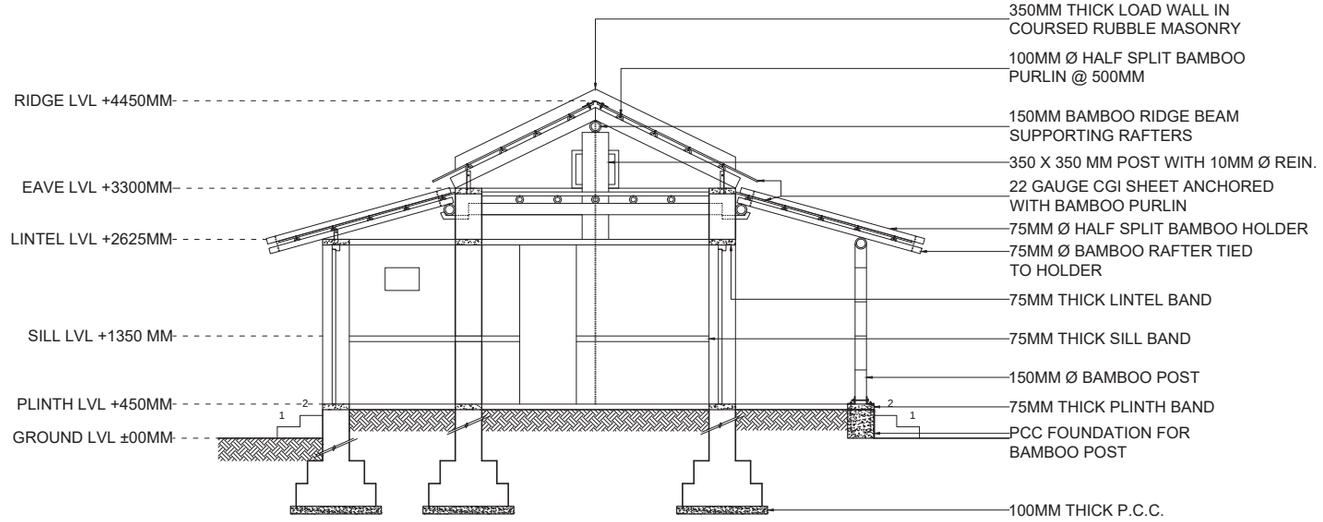
HIMACHAL PRADESH

HP-02A

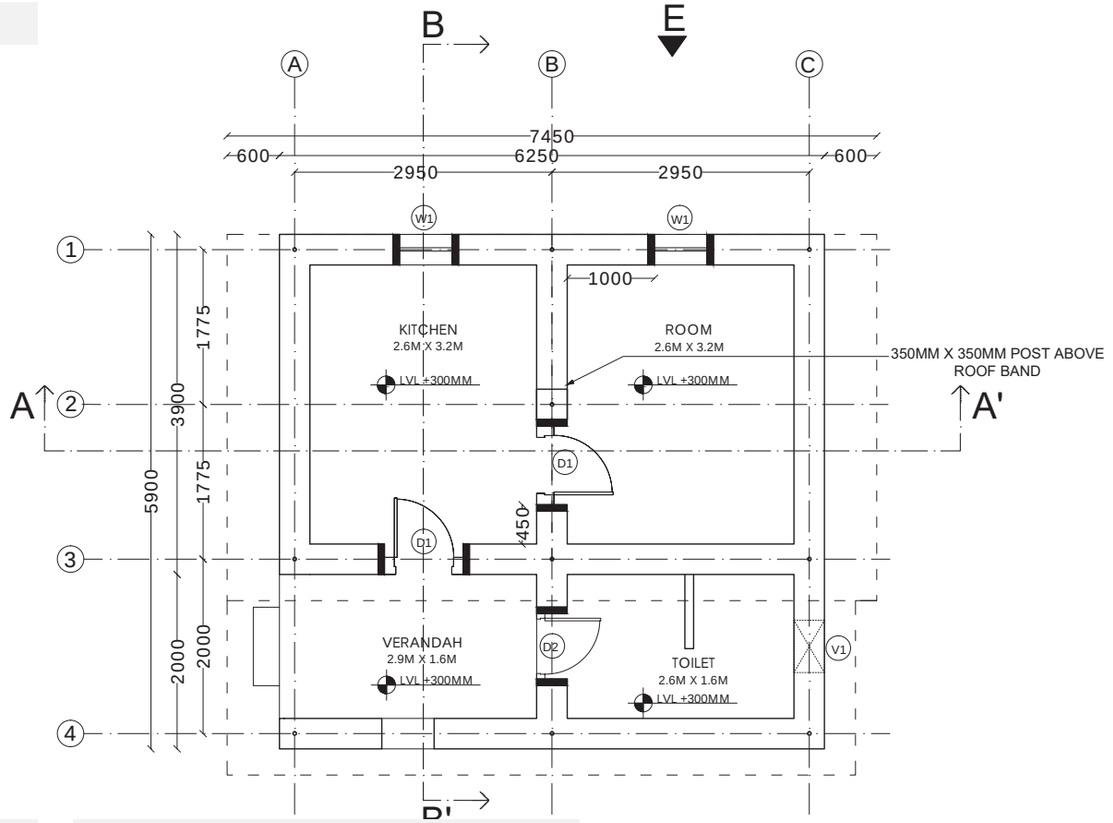
Total Cost ` 1,63,289/-



HIMACHAL PRADESH



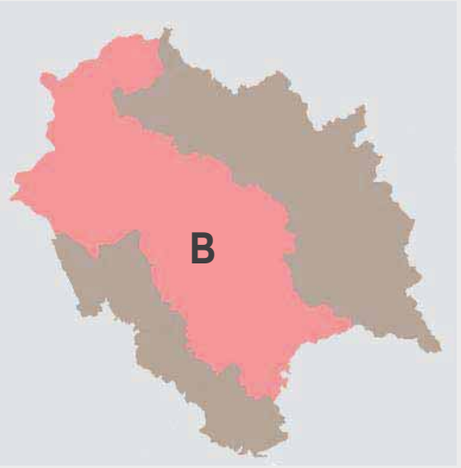
TYPICAL SECTION



TYPICAL PLAN

TYPICAL PLAN

Cost Estimation of the Core House for Zone B, HP-B-01		
S.No.	**Components**	**Amount (₹)**
1	Excavation	2,550.405
2	Filling	585.75
3	Foundation and Plinth masonry	37,235.41
4	Flooring Finish	100
5	Superstructure	40,502.89
6	Bands	8,386.1
7	Roofing	20,619.3
8	D/W & D/W painting	8,632.6
9	Pointing & Plastering	5,942.35
10	Plinth protection	1,052.3
	Total	1,25,607/-
Cost Indexing 30% extra with respect to HP SOR 2009		37,682.13
Total cost of core house(approx.)*		**1,63,289/-**



HIMACHAL PRADESH

HP-02B

The type designs recommended for the Zone B of the state responds to different physical & socio-economic factors among which livelihood is one such factor.

Zone B includes 5 Districts

- Chamba
- Kangra
- Kullu
- Mandi
- Shimla

Resources Available

- Stone, Bamboo

Two typologies
HP-B-01

HIMACHAL PRADESH

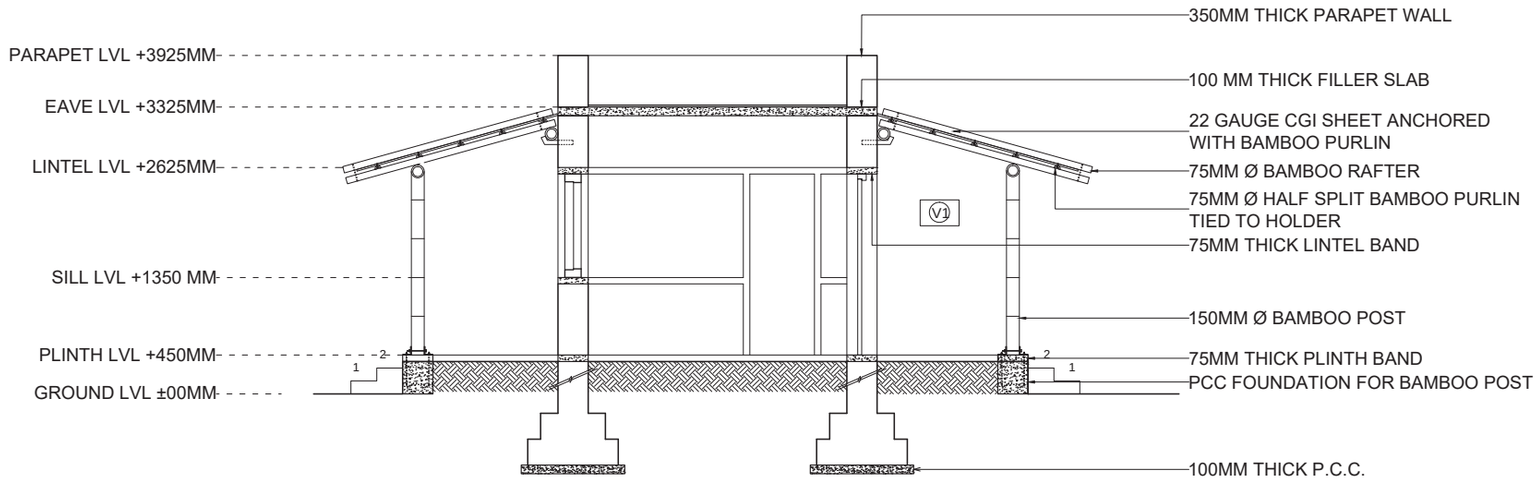
HP-B-02

Recommendations for Built Form		
Plan Layout	**Plinth/Floor**	**Roof Profile**
It has a rectangular layout with a covered verandah on both sides and a toilet. The verandah acts as a buffer space and can be used as a sitting space for visitors and family members.	Normal Plinth design	Sloped roof

Recommendations for construction systems		
Components	**Recommended Specifications**	**Specific Comments**
Foundations	• Continuous Coursed rubble foundation with cement mortar.	
Plinth	• Crushed stone with sand filling with 75 mm Plinth band provided at plinth level	
Wall	• 350 mm thick coursed rubble wall.	
Wall Finsih	• Cement plaster with pointing.	
Roof Structure	• Filler slab with bamboo as the filler material	
Roof Cover	• Roof Cover 0.63 mm CGI sheet	
Floor	• Mud Flooring	
Door and Windows	• Mild steel door and window	

HP-02B

Total Cost ` 1,49,435/-



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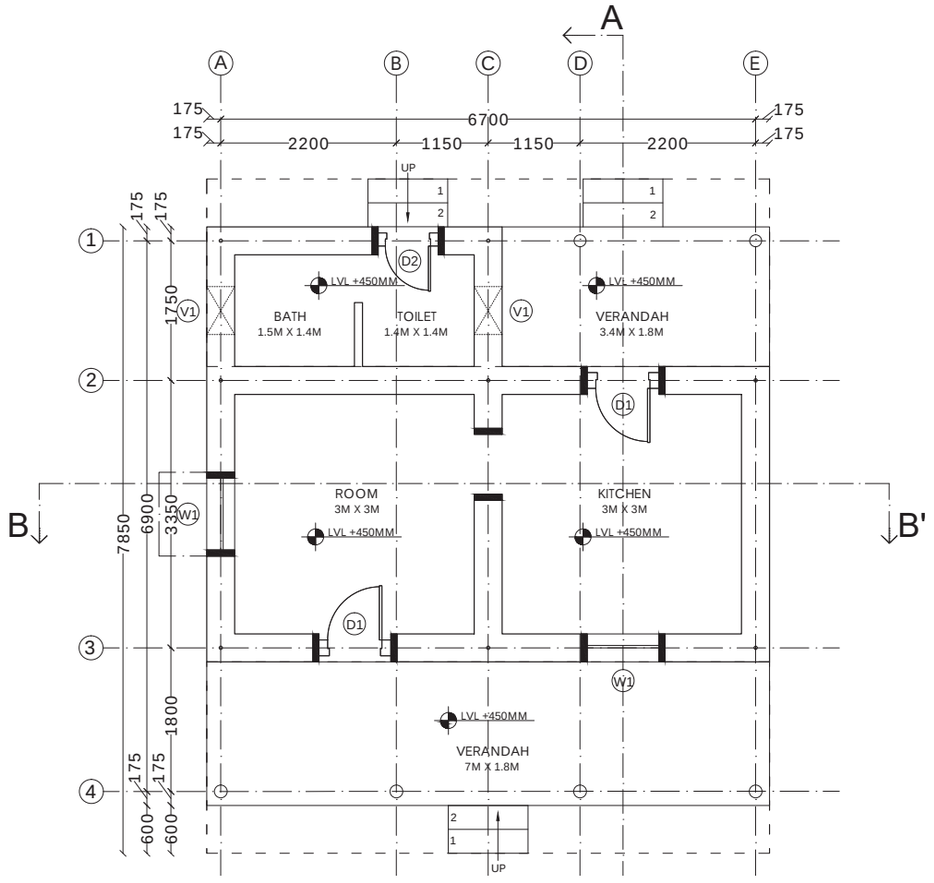


TYPICAL PLAN

HIMACHAL PRADESH

HP-02B

HIMACHAL PRADESH

Cost Estimation of the Core House for Zone B, HP-B-02		
S.No.	**Components**	**Amount (₹)**
1	Excavation	2,550.405
2	Filling	390.50
3	Foundation and Plinth masonry	37,235.41
4	Flooring Finish	100
5	Superstructure	44,548.5
6	Bands	7,197.8
7	Roofing	8,944.55
8	D/W & D/W painting	7,684
9	Pointing & Plastering	5,246.2
10	Plinth protection	1,052.3
	Total	1,14,949.7/-
Cost Indexing 30% extra with respect to HP SOR 2009		34,484.90
Total cost of core house(approx.)		**1,49,435/-**

HP-03A

HP-C-01

The type design recommended for the Zone C of the state responds to different physical & socio-economic factors among which livelihood is one such factor.

Zone C includes 5 Districts

- Sirmaur
- Solan
- Bilaspur
- Hamirpur
- Una

Resources Available

- Stone, Bamboo, CSEB

Zone C has one typology
HP-C-01

HIMACHAL PRADESH

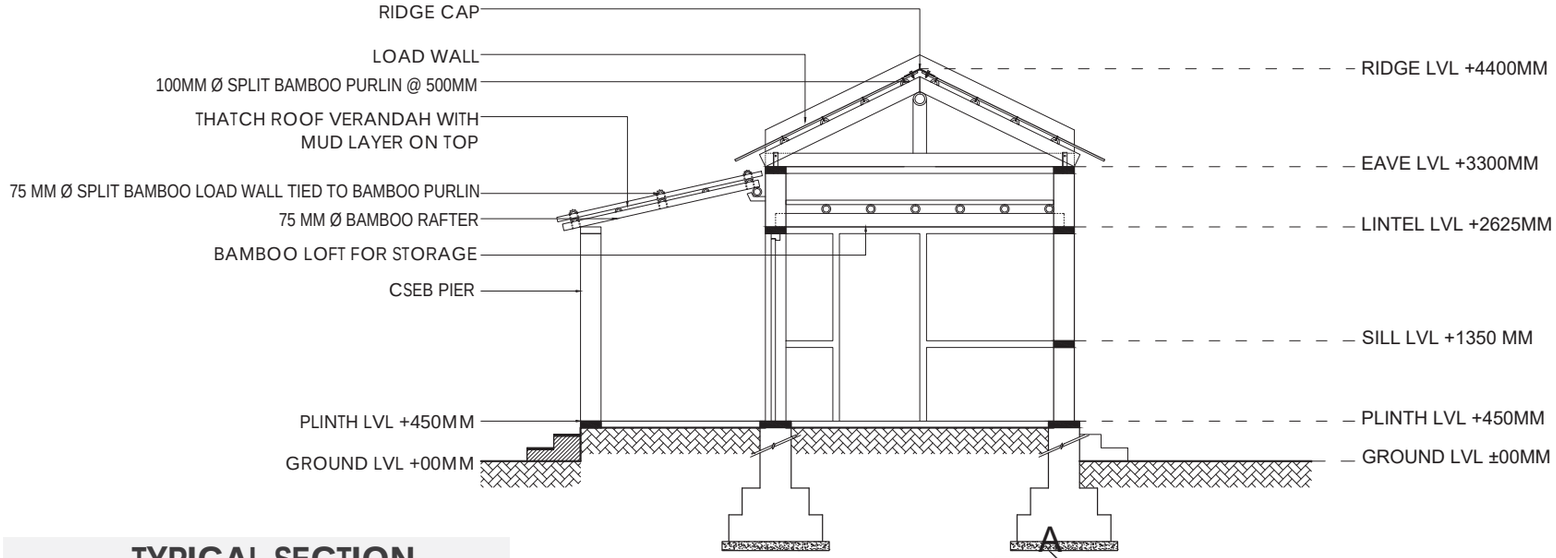
Recommendations for Built Form		
Plan Layout	**Plinth/Floor**	**Roof Profile**
A rectangular layout with an integrated kitchen. A semi-covered verandah acting as a buffer space is proposed in the front of the house. The prototype design includes a room, semi-covered verandah, a room and attached toilet & bath.	Normal Plinth design	Sloped roof

Recommendations for construction systems		
Components	**Recommended Specifications**	**Specific Comments**
Foundation	• Continuous Coursed rubble foundation with cement mortar.	
Plinth	• Crushed stone with sand filling with 75 mm Plinth band provided at plinth level	
Wall	• 350 mm thick coursed rubble wall.	
Wall Finish	• Cement plaster with pointing.	
Roof Structure	• Bamboo under structure, Bamboo loft space for storage	
Roof Cover	• 0.63 mm CGI sheet on the core house and toilet, Thatch roof on Verandah.	
Floor	• Mud Flooring	
Door and Windows	• Mild steel door and window	

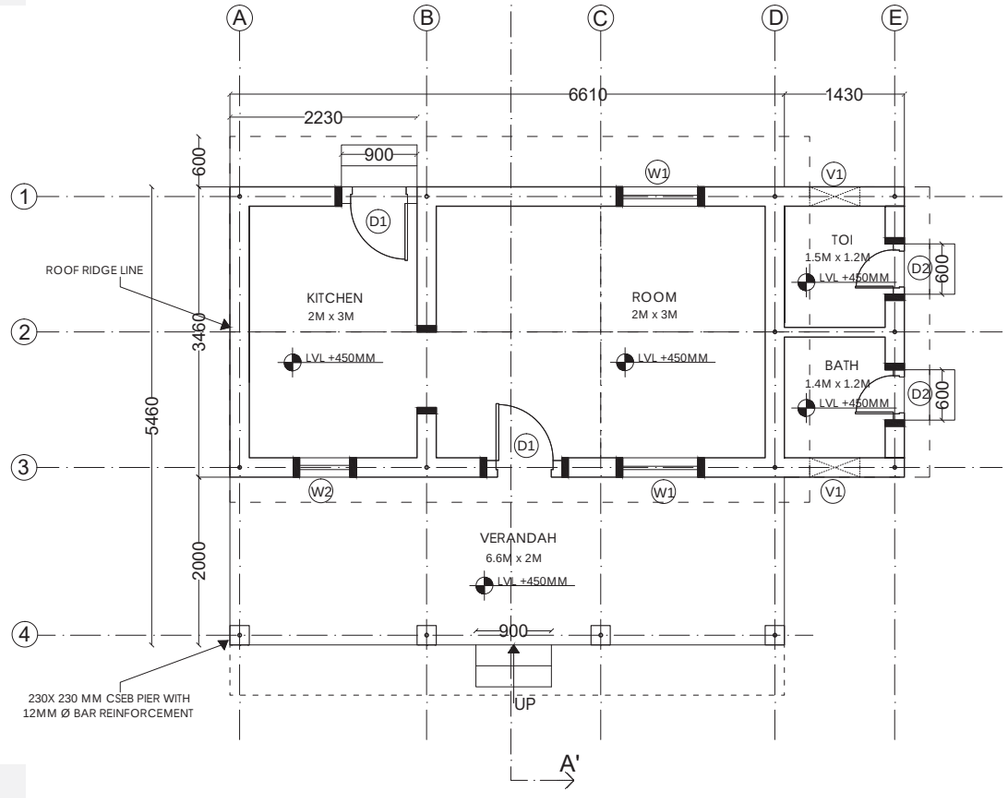
HP-03A

Total Cost ` 1,08,561/-

HIMACHAL PRADESH



TYPICAL SECTION



TYPICAL PLAN

HP-03A

Cost Estimation of the Core House for Zone C, HP-C-01		
S.No.	**Components**	**Amount (₹)**
1	Excavation	2,102.95
2	Filling	642.16
3	Foundation and Plinth masonry	31,279.15
4	Flooring Finish	100.00
5	Superstructure	12,698.15
6	Bands	6,074.10
7	Roofing	17,177.65
8	Wood work(D/W) & D/W painting	8,647.90
9	Pointing & Plastering	3,772.30
10	Plinth protection	1,014.05
	Total	**83,508.41**
Cost Indexing 30% extra with respect to HP SOR 2009		25,052.52
Total cost of core house(approx.)*		**1,08,561/-**

HIMACHAL PRADESH

HP-03B

The type designs recommended for the Zone C of the state responds to different physical & socio-economic factors among which livelihood is one such factor.

Zone B includes 5 Districts

- Sirmaur
- Solan
- Bilaspur
- Hamirpur
- Una

Resources Available

- Stone, Bamboo, CSEB

Zone C has one typology
HP-C-02

HIMACHAL PRADESH

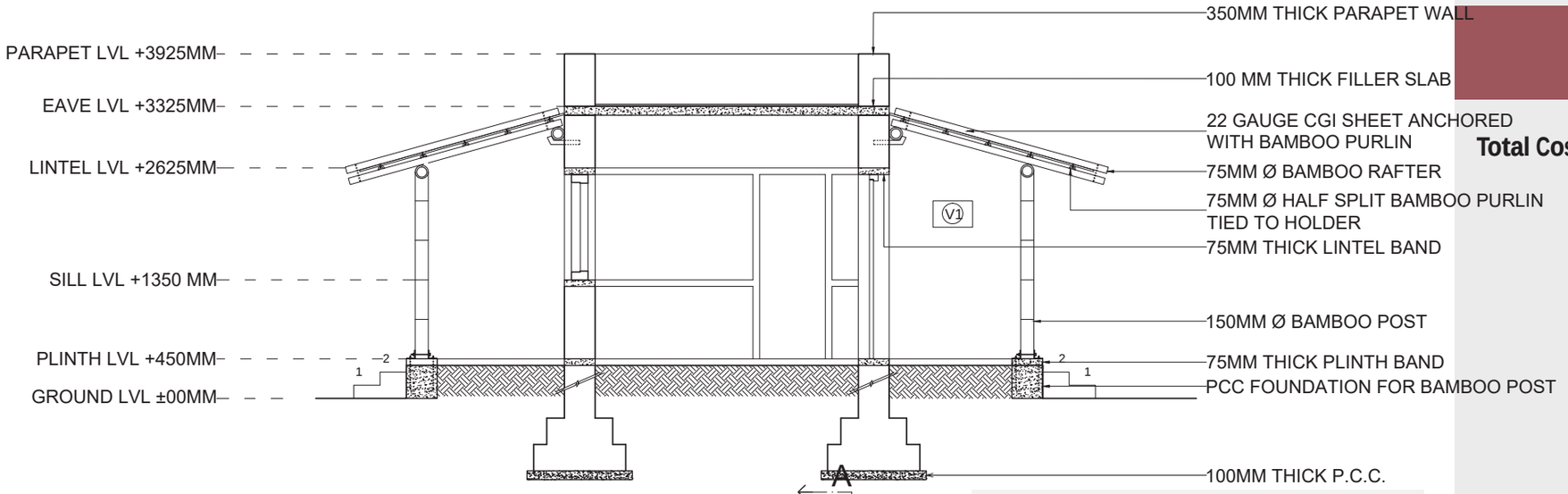
HP-C-02

Recommendations for Built Form		
Plan Layout	**Plinth/Floor**	**Roof Profile**
A rectangular layout with a semi-covered verandah. The house has a temporary partition in between the room which can be made from any suitable local material. The verandah acts as a buffer space and can be used as a sitting space for visitors and family members.	Normal Plinth design	Sloped roof

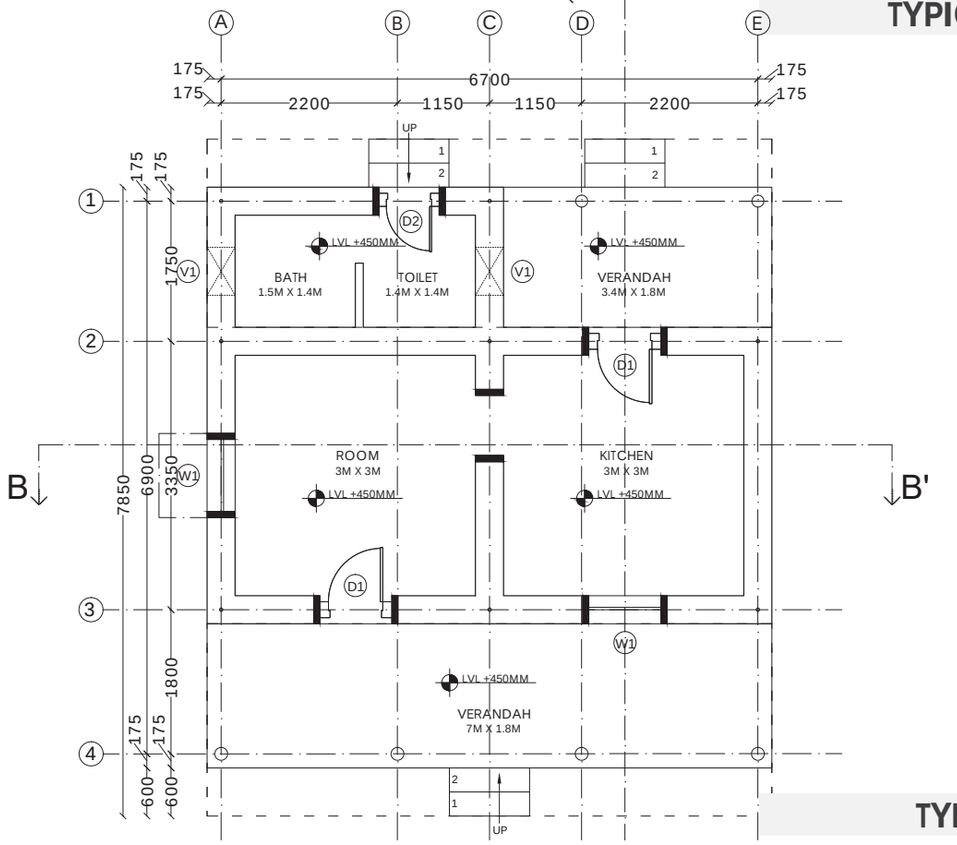
Recommendations for construction systems		
Components	**Recommended Specifications**	**Specific Comments**
Foundations	• Continuous Coursed rubble foundation with cement mortar.	
Plinth	• Crushed stone with sand filling with 75 mm Plinth band provided at plinth level	
Wall	• 230 mm thick coursed rubble wall.	
Wall Finsih	• Cement plaster with pointing.	
Roof Structure	• Bamboo under structure, Bamboo loft space for storage	
Roof Cover	• 0.63 mm CGI sheet on the core house and toilet, Thatch roof on Verandah.	
Floor	• Mud Flooring	
Door and Windows	• Mild steel door and window	

HP-03B

Total Cost ` 1,14,355/-



TYPICAL SECTION



TYPICAL PLAN

HIMACHAL PRADESH

ZONE-C
HP-C-02

HIMACHAL PRADESH

Cost Estimation of the Core House for Zone C, HP-C-02		
S.No.	**Components**	**Amount(₹)**
1	Excavation	1,872.37
2	Filling	804.50
3	Foundation and Plinth masonry	27,322.72
4	Flooring Finish	100
5	Superstructure	23,104.48
6	Bands	5,316.75
7	Roofing	18,457.75
8	D/W including Painting	6,244.1
9	Pointing & Plastering	3,744.25
10	Plinth protection	998.75
	Total	87,965.7/-
Cost Indexing 30% extra with respect to HP SOR 2009		26,389.7
Total cost of core house (approx.)		**1,14,355/-**

pahal
Prakriti Hunar Lokvidya

Jharkhand

Jharkhand contains two major types of forests, namely, Tropical Zone Dry Forests, and Tropical Zone Wet Forests. However, majority of the area under forests in the Jharkhand is dry deciduous type.

The state falls under the Tropical Monsoon climatic region, having monthly mean temperatures above 18 °C in every month of the year and feature wet and dry seasons.The average annual rainfall in the state is 1400 mm and more than 80% of the precipitation occurs between June to September. This rainfall is from the branch of monsoon from the Arabian Sea.

Various types of building materials are used for house construction in the state ranging from earth, wood, thatch, stone, concrete, bricks, metal sheets etc. Hence, people utilise wide range of materials to build their houses.

Jharkhand is vulnerable to various hazards such as droughts, floods, earthquakes, lightening, forest fire and mining related disasters.

Majority of the districts of south Jharkhand fall under seismic zone II , a minor earthquake risk zone and remaining fall under seismic zone III, having moderate-risk for earthquake.

Zone A

This zone includes the northern districts Sahibganj, Godda, Pakur, Deoghar and Dumka. Since this zone consists of districts of the Santhal Parganas region, the specificities of Santhal culture form main reference for this zone. This region has parts of the state that fall under zone 3 of earthquakes, one of the highest for the state.However, in terms of possibility of earthquake and related damage, this is still moderate risk area.

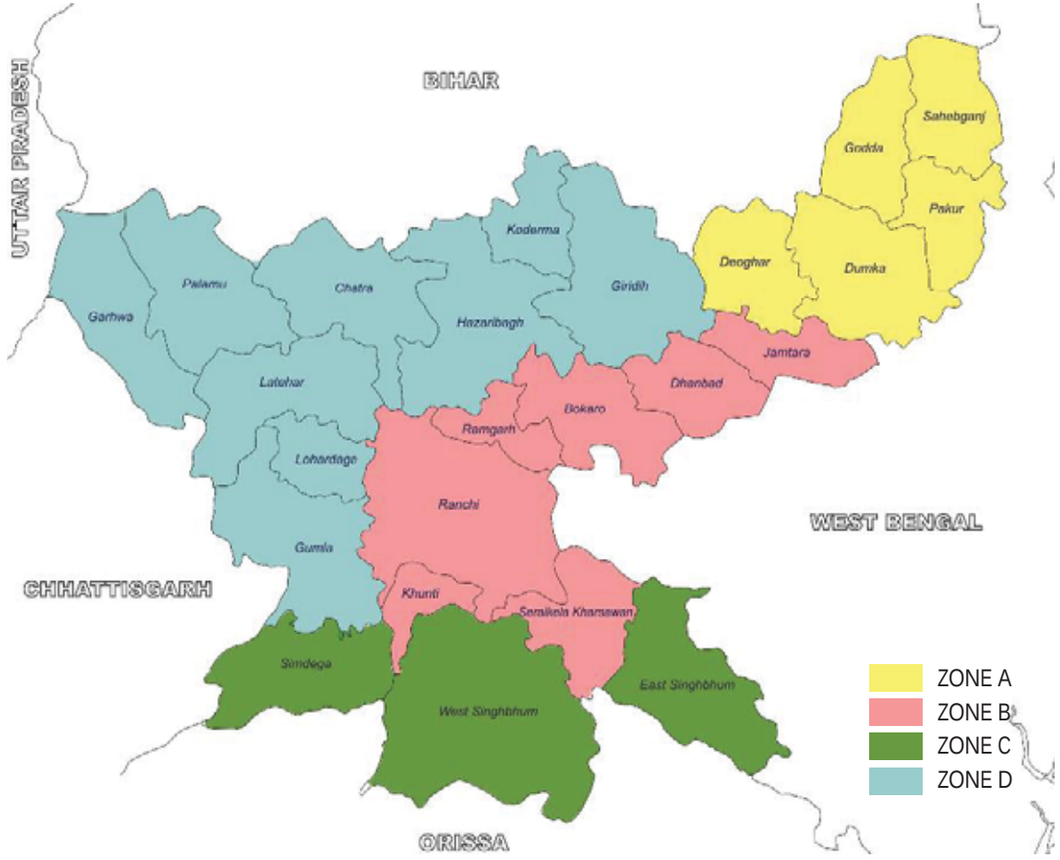
Zone B

Zone B consists of Dhanbad, Jamtara, Bokaro, Khunti, parts of Ranchi, Saraikela and West Singhbhum districts. It is characterised by presence of minerals and metals, and hence mining and related establishments form major economic activities. Due to this, it consists of some of the highly industrialised parts of the state.

This zone is characterised by presence of stone masonry walls along with cob and brick masonry walls. Often one can see cob construction combined with stone or brick masonry structures to construct the wall.

Zone C

Entire region comes under earthquake zone 2, and hence is one of the safest regions from the viewpoint of earthquake safety. Similarly, flooding or cyclones are also almost non existent threats for houses in the region. In terms of design compositions, people in this region utilise variety of configurations. Hence, possibility of various design choices is very important for this region. The designs also reflect the choice of materials and technologies they employ for construction.



Zone D

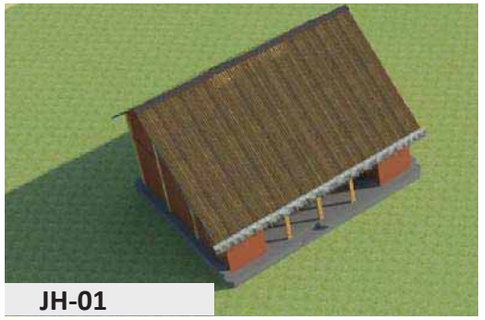
The zone is characterised by consistency of available materials with very few variations and options. The earth and burnt-bricks are the main walling options found in this region. There was almost no presence of stone or adobe structures. In terms of construction techniques, it showed mostly load bearing construction using cob and masonry using bricks.

No frame structures using wattle and daub were found in this region. For roofing too, the region showed prevalence of country tiles, while Bengal tiles and thatch were almost absent from the region. Lately, people have started using sheet roofing as well as RCC.

JHARKHAND

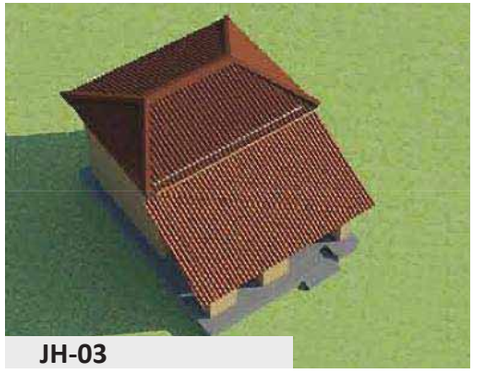
JHARKHAND HOUSING TYPOLOGIES AT A GLANCE

TYPOLOGY	APPLICABLE HOUSING ZONES	TOTAL AREA Sq.m/Sq.ft	
JH-01	Zone A	22.51 Sq.m	242.30 Sq.ft
JH-02	Zone A & C	27.14 Sq.m	292.13 Sq.ft
JH-03	Zone B	25.74 Sq.m	277.07 Sq.ft
JH-04	Zone B & C	26.24 Sq.m	282.45 Sq.ft
JH-05	Zone D	25.87 Sq.m	278.46 Sq.ft
JH-06	Zone A,B,C & D	25.87 Sq.m	278.46 Sq.ft
JH-07	Zone A,B,C & D	22.80 Sq.m	245.42 Sq.ft
JH-08	Zone A,B,C & D	25.87 Sq.m	278.46 Sq.ft



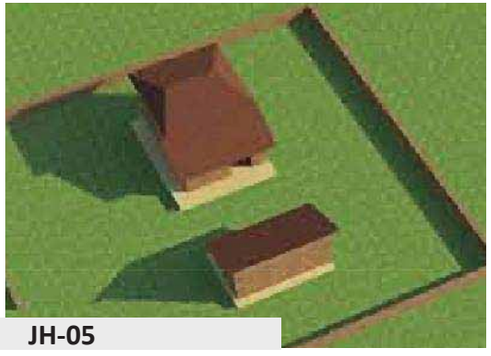
JH-01

JH-02



JH-03

JH-04



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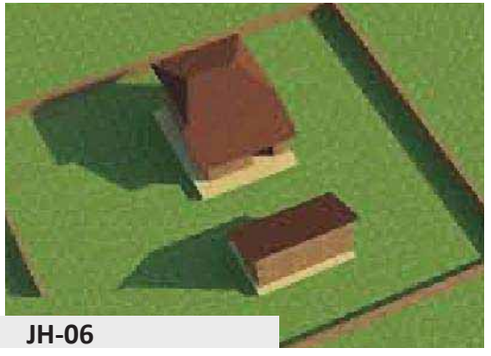

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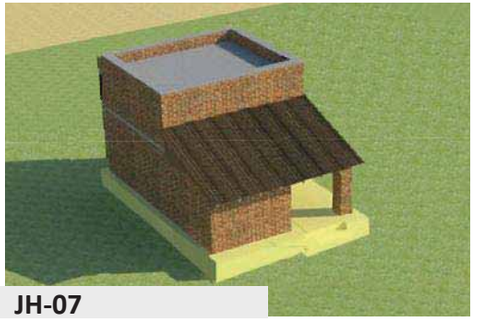

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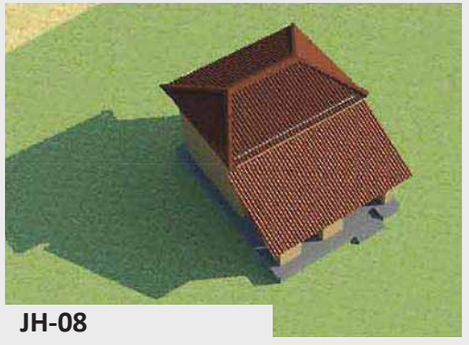

JH-08

JH-01

This typology is applicable to Zone A

Zone A highlights: This region has parts of the state that fall under zone 3 of earthquakes, one of the highest for the state.However, in terms of possibility of earthquake and related damage, this is still moderate risk area.

Zone A comprise of the following districts

1. Sahibganj
2. Godda
3. Pakur
4. Deoghar
5. Dumka

Resources Available

- Timber And Bamboo
- Fly Ash
- Stone

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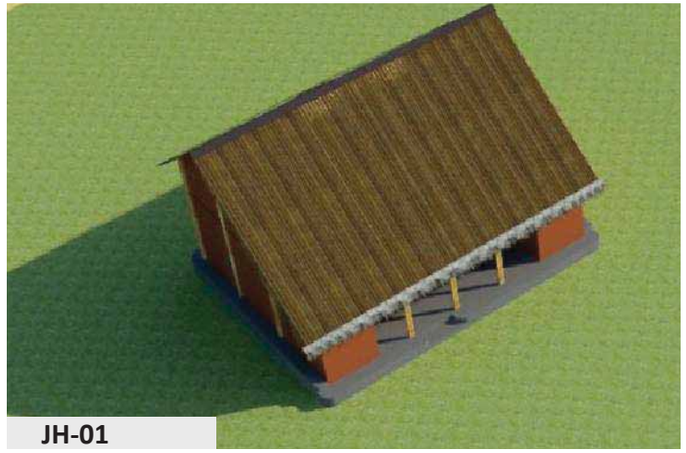
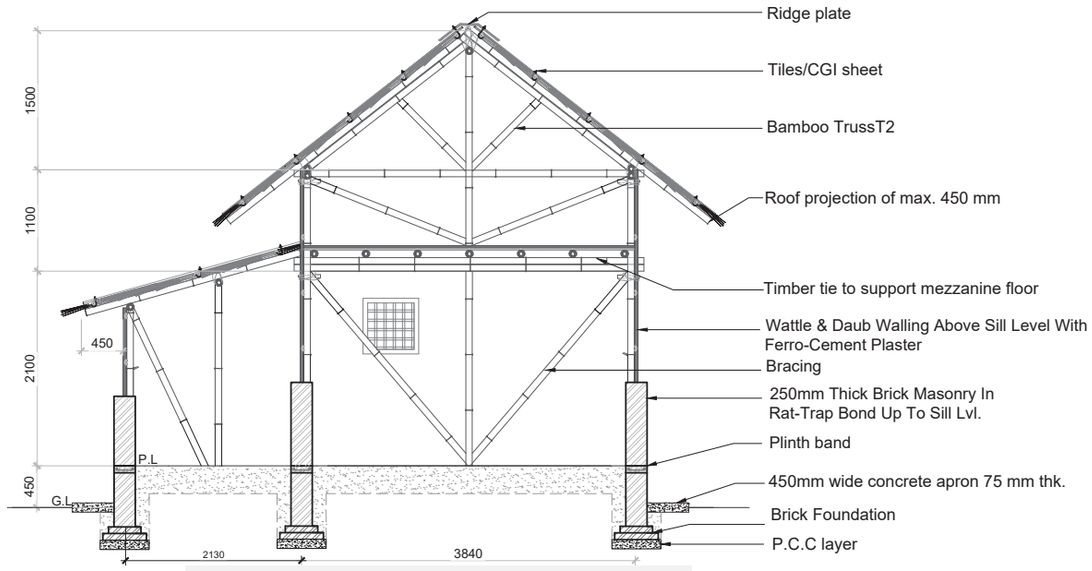


JH-01

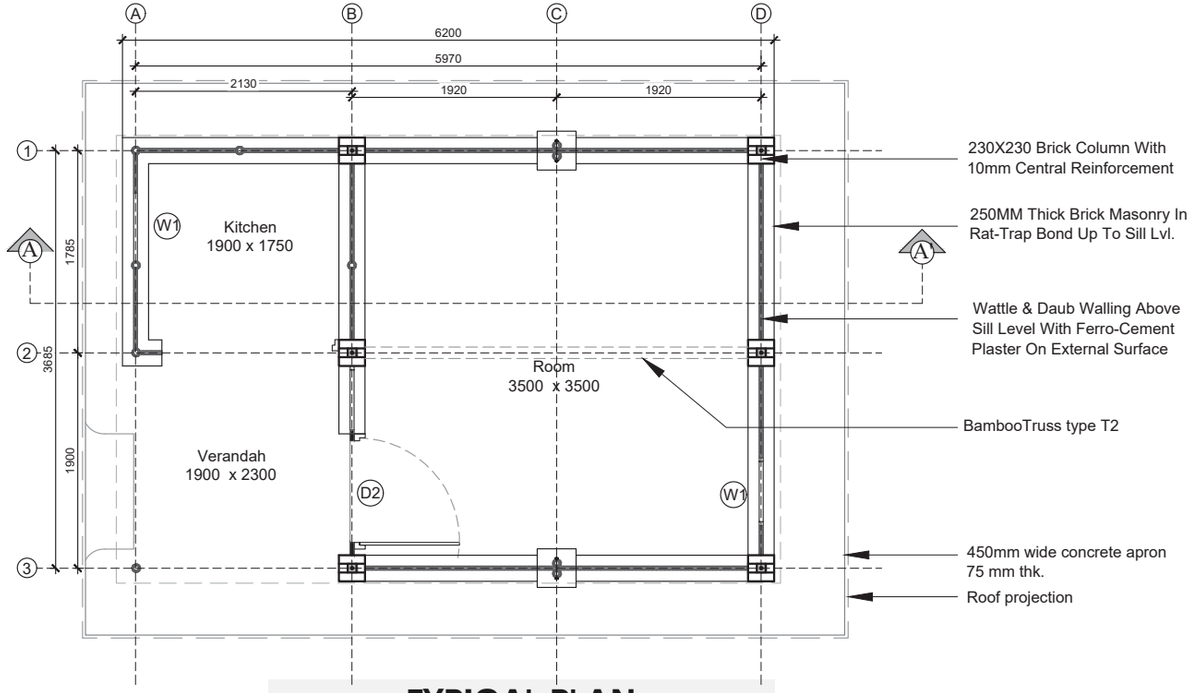
Full view

Recommendations for Built Form		
Plan Layout	**Plinth/Floor**	**Roof Profile**
Characterized by Santhal cultural associations. Large open spaces in form of central courtyard, backyard or front yard. Elements like tulsi- kyari and intermediate loft – incorporated. Loft design structure.	Normal plinth design.	Flat roof.

Recommendations for construction systems		
Components	**Recommended Specifications**	**Specific Comments**
Foundations	• Brick stub foundation for bamboo frame structure houses. • Brick foundation in cement mortar • Minimum depth – 450 mm • Minimum width 450 mm	
Plinth	• Minimum (300 mm or 150 mm more than last 50 year flood level)	
Wall	• Brick wall with Rat-Trap bond tillsilllevel • Wattle & Daub above sill level	
Wall Finish	• Ferrocement plaster on wattle & Daub	
Roof Structure	• Roof slope angle – min. 25 & max 45. • Roof over hang min. 450 missing. • Sheet and thatch with bamboo under structure • R.C.C. Slab	
Roof Cover	• 'Bengal' tiles • Country tiles • Corrugated sheets	
Floor	• Cement flooring • Mud filling over plastic sheet • Woven bamboo mat flooring • Plastic sheet laid over split bamboo base and finished with mud flooring.	
Door and Windows	• Mild steel door and window	



TYPICAL SECTION AA'



TYPICAL PLAN

JH-01

Area Statement:

Item	Area	
	Sq.m	Sq.ft
Room	11.92	128.30
Kitchen	2.97	31.97
Verandah	3.63	39.07
Carpet Area	**14.89**	**160.27**
Built up Area	**22.51**	**242.30**

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JH-01
Cost estimate

Cost breakup

Item	Cost (INR)
Foundation	₹ 26,401.20
Wall	₹ 32,463.20
Roof	₹ 43,732.00
Door window	₹ 4,100.00
Total	**₹ 106,696.40**

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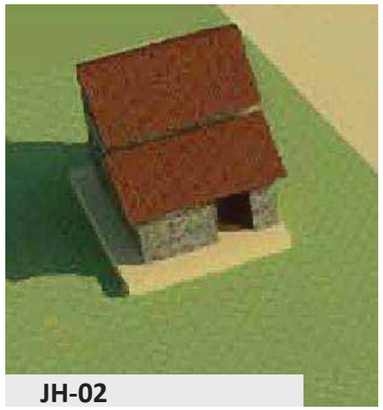
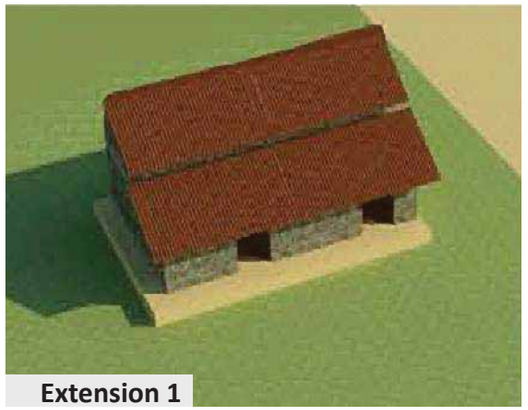
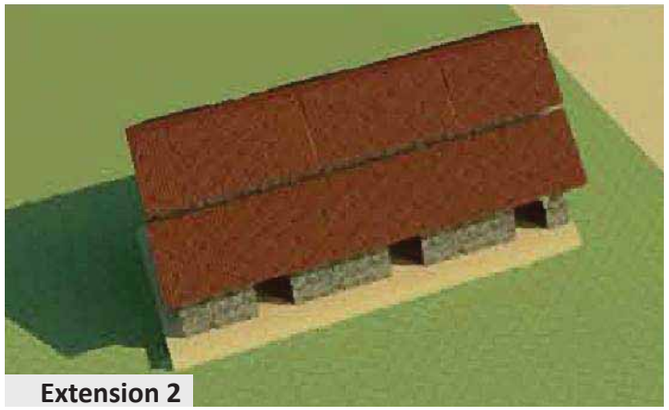
SR. NO.	ITEM OF WORK	Unit	Quantity	Rate per unit (Rs)	Cost
1	**FOUNDATION**				
	P.C.C.	cu.m	1.961	₹ 2,700.00	₹ 5,294.70
	Brickwork	pieces	2828	₹ 4.00	₹ 11,312.00
	R.C.C. Plinth Beam	cu.m	0.6475	₹ 7,000.00	₹ 4,532.50
	Plinth Filling for Otta	cu.m	2.73	₹ 200.00	₹ 546.00
	Plinth Filling for Room	cu.m	7.83	₹ 200.00	₹ 1,566.00
	Labour				₹ 3,150.00
W	**TOTAL**				**₹ 26,401.20**
2	**WALLS**				
	Wattle and daub panel(Tall)	per sqm	43.56	₹ 150.00	₹ 6,534.00
	Wattle and daub panel(short)	per sqm	7.83	₹ 150.00	₹ 1,174.50
	Deductions	per sqm	3.75	₹ 150.00	₹ 562.50
	Mud plaster for daub 1 (short)	per sqm	43.56	50	₹ 2,178.00
	Mud plaster for daub 2 (tall)	per sqm	7.83	50	₹ 391.50
	Deductions	per sqm	3.75	50	₹ 187.50
	stabilized mud plaster for exterior 1 (short)	per sqm	43.56	80	₹ 3,484.80
	stabilized mud plaster for exterior 2 (tall)	per sqm	7.83	80	₹ 626.40
	Deductions	per sqm	3.75	80	₹ 300.00
	Brickwork	pieces	2256	₹ 4.00	₹ 9,024.00
	Doors	per unit	2	₹ 800.00	₹ 1,600.00
	windows	per unit	5	₹ 500.00	₹ 2,500.00
	RBC Columns	per unit	6	₹ 800.00	
	Labour				₹ 8,000.00
X	**TOTAL**				**₹ 36,563.20**
3	**STRUCTURE ROOF**				
	Bamboo columns 1	pieces	3	₹ 150.00	₹ 450.00
	Bamboo columns 2	pieces	15	₹ 150.00	₹ 2,250.00
	Bamboo for roof	pieces	21	₹ 150.00	₹ 3,150.00
	Bamboo for rafter	pieces	14	₹ 150.00	₹ 2,100.00
	Bamboo perimeter tie	pieces	2	₹ 150.00	₹ 300.00
	Bamboo for splits	pieces	30	₹ 150.00	₹ 4,500.00
	Bamboo for intermediate floor	pieces	5	₹ 150.00	₹ 750.00
	Labour				₹ 12,000.00
Y	**TOTAL**				**₹ 25,500.00**
4	**ROOF**				
	CGI Sheets	sqm	18	800	₹ 14,400.00
	Thatch	cum	13.12	₹ 100.00	₹ 1,312.00
	Labour				₹ 2,520.00
Z	**TOTAL**				**₹ 18,232.00**
	W+X+Y+Z				**₹ 106,696.40**
	GRAND TOTAL	**₹ 106,696.40**			
	AREA (sqm)	**24.3**			
	RATE OF CONSTRUCTION (per sqm)	**₹ 4,390.80**			
	AREA (sqft)	**260.01**			
	RATE OF CONSTRUCTION (per sqft)	**₹ 410.35**			


JH-02


Extension 1


Extension 2

Highlights of the Prototype

- Built up area of the house is optimised to 28 sq.m. with possiblity for incremental growth upto 83 sq.m.
- Construction is done with load bearing stone masonry walls.
- A continuous timber lintel band is provided to support the loft & protect against seismic activities.
- Roofs are covered with country tiles with timber roof understructure. Treated bamboo is used for rafters, purlins & battens.
- A loft has been provided for additional storage space.
- The main house consists of 2 rooms. 1 room is used to store agricultural produce where as at the other acts as a space for ancillary activities such as cookng & rearing cattle.

Recommendations for Built Form		
Plan Layout	**Plinth/Floor**	**Roof Profile**
Large open spaces in form of central courtyard, backyard or front yard. Elements like tulsi- kyari and intermediate loft – incorporated. Loft design structure.	High Plinth Floor	Flat roof.

Recommendations for construction systems	
Components	**Recommended Specifications**
Foundations	• Stone foundation with cement-sand packing • Brick foundation
Plinth	• Minimum (300 mm or 150mm more than last 50 year flood level)
Wall	• Cob walls with mesh and cement plaster
Wall Finish	• Stabilised mud plaster
Roof Structure	• Roof slope angle – min. 25 & max 45. • Bamboo understructure
Roof Cover	• CGI sheets • Bamboo sheets
Floor	• cement flooring
Door and Windows	• Mild steel door and window

JH-02

This typology is applicable to Zone A & C

Zone A highlights: This region has parts of the state that fall under zone 3 of earthquakes, one of the highest for the state.However, in terms of possibility of earthquake and related damage, this is still moderate risk area.

Zone C highlights: Entire region comes under earthquake zone 2, and hence is one of the safest regions from the viewpoint of earthquake safety. Similarly, flooding or cyclones are also almost non existant threats for houses in the region.

Zone A & C comprises of the following districts

1. Dhanbad
2. Jamtara
3. Bokaro
4. Khunti
5. Ramgarh
6. Ranchi
7. Saraikelat
8. Simdega
9. West Singhbhum
10. East Singhbhum

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JH-02

Area Statement:

Item	Area	
	Sq.m	Sq.ft
Room	12.28	132.18
Verandah	9.08	97.74
Carpet Area	12.28	132.18
Built up Area	**27.14**	**292.13**

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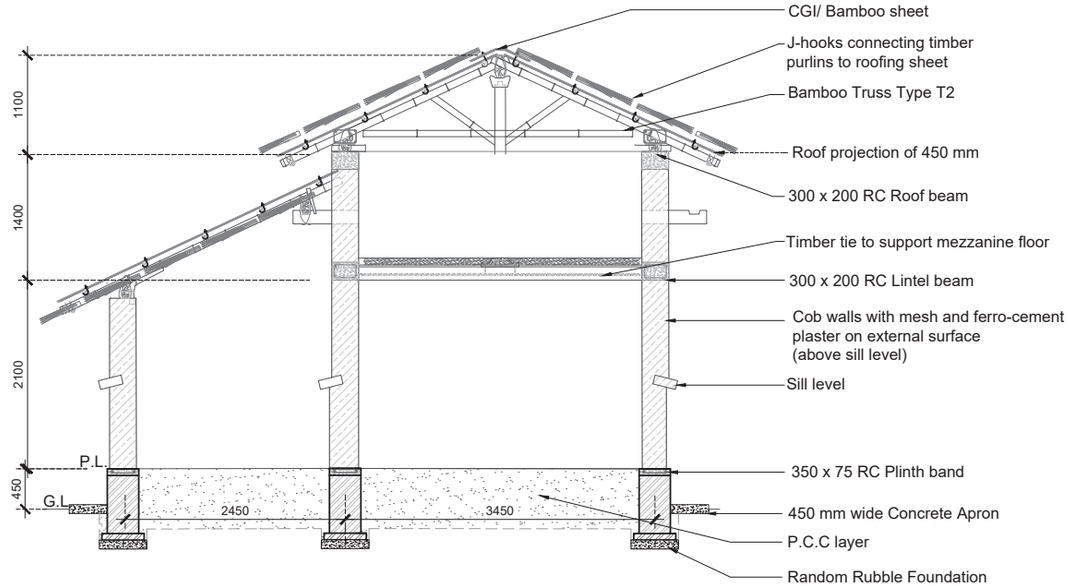
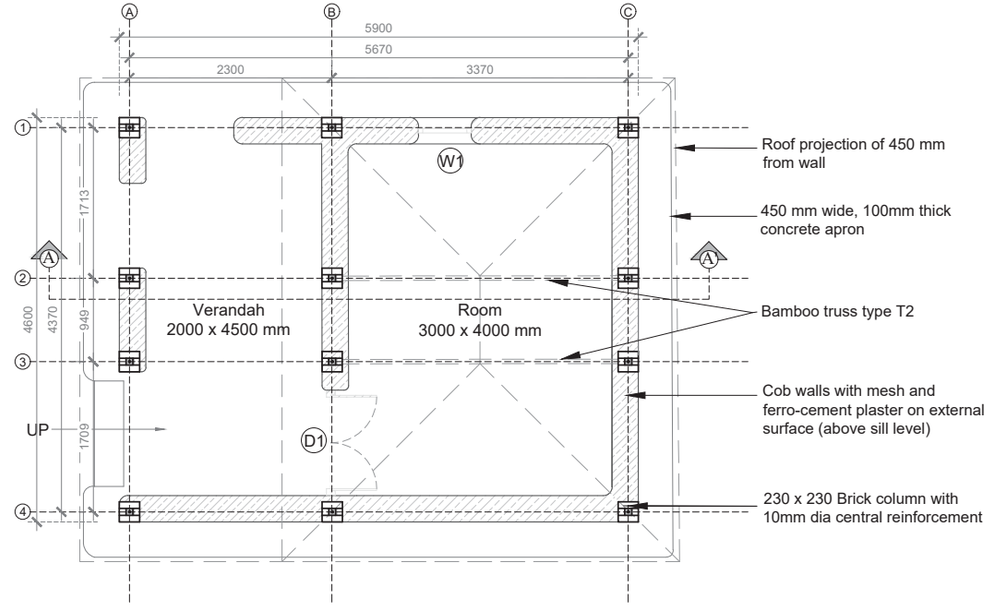


TYPICAL SECTION AA'



TYPICAL PLAN

SR. NO.		Unit	Quantity	Rate per unit (Rs)	Cost
1	**FOUNDATION**				
	P.C.C.	cum	1.25	₹ 2,700.00	₹ 3,375.00
	Brickwork	brick no.	3269	₹ 4.00	₹ 13,076.00
	R.C.C. Plinth Beam	cum	0.65	₹ 7,000.00	₹ 4,550.00
	Plinth Filling for Otta	cum	4.65	₹ 200.00	₹ 930.00
	Plinth Filling for Room	cum	10.35	₹ 200.00	₹ 2,070.00
	Labour				₹ 8,800.00
W	**TOTAL**				**₹ 32,801.00**
2	**WALLS**				
	cob 1 (short)	cum	4.72	₹ 125.00	₹ 590.00
	cob 2 (tall)	cum	29.526	₹ 125.00	₹ 3,690.75
	Deductions	cum	1.62	₹ 125.00	₹ 202.50
	Labour				₹ 10,000.00
X	**TOTAL**				**₹ 14,483.25**
	DOOR AND WINDOW				
	Doors	per unit	1	₹ 1,000.00	₹ 1,000.00
	Window	per unit	2	₹ 500.00	₹ 1,000.00
	TOTAL				**₹ 2,000.00**
3	**STRUCTURE ROOF**				
	Timber for Intermediate Floor	cum	0.45	₹ 5,000.00	₹ 2,250.00
	Bamboo for Intermediate Floor	piece	16	₹ 150.00	₹ 2,400.00
	Other materials for Intermediate Floor	lump sum		₹ 1,000.00	₹ 1,000.00
	Timber for Roof (4" X 6")	cum	0.48	₹ 5,000.00	₹ 2,400.00
	Timber for Roof (6" X 8")	cum	0.3	₹ 5,000.00	₹ 1,500.00
	Timber for Roof (other)	cum	1.75	₹ 5,000.00	₹ 8,750.00
	Bamboo for Roof	piece	38	₹ 150.00	₹ 5,700.00
	Bamboo splits for Roof	piece	26	₹ 150.00	₹ 3,900.00
	Other Materials	Lump Sum		₹ 3,000.00	₹ 3,000.00
Y	**TOTAL**				**₹ 27,900.00**
4	**ROOF**				
	Sheet	per piece	17	800	₹ 13,600.00
	Thatch	cum	16.64	₹ 100.00	₹ 1,664.00
Z	**TOTAL**				**₹ 15,264.00**
	W+X+Y+Z				**₹ 92,448.25**
	GRAND TOTAL	**₹ 92,448.25**			
	AREA (sqm)	**36.81**			
	RATE OF CONSTRUCTION (per sqm)	**₹ 2,511.50**			
	AREA (sqft)	**393.867**			
	RATE OF CONSTRUCTION (per sqft)	**₹ 234.72**			

JH-02
Cost estimate

Cost breakup

Item	Cost (INR)
Foundation	₹ 32,801.00
Wall	₹ 14,483.25
Roof	₹ 43,164.00
Door window	₹ 2,000.00
Total	**₹ 92,448.25**

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JH-03

This typology is applicable to Zone B

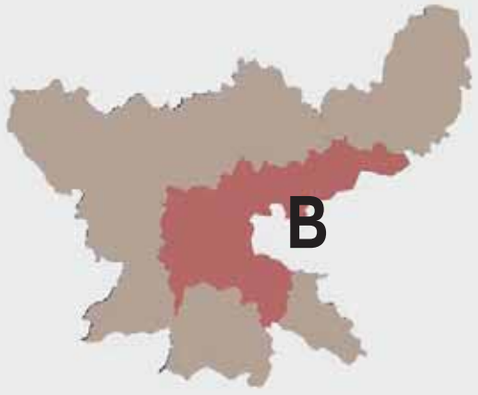
Zone B highlights: presence of mining relted activities. Highly industrialised parts of the state.

Zone B comprises of the following districts

1. Simdega
2. West Singhbhum
3. East Singhbhum

Resources Available

- Timber And Bamboo
- Fly Ash Brick
- Stone



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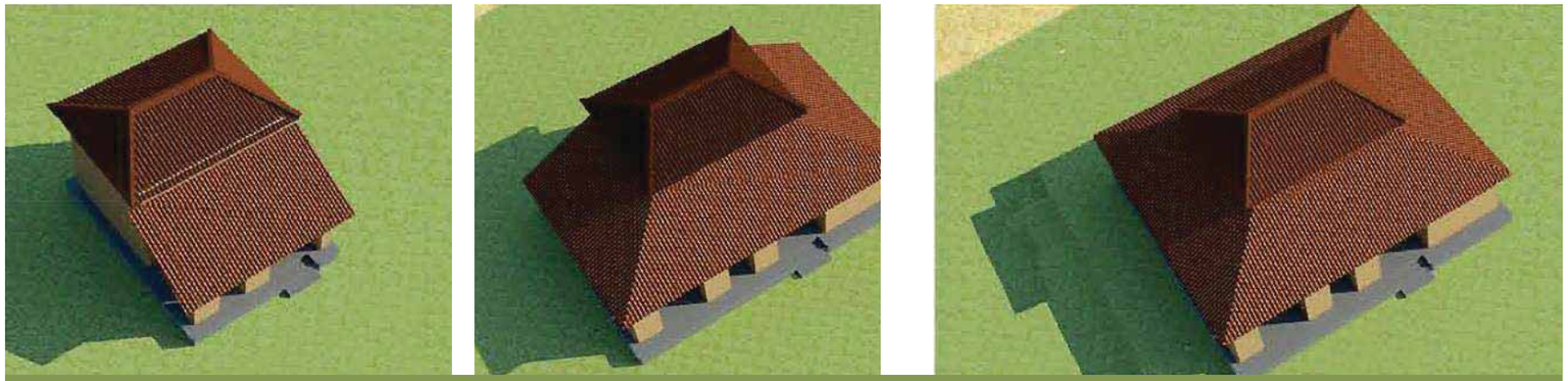


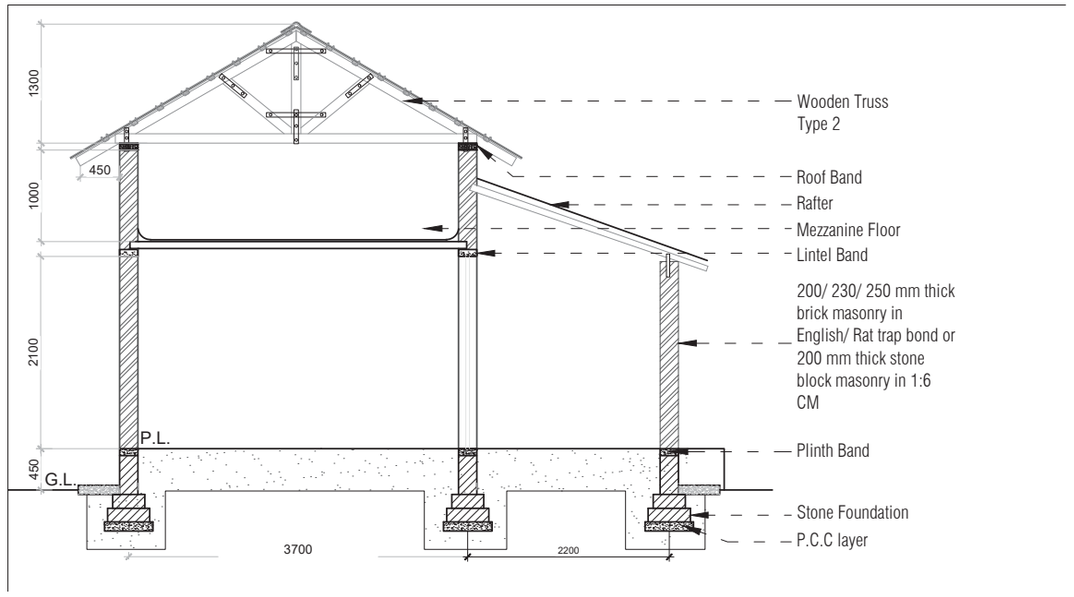
JH-03

Highlights

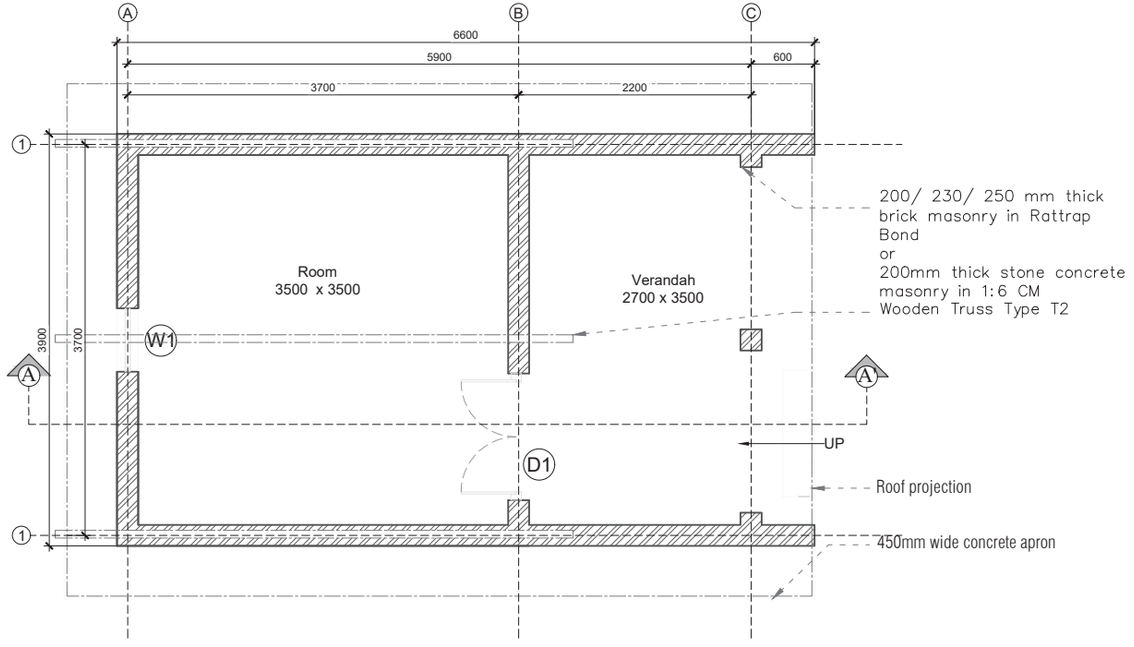
- Built up area of the house is optimized to 31.11 sq.m. with possibility for incremental growth upto 91.0 sq.m.
- construction with brick walls A continuous timber lintel band is provided to support the loft and protect against seismic activities.
- A loft has been provided for additional storage space.
- Roofs covered with thatch and timber roof understructure. Treated bamboo is used for rafters, purlins & battens.
- Main spaces of the house including room, semi-open veranda & kitchen are organised aroudn a central courtyard.

Recommendations for Built Form		
Plan Layout	**Plinth/Floor**	**Roof Profile**
Large open spaces in form of central courtyard, backyard or front yard. Elements like tulsi- kyari and intermediate loft – incorporated. Loft design structure.	High Plinth Floor	Sloped roof.

Recommendations for construction systems	
Components	**Recommended Specifications**
Foundations	• RR stone masonry foundation with cement mortar • minimum depth based on soil strata, min 450 mm • minimum width 450 mm
Plinth	• Minimum(300mm or 150mm more than last 50 year flood level)
Wall	• 200 mm thk stone block masonry • Rat trap bond brick
Wall Finish	• stabilised Mud wall plastered finish.
Roof Structure	• Roof slope angle – min 25 & max 30. • Covered with sheet & has treated timber understructure.
Roof Cover	• Bengal tile.
Floor	• Mud filling over plastic sheet



TYPICAL SECTION AA'



TYPICAL PLAN

JH-03

Area Statement:

Item	Area	
	Sq.m	Sq.ft
Room	12.49	134.44
Verandah	7.00	75.35
Carpet Area	12.49	134.44
Built up Area	**25.74**	**277.07**

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JH-03
Cost estimate

Cost breakup

Item	Cost (INR)
Foundation	₹ 34979.71
Walls	₹ 19,445/-
Doors/Windows	₹ 6,000/-
Floor and Roof	₹ 67,300/-
Total	₹ **147,724.71 /-**

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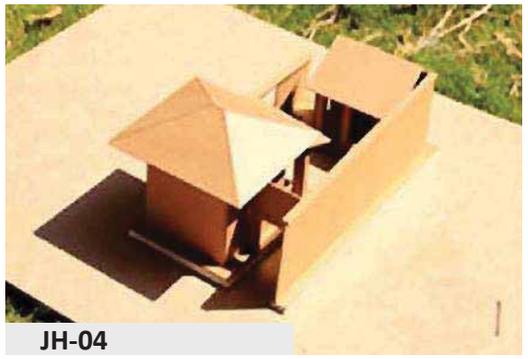
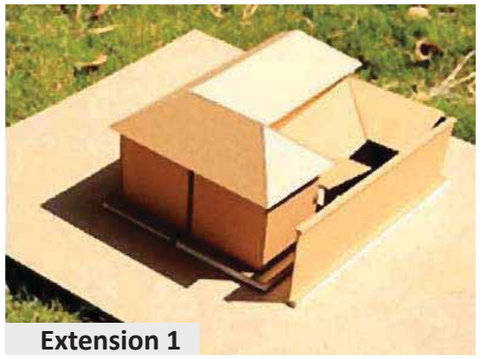
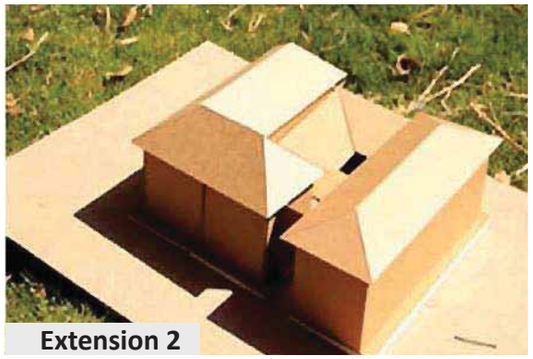
SR. NO.		CS Area	Quantity	Volume	Material cost	Rate per unit (Rs.)	Unit	Labour cost
		sqm	Nos.	cum				
1	**FOUNDATION**							
	Stone Foundation	0.46		19.274	23417.91	1215	CMt	
	Plinth Filling for House	36.5		10.95	2190	200	CMt	8800
	Plinth Filling for Cowshed	19.06		2.859	571.8	200	CMt	
W	**TOTAL**				**26179.71**			**8800**
								34979.71
2	**WALLS**							
	cob 1 (short)	11.64		29.1			CMt	
	cob 2 (tall)	6.885		28.2285			CMt	12500
	Deductions	3.93		1.7685			CMt	
	Cob Work (all)			55.56	6945	125	CMt	
X	**TOTAL**				**6945**			**12500**
								19445
3	**INTERMEDIATE FLOOR AND ROOF**							
	Timber for Intermediate Floor	0.015		0.3	1500	5000	CMt	4000
	Bamboo for Intermediate Floor		14		2100	150	per Piece	
	Other materials for Intermediate Floor				1000		Lump Sum	
	Timber for Roof (4" X 6")	0.015	1	0.63	3150	5000	CMt	
	Timber for Roof (6" X 8")	0.03	4	0.3	1500	5000	CMt	
	Timber for Roof (other)			3	15000	5000	CMt	9000
	Bamboo for Roof		58		8700	150	per Piece	
	Bamboo splits		46		6900	150	per piece	
	Manglore tiles		1050		9450	9	per Piece	
	Other Materials				5000		Lump Sum	
Y	**TOTAL**				**54300**			**13000**
								67300
3	**DOORS, WINDOWS AND OTHER FINISHES**							
	Door		1		1000	1000	per Piece	
	Windows		1		500	500	per Piece	2500
	Hand plaster and other finishes				2000		Lump Sum	
Z	**TOTAL**				**3500**			**2500**
								6000
					90,924.71			**36,800.00**
					A			B
	Total (A+B)	**127,724.71**						
	Total (C)	**20,000.00**						
	GRAND TOTAL (A+B+C)	**147,724.71**						
	AREA (sqm)	**50.15**						
	RATE OF CONSTRUCTION (per sqm)	**2,945.66**						
	AREA (sqft)	**539.61**						
	RATE OF CONSTRUCTION (per sqft)	**273.76**						


JH-04


Extension 1


Extension 2

Highlights of the Prototype - JH-D-01

- Built up area of the house is optimised to 51.90 sq.m. with possiblity for incremental growth upto 176 sq.m.
- Construction with load bearing tapering cob walls, reducing from bottom to top for increased stability.
- A continuous timber lintel band is provided to support the loft & protect against seismic activities.
- Roofs are covered with bengal tiles with timber roof understructure. Treated bamboo is used for rafters, purlins & battens.
- Main spaces of the house including room, semi-open veranda & kitchen are organised aroudn a central courtyard.
- Courtyard ventilates the surrounding rooms, provides a space for interaction.

Recommendations for Built Form		
Plan Layout	**Plinth/Floor**	**Roof Profile**
Characterised by Santhal cultural associations. Large open spaces in form of central courtyard, backyard or front yard. Elements like tulsi- kyari and intermediate loft – incorporated. Loft design structure.	Normal plinth design.	Sloped roof.

Recommendations for construction systems	
Components	**Recommended Specifications**
Foundations	• Brick foundation with cement mortar • Minimum depth – 450mm • Minimum width 450mm
Plinth	• Minimum(300mm or 150mm more than last 50 year flood level)
Wall	• 300 mm thk stone block masonry
Wall Finish	• Stabilised Mud wall plastered finish.
Roof Structure	• Roof slope angle – min 38 & max 45. • Covered with sheet & has treated bamboo/ timber understructure.
Roof Cover	• Bengal tile.
Floor	• cement flooring

JH-04

This typology is applicable to Zone B & C

Zone B highlights: presence of mining relted activities. Highly industrialised parts of the state.

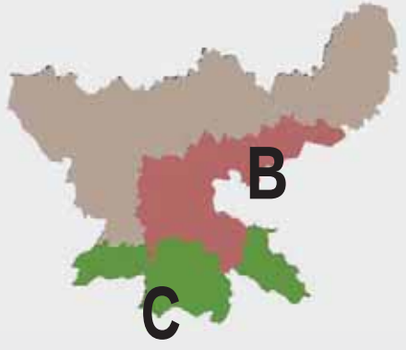
Zone C highlights: Seismic zone 2. Presence of a wider variety of construction materials.

Zone B & C comprises of the following districts

1. Jamtara
2. Dhanbad
3. Bokaro
4. Ramgarh
5. Ranchi
6. Khunti
7. Serakela Kharsawan
8. Simdega
9. West Singhbhum
10. East Singhbhum

Resources Available

- Timber And Bamboo
- Fly Ash Brick
- Stone

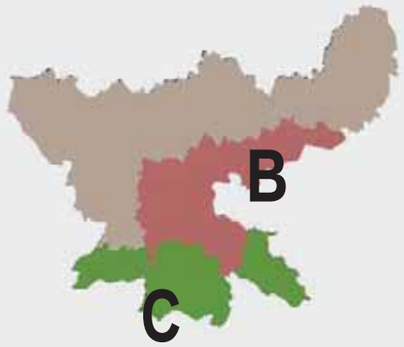


JHARKHAND

JH-04

Area Statement:

Item	Area	
	Sq.m	Sq.ft
Room 1	7.36	79.22
Room 2	12.61	135.73
Carpet Area	19.97	214.96
Built up Area	**26.24**	**282.45**



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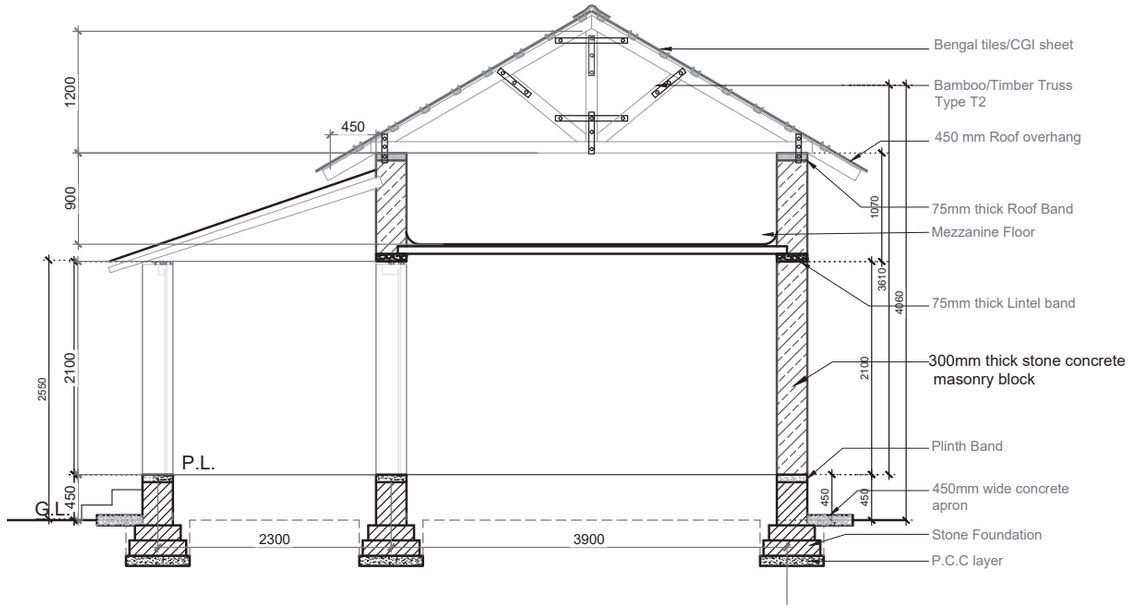
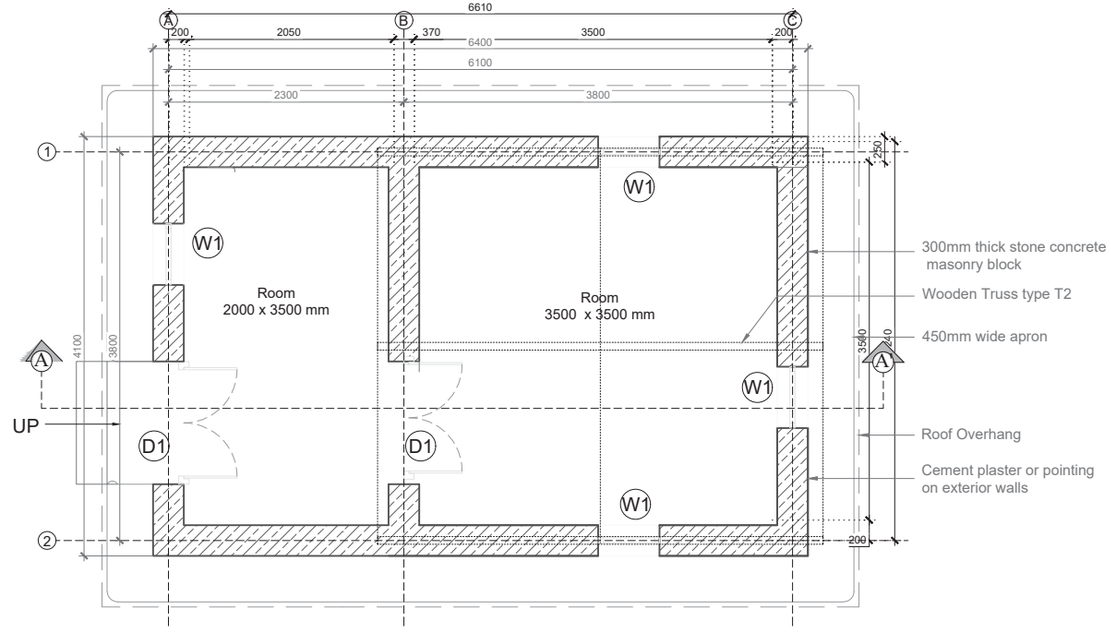


TYPICAL SECTION AA'



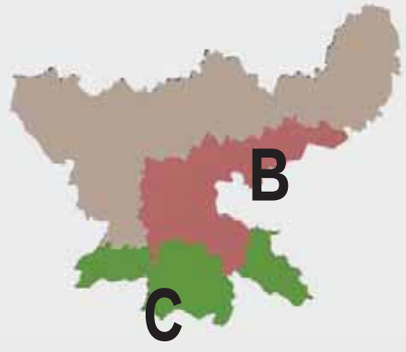
TYPICAL PLAN

SR. NO.		Unit	Quantity	Rate per unit (Rs)	Cost
1	**FOUNDATION**				
	P.C.C.	cum	1.49	₹ 2,700.00	₹ 4,023.00
	Brickwork	brick no.	3200	₹ 4.00	₹ 12,800.00
	R.C.C. Plinth Beam	cum	0.47	₹ 7,000.00	₹ 3,290.00
	Plinth Filling for Otta	cum	3.77	₹ 200.00	₹ 754.00
	Plinth Filling for Room	cum	8.37	₹ 200.00	₹ 1,674.00
	Labour				₹ 8,800.00
W	**TOTAL**				**₹ 31,341.00**
2	**WALLS**				
	Stone 1 (short)	per sqm	9.3	₹ 1,215.00	₹ 11,299.50
	Stone 2 (tall)	per sqm	20.3	₹ 1,215.00	₹ 24,664.50
	Deductions	per sqm	1.3	₹ 1,215.00	₹ 1,579.50
	Labour				₹ 18,000.00
X	**TOTAL**				**₹ 55,543.50**
	DOOR AND WINDOW				
	Doors	per unit	2	₹ 1,000.00	₹ 2,000.00
	Window	per unit	2	₹ 500.00	₹ 1,000.00
	TOTAL				**₹ 3,000.00**
3	**STRUCTURE ROOF**				
	Timber for Intermediate Floor	cum	0.258	5000	₹ 1,290.00
	Bamboo for Intermediate Floor	per piece	16	₹ 150.00	₹ 2,400.00
	Other materials for Intermediate Floor	lumpsum		₹ 2,000.00	₹ 2,000.00
	Metal Ties	per kg	6	₹ 55.00	₹ 330.00
	Timber truss	cu ft	12.95	500	₹ 6,475.00
	Timber roof for front room	per cu ft	3.13	₹ 500.00	₹ 1,565.00
	Bamboo Splits	per piece	8	₹ 150.00	₹ 1,200.00
	Labour				₹ 10,500.00
Y	**TOTAL**				**₹ 25,760.00**
4	**ROOF**				
	Country tiles	per piece	4000	1	₹ 4,000.00
	Other materials	lumpsum		₹ 3,000.00	₹ 3,000.00
Z	**TOTAL**				**₹ 7,000.00**
	W+X+Y+Z				**₹ 122,644.50**
	GRAND TOTAL	**₹ 122,644.50**			
	AREA (sqm)	**32.39**			
	RATE OF CONSTRUCTION (per sqm)	**₹ 3,786.49**			
	AREA (sqft)	**346.573**			
	RATE OF CONSTRUCTION (per sqft)	**₹ 353.88**			

JH-04
Cost estimate

Cost breakup

Item	Cost (INR)
Foundation	₹ 31,341.00
Wall	₹ 55,543.50
Roof	₹ 32,760.00
Door window	₹ 3,000.00
Total	**₹ 122,644.50**



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JH-05

This typology is applicable to Zone D

Zone D highlights: This zone partially falls under seismic zone I & II.

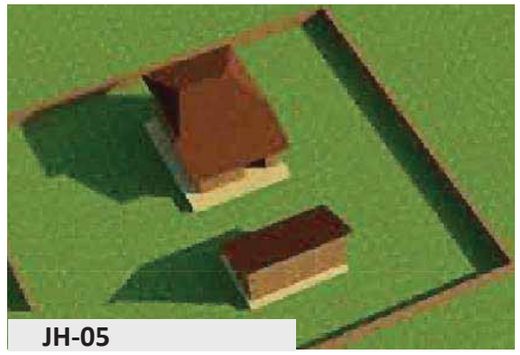
Zone D comprises of the following districts

1. Garhwa
2. Palamu
3. Latehar
4. Chatra
5. Lohardage
6. Gumla
7. Hazaribagh
8. Koderma
9. Giridh

Resources Available

- Timber And Bamboo
- Fly Ash Brick
- Stone

JHARKHAND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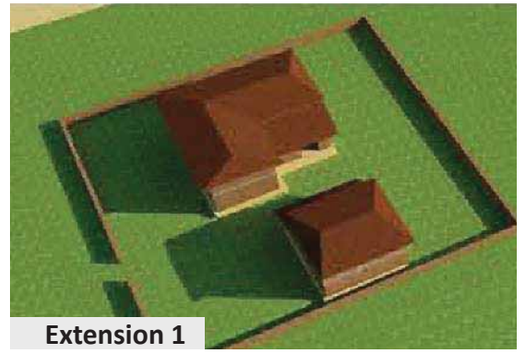
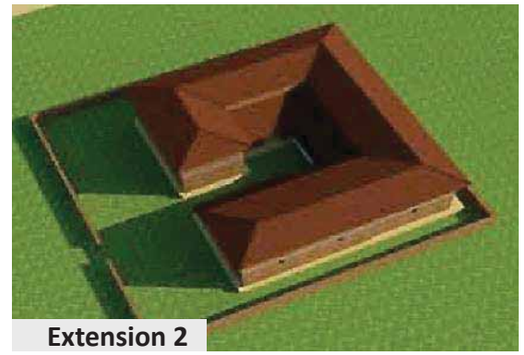

Extension 1

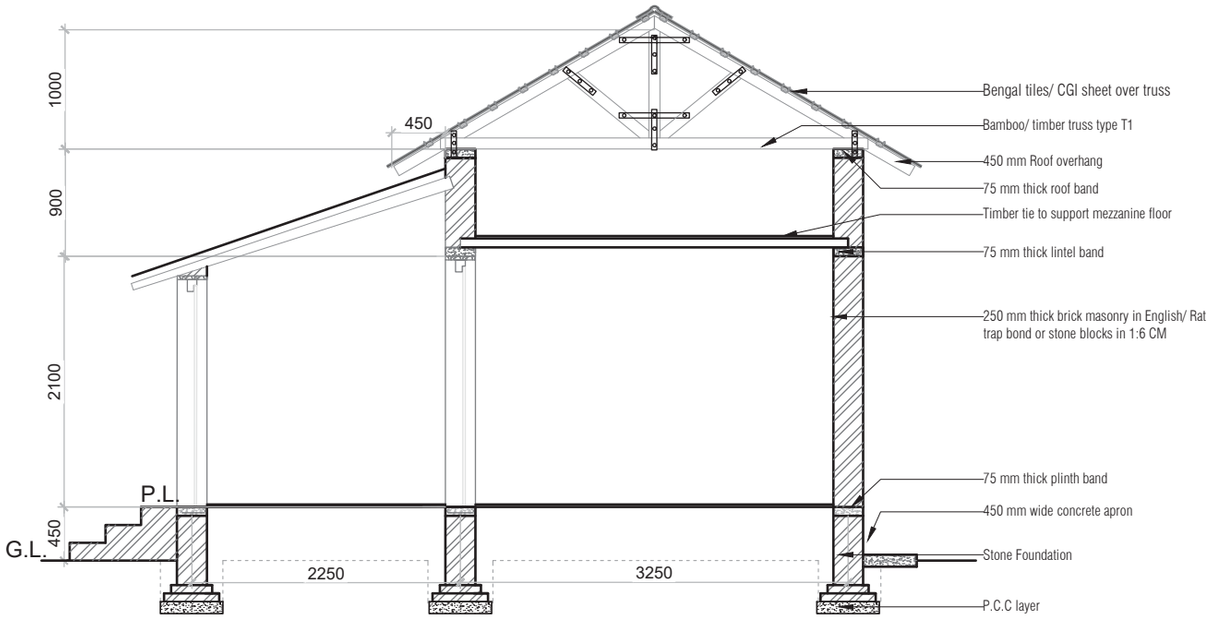

Extension 2

Highlights of the Prototype

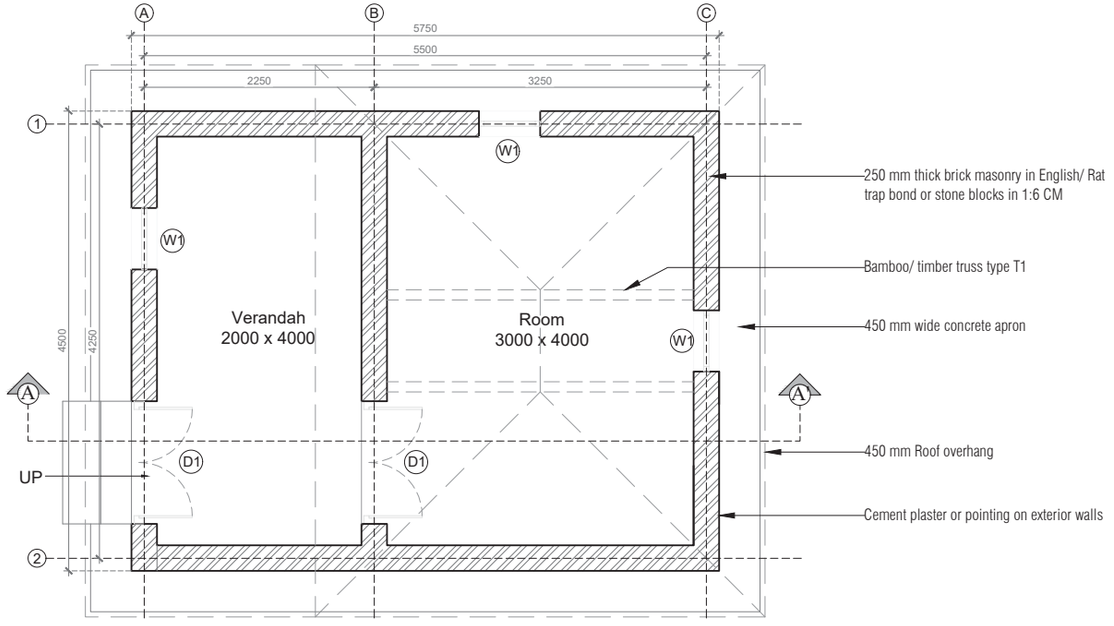
- Built up area of the house is optimized to 25.88 sq.m. with possibility for incremental growth up to 198.0 sq.m.
- The main house consists of a room and veranda. The room is used to store agricultural produce where as the veranda acts as a space for ancillary activities such as cooking and rearing cattle.
- Wall is constructed with stabilized adobe blocks
- Roof is covered with country tiles and timber- bamboo under structure

Recommendations for Built Form		
Plan Layout	**Plinth/Floor**	**Roof Profile**
Characterised by Santhal cultural associations. Large open spaces in form of central courtyard, backyard or front yard. Elements like tulsi- kyari and intermediate loft – incorporated. Loft design structure.	Normal plinth design.	Sloped roof.

Recommendations for construction systems	
Components	**Recommended Specifications**
Foundations	• Stone foundation. • Minimum depth – 450mm • Minimum width 450mm
Plinth	• Minimum(300mm or 150mm more than last 50 year flood level)
Wall	• Brick masonry with Rat-trap bond • Stone block masonry
Wall Finish	• Stabilised Mud wall plastered finish.
Roof Structure	• Roof slope angle – min 38 & max 45. • Covered with sheet & has treated bamboo/timber understructure.
Roof Cover	• Bengal tile.
Floor	• cement flooring



TYPICAL SECTION AA'



TYPICAL PLAN

JH-05

Area Statement:

Item	Area	
	Sq.m	Sq.ft
Room	12.30	132.40
Verandah	8.30	89.34
Carpet Area	12.30	132.40
Built up Area	**25.87**	**278.46**

JHARKHAND

JH-05
Cost estimate

Cost breakup

Item	Cost (INR)
Foundation	₹ 25,638.00
Wall	₹ 35,703.50
Roof	₹ 32,760.00
Door window	₹ 3,000.00
Total	**₹ 97,101.50**

JHARKHAND

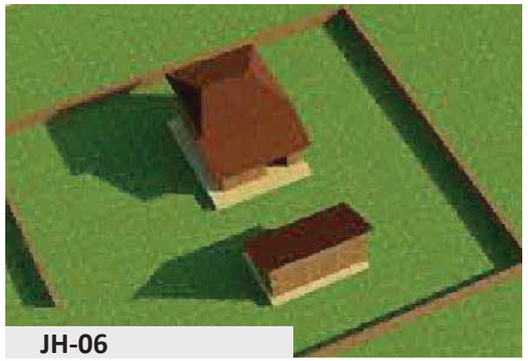
SR. NO.		Unit	Quantity	Rate per unit (Rs)	Cost
1	**FOUNDATION**				
	P.C.C.	cum	1.2	₹ 2,700.00	₹ 3,240.00
	Brickwork	brick no.	2340	₹ 3.50	₹ 8,190.00
	R.C.C. Plinth Beam	cum	0.42	₹ 7,000.00	₹ 2,940.00
	Plinth Filling for Otta	cum	3.77	₹ 200.00	₹ 754.00
	Plinth Filling for Room	cum	8.57	₹ 200.00	₹ 1,714.00
	Labour				₹ 8,800.00
W	**TOTAL**				**₹ 25,638.00**
2	**WALLS**				
	Brick 1 (short)	per sqm	1767	₹ 3.50	₹ 6,184.50
	Brick 2 (tall)	per sqm	8434	₹ 3.50	₹ 29,519.00
	Labour				₹ 12,500.00
X	**TOTAL**				**₹ 35,703.50**
	DOOR AND WINDOW				
	Doors	per unit	2	₹ 1,000.00	₹ 2,000.00
	Window	per unit	2	₹ 500.00	₹ 1,000.00
	TOTAL				**₹ 3,000.00**
3	**STRUCTURE ROOF**				
	Lintel Band	cum	0.616	7000	₹ 4,312.00
	Timber for Intermediate Floor	cum	0.258	5000	₹ 1,290.00
	Bamboo for Intermediate Floor	per piece	16	₹ 150.00	₹ 2,400.00
	Other materials for Intermediate Floor	lumpsum		₹ 2,000.00	₹ 2,000.00
	Metal Ties	per kg	6	₹ 55.00	₹ 330.00
	Timber truss	cu ft	12.95	500	₹ 6,475.00
	Timber roof for front room	per cu ft	3.13	₹ 500.00	₹ 1,565.00
	Bamboo Splits	per piece	8	₹ 150.00	₹ 1,200.00
	Labour				₹ 10,500.00
Y	**TOTAL**				**₹ 25,760.00**
4	**ROOF**				
	Country tiles	per piece	4000	1	₹ 4,000.00
	Other materials	lumpsum		₹ 3,000.00	₹ 3,000.00
Z	**TOTAL**				**₹ 7,000.00**
	W+X+Y+Z				**₹ 97,101.50**
	GRAND TOTAL	**₹ 97,101.50**			
	AREA (sqm)	**30.94**			
	RATE OF CONSTRUCTION (per sqm)	**₹ 3,138.38**			
	AREA (sqft)	**331.058**			
	RATE OF CONSTRUCTION (per sqft)	**₹ 293.31**			

JH-06

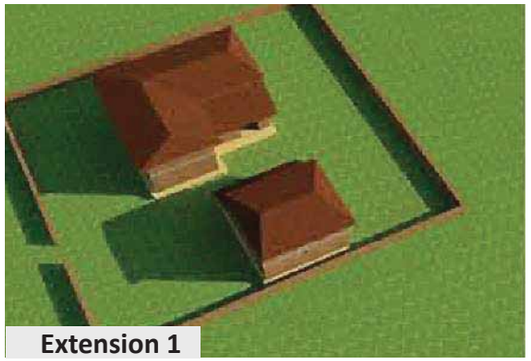
This typology is applicable to all the housing zones in Jharkhand

Resources Available

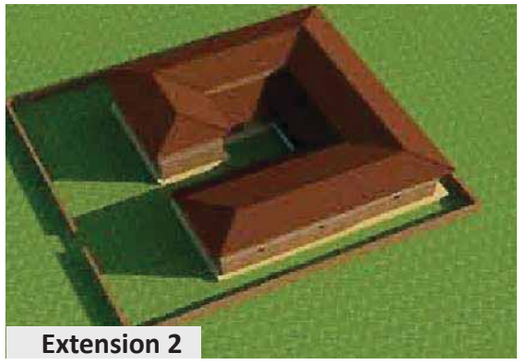
- Timber And Bamboo
- Fly Ash Brick
- Stone



JH-06



Extension 1



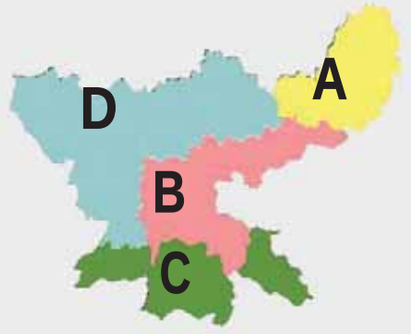
Extension 2

Highlights of the Prototype

- Built up area of the house is optimised to 25.86 sq.m. with possiblity for incremental growth upto 185 sq.m.
- Construction is done with load bearing stabilised adobe bricks.
- A continuous timber lintel band is provided to support the loft & protect against seismic activities.
- Roofs are covered with country tiles with timber roof understructure. Treated bamboo is used for rafters, purlins & battens.
- A loft has been provided for additional storage space.
- The main house consists of 2 rooms. 1 room is used to store agricultural produce where as at the other acts as a space for ancillary activities such as cookng & rearing cattle.

Recommendations for Built Form		
Plan Layout	**Plinth/Floor**	**Roof Profile**
Characterised by Santhal cultural associations. Large open spaces in form of central courtyard, backyard or front yard. Elements like tulsi- kyari and intermediate loft – incorporated. Loft design structure.	Normal plinth design.	Sloped roof.

Recommendations for construction systems	
Components	**Recommended Specifications**
Foundations	• Stone foundation with cement mortar • Minimum depth – 450mm • Minimum width 450mm
Plinth	• Minimum(300mm or 150mm more than last 50 year flood level)
Wall	• 250 mm thk Adobe wall • Continuous earthquake bands in the structure.
Wall Finish	• stabilised Mud wall plastered finish.
Roof Structure	• Roof slope angle – min 38 & max 45. • Covered with sheet & has treated bamboo/timber understructure.
Roof Cover	• Bengal tile.
Floor	• cement flooring

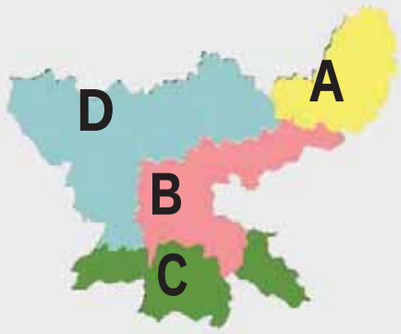


JHARKHAND

JH-06

Area Statement:

Item	Area	
	Sq.m	Sq.ft
Room	12.30	132.40
Verandah	8.30	89.34
Carpet Area	12.30	132.40
Built up Area	**25.87**	**278.46**



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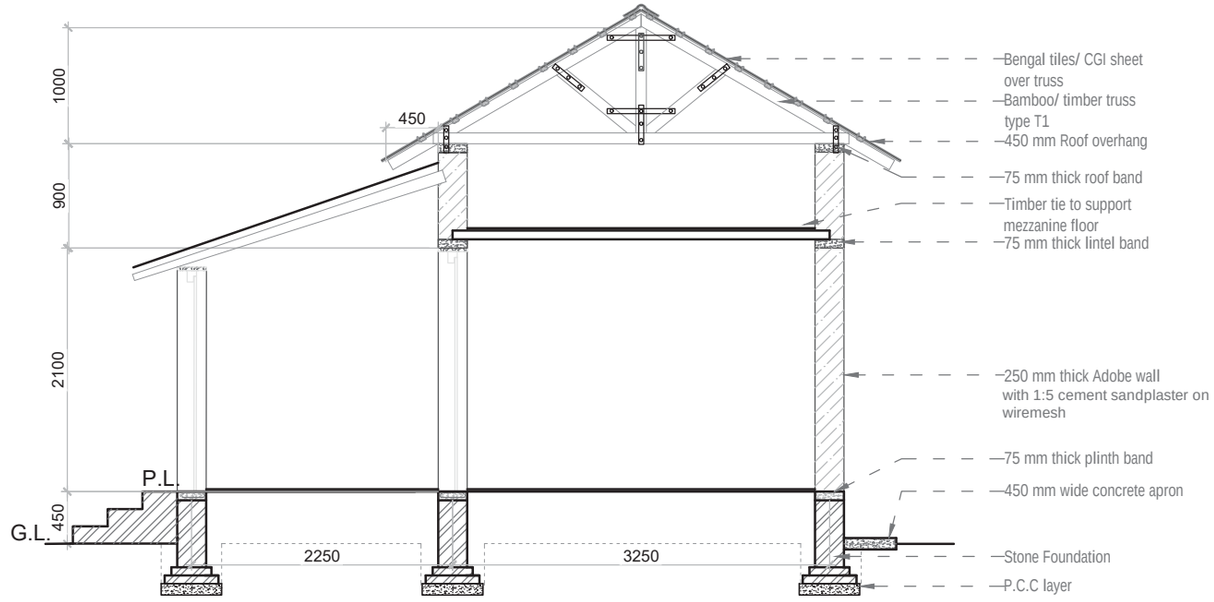
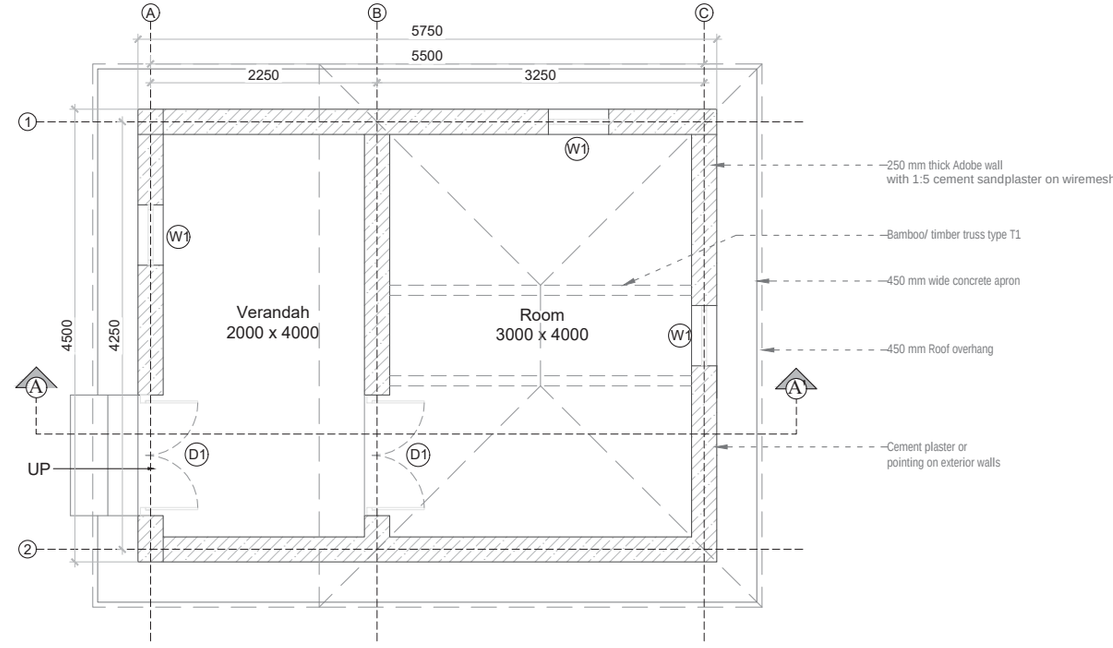


TYPICAL SECTION AA'



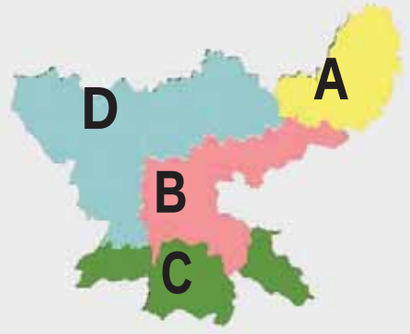
TYPICAL PLAN

SR. NO.		Unit	Quantity	Rate per unit (Rs)	Cost
1	**FOUNDATION**				
	P.C.C.	cum	1.2	₹ 2,700.00	₹ 3,240.00
	Brickwork	brick no.	2340	₹ 3.50	₹ 8,190.00
	R.C.C. Plinth Beam	cum	0.42	₹ 7,000.00	₹ 2,940.00
	Plinth Filling for Otta	cum	3.87	₹ 200.00	₹ 774.00
	Plinth Filling for Room	cum	7.875	₹ 200.00	₹ 1,575.00
	Labour				₹ 8,800.00
W	**TOTAL**				**₹ 25,519.00**
2	**WALLS**				
	Adobe 1 (short)	cum	3.906	₹ 2,000.00	₹ 7,812.00
	Adobe 2 (tall)	cum	21.66	₹ 2,000.00	₹ 43,320.00
	Deductions	cum	1.57	₹ 2,000.00	₹ 12,500.00
	Labour				₹ 12,500.00
X	**TOTAL**				**₹ 51,132.00**
	DOOR AND WINDOW				
	Doors	per unit	2	₹ 1,000.00	₹ 2,000.00
	Window	per unit	3	₹ 500.00	₹ 1,500.00
	Hand plaster and other finishes	lump sum			₹ 2,000.00
	TOTAL				**₹ 5,500.00**
3	**STRUCTURE ROOF**				
	Lintel Band	cum	0.616	7000	₹ 4,312.00
	Timber for Intermediate Floor	cum	0.258	5000	₹ 1,290.00
	Bamboo for Intermediate Floor	per piece	16	₹ 150.00	₹ 2,400.00
	Other materials for Intermediate Floor	lumpsum		₹ 2,000.00	₹ 2,000.00
	Metal Ties	per kg	6	₹ 55.00	₹ 330.00
	Timber truss	cu ft	12.95	500	₹ 6,475.00
	Timber roof for front room	per cu ft	3.13	₹ 500.00	₹ 1,565.00
	Bamboo Splits	per piece	8	₹ 150.00	₹ 1,200.00
	Labour				₹ 13,000.00
Y	**TOTAL**				**₹ 28,260.00**
4	**ROOF**				
	Country tiles	per piece	4000	1	₹ 4,000.00
	Other materials	lumpsum		₹ 3,000.00	₹ 3,000.00
Z	**TOTAL**				**₹ 7,000.00**
	W+X+Y+Z				**₹ 117,411.00**
	GRAND TOTAL	**₹ 117,411.00**			
	AREA (sqm)	**32.86**			
	RATE OF CONSTRUCTION (per sqm)	**₹ 3,573.07**			
	AREA (sqft)	**351.602**			
	RATE OF CONSTRUCTION (per sqft)	**₹ 333.93**			

JH-06
Cost estimate

Cost breakup

Item	Cost (INR)
Foundation	₹ 25,519.00
Wall	₹ 51,132.00
Roof	₹ 35,260.00
Door window	₹ 3,500.00
Total	**₹ 115,411.00**



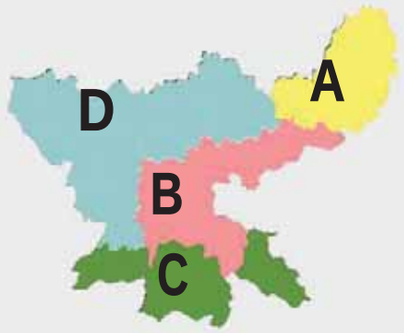
JHARKHAND

JH-07

This typology is applicable to all the housing zones in Jharkhand

Resources Available

- Timber And Bamboo
- Fly Ash Brick
- Stone



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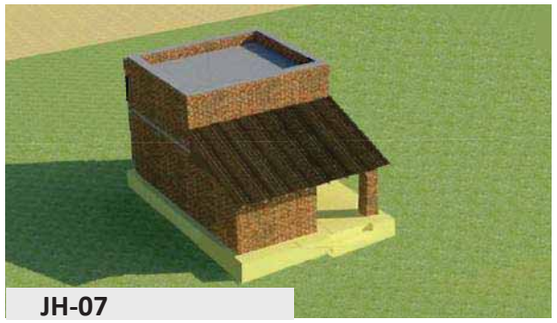
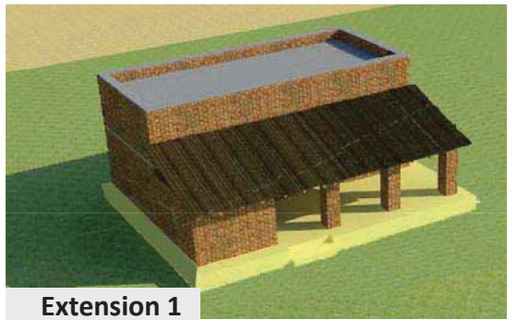
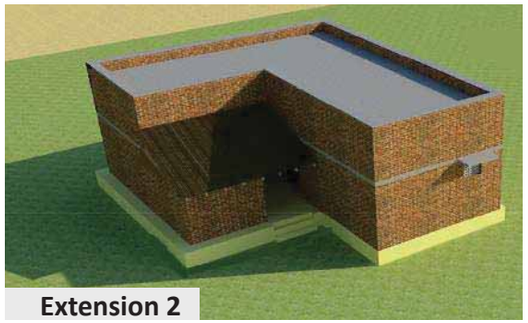


JH-07



Extension 1



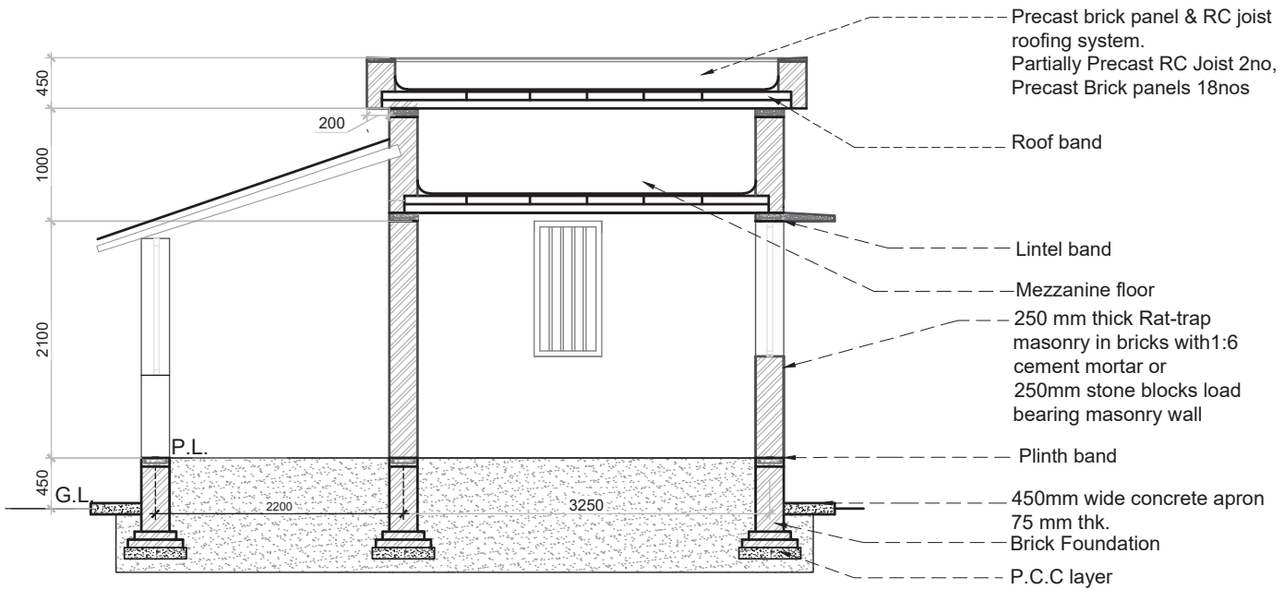
Extension 2

Highlights of the Prototype - JH07

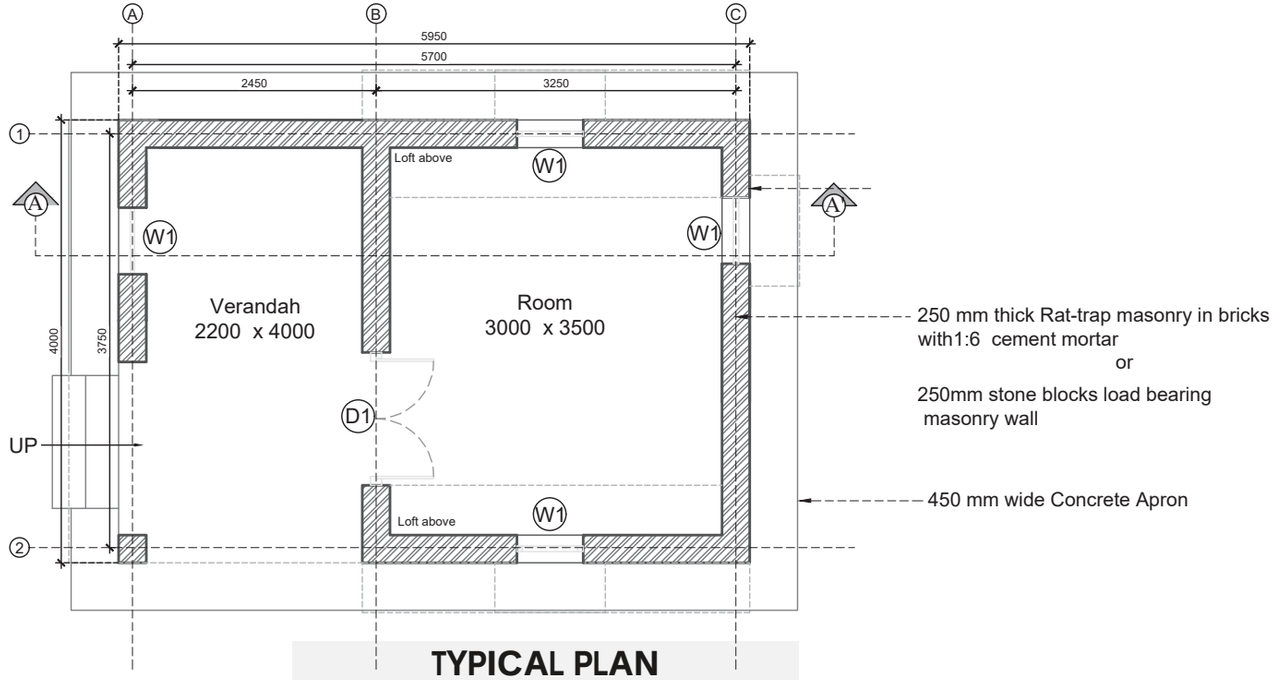
- Built up area of the house is optimised to 22.80 sq.m. with possiblity for incremental growth upto 60.70 sq.m.
- Construction is done with load bearing stabilised adobe blocks or burnt bricks.
- A continuous R.C.C. lintel band is provided to support the loft & protect against seismic activities.
- The roof over the rooms is RCC flat slab, while the verandah is covered with corrugated sheets using timber and bamboo understructure. the bamboo is chemically treated for longevity.
- An RCC shelf is provided at lintel level for storage.
- The main house consists of 2 rooms. 1 room is used to store agricultural produce where as at the other acts as a space for ancillary activities such as cookng & rearing cattle.

Recommendations for Built Form		
Plan Layout	**Plinth/Floor**	**Roof Profile**
Characterised by Santhal cultural associations. Large open spaces in form of central courtyard, backyard or front yard. Elements like tulsi- kyari and intermediate loft – incorporated. Loft design structure.	Normal plinth design.	Sloped roof.

Recommendations for construction systems	
Components	**Recommended Specifications**
Foundations	• Stone foundation with cement mortar • Minimum depth – 450mm • Minimum width 450mm
Plinth	• Minimum(300mm or 150mm more than last 50 year flood level)
Wall	• 250 mm thk Rat-trap brick masonry or • 250 mm thk stone block masonry • load bearing
Wall Finish	• Stabilised Mud plastered finish.
Roof Structure	• Roof slope angle – min 38 & max 45. • Covered with sheet & has treated bamboo/ Timber understructure.
Roof Cover	• Bengal tile.
Floor	• cement flooring



TYPICAL SECTION AA'

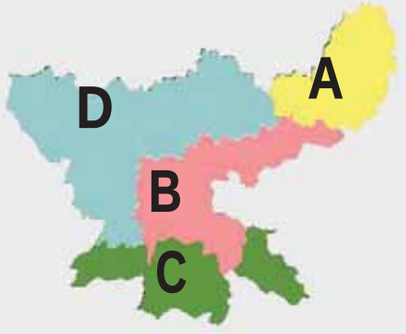


TYPICAL PLAN

JH-07

Area Statement:

Item	Area	
	Sq.m	Sq.ft
Room	10.80	116.25
Verandah	7.70	82.88
Carpet Area	10.80	116.25
Built up Area	**22.80**	**245.42**

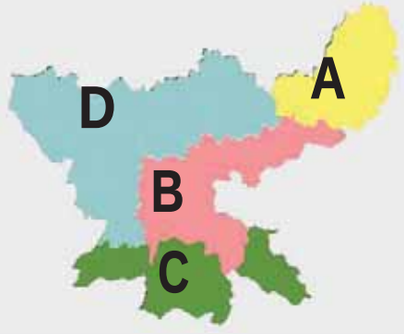


JHARKHAND

JH-07
Cost estimate

Cost breakup

Item	Cost (INR)
Foundation	₹ 25,328.80
Wall	₹ 54,198.05
Roof	₹ 29,940.00
Door window	₹ 3,000.00
Total	**₹ 112,466.85**



JHARKHAND

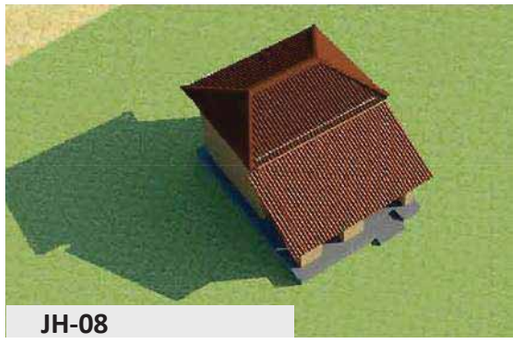
SR. NO.		Unit	Quantity	Rate per unit (Rs)	Cost
1	**FOUNDATION**				
	P.C.C.	cum	1.2	₹ 2,700.00	₹ 3,240.00
	Brickwork	brick no.	2340	₹ 3.50	₹ 8,190.00
	R.C.C. Plinth Beam	cum	0.42	₹ 7,000.00	₹ 2,940.00
	Plinth Filling for Otta	cum	3.45	₹ 200.00	₹ 690.00
	Plinth Filling for Room	cum	7.344	₹ 200.00	₹ 1,468.80
	Labour				₹ 8,800.00
W	**TOTAL**				**₹ 25,328.80**
2	**WALLS**				
	Brick 1 (short)	per sqm	688	₹ 4.00	₹ 2,752.00
	Brick 2 (tall)	per sqm	6510	₹ 4.00	₹ 26,040.00
	Cement mortar	cum	13.271	₹ 550.00	₹ 7,299.05
	RCC plinth & lintel	cum	0.7	₹ 7,000.00	₹ 4,900.00
	RCC chajja	cum	0.101	₹ 7,000.00	₹ 707.00
	Labour				₹ 12,500.00
X	**TOTAL**				**₹ 54,198.05**
	DOOR AND WINDOW				
	Doors	per unit	1	₹ 1,000.00	₹ 1,000.00
	Window	per unit	4	₹ 500.00	₹ 2,000.00
	Plaster and other finishes	lump sum			₹ 3,000.00
	labour				₹ 2,500.00
	TOTAL				**₹ 3,000.00**
3	**STRUCTURE ROOF**				
	Partially precast RC joist	cum	0.22	7000	₹ 1,540.00
	Brick Panels	per unit	18	650	₹ 11,700.00
	Labour				₹ 10,500.00
Y	**TOTAL**				**₹ 23,740.00**
4	**ROOF**				
	sheet	per piece	4	800	₹ 3,200.00
	Other materials	lumpsum		₹ 3,000.00	₹ 3,000.00
Z	**TOTAL**				**₹ 6,200.00**
	W+X+Y+Z				**₹ 112,466.85**
	GRAND TOTAL	**₹ 112,466.85**			
	AREA (sqm)	**26.46**			
	RATE OF CONSTRUCTION (per sqm)	**₹ 4,250.45**			
	AREA (sqft)	**283.122**			
	RATE OF CONSTRUCTION (per sqft)	**₹ 397.24**			

JH-08

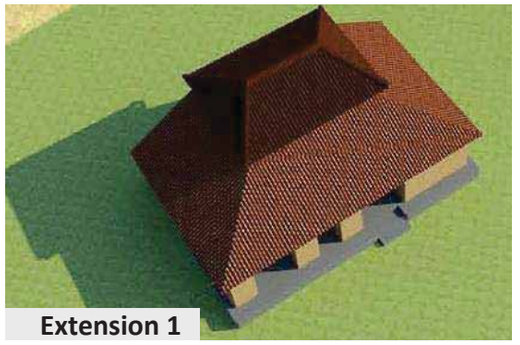
This typology is applicable to all the housing zones in Jharkhand

Resources Available

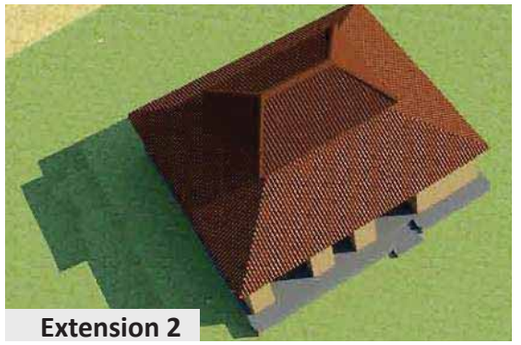
- Timber And Bamboo
- Fly Ash Brick
- Stone



JH-08



Extension 1



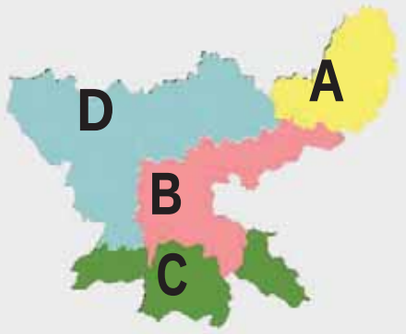
Extension 2

Highlights of the Prototype - JH-D-05

- Built up area of the house is optimized to 25.86 sq.m. with possiblity for incremental growth upto 78.0 sq.m.
- Construction is done with rammed earth.
- A continuous timber lintel band is provided to support the loft & protect against seismic activities.
- Roofs are covered with sheet and thatch roofing over timber and bamboo under-structure. Treated bamboo is used for rafters, purlins & battens.
- A loft has been provided for additional storage space.
- The main house consists of 2 rooms. 1 room is used to store agricultural produce where as at the other acts as a space for ancillary activities such as cookng & rearing cattle.

Recommendations for Built Form - ZONE D		
Plan Layout	**Plinth/Floor**	**Roof Profile**
Characterised by Santhal cultural associations. Large open spaces in form of central courtyard, backyard or front yard. Elements like tulsi- kyari and intermediate loft – incorporated. Loft design structure.	Normal plinth design.	Sloped roof.

Recommendations for construction systems	
Components	**Recommended Specifications**
Foundations	• Brick foundation with cement mortar • Minimum depth – 450mm • Minimum width 450mm
Plinth	• Minimum(300mm or 150mm more than last 50 year flood level)
Wall	• 250 mm thk Rat-trap brick masonry or • 250 mm thk stone block masonry • load bearing
Wall Finish	• Cement plastering or pointing
Roof Structure	• Roof slope angle – min 38 & max 45. • Covered with sheet & has treated bamboo understructure.
Roof Cover	• Bengal tile/ CGI sheet
Floor	• Cement flooring

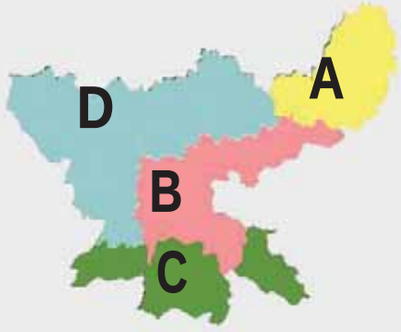


JHARKHAND

JH-08

Area Statement:

Item	Area	
	Sq.m	Sq.ft
Room	12.30	132.40
Verandah	8.94	96.23
Carpet Area	12.30	132.40
Built up Area	**25.87**	**278.46**



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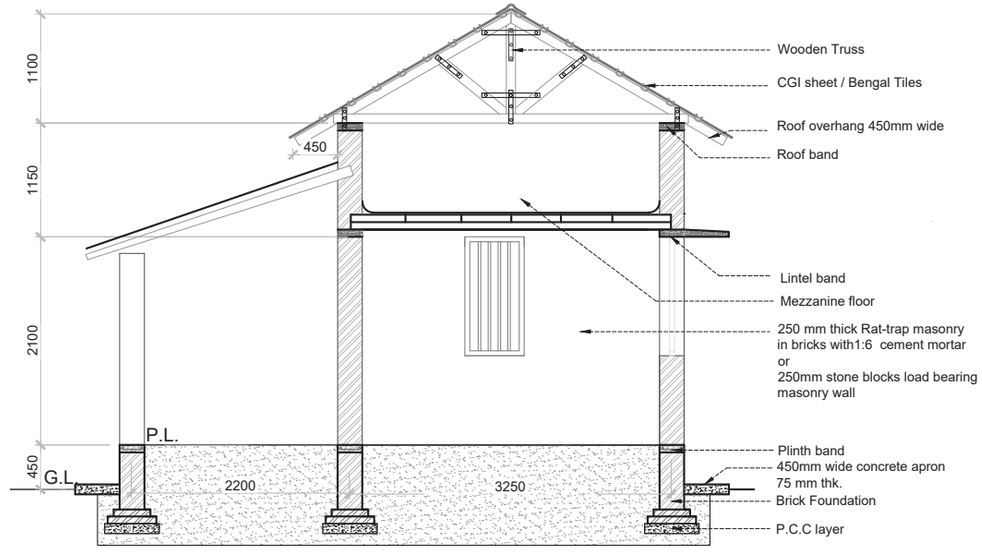
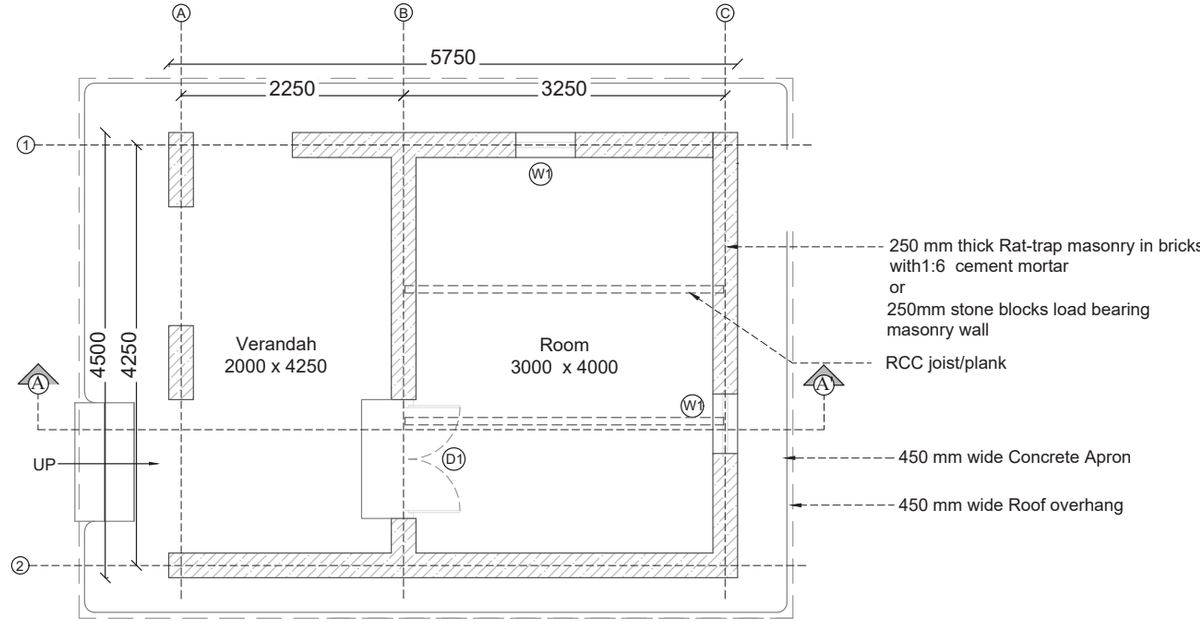


TYPICAL SECTION AA'



TYPICAL PLAN

SR. NO.		Unit	Quantity	Rate per unit (Rs)	Cost
1	**FOUNDATION**				
	P.C.C.	cum	1.2	₹ 2,700.00	₹ 3,240.00
	Brickwork	brick no.	2340	₹ 3.50	₹ 8,190.00
	R.C.C. Plinth Beam	cum	0.42	₹ 7,000.00	₹ 2,940.00
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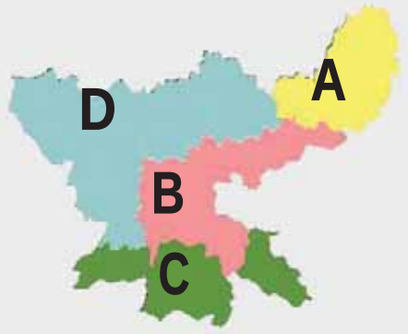
	Plinth Filling for Room	cum	7.344	₹ 200.00	₹ 1,468.80
	Labour				₹ 8,800.00
W	**TOTAL**				**₹ 25,328.80**
2	**WALLS**				
	Brick 1 (short)	per sqm	688	₹ 4.00	₹ 2,752.00
	Brick 2 (tall)	per sqm	6510	₹ 4.00	₹ 26,040.00
	Cement mortar	cum	13.271	₹ 550.00	₹ 7,299.05
	RCC plinth & lintel	cum	0.7	₹ 7,000.00	₹ 4,900.00
	RCC chajja	cum	0.101	₹ 7,000.00	₹ 707.00
	Labour				₹ 12,500.00
X	**TOTAL**				**₹ 54,198.05**
	DOOR AND WINDOW				
	Doors	per unit	1	₹ 1,000.00	₹ 1,000.00
	Window	per unit	4	₹ 500.00	₹ 2,000.00
	Plaster and other finishes	lump sum			₹ 3,000.00
	labour				₹ 2,500.00
	TOTAL				**₹ 3,000.00**
3	**STRUCTURE ROOF**				
	Partially precast RC joist	cum	0.22	7000	₹ 1,540.00
	Brick Panels	per unit	18	650	₹ 11,700.00
	Labour				₹ 10,500.00
Y	**TOTAL**				**₹ 23,740.00**
4	**ROOF**				
	sheet	per piece	4	800	₹ 3,200.00
	Other materials	lumpsum		₹ 3,000.00	₹ 3,000.00
Z	**TOTAL**				**₹ 6,200.00**
	W+X+Y+Z				**₹ 112,466.85**
	GRAND TOTAL	**₹ 112,466.85**			
	AREA (sqm)	**26.46**			
	RATE OF CONSTRUCTION (per sqm)	**₹ 4,250.45**			
	AREA (sqft)	**283.122**			
	RATE OF CONSTRUCTION (per sqft)	**₹ 397.24**			

JH-08
Cost estimate

Cost breakup

Item	Cost (INR)
Foundation	₹ 25,328.80
Wall	₹ 54,198.05
Roof	₹ 29,940.00
Door window	₹ 3,000.00
Total	**₹ 112,466.85**



JHARKHAND

pahal
Prakriti Hunar Lokvidya

Madhya Pradesh

MADHYA PRADESH

Tribal culture is an integral part of MP. The main tribal groups are Gond, Bhil, Baiga, Korku, Bhariya, Halba, Kaul, Mariya, and Sahariya. Dhar, Jhabua and Mandla districts have a more than 50% tribal population. In Khargone, Chhindwara, Seoni, Sidhi and Shahdol districts, 30%-50% of the population is tribal. MP is distinguished for its art, architecture, music, etc.

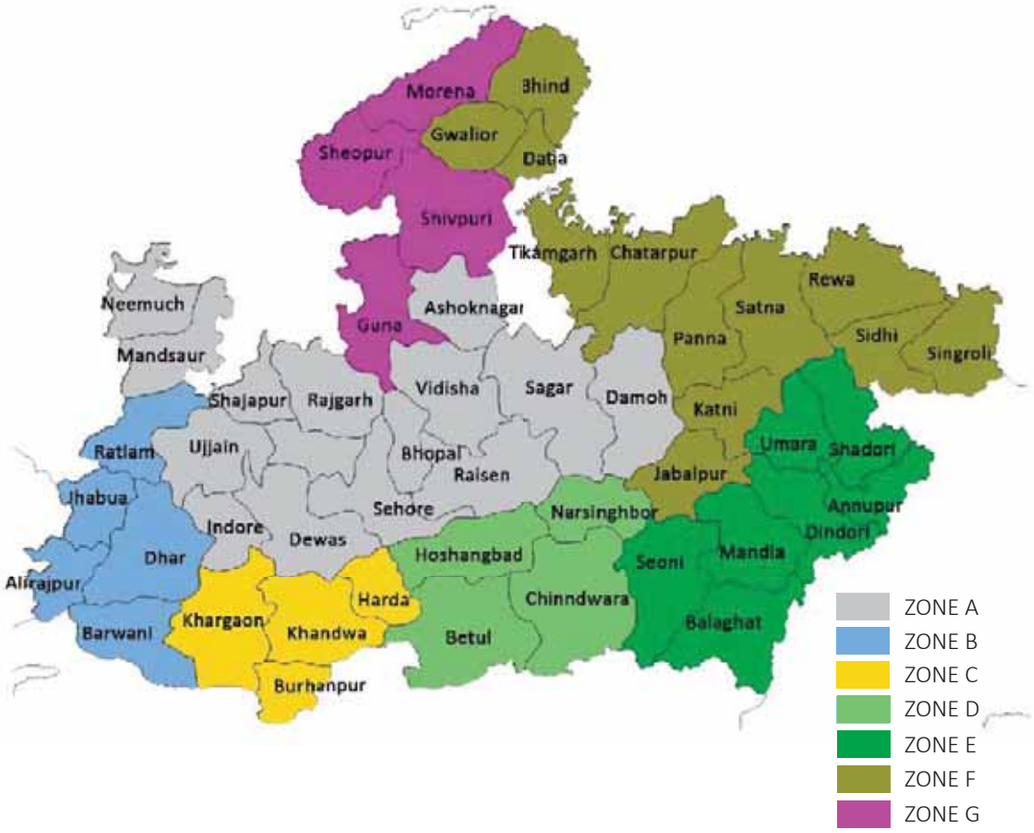
MP has some flood prone areas. Its 28 districts are in Zone III of seismicity and the remaining in Zone II. MP has been divided into several 'housing zones' based on socio-cultural pattern of living, geo-climate, soil type, local materials, existing traditional construction practices (materials and skills), multi-hazards, etc. For each zone, context-specific affordable designs with matching technologies have been suggested which are environment friendly and supportive to local level livelihood generation. While upgrading/ revitalising traditional construction practices have been the focus, adequate room has been kept for introducing innovative technologies that are rural landscape friendly. MP has been divided into seven design zones, three soil zones and six walling and roofing zones. The following section describes each of the seven social zones with information on context-specific suitable foundation, wall and roofing materials.

Zone A: Mandsaur Neemach, etc.
The entire area is full of low quality clamp bond brick produced in local bhattas having very low thermal efficiency. It is energy and emission intensive. The locality has potential for cement stabilised mud block. Flag stone roofing on rolled steel joint is common. There are places with black cotton soil. This area is primarily hot dry.

Zone B: Jhabua, Dhar (Bhil, Bhilala, Pateliya)
In general buildings have small windows with only one door. Cattle and living quarters are kept side by side. Most of the buildings in Jhabua have RR foundation and wall with a combination of thin stones. The gable walls are in brick. The corners of such construction are hybridised with clay bricks to make neat and strong joints. Roofs are mostly in CGI/ACC sheets on local timber understructure. Local masons evolved their own way of utilising the convenience of both stone and brick. This is a hot dry area.

Zone C: Burhanpur, etc
This zone has a few varieties of plan-forms, a) compact, b) Linear, c) L type layout, etc (Bori Buzurg, Burhanpur). Timber under-structure with clay tile roof is common. The locality has about 600mm BC soil, which the local masons remove before making a foundation. In the other block, the depth of BC soil is as high as 2m.Plenty of random and coursed rubble stones are available.

Zone D: Hoshangabad, Chhindwara, etc
Hoshangabad has a large population of Gond people. This is a deep black cotton soil area (depth 3500mm or more) . However, there are pockets where BC soil is shallow. For example at Kesla, Hoshangabad, the local people are aware that the good soil is available at 900mm from the ground level. Bricks are found everywhere. It was reported that local people make their own bricks. However, the quality is poor.



Zone E: Balaghat, Mandla, Anuppur, Dindori, etc
In Seoni, Mandla, Balaghat, etc. people prefer to keep their cattle-shed (called Dahal) in front of their living quarters, with a courtyard in between providing adequate privacy to the HH. Majority of the buildings in this region are of burnt clay tile roof on local timber understructure on mud.

Zone F: Sidhi, Chhatarpur, Datia, etc
This zone has abundance of stone. The area is hot during peak summer and hence, many buildings have veranda all around to protect the core house. Chhattarpur, Satna, Datia, etc. have a large number of flag stone roofing. Water scarcity is common in the area.

Zone G: Guna, Shivpuri, etc
Guna, etc., have plenty of random and coursed rubble stones. The villagers use the local stones and have the skill to build such structures on their own. In Guna the poor quality of bricks demanded alternative construction materials. Cement stabilised mud block could be recommended for these areas. Some parts of this zone have stone and hence, RR foundation may be recommended for foundation and wall.

MADHYA PRADESH HOUSING TYPOLGIES AT A GLANCE

TYPOLOGY	APPLICABLE HOUSING ZONES	TOTAL AREA Sq.m/Sq.ft	
MP-01	Zone A	27.09 Sq.m	**291.60 Sq.ft**
MP-02	Zone A	**27.78** Sq.m	**299.02 Sq.ft**
MP-03	Zone B	**32.25** Sq.m	**347.14 Sq.ft**
MP-04	Zone B	**59.29** Sq.m	**638.20 Sq.ft**
MP-05	Zone G	**33.79** Sq.m	**363.72 Sq.ft**
MP-06	Zone C	**45.43** Sq.m	**489.00 Sq.ft**
MP-07	Zone F	77.94 Sq.m	**838.95 Sq.ft**
MP-08	Zone E	42.00 Sq.m	**452.08 Sq.ft**
MP-09	Zone D	35.10 Sq.m	377.82 **Sq.ft**


MP-01


MP-02


MP-03


MP-04


MP-05


MP-06


MP-07


MP-08


MP-09

MADHYA PRADESH

MP-01

Designed to suit social and architectural conditions in Zone A

Zone A highlights: Flag stone roofing on rolled steel joint is common. There are places with black cotton soil. This area is primarily hot dry.

This Zone comprises of Mandsaur & Neemach & other tribal areas

Local building construction technology::

- Mud
- Flag Stone roofing
- MS sections
- Clamp bond brick

MADHYA PRADESH

MP-01

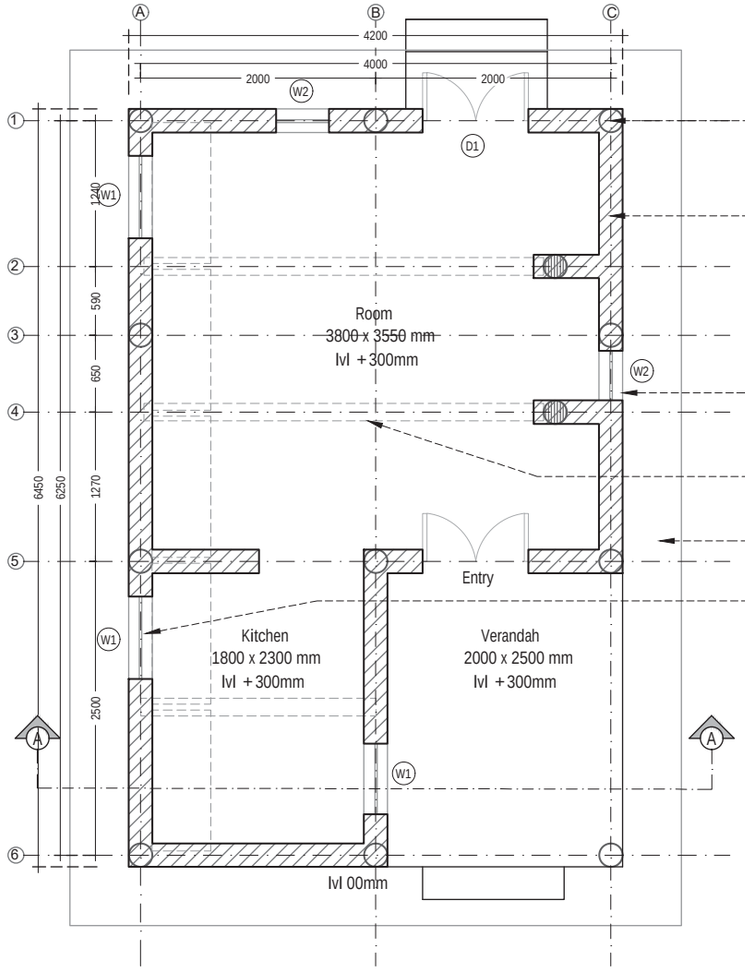
Highlights of the Prototype

- While some buildings are around courtyard, most are compact plan form with a front veranda next to a kitchen.
- Excellent quality mud walls are found in this region.
- The entire area is full of low quality clamp bond brick produced in local bhattas having very low thermal efficiency. It is energy and emission intensive.
- The locality has potential for cement stabilised mud block. Flag stone roofing on rolled steel joint is common. There are places with black cotton soil.
- This area is primarily hot dry.

Recommendations for construction systems	
Components	**Recommended Specifications**
Foundations	• strip foundation • 75mm thick plinth band to be provided over full width of the plinth masonry
Plinth	• Minimum (300 mm or 150mm more than last 50 year flood level)
Wall	• 20 cm thick brick or Stone masonry block or load-bearing hollow block walls may be constructed in 1:6 cement sand mortar
Wall Finish	• Cement plaster finish/ exposed Bricks
Roof Structure	• Pre-cast RC joist constructed flat roofing system.
Roof Cover	• PCC
Floor	• IPS flooring
Door and Windows	• Wood/Mild steel door and window frames with welded grills

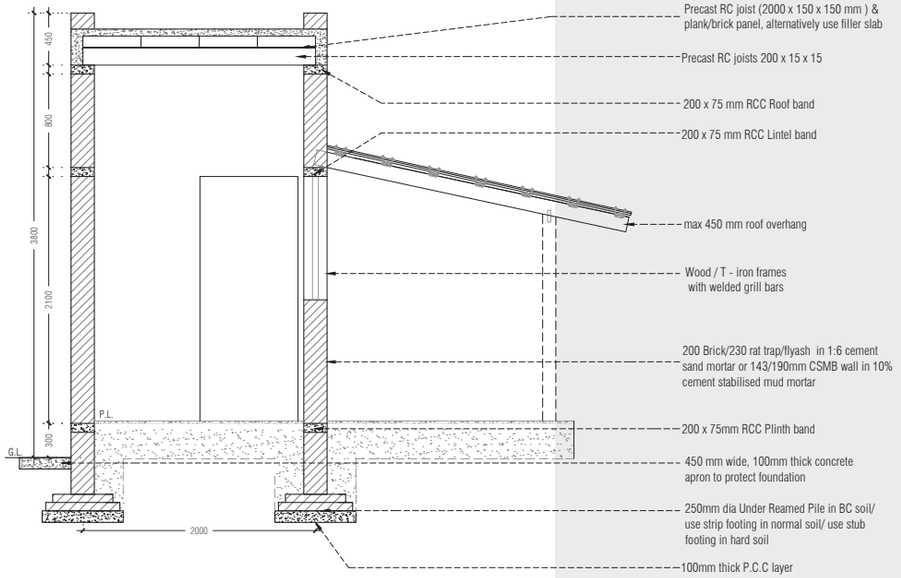
MP-01

AREA STATEMENT:



TYPICAL PLAN

PHASE I



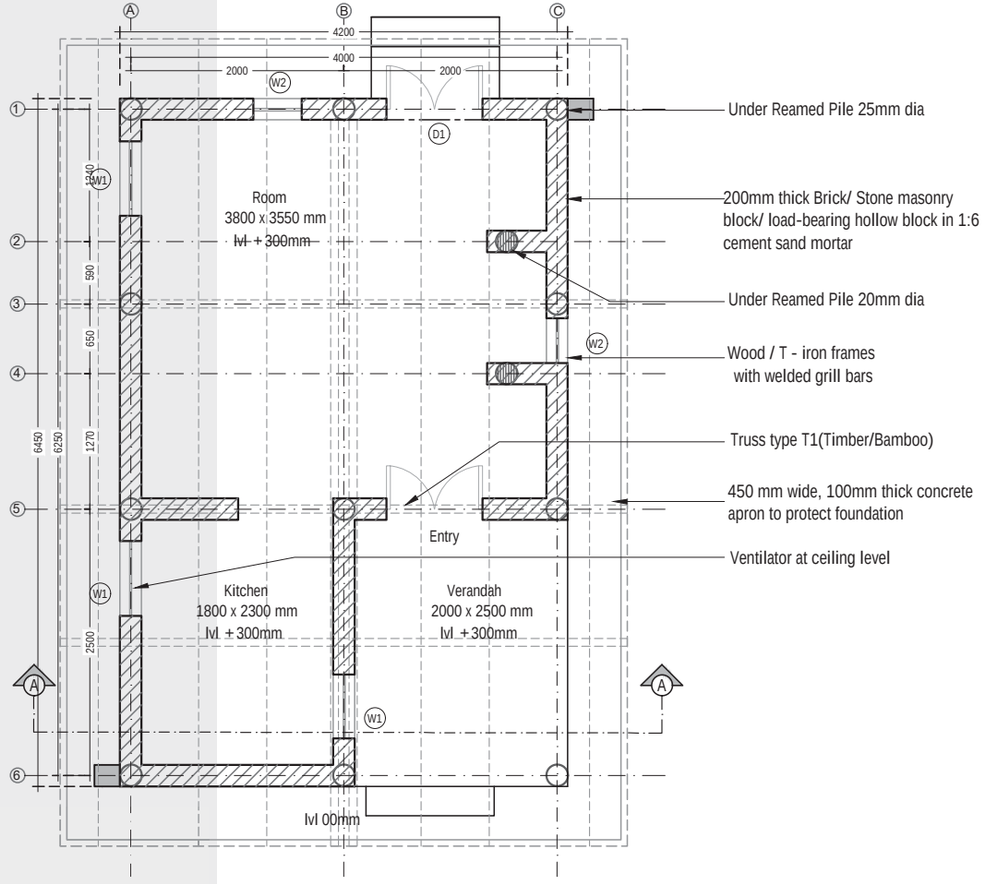
TYPICAL SECTION AA'

Area Statement:

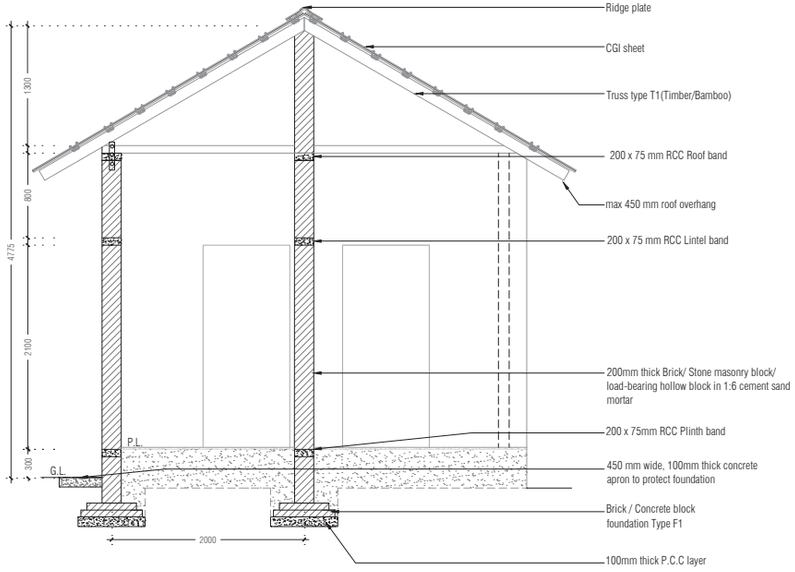
Item	Area	
	Sq.m	Sq.ft
Room	13.45	144.77
Kitchen	4.32	46.50
Verandah	5.00	53.82
Carpet Area	**17.77**	**191.28**
Built up Area	**27.09**	**291.60**

MADHYA PRADESH

MP-01
Alternative roofing



TYPICAL PLAN



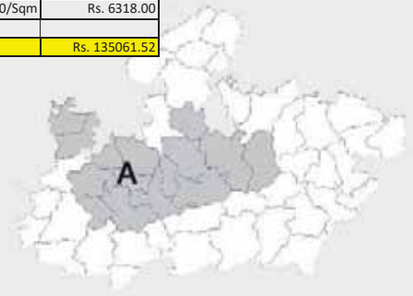
TYPICAL SECTION AA'

MADHYA PRADESH

MP-01
Cost estimate

	A	B	G	H	I	J
18	SL	DESCRIPTION	QUANTITY		UNIT RATE	COST
19		FOUNDATION				
20	1a	Excavation in foundation				
23		Total volume of excavation	6.519 Cum		Rs.93.80/Cum	Rs. 611.47
24						
25	1b	Filling				
29		Total vol of filling	8.899 Cum		Rs.93.80/Cum	Rs. 834.72
30						
31	2	Lean concrete (1:4:8) with 20-12.5 mm chips				
34		Total volume of Lean concrete	1.228 Cum		Rs.2626.0/Cum	Rs. 3223.63
35						
36	3	Brick work in foundation				
37	3a	400 mm thick Brick work in foundation				
40	3b	300 mm thick Brick work in foundation				
43	3c	200 mm thick Brick work in foundation				
47		Total volume of brickwork in foundation	4.654 Cum		Rs.3294.1/Cum	Rs. 15329.09
48						
49	4	PLINTH BAND				
52		Total vol of plinth band	0.404 Cum		Rs.3429.9/Cum	Rs. 1383.96
53						
56		Total area of shuttering	4.035 Sqm		Rs.168.70/Sqm	Rs. 680.70
57						
58	4c	Reinforcement @70 kg/cum	28.245 Kg		Rs.65.70/kg	Rs. 1855.70
59						
60	5	FLOORING				
61		25mm flooring: Flag stone				
66		Total area 5% increase for skirting	23.541 Sqm		Rs.389.70/Sqm	Rs. 9173.93
67	6	WALLS				
68		200 mm masonry wall				
73		Total vol of brickwork	11.646 Cum		Rs.3294.1/Cum	Rs. 38363.09
74	7	LINTEL BAND				
75	7a	100X200 RCC lintel -4-8 TOR ALTHRO'+ 6 dia @ 175C/C				
77		Total vol of RCC works	0.450 Cum		Rs.3429.9/Cum	Rs. 1543.46
78						
79	7b	Shuttering				
81		Total area of shuttering	4.500 Sqm		Rs.168.70/Sqm	Rs. 759.15
83	7c	Reinforcement @70 kg/cum	31.500 Kg		Rs.65.70/kg	Rs. 2069.55

	A	B	G	H	I	J
85	8	RCC LEDGE 62.5MM				
86	8a	450X62.5 RCC ledge -4-8 TOR ALTHRO'+ 6 dia @ 175C/C				
88		Total vol of RCC works	0.225 Cum		Rs.3429.9/Cum	Rs. 771.73
89						
90	8b	Shuttering				
92		total area of shuttering	4.100 Sqm		Rs.168.70/Sqm	Rs. 691.67
93						
94	8c	Reinforcement @ 70 kg/cum	15.750 Kg		Rs.65.70/kg	Rs. 1034.78
95						
96	9	100 RCC FOR ROOF IN M20				
97	9a	area of 100RCC flat roof - 26.8 SqmX1.05	2.82 Cum		Rs.3429.9/Cum	Rs. 9680.55
98						
99	9b	shuttering	28.22 Sqm			
100		total area of shuttering	28.22 Sqm		Rs.168.70/Sqm	Rs. 4761.39
101						
102	9c	Reinforcement @ 90kg/cum	254.016 Kg		Rs.65.70/kg	Rs. 16688.85
103						
104	10	WHITE WASHING				
110		Total area of white wash inside	84.39 Sqm			
111						
112	10b	Outside white wash	area			
116		Overall total area of plaster to be used	147.99 Sqm		Rs.20.00/sqm	Rs. 2959.80
117						
118	11	PLASTERING				
119	11a	inside plaster	area			
124		Total area of plaster to be used inside	84.39 Sqm		Rs.107.40/sqm	Rs. 9063.49
125						
126	11b	Outside pointing	area			
129		Total area of plaster to be used outside	63.60 Sqm		Rs.53.70/sqm	Rs. 3415.32
130						
131	12	DOOR WINDOWS				
136		Total volume 35x35x6 @ 2.25 kg/m	22.950 Kg		Rs.75.00/kg	Rs. 1721.25
137		Window frames 35x35x6 ISA				
138		Window W1 - 3nos	12.600 m			
139		Total quantity for frames	28.350 Kg		Rs.75.00/kg	Rs. 2126.25
140						
141	12b	LOCAL WOOD SHUTTER				
149		Total area of wood shutter	7.020 Sqm		Rs.900.00/Sqm	Rs. 6318.00
150						
151					GRAND TOTAL	Rs. 135061.52



MADHYA PRADESH

MP-02

Designed to suit social and architectural conditions in Zone A

Zone A highlights: Flag stone roofing on rolled steel joint is common. There are places with black cotton soil. This area is primarily hot dry.

This Zone comprises of Mandsaur & Neemach & other tribal areas

Local building construction technology::

- Mud
- Flag Stone roofing
- MS sections
- Clamp bond brick

MADHYA PRADESH

MP-02

Highlights of the Prototype

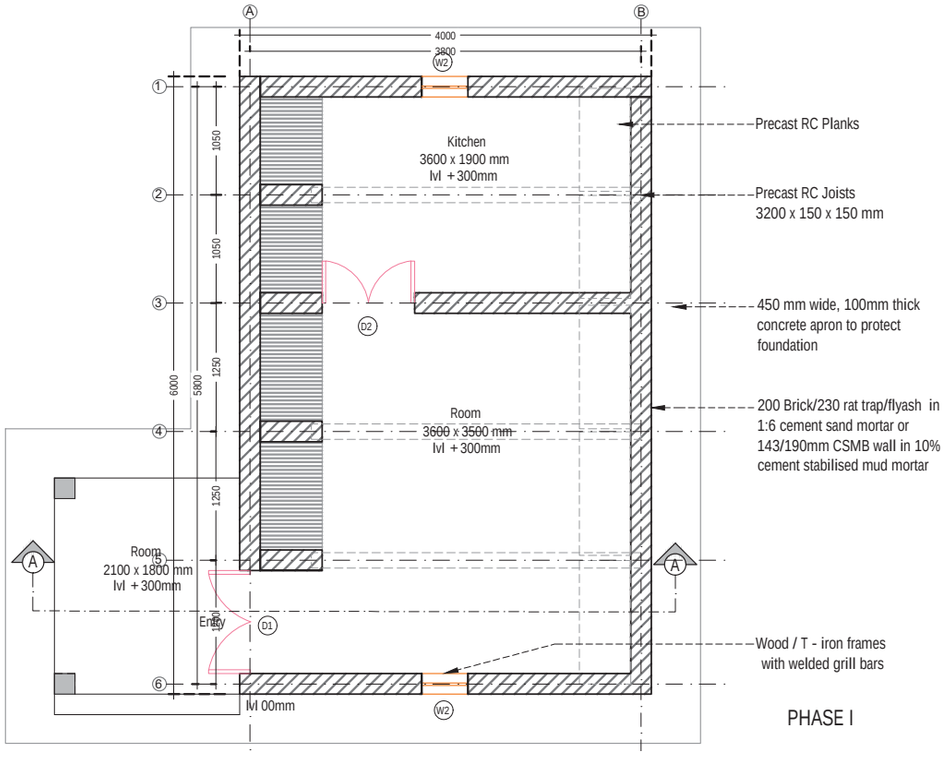
- While some buildings are around courtyard, most are compact plan form with a front veranda next to a kitchen.
- Excellent quality mud walls are found in this region.
- The entire area is full of low quality clamp bond brick produced in local bhattas having very low thermal efficiency. It is energy and emission intensive.
- The locality has potential for cement stabilised mud block. Flag stone roofing on rolled steel joint is common. There are places with black cotton soil.
- This area is primarily hot dry.

Recommendations for construction systems	
Components	**Recommended Specifications**
Foundations	• strip foundation • 75mm thick plinth band to be provided over full width of the plinth masonry
Plinth	• Minimum (300 mm or 150mm more than last 50 year flood level)
Wall	• 20 cm thick brick or Stone masonry block or load-bearing hollow block walls may be constructed in 1:6 cement sand mortar
Wall Finish	• Cement plaster finish/ exposed Bricks
Roof Structure	• Pre-cast RC joist constructed flat roofing system. • or sloping roof with timber/bamboo understructure
Roof Cover	• Brick coba / mud phuska
Floor	• IPS flooring
Door and Windows	• Wood/Mild steel door and window frames with welded grills

MP-02

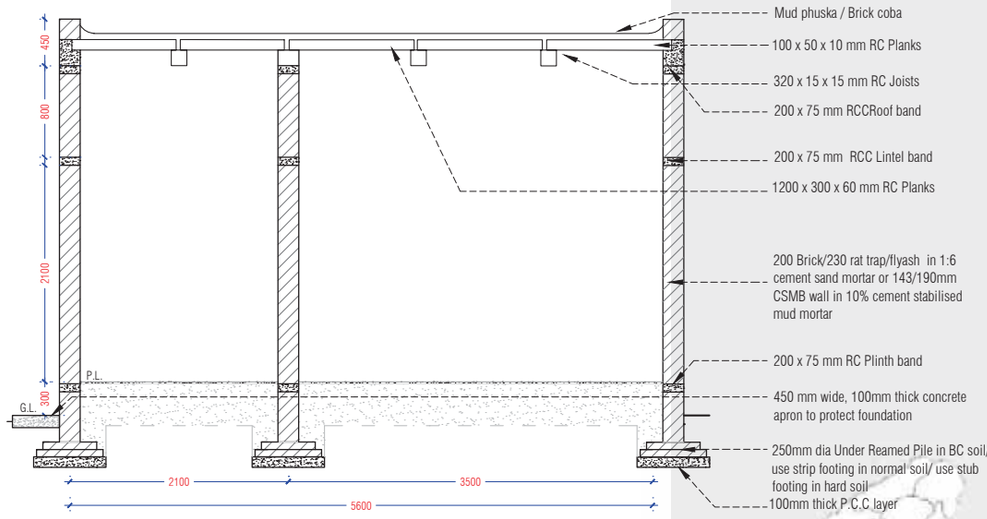
Area Statement:

Item	Area	
	Sq.m	Sq.ft
Room	12.56	135.20
Kitchen	6.90	74.27
Verandah	3.78	40.69
Carpet Area	**19.46**	**209.47**
Built up Area	**27.78**	**299.02**



PHASE I

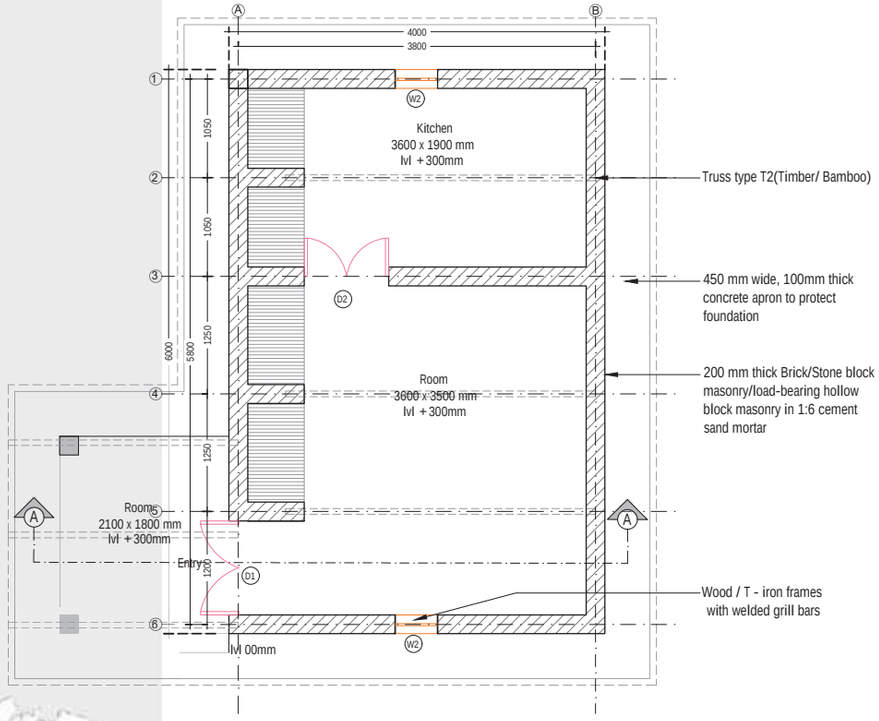
TYPICAL PLAN



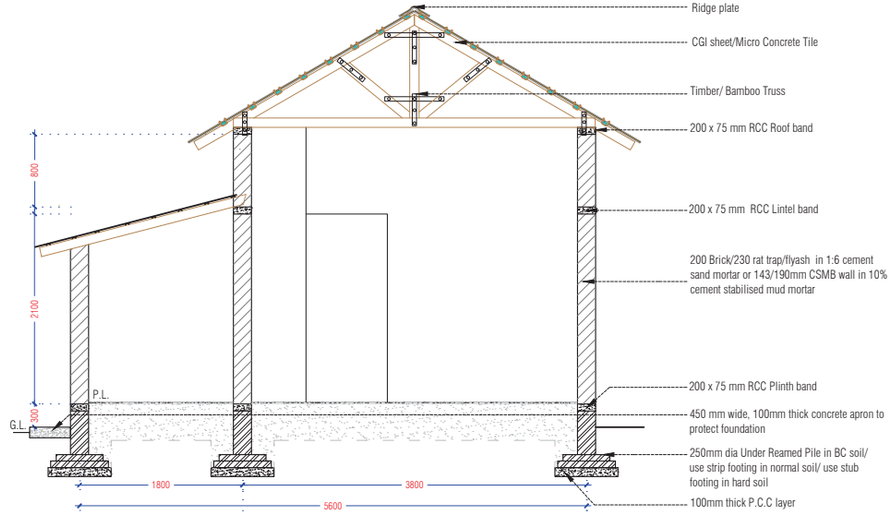
TYPICAL SECTION AA'

MADHYA PRADESH

MP-02
Alternative roofing



TYPICAL PLAN



TYPICAL SECTION AA'

MADHYA PRADESH

MP-02
Cost estimate

	A	B	G	H	I	J
16	SL	DESCRIPTION	QUANTITY		Unit Rate	Costs
17		FOUNDATION				
18	1a	Excavation in foundation				
21		Total vol of excavation	6.945 Cum		Rs.93.80/Cum	Rs. 651.45
22						
23	1b	Filling				
28		Total vol of filling	12.386 Cum		Rs.93.80/kg	Rs. 1161.81
29						
30	1c	Sand filling 75mm on trench				
33		Total vol of sand	1.042 Cum		Rs.400.00/cum	Rs. 416.71
34						
35	2	Lean concrete bed 100mm in 1:3:6				
38		Total vol of lean concrete	1.306 Cum		Rs.2626.0/Cum	Rs. 3430.79
39						
40	3a	400 mm thick Brick work in foundation				
43						
44	3b	300 mm thick Brick work in foundation				
47	3c	200 mm thick Brick work in foundation				
51		TOTAL VOLUME OF BRICKWORK IN FOUNDATION	4.391 Cum		Rs.3294.1/Cum	Rs. 14463.40
52						
53	4b	75x200 RCC plinth band- 2-8mm tor+ 6 dia links @ 175 c/c				
55		Total vol	0.431 Cum		Rs.3429.9/Cum	Rs. 1476.57
56						
57	4c	Shuttering				
59		total area of shuttering	4.305 Sqm		Rs.168.70/Sqm	Rs. 726.25
60						
61	4c	Reinforcement @ 70 kg/cum	30.135 Kg		Rs.65.70/kg	Rs. 1979.87
62						
63	5	FLOORING				
64		20mm 1:4 CM on FBS in 1:4 CM with neat cement punning				
68		Total vol including skirting	24.381 Sqm		Rs.389.70/Sqm	Rs. 9501.28
69						

	A	B	G	H	I	J
70	6	WALLS				
71		200 mm masonry wall				
76		Total vol of brickwork	11.936 Cum		Rs.3294.1/cum	Rs. 39318.38
77						
78	7a	LINTEL BAND				
79		100X200 RCC lintel -4-8 TOR ALTHRO'+ 6 dia @ 175C/C				
81		Total vol of concrete	0.345 Cum		Rs.3429.90/kg	Rs. 1183.32
82						
83	7b	Shuttering				
85		Total area of shuttering	9.200 Sqm		Rs.168.70/kg	Rs. 1552.04
86						
87	7c	Reinforcement @70 kg/cum	24.150 Kg		Rs.65.70/kg	Rs. 1586.66
88						
89	8	RCC LEDGE 62.5MM				
90	8a	450X62.5 RCC ledge -4-8 TOR+ 6 dia @ 175C/C				
94		Total vol of RCC works	0.261 Cum		Rs.3429.9/cum	Rs. 895.20
95						
96	8b	Shuttering				
100		total area of shuttering	5.945 Sqm		Rs.168.70/sqm	Rs. 1002.92
101						
102	8c	Reinforcement @ 70 kg/cum	18.270 Kg		Rs.65.70/kg	Rs. 1200.34
103						
104	9	100 RCC FOR ROOF IN M20				
105	9a	area of 100RCC flat roof - 27.78Sqm + 5% for projection	2.92 Cum		Rs.3429.9/cum	Rs. 10004.68
106						
107	9b	shuttering	29.780 Sqm			
108		total area of shuttering	29.78 Sqm		Rs.168.70/sqm	Rs. 5023.89
109						
110	9c	Reinforcement @ 90 kg/cum	262.521 Kg		Rs.65.70/kg	Rs. 17247.63
111						
112	10	WHITE WASHING				
113	10a	inside white washing	24.381 Sqm			
117						
118	10b	Outside white wash	area			
122		Overall total area of plaster to be used	158.62 Sqm		Rs.20.00/sqm	Rs. 3172.42
123						
124	11	PLASTERING				
125	11a	inside plaster	area			
128		Total area of plaster to be used inside	74.24 Sqm		Rs.107.40/sqm	Rs. 7973.38
129						
130	11b	Outside plaster/pointing	area			
133		Total area of pointing outside	60.00 Sqm		Rs.53.70/sqm	Rs. 3222.00
134						
135	12a	MS FRAMES				
136		Door frames local wood 35x35x6 ISA				
142		Total quantity for frames	28.350 Kg		Rs.75.00/kg	Rs. 2126.25
143						
144	12b	LOCAL WOOD SHUTTER				
145		Door Shutter 40mm thick local wood shutter				
152		Total area of wood shutter	7.020 Sqm		Rs.900.00/Sqm	Rs. 6318.00
153						
154					GRAND TOTAL	Rs. 137356.47

MADHYA PRADESH

MP-03

Designed to suit social and architectural conditions in Zone B

Zone B highlights: This is a hot dry area.

This Zone comprises of districts of Jhabua, Dhar (Bhil, Bhilala, Pateliya)

Local building construction technology::

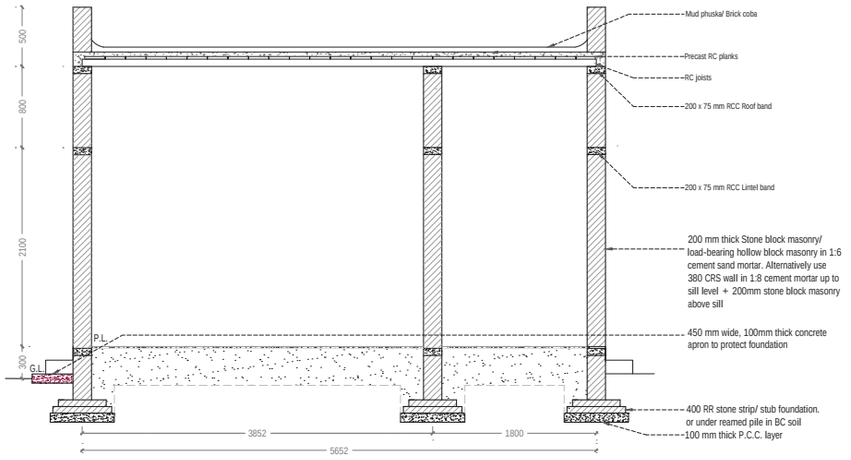
- RR foundation
- Coursed stone masonry
- GI sheet roofing
- Timber understructure

MADHYA PRADESH

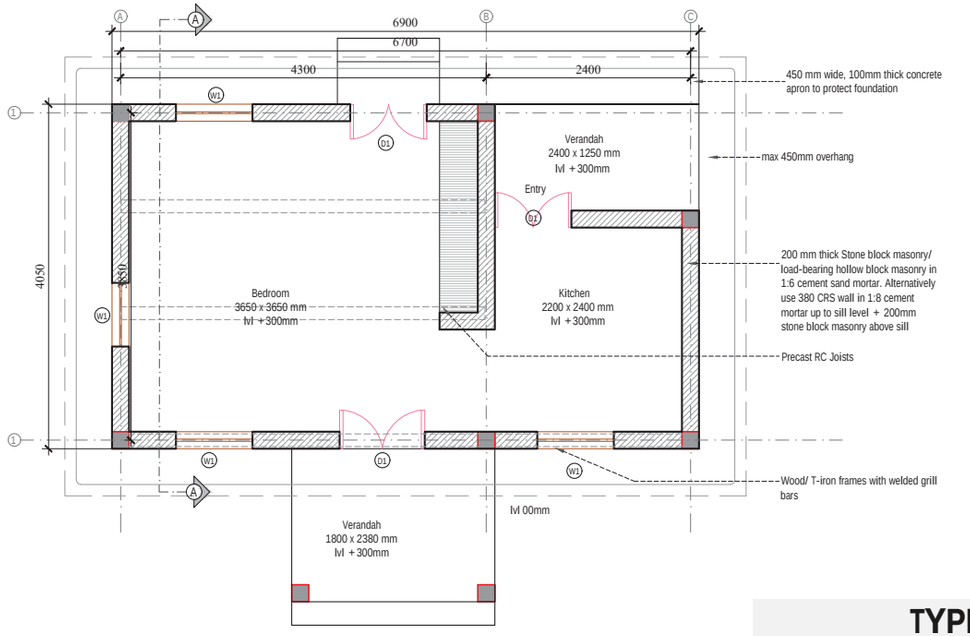
Highlights of the Prototype

- The fear of theft of the livestock is very strong which is reflected in house design. In general buildings have small windows with only one door. Cattle and living quarters are kept side by side.
- Most of the buildings in Jhabua have RR foundation and wall with a combination of thin stones.
- The gable walls are in brick.
- The corners of such construction are hybridised with clay bricks to make neat and strong joints.
- Roofs are mostly in CGI/ACC sheets on local timber understructure.
- Local masons evolved their own way of utilising the convenience of both stone and brick.
- This is a hot dry area.

Recommendations for construction systems	
Components	**Recommended Specifications**
Foundations	• Strip foundation in normal soil of bearing capacity of 10T/sqm or higher • Strip foundation in Black cotton soil not more than 1.5m deep. • Masonry stub fdn with tie beam, Black cotton soil not more than 1.5m deep, single storey construction. • Brick arch fdn with brick/ block/stone arch. BC soil not more than 1.5m deep.Hard rocky strata trenching difficult. • Single Under-reamed Pile foundation, diameter and length as given in drawings.
Plinth	• Minimum (300 mm or 150mm more than last 50 year flood level)
Wall	• 20 cm thick brick/Stone masonry block or load-bearing hollow block walls may be constructed in 1:6 cement sand mortar.
Wall Finish	• cement plaster
Roof Structure	• RC plank joist system or • Sloping roofs with Timber/bamboo understructure
Roof Cover	• 'PCC for flat roofs with waterproofing • GI sheet
Floor	• cement concrete/ brick paving
Door and Windows	• Mild steel door and window



TYPICAL SECTION AA'



TYPICAL PLAN

MP-03

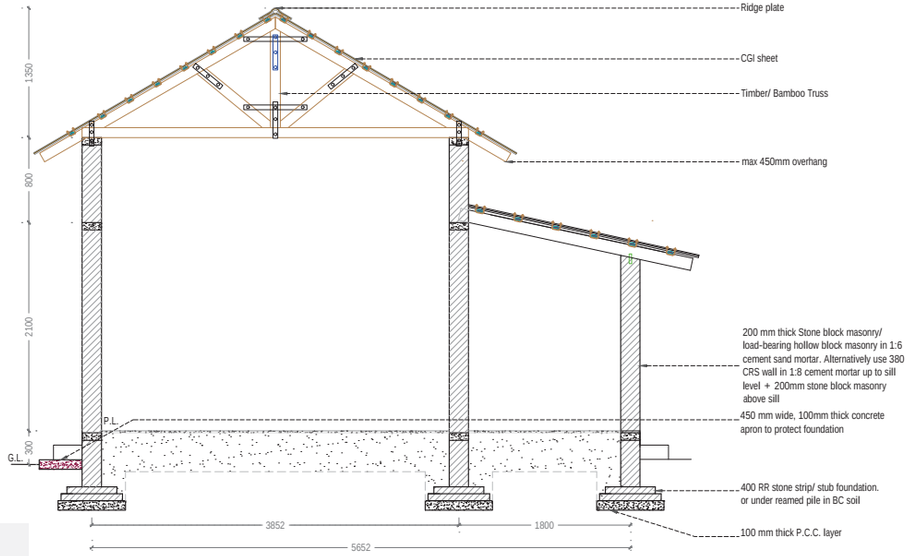
Area Statement:

Item	Area	
	Sq.m	Sq.ft
Room	15.49	166.73
Kitchen	5.46	58.77
Verandah 1	4.29	46.18
Verandah 2	**2.99**	**32.18**
Carpet Area	**20.95**	**225.50**
Built up Area	**32.25**	**347.14**

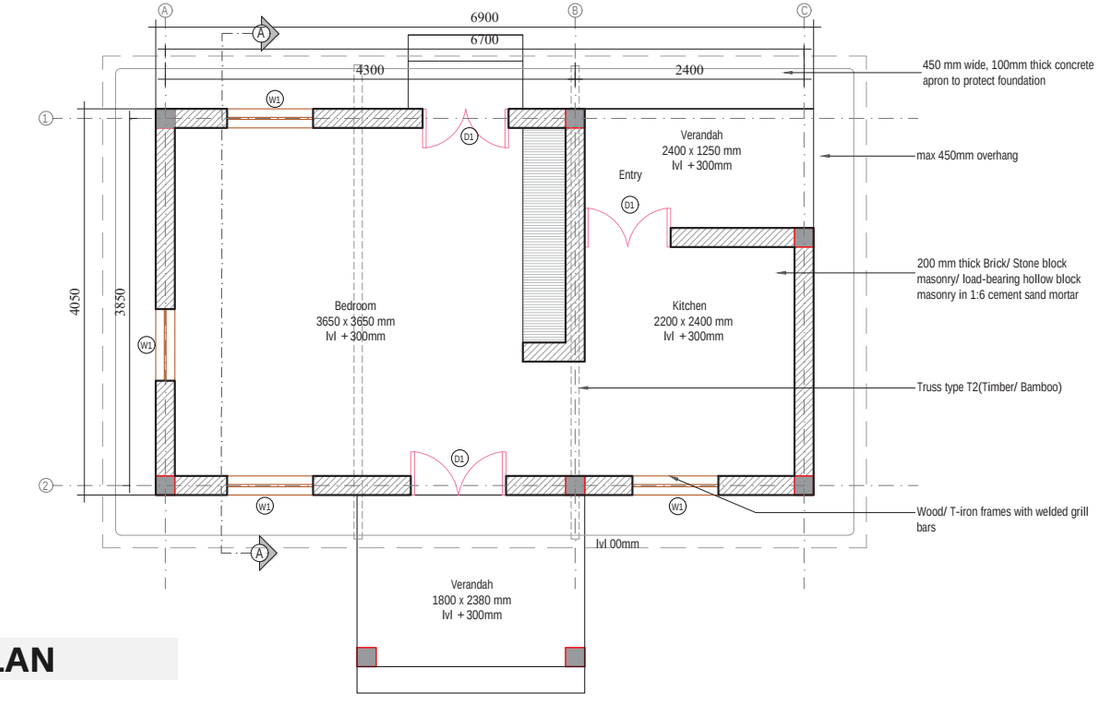
MADHYA PRADESH

MP-03
Alternative roofing

MADHYA PRADESH



TYPICAL SECTION AA'



TYPICAL PLAN

MP-03
Cost estimate

	A	B	G	H	I	J
15	SL	DESCRIPTION	QUANTITY		UNIT rate	Costs
16		FOUNDATION				
17	1a	Excavation in foundation				
20		Total vol of excavation	7.494 Cum		Rs.93.80/Cum	Rs. 702.91
21						
22	1b	Filling				
26		Total vol of filling	9.562 Cum		Rs.93.80/Cum	Rs. 896.94
27						
28	1c	Sand filling 75mm on trench				
31		Total vol of sand	1.124 Cum		Rs.400.00/cum	Rs. 449.63
32						
33	2	Lean concrete bed 100mm in 1:3:6				
36		Total vol of lean concrete	1.410 Cum		Rs.2626.0/Cum	Rs. 3703.32
37						
38	3a	300 mm thick Brick work in foundation				
41	3b	200 mm thick Brick work in foundation				
45		TOTAL VOLUME OF BRICKWORK IN FOUNDATION	4.054 Cum		Rs.3294.1/Cum	Rs. 13355.1
46						
47	4a	75x200 RCC plinth band- 2-8mm tor+ 6 dia links @ 175 c/c				
49		Total vol	0.374 Cum		Rs.3429.9/Cum	Rs. 1283.64
50						
51	4b	Shuttering				
53		Total area of shuttering	3.743 Sqm		Rs.168.70/Sqm	Rs. 631.36
54						
55	4c	Reinforcement @70 kg/cum	26.198 Kg		Rs.65.70/kg	Rs. 1721.18
56						
57	5	FLOORING				
58		20mm CM with neat cement punning on 75 FBS in 1:4 CM				
61		Total vol	28.045 Sqm		Rs.389.70/Sqm	Rs. 10929.1
62						
63	6	WALLS				
64		200 mm masonry wall				
69		Total vol of brickwork	13.067 Cum		Rs.3294.1/Cum	Rs. 43044.0
70						
71	7a	LINTEL BAND				
72		100X200 RCC lintel -4-8 TOR ALTHRO'+ 6 dia @ 175C/C				
74		Total vol of concrete	0.499 Cum		Rs.3429.9/Cum	Rs. 1711.52
75						
76	7b	Shuttering				
78		Total area of shuttering	9.980 Sqm		Rs.168.70/Sqm	Rs. 1683.63
79						
80	7c	Reinforcement @70 kg/cum	34.930 kg		Rs.65.70/kg	Rs. 2294.90
81						
82	8a	RCC LEDGE 62.5MM				
83		450X62.5 RCC ledge -4-8 TOR+ 6 dia @ 175C/C				
85		Total vol of RCC works	0.219 Cum		Rs.3429.9/Cum	Rs. 752.43
86						
87	8b	Shuttering				
89		total area of shuttering	3.998 Sqm		Rs.168.70/Sqm	Rs. 674.38
90						
91	8c	Reinforcement @ 70 kg/cum	15.356 Kg		Rs.65.70/kg	Rs. 1008.91
92						

	A	B	G	H	I	J
93	9a	100 RCC FOR ROOF IN M20				
94		area of 100RCC flat roof 10% extra for projection	2.93 Cum		Rs.3429.9/Cum	Rs. 10064.1
95						
96	9b	shuttering for house a				
97			30.135 Sqm			
98		total area of shuttering	30.14 Sqm		Rs.168.70/Sqm	Rs. 5083.77
99						
100	9c	Reinforcement @ 90 kg/cum	264.080 Kg		Rs.65.70/kg	Rs. 17350.1
101						
102	10	WHITE WASHING				
103	10a	inside white washing	area			
107		Total area of white wash inside	103.77 Sqm			
108						
109	10b	Outside white wash	area			
113		Overall total area of plaster to be used	169.47 Sqm		Rs.20.00/sqm	Rs. 3389.30
114						
115	11	PLASTERING				
116	11a	inside plaster	area			
119		Total area of plaster to be used inside	80.04 Sqm		Rs.107.40/sqm	Rs. 8596.30
120						
121	11b	Outside plaster/pointing	area			
124		Total area of pointing to be used outside	65.70 Sqm		Rs.53.70/sqm	Rs. 3528.1
125						
126	12	MS FRAMES				
127		Door frames local wood 35x35x6 ISA				
133		Total quantity for frames	28.350 Kg		Rs.75.00/kg	Rs. 2126.25
134						
135	13	LOCAL WOOD SHUTTER				
140		Window Shutter 35mm thick local wood shutter				
143		Total area of wood shutter	7.020 Sqm		Rs.900.00/Sqm	Rs. 6318.00
144						
145					GRAND TOTAL	Rs.143020.12

MADHYA PRADESH

140

MP-04

Designed to suit social and architectural conditions in Zone B

Zone B highlights: This is a hot dry area.

This Zone comprises of districts of Jhabua, Dhar (Bhil, Bhilala, Pateliya)

Local building construction technology::

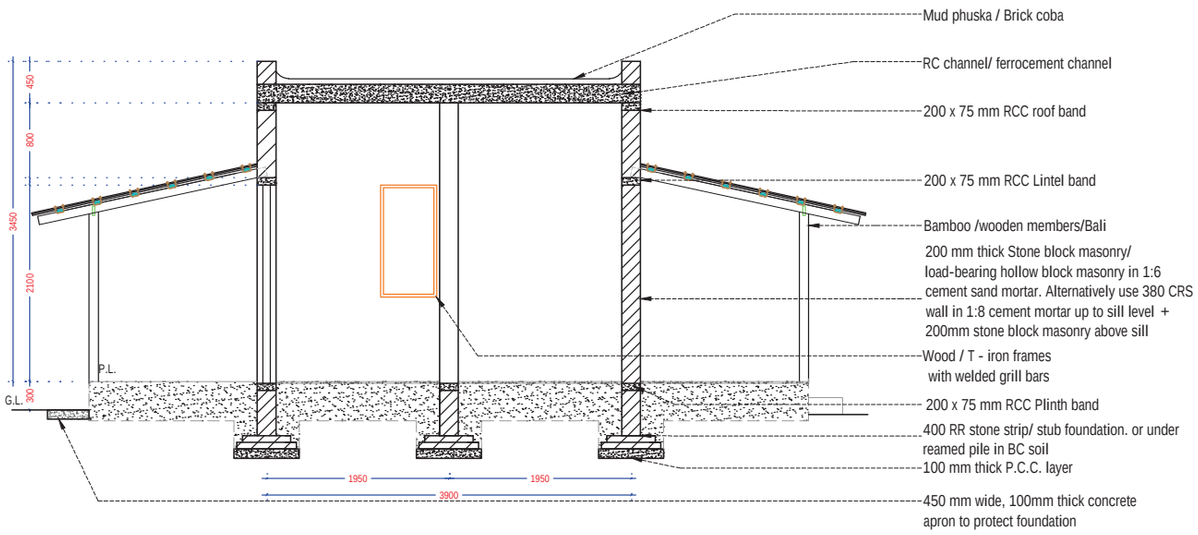
- RR foundation
- Coursed stone masonry
- GI sheet roofing
- Timber understructure

MADHYA PRADESH

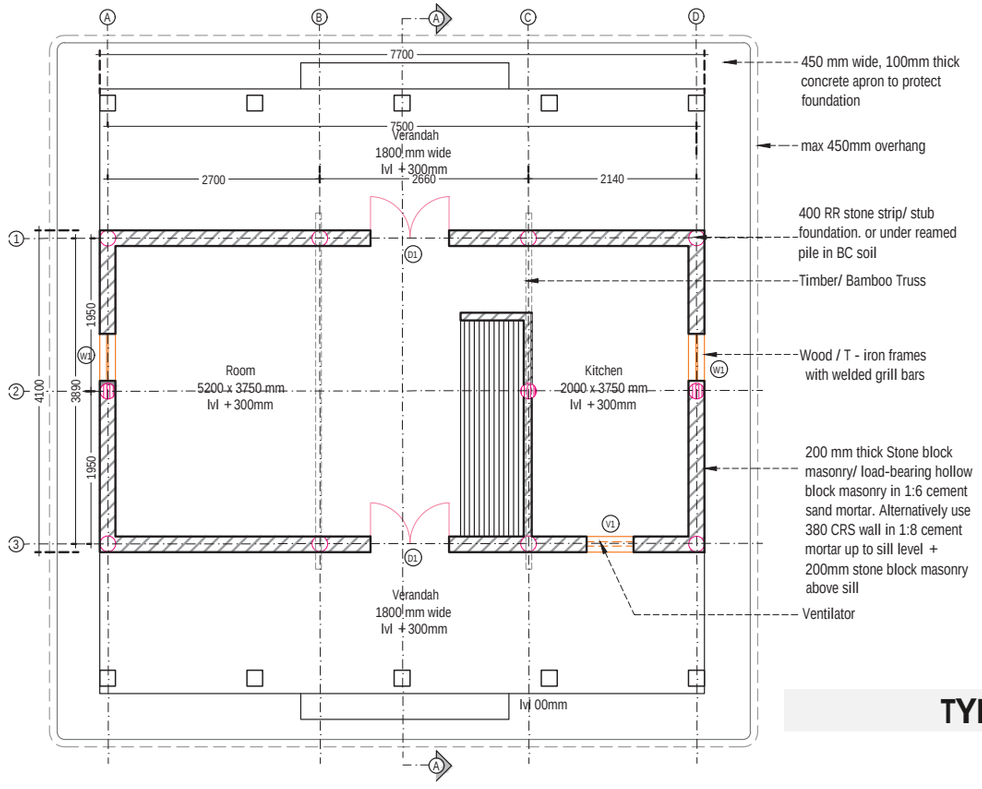
Highlights of the Prototype

- The fear of theft of the livestock is very strong which is reflected in house design. In general buildings have small windows with only one door. Cattle and living quarters are kept side by side.
- Most of the buildings in Jhabua have RR foundation and wall with a combination of thin stones.
- The gable walls are in brick.
- The corners of such construction are hybridised with clay bricks to make neat and strong joints.
- Roofs are mostly in CGI/ACC sheets on local timber understructure.
- Local masons evolved their own way of utilising the convenience of both stone and brick.
- This is a hot dry area.

Recommendations for construction systems	
Components	**Recommended Specifications**
Foundations	• Strip foundation in normal soil of bearing capacity of 10T/sqm or higher • Strip foundation in Black cotton soil not more than 1.5m deep. • Masonry stub fdn with tie beam, Black cotton soil not more than 1.5m deep, single storey construction. • Brick arch fdn with brick/ block/stone arch. BC soil not more than 1.5m deep.Hard rocky strata trenching difficult. • Single Under-reamed Pile foundation, diameter and length as given in drawings.
Plinth	• Minimum (300 mm or 150mm more than last 50 year flood level)
Wall	• 20 cm thick brick/Stone masonry block or load-bearing hollow block walls may be constructed in 1:6 cement sand mortar.
Wall Finish	• cement plaster
Roof Structure	• RC plank joist system or • Sloping roofs with Timber understructure
Roof Cover	• 'PCC for flat roofs with waterproofing • GI sheet
Floor	• cement concrete/ brick paving
Door and Windows	• Mild steel door and window



TYPICAL SECTION AA'



TYPICAL PLAN

MP-04

Area Statement:

Item	Area	
	Sq.m	Sq.ft
Room	19.64	211.40
Kitchen	7.39	79.55
Verandah 1	13.86	149.19
Verandah 2	**13.86**	**149.19**
Carpet Area	**27.04**	**291.06**
Built up Area	**59.29**	**638.20**

MADHYA PRADESH

MP-04
Cost estimate

	A	B	G	H	I	J
16	SL	DESCRIPTION	QUANTITY		UNIT RATE	COSTS
17		FOUNDATION				
18	1	Excavation in foundation				
21		Total vol of excavation	6.788 Cum		Rs.93.80/Cum	Rs. 636.68
22						
23	1b	Filling				
27		Total vol of filling	8.646 Cum		Rs.93.80/Cum	Rs. 810.99
28						
29	1c	Sand filling 75mm on trench				
32		Total vol of sand	1.018 Cum		Rs.400.00/cum	Rs. 407.26
33						
34	2	Lean concrete bed 100mm in 1:3:6				
37		Total vol of lean concrete	1.278 Cum		Rs.2626.0/Cum	Rs. 3357.26
38						
39	3a	300 mm thick Brick work in foundation				
42	3b	200 mm thick Brick work in foundation				
47		TOTAL VOLUME OF BRICKWORK IN FOUNDATION	3.255 Cum		Rs.3294.1/Cum	Rs. 10720.6
48						
49	4a	75x200 RCC plinth band- 2-8mm tor+ 6 dia links @ 175 c/c				
51		Total vol	0.368 Cum		Rs.3429.9/Cum	Rs. 1263.06
52						
53	4b	Shuttering				
54			3.683 Cum			
55		Total area of shuttering	3.683 Sqm		Rs.168.70/Sqm	Rs. 621.24
56						
57	4c	Reinforcement @70 kg/cum	25.778 Kg		Rs.65.70/kg	Rs. 1693.58
58		FLOORING				
59	5	25mm flooring: Flag stone				
62		Total quantity (5% skirting)	25.003 Sqm		Rs.389.70/Sqm	Rs. 9743.7
63						

MADHYA PRADESH

	A	B	G	H	I	J
64	6	WALLS				
65		200 mm masonry wall				
71		Total vol of brickwork	12.259 Cum		Rs.3294.1/Cum	Rs. 40382.4
72						
73	7	LINTEL BAND				
74	7a	100X200 RCC lintel -4-8 TOR ALTHRO'+ 6 dia @ 175C/C				
76		Total vol of concrete	0.491 Cum		Rs.3429.9/Cum	Rs. 1684.08
77						
78	7b	Shuttering				
80		Total area of shuttering	9.820 Sqm		Rs.168.70/Sqm	Rs. 1656.63
81						
82	7c	Reinforcement @70 kg/cum	34.370 Kg		Rs.65.70/kg	Rs. 2258.11
83						
84	8	RCC LEDGE 62.5MM				
85	8a	450X62.5 RCC ledge -4-8 TOR+ 6 dia @ 175C/C				
88		Total vol of RCC works	0.295 Cum		Rs.3429.9/Cum	Rs. 1012.89
89						
90	8b	Shuttering				
93		total area of shuttering	5.381 Sqm		Rs.168.70/Sqm	Rs. 907.82
94						
95	8c	Reinforcement @ 70 kg/cum	20.672 Kg		Rs.65.70/kg	Rs. 1358.14
96						
97	9	100 RCC FOR ROOF IN M20				
98	9a	area of 100RCC flat roof	2.82 Cum		Rs.3429.9/Cum	Rs. 9656.24
99						
100	9b	shuttering				
102		total area of shuttering	28.15 Sqm		Rs.168.70/Sqm	Rs. 4749.43
103						
104	9c	Reinforcement @ 90 kg/cum	253.378 Kg		Rs.65.70/kg	Rs. 16646.94
105						
106	10	WHITE WASHING				
107	10a	inside white washing	area			
111		Total area of white wash inside	100.62 Sqm			
112						
113	10b	Outside white wash	area			
117		Overall total area of plaster to be used	166.02 Sqm		Rs.20.00/sqm	Rs. 3320.45
118						
119	11	PLASTERING				
120	11a	inside plaster	area			
123		Total area of plaster to be used inside	78.01 Sqm		Rs.107.40/sqm	Rs. 8378.27
124						
125	11b	Outside plaster/pointing	area			
128		Total area of pointing to be used outside	65.40 Sqm		Rs.53.70/sqm	Rs. 3511.98
129						
130	12a	MS FRAMES				
131		Door frames local wood 35x35x6 ISA				
137		Total quantity for frames	28.350 Kg		Rs.75.00/kg	Rs. 2126.25
138						
139	12b	LOCAL WOOD SHUTTER				
140		Door Shutter 40mm thick local wood shutter				
147		Total area of wood shutter	7.020 Sqm		Rs.900.00/Sqm	Rs. 6318.00
148						
149					GRAND TOTAL	Rs. 134943.30

MP-05

Designed to suit social and architectural conditions in Zone G

Zone D highlights: Composite climate and presence of black cotton soil, hard soil at 1.5-1.7 m

This Zone comprises of the district of Guna, Shivpuri

Local Local building construction technology::

- RR stone
- Coursed stone

Highlights of the Prototype

- Have plenty of random and coursed rubble stones.
- The villagers use the local stones and have the skill to build such structures on their own.
- In Guna the poor quality of bricks demanded alternative construction materials.
- Cement stabilised mud block could be recommended for these areas.
- Some parts of this zone have stone and hence, RR foundation may be recommended for foundation and wall.

Recommendations for construction systems	
Components	**Recommended Specifications**
Foundations	• Strip foundation in normal soil of bearing capacity of 10T/sqm or higher • Strip foundation in Black cotton soil not more than 1.5m deep. • Masonry stub fdn with tie beam, Black cotton soil not more than 1.5m deep, single storey construction. • Brick arch fdn with brick/ block/stone arch. BC soil not more than 1.5m deep.Hard rocky strata trenching difficult. • Single Under-reamed Pile foundation, diameter and length as given in drawings.
Plinth	• Minimum (300 mm or 150mm more than last 50 year flood level)
Wall	• 20 cm thick brick/Stone masonry block or load-bearing hollow block walls may be constructed in 1:6 cement sand mortar.
Wall Finish	• cement plaster
Roof Structure	• Sloping roofs with Timber/bamboo understructure
Roof Cover	• GI sheet
Floor	• cement concrete/ brick paving
Door and Windows	• Mild steel door and window

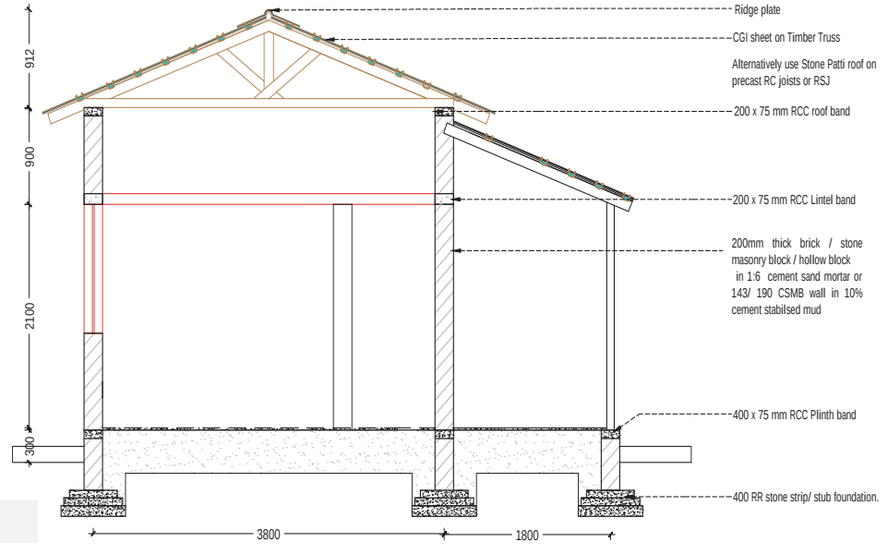
MADHYA PRADESH

MP-05

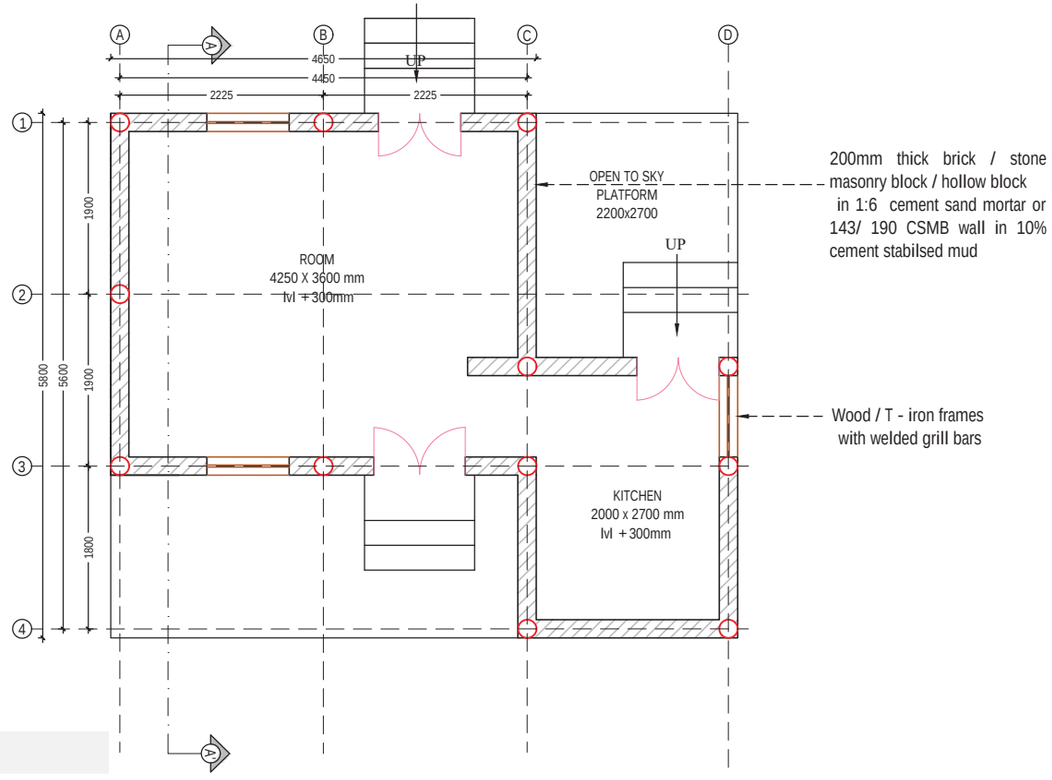
Area Statement:

Item	Area	
	Sq.m	Sq.ft
Room	15.75	169.53
Kitchen	5.58	60.06
Verandah	8.37	90.09
Carpet Area	**21.33**	**229.60**
Built up Area	**33.79**	**363.72**

MADHYA PRADESH



TYPICAL SECTION AA'



TYPICAL PLAN

MP-05
Cost estimate

	A	B	C	D	E	F	G	H	I	J
17	SL	DESCRIPTION	NOS	L	B	H	QUANTITY		UNIT RATE	COSTS
18		FOUNDATION								
19	1a	Excavation in foundation								
22		Total vol of excavation					7.616 Cum		Rs.93.80/Cum	Rs. 714.40
23										
24	1b	Filling								
28		Total vol of filling					7.421 Cum		Rs.93.80/Cum	Rs. 696.11
29										
30	1c	Sand filling 75mm on trench								
33		Total vol of sand					1.142 Cum		Rs.400.00/cum	Rs. 456.97
34										
35	2	Lean concrete bed 100mm in 1:3:6								
38		Total vol of lean concrete					1.076 Cum		Rs.2626.0/Cum	Rs. 2826.51
39										
40	3a	300 mm thick Brick work in foundation								
43	3b	200 mm thick Brick work in foundation								
47		TOTAL VOLUME OF BRICKWORK IN FOUNDATION					3.767 Cum		Rs.3294.1/Cum	Rs. 12408.9
48										
49	4a	75x200 RCC plinth band- 2-8mm tor+ 6 dia links @ 175 c/c								
51		Total vol					0.401 Cum		Rs.3429.9/Cum	Rs. 1373.67
52										
53	4b	Shuttering								
55		Total area of shuttering					4.005 Sqm		Rs.168.70/Sqm	Rs. 675.64
56										
57	4c	Reinforcement @70 kg/cum					28.035 Kg		Rs.65.70/kg	Rs. 1841.90
58										
59	5	FLOORING								
60		25mm flooring: Flag stone								
64		Total vol					27.405 Sqm		Rs.389.70/Sqm	Rs. 10679.7
65										
66	6	WALLS								
67		200 mm masonry wall								
73		Total vol of brickwork					13.794 Cum		Rs.3294.1/Cum	Rs. 45438.8

	A	B	C	D	E	F	G	H	I	J
75	7	LINTEL BAND								
76	7a	100X200 RCC lintel -4-8 TOR ALTHRO'+ 6 dia @ 175C/C								
78		Total vol of concrete					0.534 Cum		Rs.3429.9/Cum	Rs. 1831.57
79										
80	7b	Shuttering								
82		Total area of shuttering					5.340 Sqm		Rs.168.70/Sqm	Rs. 900.86
83										
84	7c	Reinforcement @70 kg/cum					37.380 Kg		Rs.65.70/kg	Rs. 2455.87
85										
86	8	RCC LEDGE 62.5MM								
87	8a	450X62.5 RCC ledge -4-8 TOR+ 6 dia @ 175C/C								
89										
90		Total vol of RCC works					0.214 Cum		Rs.3429.9/Cum	Rs. 733.14
91										
92	8b	Shuttering								
94										
95		total area of shuttering					3.895 Sqm		Rs.168.70/Sqm	Rs. 657.09
96										
97	8c	Reinforcement @ 70 kg/cum					14.963 Kg		Rs.65.70/kg	Rs. 983.04
98										
99	9	100 RCC FOR ROOF IN M20								
100	9a	area of 100RCC flat roof - 25.16 Sqm	25.16			0.1	2.64 Cum		Rs.3429.9/Cum	Rs. 9061.11
101										
102	9b	shuttering								
103							26.418 Sqm			
104		total area of shuttering					26.42 Sqm		Rs.168.70/Sqm	Rs. 4456.72
105										
106	9c	Reinforcement @ 90 kg/cum					237.762 Kg		Rs.65.70/kg	Rs. 15620.96
107										
108	10	WHITE WASHING								
109	10a	inside white washing					area			
115		Total area of white wash inside					97.95 Sqm			
116										
117	10b	Outside white wash					area			
121		Overall total area of plaster to be used					172.65 Sqm		Rs.20.00/sqm	Rs. 3453.00
122										
123	11	PLASTERING								
124	11a	inside plaster					area			
129		Total area of plaster to be used inside					72.79 Sqm		Rs.107.40/sqm	Rs. 7817.65
130										
131	11b	Outside plaster/pointing					area			
134		Overall total area of pointing to be used					74.70 Sqm		Rs.53.70/sqm	Rs. 4011.39
135										
136	12a	MS FRAMES								
137		Door frames local wood 35x35x6 ISA								
143		Total quantity for frames					28.350 Kg		Rs.75.00/kg	Rs. 2126.25
144										
145	12b	LOCAL WOOD SHUTTER								
146		Door Shutter 40mm thick local wood shutter								
153		Total area of wood shutter					7.020 Sqm		Rs.900.00/Sqm	Rs. 6318.00
154										
155									GRAND TOTAL	Rs. 139260.5

MADHYA PRADESH

MP-06

Designed to suit social and architectural conditions in Zone C

Zone C highlights: The locality has about 600mm BC soil, which the local masons remove before making a foundation. This zone falls under seismic zone III.

This Zone comprises of the district of Burhanpur.

Local building construction technology::

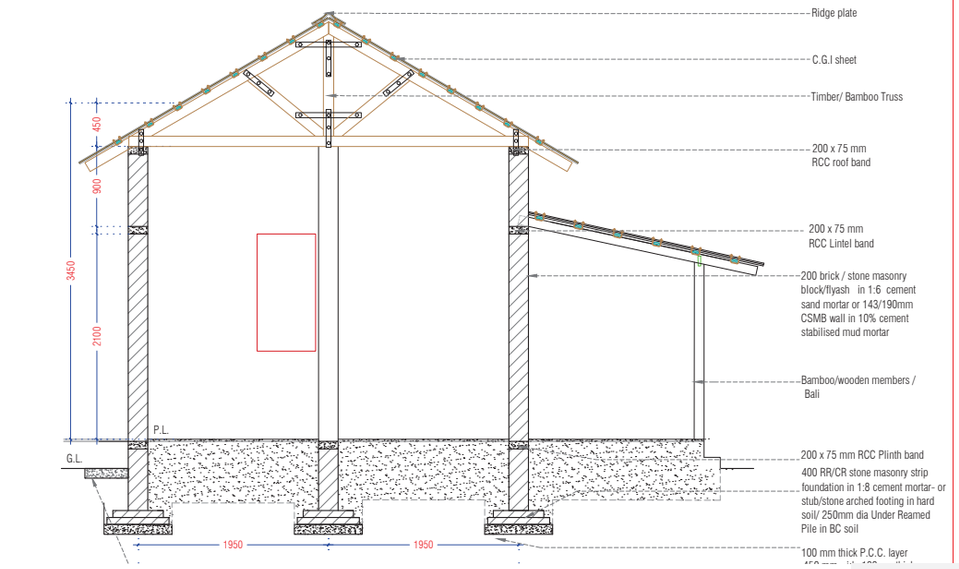
- clay tile roofing
- RR and coursed stone masonry

MADHYA PRADESH

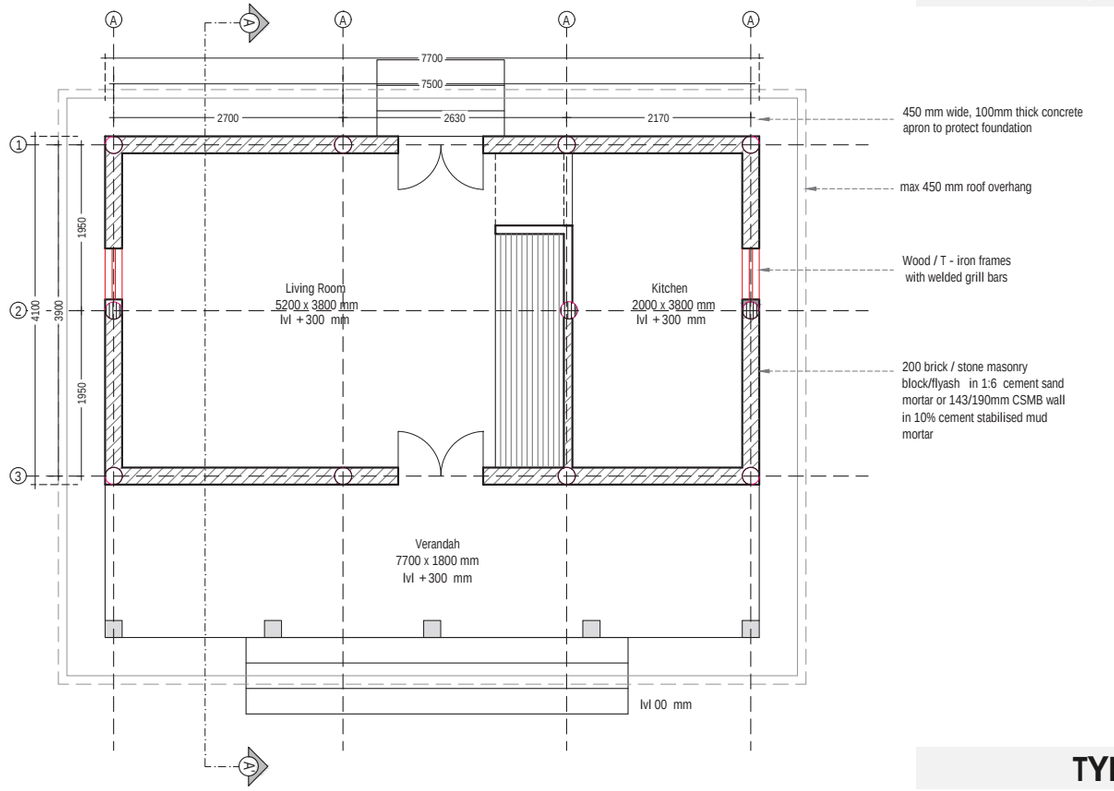
Highlights of the Prototype

- This zone has a few varieties of plan-forms, a) compact, b) Linear, c) L type layout, etc (Bori Buzurg, Burhanpur).
- Timber under-structure with clay tile roof is common.
- The locality has about 600mm BC soil, which the local masons remove before making a foundation. In the other block, the depth of BC soil is as high as 2m.
- Plenty of random and coursed rubble stones are available. The villagers have the skill to build such structures on their own.
- Generally, foundation is built with RR stones and the walls are in clay bricks.

Recommendations for construction systems	
Components	**Recommended Specifications**
Foundations	• Strip foundation in normal soil of bearing capacity of 10T/sqm or higher • Strip foundation in Black cotton soil not more than 1.5m deep. • Masonry stub fdn with tie beam, Black cotton soil not more than 1.5m deep, single storey construction. • Brick arch fdn with brick/ block/stone arch. BC soil not more than 1.5m deep.Hard rocky strata trenching difficult. • Single Under-reamed Pile foundation, diameter and length as given in drawings.
Plinth	• Minimum (300 mm or 150mm more than last 50 year flood level)
Wall	• 20 cm thick brick/Stone masonry block or load-bearing hollow block walls may be constructed in 1:6 cement sand mortar.
Wall Finish	• cement plaster
Roof Structure	• Pre cast flat RC channel or • Sloping roofs with Timber/bamboo understructure
Roof Cover	• 'PCC for flat roofs with waterproofing • GI sheet
Floor	• cement concrete/ brick paving
Door and Windows	• Mild steel door and window



TYPICAL SECTION AA'



TYPICAL PLAN

MP-06

Area Statement:

Item	Area	
	Sq.m	Sq.ft
Room	19.64	211.40
Kitchen	7.40	79.65
Verandah	13.86	149.19
Carpet Area	**27.04**	**291.06**
Built up Area	**45.43**	**489.00**

MADHYA PRADESH

MP-06

	A	B	G	H	I	J
15	SL	DESCRIPTION	QUANTITY		UNIT RATE	COSTS
16		FOUNDATION				
17	1a	Excavation in foundation				
20		Total vol of excavation	8.277 Cum		Rs.93.80/Cum	Rs. 776.42
21						
22	1b	Filling				
26		Total vol of filling	9.117 Cum		Rs.93.80/Cum	Rs. 855.19
27						
28	1c	Sand filling 75mm on trench				
31		Total vol of sand	1.242 Cum		Rs.400.00/cum	Rs. 496.64
32						
33	2	Lean concrete bed 100mm in 1:3:6				
36		Total vol of lean concrete	1.655 Cum		Rs.2626/Cum	Rs.4347/Cum
37						
38	3	300 mm thick Brick work in foundation				
41	4	200 mm thick Brick work in foundation				
45		TOTAL VOLUME OF BRICKWORK IN FOUNDATION	2.286 Cum		Rs.3294/Cum	Rs.7529/Cum
46						
47	5a	75x200 RCC plinth band- 2-8mm tor+ 6 dia links @ 175 c/c				
49		Total vol	0.512 Cum		Rs.3430/Cum	Rs.1757/Cum
50						
51	5b	Shuttering				
53		Total area of shuttering	5.123 Sqm		Rs.169/Cum	Rs.864/Cum
54						
55	5c	Reinforcement @70 kg/cum	35.858 Kg		Rs.66/Cum	Rs.2356/Cum
56						
57	6	FLOORING				
58		20mm 1:4 CM on FBS in 1:4 CM with neat cement punning				
62		Total vol	37.653 Sqm		Rs.389.70/Sqm	Rs. 14673.4
63						
64	7	WALLS				
65		200 mm masonry wall				
70		Total vol of brickwork	13.217 Cum		Rs.3294/Cum	Rs.43538/Cum

MADHYA PRADESH

	A	B	G	H	I	J
72	8a	LINTEL BAND				
73		100X200 RCC lintel -4-8 TOR ALTHRO'+ 6 dia @ 175C/C				
75		Total vol of concrete	0.489 Cum		Rs.3430/Cum	Rs.1677/Cum
76						
77	8b	Shuttering				
79		Total area of shuttering	4.890 Sqm		Rs.169/Cum	Rs.825/Cum
80						
81	8c	Reinforcement @70 kg/cum	34.230 Kg		Rs.66/Cum	Rs.2249/Cum
82						
83	9a	RCC LEDGE 62.5MM				
84		450X62.5 RCC ledge -4-8 TOR+ 6 dia @ 175C/C				
86		Total vol of RCC works	0.200 Cum		Rs.3430/Cum	Rs.685/Cum
87						
88	9b	Shuttering				
89		long wall	3.639 Sqm			
90		total area of shuttering	3.639 Sqm		Rs.169/Cum	Rs.614/Cum
91						
92	9c	Reinforcement @ 70 kg/cum	13.978 Kg		Rs.66/Cum	Rs.918/Cum
93						
94	10a	100 RCC FOR ROOF IN M20				
95		area of 100RCC flat roof - 26.6 Sqm	2.79 Cum		Rs.3430/Cum	Rs.9580/Cum
96						
97	10b	shuttering				
98			26.600 Sqm			
99		total area of shuttering	26.60 Sqm		Rs.169/Cum	Rs.4487/Cum
100						
101	10c	Reinforcement @ 90 kg/cum	251.370 Kg		Rs.66/Cum	Rs.16515/Cum
102						
103	10d	Veranda portion	12.780 Sqm		Rs.853.00/sqm	Rs. 10901.34
104						
105	11a	WHITE WASHING				
106		inside white washing	area			
110		Total area of white wash inside	104.32 Sqm			
111						
112	11b	Outside white wash	area			
116		Overall total area of plaster to be used	169.42 Sqm		Rs.20.00/sqm	Rs. 3388.40
117						
118	12a	PLASTERING				
119	a	inside plaster	area			
122		Total area of plaster to be used inside	77.72 Sqm		Rs.107.40/sqm	Rs. 8347.13
123						
124	12b	Outside plaster/pointing	area			

	A	B	G	H	I	J
127		Total area of pointing to be used outside	65.10 Sqm		Rs.53.70/sqm	Rs. 3495.87
128						
129	13a	MS FRAMES				
130		Door frames local wood 35x35x6 ISA				
134		Window frames 35x35x6 ISA				
136		Total quantity for frames	28.350 Kg		Rs.75.00/kg	Rs. 2126.25
137						
138	13b	LOCAL WOOD SHUTTER				
139		Door Shutter 40mm thick local wood shutter				
143		Window Shutter 35mm thick local wood shutter				
146		Total area of wood shutter	7.020 Sqm		Rs.900.00/Sqm	Rs. 6318.00
147						
148						
149					GRAND TOTAL	Rs. 151041.68

MP-07

Designed to suit social and architectural conditions in Zone F

Zone F highlights: this zone primarily falls under seismic zone II & composite climate

This Zone comprises of the district of Sidhi, Chhatarpur, Datia.

Local Local building construction technology::

- Flag stone roofing

Highlights of the Prototype

- This zone has abundance of stone.
- The area is hot during peak summer and hence, many buildings have veranda all around to protect the core house.
- Chhattarpur, Satna, Datia, etc. have a large number of flag stone roofing. Water scarcity is common in the area.
- Many excellent looking buildings were found in these areas

Recommendations for construction systems	
Components	**Recommended Specifications**
Foundations	• Strip foundation in normal soil of bearing capacity of 10T/sqm or higher • Strip foundation in Black cotton soil not more than 1.5m deep. • Masonry stub fdn with tie beam, Black cotton soil not more than 1.5m deep, single storey construction. • Brick arch fdn with brick/ block/stone arch. BC soil not more than 1.5m deep.Hard rocky strata trenching difficult. • Single Under-reamed Pile foundation, diameter and length as given in drawings.
Plinth	• Minimum (300 mm or 150mm more than last 50 year flood level)
Wall	• 20 cm thick brick/Stone masonry block or load-bearing hollow block walls may be constructed in 1:6 cement sand mortar.
Wall Finish	• cement plaster
Roof Structure	• Pre cast flat RC channel or • Sloping roofs with Timber/bamboo understructure
Roof Cover	• 'PCC for flat roofs with waterproofing • GI sheet
Floor	• cement concrete/ brick paving
Door and Windows	• Mild steel door and window

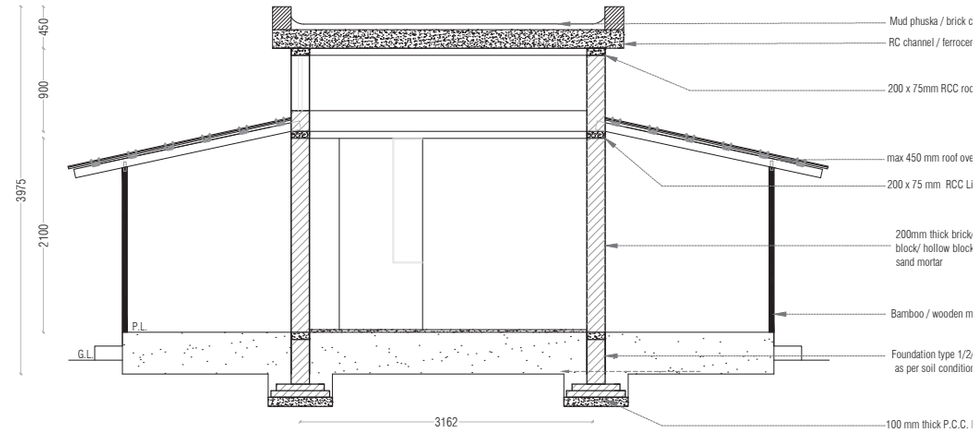
MADHYA PRADESH

MP-07

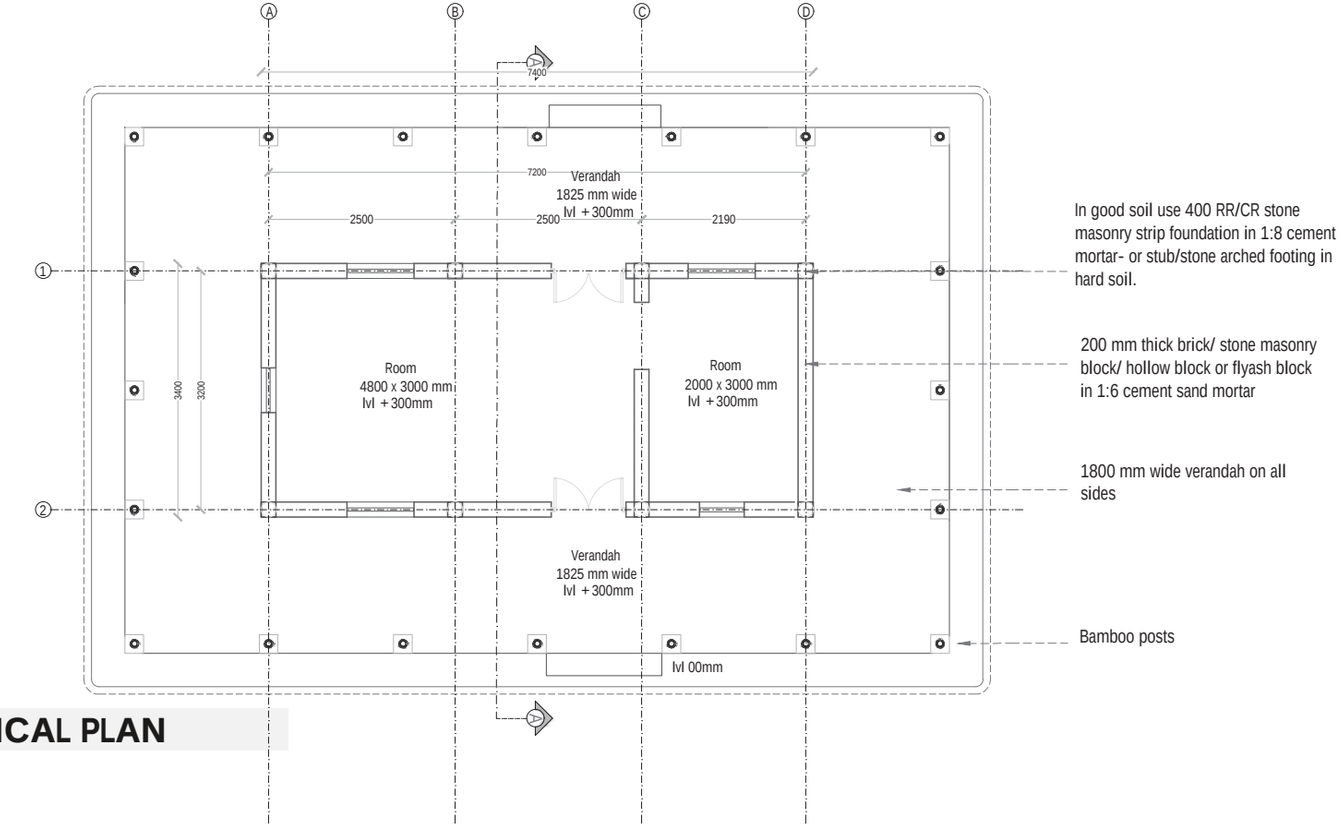
Area Statement:

Item	Area	
	Sq.m	Sq.ft
Room	14.80	159.31
Room	6.18	66.52
Verandah	52.78	568.12
Carpet Area	**20.98**	**225.83**
Built up Area	**77.94**	**838.95**

MADHYA PRADESH

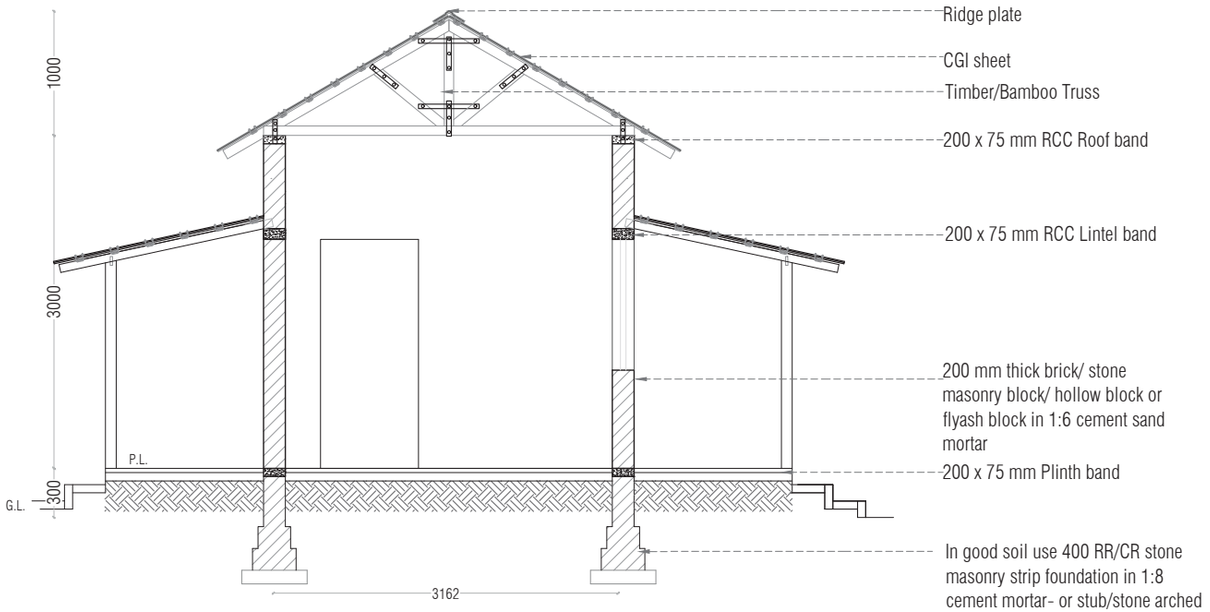


TYPICAL SECTION AA'



TYPICAL PLAN

MP-07
Alternative roofing



TYPICAL SECTION AA' - SLOPING ROOF OPTION

MADHYA PRADESH

MP-07
Cost estimate

	A	B	G	H	I	J
15	SL	DESCRIPTION	QUANTITY		UNIT RATE	COSTS
16		FOUNDATION				
17	1a	Excavation in foundation				
20		Total vol of excavation	5.824 Cum		Rs.93.80/Cum	Rs. 546.29
21						
22	1b	Filling				
25		Total vol of filling	7.716 Cum		Rs.93.80/Cum	Rs. 723.79
26						
27	1c	Sand filling 75mm on trench				
30		Total vol of sand	0.874 Cum		Rs.400.00/cum	Rs. 349.44
31						
32	2	Lean concrete bed 100mm in 1:3:6				
35		Total vol of lean concrete	1.165 Cum		Rs.2626/Cum	Rs.3059/Cum
36						
37	3a	300 mm thick Brick work in foundation				
40	3b	200 mm thick Brick work in foundation				
44		TOTAL VOLUME OF BRICKWORK IN FOUNDATION	2.880 Cum		Rs.3294.1/Cum	Rs. 9487.0
45						
46	4a	75x200 RCC plinth band- 2-8mm tor+ 6 dia links @ 175 c/c				
48		Total vol	0.360 Cum		Rs.3429.9/Cum	Rs. 1234.76
49						
50	4b	Shuttering				
52		Total area of shuttering	7.200 Sqm		Rs.168.70/Sqm	Rs. 1214.64
53						
54	4c	Reinforcement @70 kg/cum	25.20 Kg		Rs.65.70/kg	Rs. 1655.64
55						
56	5	FLOORING				
57		20mm 1:4 CM on FBS in 1:4 CM with neat cement punning				
60		Total vol	25.358 Sqm		Rs.389.70/Sqm	Rs. 9881.8
61						
62	6	WALLS				
63		200 mm masonry wall				
68		Total vol of brickwork	12.516 Cum		Rs.3294.1/Cum	Rs. 41229.0

MADHYA PRADESH

	A	B	G	H	I	J
70	7	LINTEL BAND				
71	7a	100X200 RCC lintel -4-8 TOR ALTHRO'+ 6 dia @ 175C/C				
73		Total vol of concrete	0.480 Cum		Rs.3429.9/Cum	Rs. 1646.35
74						
75	7b	Shuttering				
77		Total area of shuttering	4.800 Sqm		Rs.168.70/Sqm	Rs. 809.76
78						
79	7c	Reinforcement @70 kg/cum	33.600 Kg		Rs.65.70/kg	Rs. 2207.52
80						
81	8	RCC LEDGE 62.5MM				
82	8a	450X62.5 RCC ledge -4-8 TOR+ 6 dia @ 175C/C				
84		Total vol of RCC works	0.204 Cum		Rs.3429.9/Cum	Rs. 699.38
85						
86	8b	Shuttering				
88		total area of shuttering	3.716 Sqm		Rs.168.70/Sqm	Rs. 626.83
89						
90	8c	Reinforcement @ 70 kg/cum	14.273 Kg		Rs.65.70/kg	Rs. 937.76
91						
92	9	100 RCC FOR ROOF IN M20				
93	9a	area of 100RCC flat roof - 25.16 Sqm	2.64 Cum		Rs.3429.9/Cum	Rs. 9061.11
94						
95	9b	shuttering				
96			26.418 Sqm			
97		total area of shuttering	26.42 Sqm		Rs.168.70/Sqm	Rs. 4456.72
98						
99	9c	Reinforcement @ 90 kg/cum	237.762 Kg		Rs.65.70/kg	Rs. 15620.96
100						
101	10	WHITE WASHING				
102	10a	inside white washing	area			
106		Total area of white wash inside	100.56 Sqm			
107						
108	10b	Outside white wash	area			
112		Overall total area of plaster to be used	165.36 Sqm		Rs.20.00/sqm	Rs. 3307.20
113						
114	11	PLASTERING				
115	11a	inside plaster	area			
118		Total area of plaster to be used inside	75.40 Sqm		Rs.107.40/sqm	Rs. 8097.96
119						
120	11b	Outside plaster/pointing	area			
123		Total area of pointing to be used outside	64.80 Sqm		Rs.53.70/sqm	Rs. 3479.76
124						
125	12a	MS FRAMES				
132		Total quantity for frames	28.350 Kg		Rs.75.00/kg	Rs. 2126.25
133						
134	12b	LOCAL WOOD SHUTTER				
142		Total area of wood shutter	7.020 Sqm		Rs.900.00/Sqm	Rs. 6318.00
143						
144						
145					GRAND TOTAL	130497.9241

MP-08

Designed to suit social and architectural conditions in Zone E

Zone E highlights: This zone partially falls under seismic zone II & III

This Zone comprises of the district of Balaghat, Mandla, Anuppur,Dindori

Local building construction technology::

- Bamboo
- Burnt clay tile roofing
- Timber undertsructure
- Burnt clay bricks

Highlights of the Prototype

- In Seoni, Mandla, Balaghat, etc. people prefer to keep their cattle-shed (called Dahal) in front of their living quarters, with a courtyard in between providing adequate privacy to the HH. Majority of the buildings in this region are of burnt clay tile roof on local timber understructure on mud.
- The use of bamboo truss as under-structure of the roofs would bring down the cost of construction and hence, would facilitate increased covered area. It will also provide a local style of architecture in line with their vernacular system.

Recommendations for construction systems	
Components	**Recommended Specifications**
Foundations	• Strip foundation in normal soil of bearing capacity of 10T/sqm or higher • Strip foundation in Black cotton soil not more than 1.5m deep. • Masonry stub fdn with tie beam, Black cotton soil not more than 1.5m deep, single storey construction. • Brick arch fdn with brick/ block/stone arch. BC soil not more than 1.5m deep.Hard rocky strata trenching difficult. • Single Under-reamed Pile foundation, diameter and length as given in drawings.
Plinth	• Minimum (300 mm or 150mm more than last 50 year flood level)
Wall	• 20 cm thick brick/Stone masonry block or load-bearing hollow block walls may be constructed in 1:6 cement sand mortar.
Wall Finish	• cement plaster
Roof Structure	• Pre cast flat RC channel or RC filler slab or • Sloping roofs with Timber/bamboo understructure
Roof Cover	• 'PCC for flat roofs with waterproofing • GI sheet
Floor	• cement concrete/ brick paving
Door and Windows	• Mild steel door and window

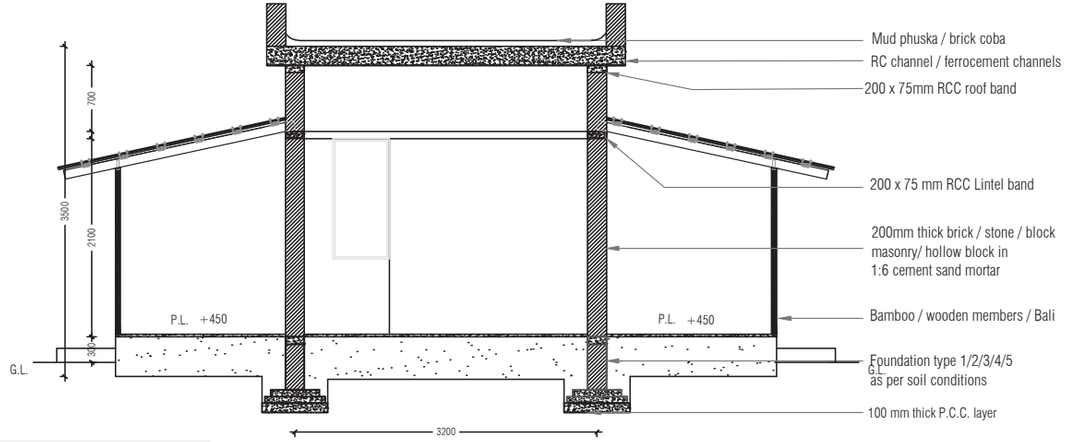
MADHYA PRADESH

MP-08

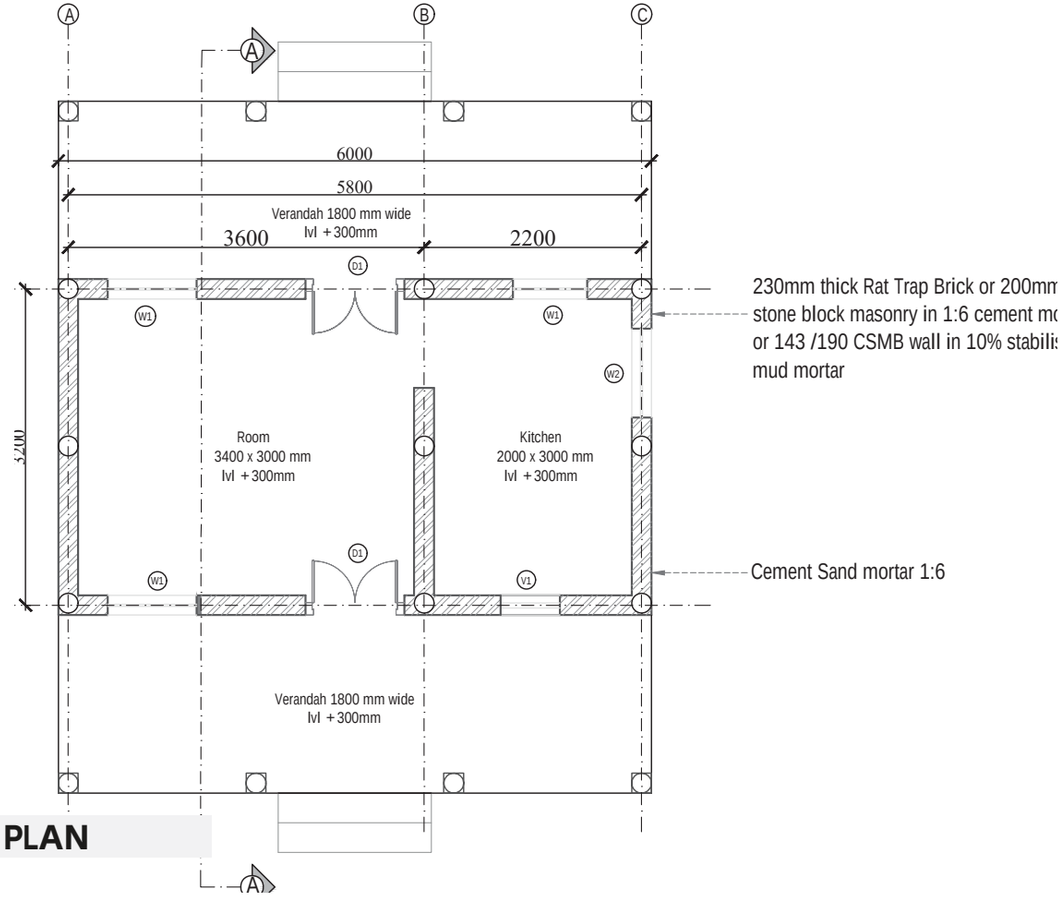
Area Statement:

Item	Area	
	Sq.m	Sq.ft
Room	10.60	114.10
Kitchen	6.18	66.52
Verandah 1	10.80	116.25
Verandah 2	**10.80**	**116.25**
Carpet Area	**16.78**	**180.62**
Built up Area	**42.00**	**452.08**

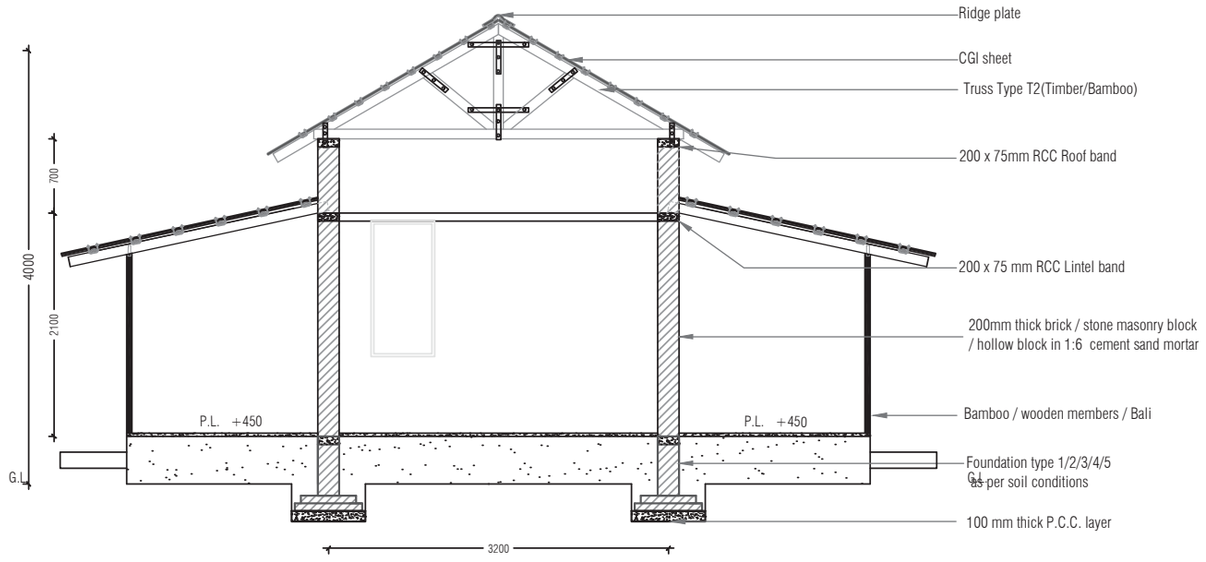
MADHYA PRADESH



TYPICAL SECTION AA'



TYPICAL PLAN



TYPICAL SECTION AA' - SLOPING ROOF OPTION

MADHYA PRADESH

MP-08
Cost estimate

	A	B	G	H	I	J
16	SL	DESCRIPTION	QUANTITY		UNIT RATE	COSTS
17		FOUNDATION				
18	1a	Excavation in foundation				
23		Total vol of excavation	8.738 Cum		Rs.93.80/Cum	Rs. 819.62
24						
25	1b	Filling				
30		Total vol of filling	8.488 Cum		Rs.93.80/Cum	Rs. 796.14
31						
32	1c	Sand filling 75mm on trench				
37		Total vol of sand	1.329 Cum		Rs.400.0/cum	Rs.531.7/cum
38						
39	2	Lean concrete bed 100mm in 1:3:6				
44		Total vol of lean concrete	1.537 Cum		Rs.2626/Cum	Rs.4037/Cum
45						
46	3a	300 mm thick Brick work in foundation				
48		Total vol of brickwork	0.450 Cum			
49						
50	3b	200 mm thick Brick work in foundation				
56		TOTAL VOLUME OF BRICKWORK IN FOUNDATION	3.382 Cum		Rs.3294/Cum	Rs.11142/Cum
57						
58	4a	75x200 RCC plinth band- 2-8mm tor+ 6 dia links @ 175 c/c				
62		Total vol	0.553 Cum		Rs.3430/Cum	Rs.1897/Cum
63						
64	4b	Shuttering				
68		Total area of shuttering	5.530 Sqm		Rs.168.7/Sqm	Rs. 932.91
69						
70	4c	Reinforcement @70 kg/cum	38.710 Kg		Rs.65.70/kg	Rs. 2543.25
71	5	FLOORING				
72		100 thk 1:3:6 CC with neat cement punning				
77		Total vol	26.42 Sqm		Rs.389.7/Sqm	Rs.10295.1/Sqm

MADHYA PRADESH

	A	B	G	H	I	J
79	6	WALLS				
80		200 mm masonry wall				
86		Total vol of brickwork	11.882 Cum		Rs.3294/Cum	Rs.39140/Cum
87						
88	7a	LINTEL BAND				
89		100X200 RCC lintel -4-8 TOR ALTHRO'+ 6 dia @ 175C/C				
91		Total vol of concrete	0.636 Cum		Rs.3430/Cum	Rs.2181/Cum
92						
93	7b	Shuttering				
94		Wall CL	4.24 Sqm			
95			5.64 Sqm			
96		Total area of shuttering	9.880 Sqm		Rs.169/Cum	Rs.1667/Cum
97						
98	7c	Reinforcement @70 kg/cum	44.52 Kg		Rs.66/Cum	Rs.2925/Cum
99						
100	8a	RCC LEDGE 62.5MM				
101		450X62.5 RCC ledge -4-8 TOR+ 6 dia @ 175C/C				
103		Total vol of RCC works	0.169 Cum		Rs.3430/Cum	Rs.579/Cum
104						
105	8b	Shuttering				
107		total area of shuttering	3.075 Sqm		Rs.169/Cum	Rs.519/Cum
108						
109	8c	Reinforcement @ 70 kg/cum	11.813 Kg		Rs.66/Cum	Rs.776/Cum
110						
111	9a	100 RCC FOR ROOF IN M20				
112		area of 100RCC flat roof -	2.14 Cum			
113		Veranda	1.19 Cum			
114		Total volume of concrete	3.33 Cum		Rs.3430/Cum	Rs. 11421.57
115						
116	9b	shuttering				
119		total area of shuttering	34.40 Sqm		Rs.169/Cum	Rs. 5802.94
120						
121	9c	Reinforcement @ 90 kg/cum	299.700 Kg		Rs.65.70/kg	Rs. 19690.29
122						
123	11	WHITE WASHING				
124	10a	inside white washing	area			
128		Total area of white wash inside	87.68 Sqm			
129						
130	10b	Outside white wash	area			
134		Overall total area of plaster to be used	142.88 Sqm		Rs.20.00/sqm	Rs. 2857.60
135						
136	11a	PLASTERING				
137		inside plaster	area			
140		Total area of plaster to be used inside	67.28 Sqm		Rs.107.4/sqm	Rs.7225.9/sqm
141						
142	11b	Outside plaster/pointing	area			
145		Total area of pointing to be used outside	55.20 Sqm		Rs.53.7/sqm	Rs.2964.2/sqm
146						
147	12a	MS FRAMES				
148		Door frames local wood 35x35x6 ISA				
152		Window frames 35x35x6 ISA				
154		Total quantity for frames	28.350 Kg		Rs.75.00/kg	Rs. 2126.25
155						
156	12b	LOCAL WOOD SHUTTER				
157		Door Shutter 40mm thick local wood shutter				
161		Window Shutter 35mm thick local wood shutter				
164		Total area of wood shutter	7.020 Sqm		Rs.900.0/Sqm	Rs. 6318.00
165						
166					GRAND TOTAL	Rs.140909.49

MP-09

Designed to suit social and architectural conditions in Zone D

Zone D highlights: This zone falls under Seismic zone III and a minimal part falls under seismic zone II.

This Zone comprises of the district of Hoshangabad, Chhindwara.

Local building construction technology::

- clay tile roofing
- Clay bricks

Highlights of the Prototype

- Hoshangabad has a large population of Gond people. They live in houses where spaces are placed one after another- it stars with a front veranda, guests' rest place, bed rooms and kitchen and store to the back.
- Cattle-shed is either to the left or right of the plot. Front veranda is used for income generating activities (boat making).
- This is a deep black cotton soil area (depth 3500mm or more) . However, there are pockets where BC soil is shallow. For example at Kesla, Hoshangabad, the local people are aware that the good soil is available at 900mm from the ground level.
- Bricks are found everywhere. It was reported that local people make their own bricks. However, the quality is poor.

Recommendations for construction systems	
Components	**Recommended Specifications**
Foundations	• Strip foundation in normal soil of bearing capacity of 10T/sqm or higher • Strip foundation in Black cotton soil not more than 1.5m deep. • Masonry stub fdn with tie beam, Black cotton soil not more than 1.5m deep, single storey construction. • Brick arch fdn with brick/ block/stone arch. BC soil not more than 1.5m deep.Hard rocky strata trenching difficult. • Single Under-reamed Pile foundation, diameter and length as given in drawings.
Plinth	• Minimum (300 mm or 150mm more than last 50 year flood level)
Wall	• 20 cm thick brick/Stone masonry block or load-bearing hollow block walls may be constructed in 1:6 cement sand mortar.
Wall Finish	• cement plaster
Roof Structure	• Sloping roofs with Timber/bamboo understructure
Roof Cover	• 'PCC for flat roofs with waterproofing • GI sheet
Floor	• cement concrete/ brick paving
Door and Windows	• Mild steel door and window

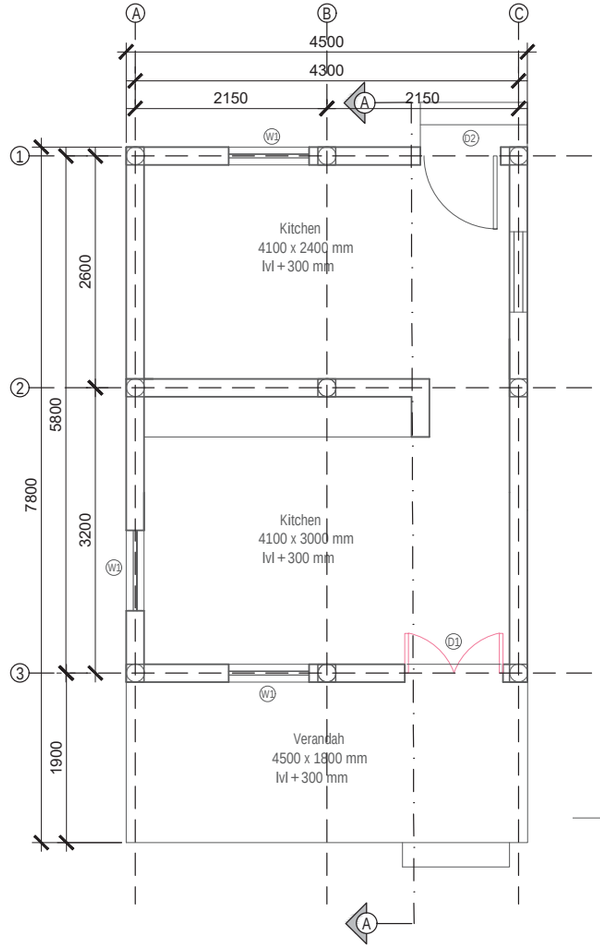
MADHYA PRADESH

MP-09

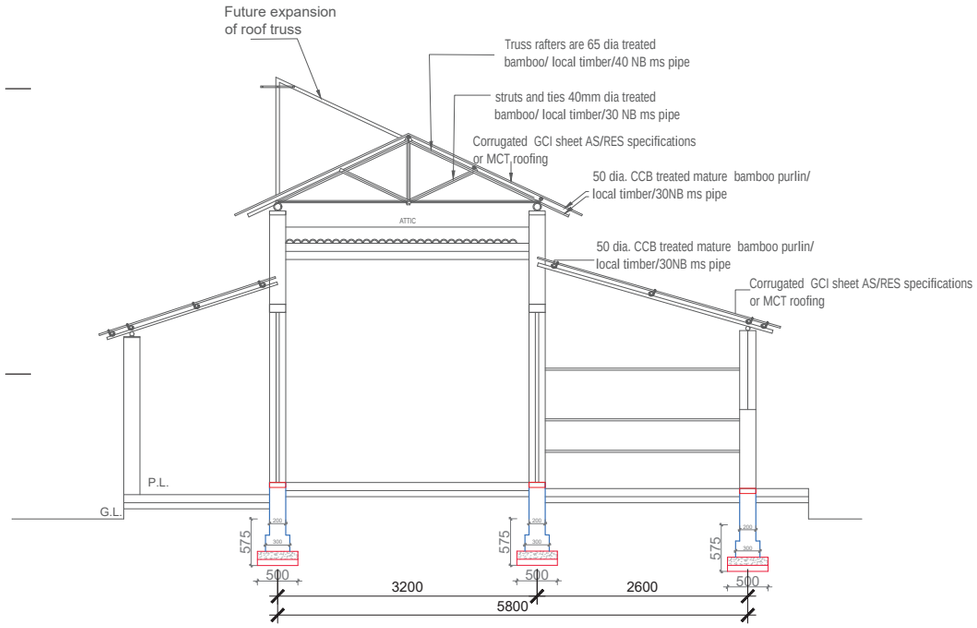
Area Statement:

Item	Area	
	Sq.m	Sq.ft
Room	12.61	135.73
Kitchen	10.02	107.86
Verandah	8.10	87.19
Carpet Area	**22.63**	**243.59**
Built up Area	**35.10**	**377.82**

MADHYA PRADESH



TYPICAL PLAN



TYPICAL SECTION AA'

MP-09
Cost estimate

	A	B	G	H	I	J
16	SL	DESCRIPTION	QUANTITY		UNIT RATE	COSTS
17		FOUNDATION				
18	1a	Excavation in foundation				
21		Total vol of excavation	8.221 Cum		Rs.93.80/Cum	Rs. 771.14
22						
23	1b	Filling				
28		Total vol of filling	9.949 Cum		Rs.93.80/Cum	Rs. 933.20
29						
30	1c	Sand filling 75mm on trench				
33		Total vol of sand	1.162 Cum		Rs.400.0/cum	Rs.464.7/cum
34						
35	2	Lean concrete bed 100mm in 1:3:6				
38		Total vol of lean concrete	1.549 Cum		Rs.2626/Cum	Rs.4067/Cum
39						
40	3a	300 mm thick Brick work in foundation				
43	3b	200 mm thick Brick work in foundation				
49		TOTAL VOLUME OF BRICKWORK IN FOUNDATION	3.787 Cum		Rs.3294/Cum	Rs.12473/Cum
50						
51	4a	75x200 RCC plinth band- 2-8mm tor+ 6 dia links @ 175 c/c				
55		Total vol	0.462 Cum		Rs.2626/Cum	Rs.1212/Cum
56						
57	4b	Shuttering				
61		Total area of shuttering	4.615 Sqm		Rs.168.7/Sqm	Rs. 778.55
62						
63	4c	Reinforcement @70 kg/cum	32.305 Kg		Rs.65.70/kg	Rs. 2122.44
64						
65	5	FLOORING				
66		100 thk 1:3:6 CC with neat cement punning				
71		Total vol	32.66 Sqm		Rs.389.7/Sqm	Rs.12725.7/Sqm
72						
73	6	WALLS				
74		200 mm masonry wall				
80		Total vol of brickwork	13.094 Cum		Rs.3294/Cum	Rs.43133/Cum
81						
82	7a	LINTEL BAND				
83		100X200 RCC lintel -4-8 TOR ALTHRO'+ 6 dia @ 175C/C				
85		Total vol of concrete	0.490 Cum		Rs.3430/Cum	Rs.1681/Cum
86						
87	7b	Shuttering				
89		Total area of shuttering	4.900 Sqm		Rs.169/Cum	Rs.827/Cum
90						
91	7c	Reinforcement @70 kg/cum	34.30 Kg		Rs.66/Cum	Rs.2254/Cum
92						
93	8a	RCC LEDGE 62.5MM				
94		450X62.5 RCC ledge -4-8 TOR+ 6 dia @ 175C/C				
96		Total vol of RCC works	0.169 Cum		Rs.3430/Cum	Rs.579/Cum
97						
98	8b	Shuttering				
100		total area of shuttering	3.075 Sqm		Rs.169/Cum	Rs.519/Cum
101						
102	8c	Reinforcement @ 70 kg/cum	11.813 Kg		Rs.66/Cum	Rs.776/Cum

	A	B	G	H	I	J
104	9a	100 RCC FOR ROOF IN M20				
105		area of 100RCC flat roof -	2.84 Cum			
106		Veranda	0.85 Cum			
107		Total volume of concrete	3.69 Cum		Rs.3430/Cum	Rs. 12640.90
108						
109	9b	shuttering				
112		total area of shuttering	38.70 Sqm		Rs.169/Cum	Rs. 6528.31
113						
114	9c	Reinforcement @ 90 kg/cum	331.695 Kg		Rs.65.70/kg	Rs. 21792.36
115						
116	10a	WHITE WASHING				
117		inside white washing	area			
121		Total area of white wash inside	84.08 Sqm			
122						
123	10b	Outside white wash	area			
127		Overall total area of plaster to be used	139.28 Sqm		Rs.20.00/sqm	Rs. 2785.60
128						
129	11a	PLASTERING				
130		inside plaster	area			
133		Total area of plaster to be used inside	67.28 Sqm		Rs.107.4/sqm	Rs.7225.9/sqm
134						
135	11b	Outside plaster/pointing	area			
138		Total area of pointing to be used outside	55.20 Sqm		Rs.53.7/sqm	Rs.2964.2/sqm
139						
140	12a	MS FRAMES				
141		Door frames local wood 35x35x6 ISA				
145		Window frames 35x35x6 ISA				
147		Total quantity for frames	28.350 Kg		Rs.75.00/kg	Rs. 2126.25
148						
149	12b	LOCAL WOOD SHUTTER				
150		Door Shutter 40mm thick local wood shutter				
154		Window Shutter 35mm thick local wood shutter				
157		Total area of wood shutter	7.020 Sqm		Rs.900.0/Sqm	Rs. 6318.00
158						
159					GRAND TOTAL	Rs.149418.28

MADHYA PRADESH

pahal
Prakriti Hunar Lokvidya

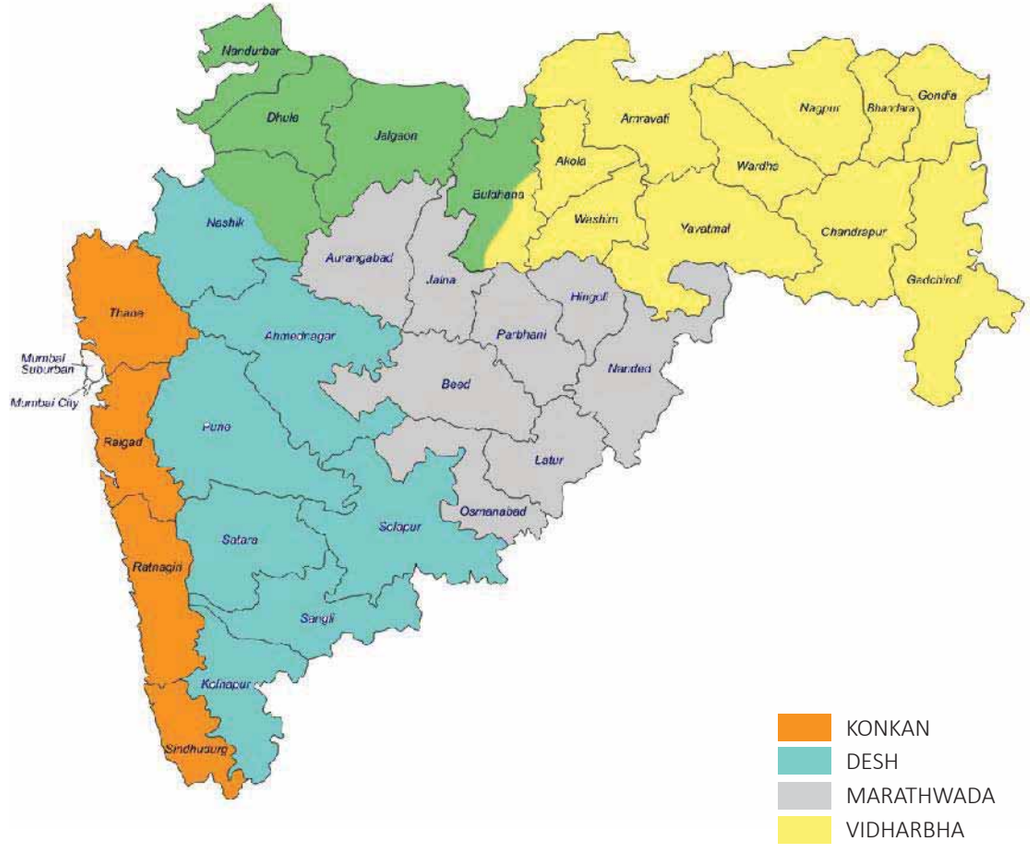
Maharashtra

MAHARASHTRA

Maharashtra occupies the western and central part of the country.One of the more prominent physical features of Maharashtra is the Deccan plateau.

Maharashtra is divided into five geographic regions. Konkan is the western coastal region, between the Western Ghats and the sea. Kandesh is the north-western region lying in the valley of the Tapti River. Desh is in the center of the state. Marathwada, which was a part of the princely state of Hyderabad until 1956, is in the southeastern part of the state. Vidarbha is the easternmost region of the state. Maharashtra has typical monsoon climate, with hot, rainy and cold weather seasons.

As a result of the study, housing zones were identified under each division of Konkan and Marathwada.



KONKAN HOUSING ZONES

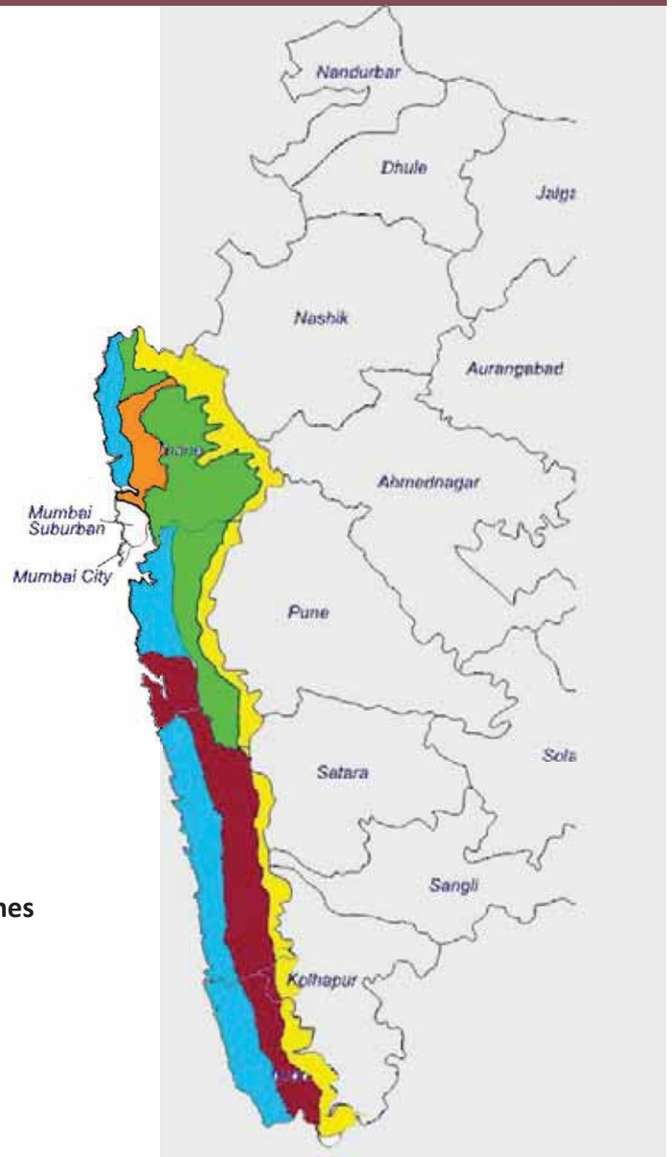
Zone A
This region is in the higher reaches of the Western Ghats or the Sahayardris where soil is sandy and shallow. They are situated largely along the flat topped none lateritic hills, precipitous slopes and upper narrow river valleys. Stone is available but is used to limited quantities. Adobe bricks are prepared from the relatively aluminium and iron rich sandy subsoil and local stabilisers are recommended. This zone comprises a string of regions which are present in every district of the Konkan.

Zone B
This zone comprises of the lower hills along the Western Ghats escarpment including the isolated hills present in the Northern palghar and thane districts and like southern Konkan this region is not characterised by the dominant presence of lateritic soil and stone strata with its distinctive rich red colour. Zone 2 is characterised by the stepped formation of the traps and the beheaded plateau valleys formed by the eastward recession of the western ghats. The forests of this region have also been known for their prized produce.

Zone C
This zone consists of the pediments in the stepped trappean region where along with the available resources traditional practice consciously created a situation where they could grow their own resources. Predominantly the region of the Warli Tribe, communities settled around ponds fashioned in hollows in the terrain. Traditionally the village is community owned. The lifestyle of native adivasis in the region was extremely sustainable as they produced almost all their resources besides maintaining soil and water health.

Zone D
This zone is the coastal zone and the Konkan's coastal zone is one where the shelter constantly battles the sea sand and salt laden winds. Yet for the people who live in this region being close to their livehood supersedes all else. In terms of building resources this is an extremely poor zone with nearly every requirement brought in from outside. Ponds are used to create resources by some communities including water food and reeds for wattle and daub.

Zone E
The lateritic duricrust capped uplands of Ratnagiri and Sindhudurg and parts of raigad are typically stepped with swift running erosive and depository Rivers, the rain in the region and erode and deposit on the land they traverse depending on the seasonal flow. With the water they carry down a huge amount of sediment including stone and small boulders. Sharply dipping terrain with luxuriant vegetation more or less defines the morphology of the region. Rain is generally plenty and heavy and driving. The challenge is to slow it down so that it infiltrates and does not all get washed away on the slopes. Siting of houses and adaptive plant cover thus becomes important.



KONKAN HOUSING TYPOLOGIES AT A GLANCE

TYPOLOGY	APPLICABLE HOUSING ZONES	TOTAL AREA Sq.m/Sq.ft	
MH-K-01	Zone A	48.60 Sq.m	523.13 Sq.ft
MH-K-02	Zone B	36.00 Sq.m	387.50 Sq.ft
MH-K-03	Zone C	37.02 Sq.m	398.48 Sq.ft
MH-K-04A	Zone D	32.06 Sq.m	345.09 Sq.ft
MH-K-04B	Zone D	27.81 Sq.m	299.35 Sq.ft
MH-K-05	Zone E	51.65 Sq.m	555.96 Sq.ft


MH-K-01


MH-K-02


MH-K-03


MH-K-04A


MH-K-04B


MH-K-05

MAHARASHTRA

MH-K-01

MH-K-01

Designed to suit conditions in Zone A in Konkan Division

Zone A constitutes the Eastern strip of the Konkan Division basically addresses the construction technology for:
1. higher areas of the Western Ghats
2. Sandy soil

Local building construction technology:

- Mud excavated from site to prepare adobe or sundried bricks
- Stone
- country tiles
- timber

Highlights of the Prototype

- The Design Prototype for Zone 1 is a rectangular structure with a sloping hipped roof accommodating attic space.
- The hipped roof is better able to withstand the winds and heavy rains typical to the region.
- Country tiles roof ventilate the house and the extension of eaves protects the wall.
- Settlement pattern ranges from dispersed houses to dispersed clusters.
- The thermal mass of adobe walls protects the interior during warm days from the heat penetration during the hot day.
- Limited openings placed in straight lines enable winds to enter and escape quickly.

Recommendations for construction systems	
Components	**Recommended Specifications**
Foundations	• Stone foundation with cement-sand packing • Brick foundation
Plinth	• Minimum (300 mm or 150mm more than last 50 year flood level) with Plinth Band
Wall	• reinforced brick columns • stone with cement or rat trap till sill level • Adobe wall with mesh reinforcment above sill level • Wattle & Daub partitions
Wall Finish	• Stabilised mud plaster or exposed brick • ferrocement plaster
Roof Structure	• Sloping roofs with timber understructure
Roof Cover	• CGI sheets/Country tiles with thatch insulation/ any other insulation material
Floor	• Cement flooring/ brick paving
Door and Windows	• Mild steel door and window

Konkan Zone A

MAHARASHTRA

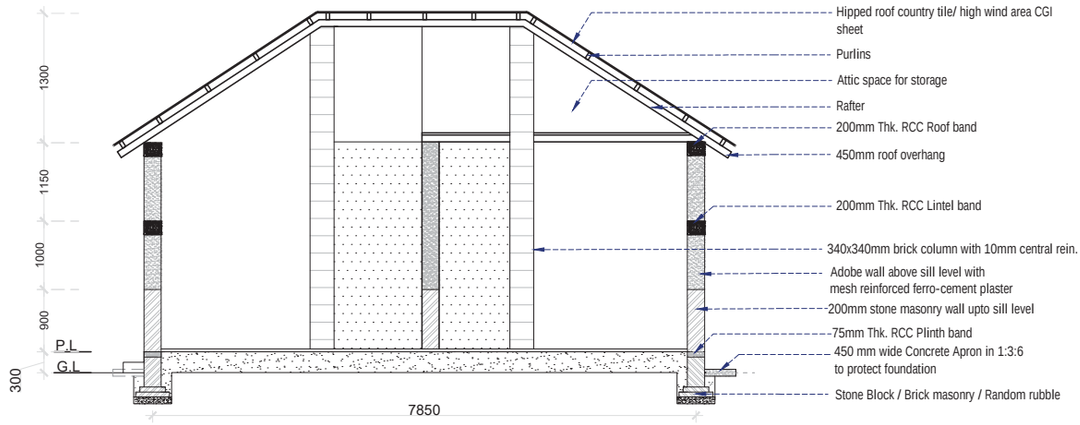
MH-K-01

Area Statement:

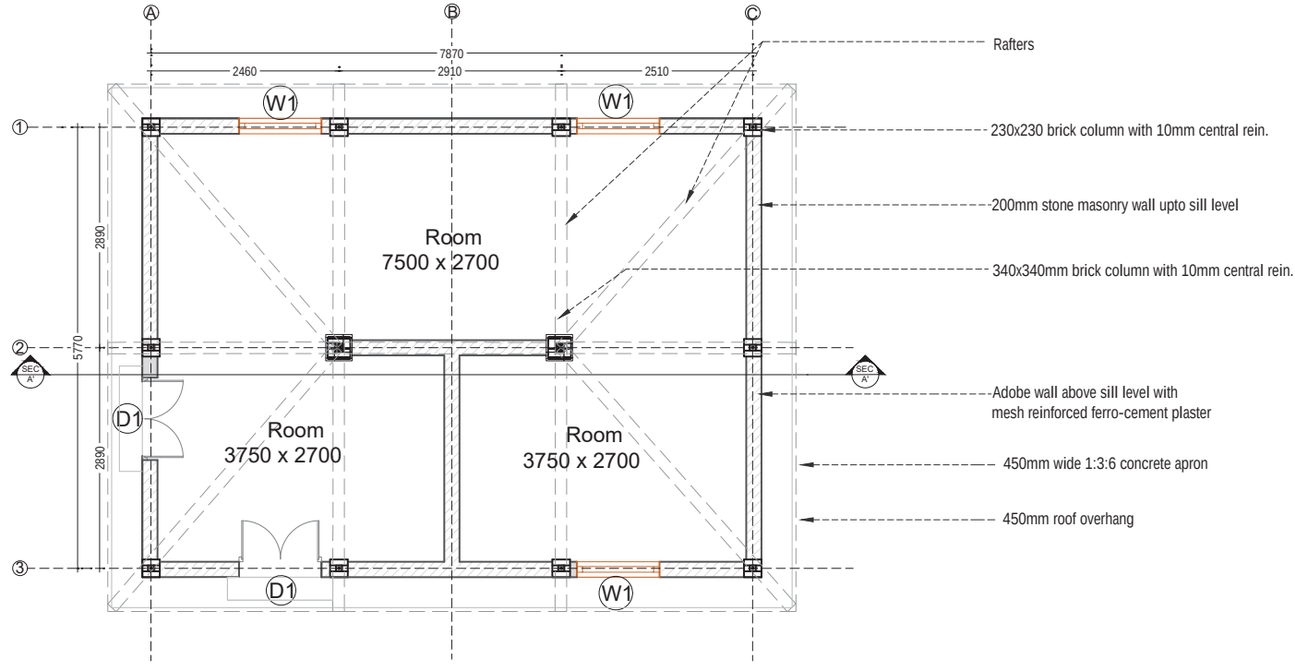
Item	Area	
	Sq.m	Sq.ft
Room 1	10.49	112.91
Room 2	21.70	233.58
Room 3	10.06	108.29
Carpet Area	**21.70**	**233.58**
Built up Area	**48.60**	**523.13**

Konkan Zone A

MAHARASHTRA



TYPICAL SECTION AA'



TYPICAL PLAN

MH-K-01
Cost estimate

SR.NO.	ITEM OF WORK	Quantity	Unit	Rate (Rs)	Cost
a	**CORE HOUSE**				
A	**FOUNDATION WORK**				
1	**Excavation-**Excavation of trench/pit 0.6 m deep including and carting away as specified and stacking excavated mud for cob wall, etc. complete as directed	17.9	Cum.	277	4,958
2	**Uncoursed Stone masonry** in mud lime ash mortar 1'6" thick for retaining wall,foundation and plinth etc. complete	7	Cum.	3,000	21,000
3	**Filling** in trench/pit with excavated mud to get a uniform base watered and compressed at intervals with top finished with addition of cowdung slurry.	32.6	Cum.	750	24,450
	TOTAL FOR FOUNDATION WORK				**50,408**
B	**SUPERSTRUCTURE**				
1	Brick masonry upto cill level	10	Cum.	3,000	30,000
2	Adobe masonry above cill level	15	Cum.	600	9,000
3	RBC columns	12	no.	700	8,400
4	Roof RCC band	0.5	cu.m	4500	2,250
5	Lintel RCC band	0.5	cu.m	4500	2,250
6	Plinth RCC band	0.25	cu.m	4500	1,125
7	Steel in Roof RCC band	32	kg	58	1,856
8	Steel in Lintel RCC band	32	kg	58	1,856
9	Steel in Plinth RCC band	16	kg	58	928
	TOTAL FOR SUPER STRUCTURE				**57,665**
C	**PLASTERING & FINISHING**				
1	**Finishing external wall vertical surfaces** with mud plaster and rendering the surface .	79	Sqm.	98	7,742
2	**Finishing internal wall vertical surfaces** with mud plaster finished with lime wash .	76	Sqm.	98	7,448
	TOTAL FOR PLASTERING & FINISHING				**15,190**
	TOTAL FOR CIVIL WORK				**123,263**
D	**Roof with precast RCC plank and joist**				
1	GCI sheet roof - 0.5mm thick for verandah and kitchen				
	size 2740 x 900 (9'x3')	50	No.	500	25,000
	size 2135 x 900 (7'x3')		No.	425	-
2	Bamboo understructure				
	75-100mm dia bamboo	25		130	3,250
	50-60mm dia bamboo	7		100	700
3	Manpower				
	Skilled artisan/carpenter	3	mandays	500	1,500
	Labour	6	mandays	250	1,500
4	Nails and hardware		lumsum		2000
	TOTAL FOR ROOFING				**33,950**
E	**DOORS & WINDOWS**				
1	**Providing and fixing country wood two leaved Door** including mouldings, rebating hold fasts and finished with primer and paint inclusive of country teak wood frame without ventilators, windows and fanlights	3.8	Sqm.	4,500	17,100
2	**Providing and fixing country wood single leaved Door** including mouldings, rebating hold fasts and finished with primer and paint inclusive of country teak wood frame without ventilators, windows and fanlights	4.3	Sqm.	4,500	19,350
	TOTAL FOR DOORS &WINDOWS				**36,450**
	GRAND TOTAL				**193,663**
	TOTAL COST PER HOUSE (RS)				193,663
	AREA OF HOUSE (SQM)				45
	COST PER SQ.M (RS)				4303.628889

Konkan Zone A

MAHARASHTRA

MH-K-02

Designed to suit conditions in Zone B in Konkan Division

This zone comprises of the lower hills along the Western Ghats Escarpment including the isolated hills present in the Northern Palghar and Thane districts.

Local building construction technology::

- Wattle & Daub
- conventional construction materials due to proximity to urban areas.

Konkan Zone B

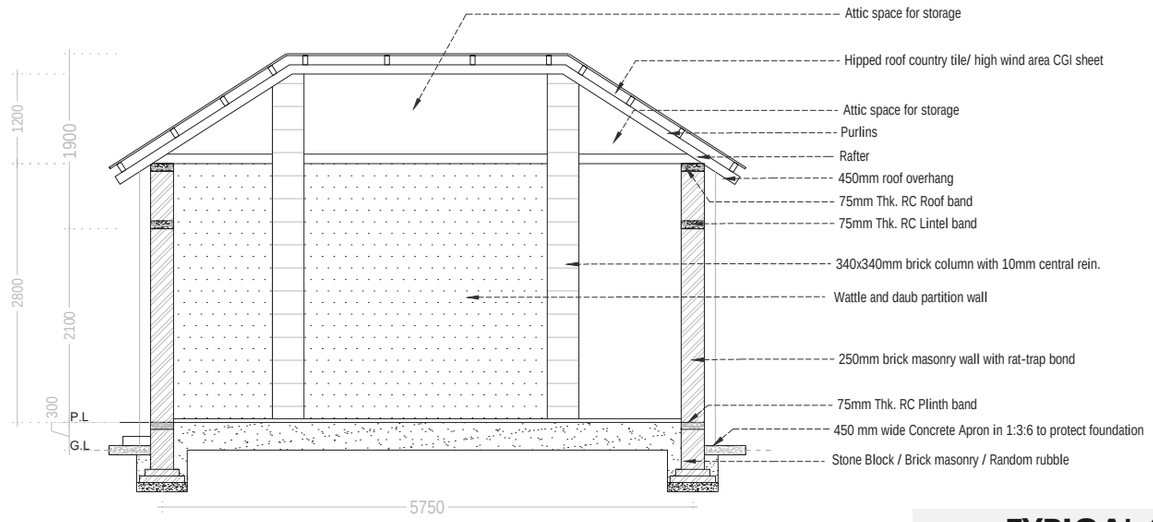
MAHARASHTRA

MH-K-02

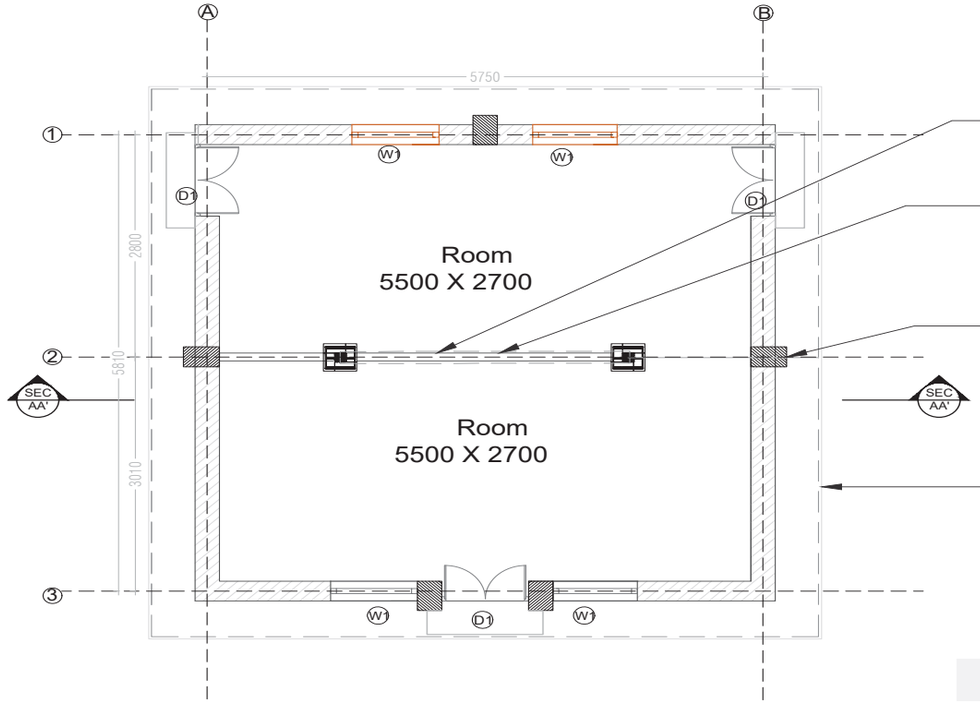
Highlights of the Prototype

- Climatically all shelters built in this area have to deal with the heat and glare of the tropical sun, constant humidity and seasonal driving rain.
- Settlements are largely wrapped around the slopes and the preferred orientation of the dwelling facing east has lead to specific slopes being settled on.
- Strong winds and driving rain along with a previously or maybe even now timber rich region led to the hipped roof with the comparatively new technology of Mangalore Tiles
- A hipped tile roof creates a cooling and usable attic space.

Recommendations for construction systems	
Components	**Recommended Specifications**
Foundations	• Stone foundation with cement-sand packing • Brick foundation
Plinth	• Minimum (300 mm or 150mm more than last 50 year flood level) with Plinth Band
Wall	• reinforced brick columns • stone with cement or rat trap till sill level • Adobe wall with mesh reinforcment above sill level • Wattle& Daub partitions
Wall Finish	• Stabilised mud plaster or exposed brick • ferrocement plaster on Adobe walls
Roof Structure	• Sloping roofs with timber understructure
Roof Cover	• CGI sheets/Country tiles with thatch insulation/ any other insulation material
Floor	• Cement flooring/ brick paving
Door and Windows	• Mild steel door and window



TYPICAL SECTION AA'



TYPICAL PLAN

MH-K-02

Area Statement:

Item	Area	
	Sq.m	Sq.ft
Room 1	15.39	165.66
Room 2	14.92	160.60
Carpet Area	30.32	326.36
Built up Area	**36.00**	**387.50**

Konkan Zone B

MAHARASHTRA

MH-K-02
Cost estimate

SR.NO.	ITEM OF WORK	Quantity	Unit	Rate (Rs)	Cost
a	**CORE HOUSE**				
A	**FOUNDATION WORK**				
1	**Excavation**-Excavation of trench/pit 0.6 m deep including and carting away as specified and stacking excavated mud for cob wall, etc. complete as directed	17.4	Cum.	277	4,820
2	**Uncoursed Stone masonry** in mud lime ash mortar 1'6" thick for retaining wall,foundation and plinth etc. complete	10.7	Cum.	4,500	48,150
3	**Filling** in trench/pit with excavated mud to get a uniform base watered and compressed at intervals with top finished with addition of cowdung slurry.	36.3	Cum.	750	27,225
	TOTAL FOR FOUNDATION WORK				**80,195**
B	**SUPERSTRUCTURE**				
1	**Brick masonry with Rat trap bond** in super structure with cement mortar 1:6	12.5	Cum.	4,170	52,125
2	**Brick masonry wall 0'9" thick** laid in mud mortar. Mud to be premixed slaked to required consistency	13.4	Cum.	1,200	16,080
3	**Brick masonry PIERS** 0'-9" thick and 10'4" tall laid in mud mortar. Mud to be premixed/slaked with agricultural waste like husk, straw etc.	2	each	880	1,760
4	**Brick masonry steps** 1'-0" tread, and 10'4" tall laid in mud mortar. Mud to be premixed/slaked with agricultural waste like husk, straw etc.	5	Cum.	1,200	6,000
5	**Wattle and Daub** infill with bamboo as wattle 4" thick and mud mixed with cowdung etc. finished complete.	10.5	Sqm.	150	1,575
6	Roof RCC band	0.25	cu.m	4500	1,125
7	Lintel RCC band	0.25	cu.m	4500	1,125
8	Plinth RCC band	0.25	cu.m	4500	1,125
9	Steel in Roof RCC band	16	kg	58	928
10	Steel in Lintel RCC band	16	kg	58	928
11	Steel in Plinth RCC band	16	kg	58	928
	TOTAL FOR SUPER STRUCTURE				**83,699**
C	**PLASTERING & FINISHING**				
1	Finishing pier surfaces with mud plaster and rendering the surface	5.8	Sqm.	98	568
	TOTAL FOR PLASTERING & FINISHING				**568**
D	**Flooring**				
	Providing and laying polished Shahbad stone 1'0" X1'0", 25 to 30mm thick and 30cm wide laid on a bed of cement mortar 1:4 including levelling surface before laying, cement float,mortar bedding, striking joints, curing, polishing, cleaning complete	33.3	Sq.m.	640	21,312
	TOTAL FOR FLOORING				**21,312**
	TOTAL FOR CIVIL WORK				**185,774**
E	**Roofing**				
	Providing and fixing Mangalore tile roofs inclusive of securing lowermost tile on country wood battens inclusive of seasoned country wood, wall plates and posts as required etc. complete	44.5	Sq.m.	555	24,698
	TOTAL FOR ROOFING				**24,698**
F	**DOORS & WINDOWS**				
1	**Providing and fixing Country Wood Single leaf Door** including mouldings, rebating hold fasts and finished with primer and paint inclusive of country teak wood frame without ventilators, windows and fanlights	5.67	Sqm.	4,500	25,515
2	**Providing and fixing Country Wood windows double leaved** with panelled shutters 35 mm thick and panels 25mm thick with chromium plated fixtures and fastenings inclusive of frame exclusive of ventilators and fan lights, with one coat of primer etc. complete.	4.3	Sqm.	4,500	19,350
	TOTAL FOR DOORS &WINDOWS				**44,865**
	GRAND TOTAL				**255,337**
	TOTAL COST PER HOUSE (RS)				255,337
	AREA OF HOUSE (SQM)				42
	COST PER SQ.M (RS)				6079.44524

Konkan Zone B

MAHARASHTRA

MH-K-03

Highlights of the Prototype

- Stone and mud tamped squarish plinths/platforms known as chauthara, the Fired Brick piers with wattle and daub infill support the timber structure of a gabled roof of Mangalore tiles.
- The gabled roof is not as economical on use of timber as the hipped roof is but it is simpler to construct.
- Also in the event of high winds the hipped roof is a stronger roof and breathable Mangalore tiles.
- The attic also cools the house.
- Houses are traditionally prescribed as east facing. With steep slopes this means they would be situated on sheltered slopes.

Recommendations for construction systems	
Components	**Recommended Specifications**
Foundations	• Stone foundation with cement-sand packing • Brick foundation
Plinth	• Minimum (300 mm or 150mm more than last 50 year flood level) with Plinth Band
Wall	• Brick masonry with Rat trap bond till sill level • Wattle & Daub above sill level
Wall Finish	• Stabilised mud plaster or exposed brick • ferrocement plaster on wattle & daub
Roof Structure	• Sloping roofs with timber understructure
Roof Cover	• CGI sheets/Country tiles with thatch insulation/ any other insulation material
Floor	• Cement flooring/ brick paving
Door and Windows	• Mild steel door and window

MH-K-03

Designed to suit conditions in Zone C in Konkan Division

This zone consists of the pediments in the stepped trappean region where along with the available resources traditional practices consciously created a situation where they could grow their own resources. Predominantly the region of the Warli Tribe, communities settled around ponds fashioned in hollows in the terrain. Traditionally the village is community owned.

Local building construction technology::

- Timber
- Bamboo
- Stone

Konkan Zone C

MAHARASHTRA

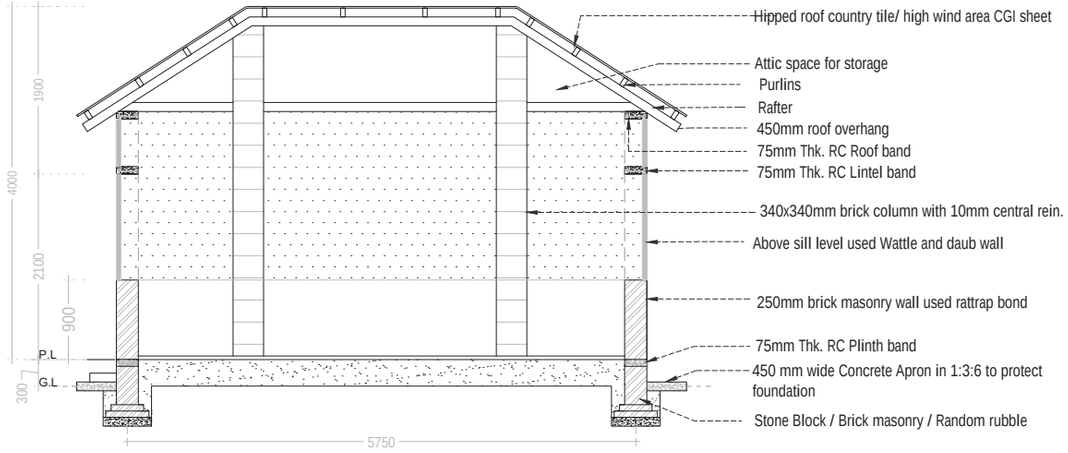
MH-K-03

Area Statement:

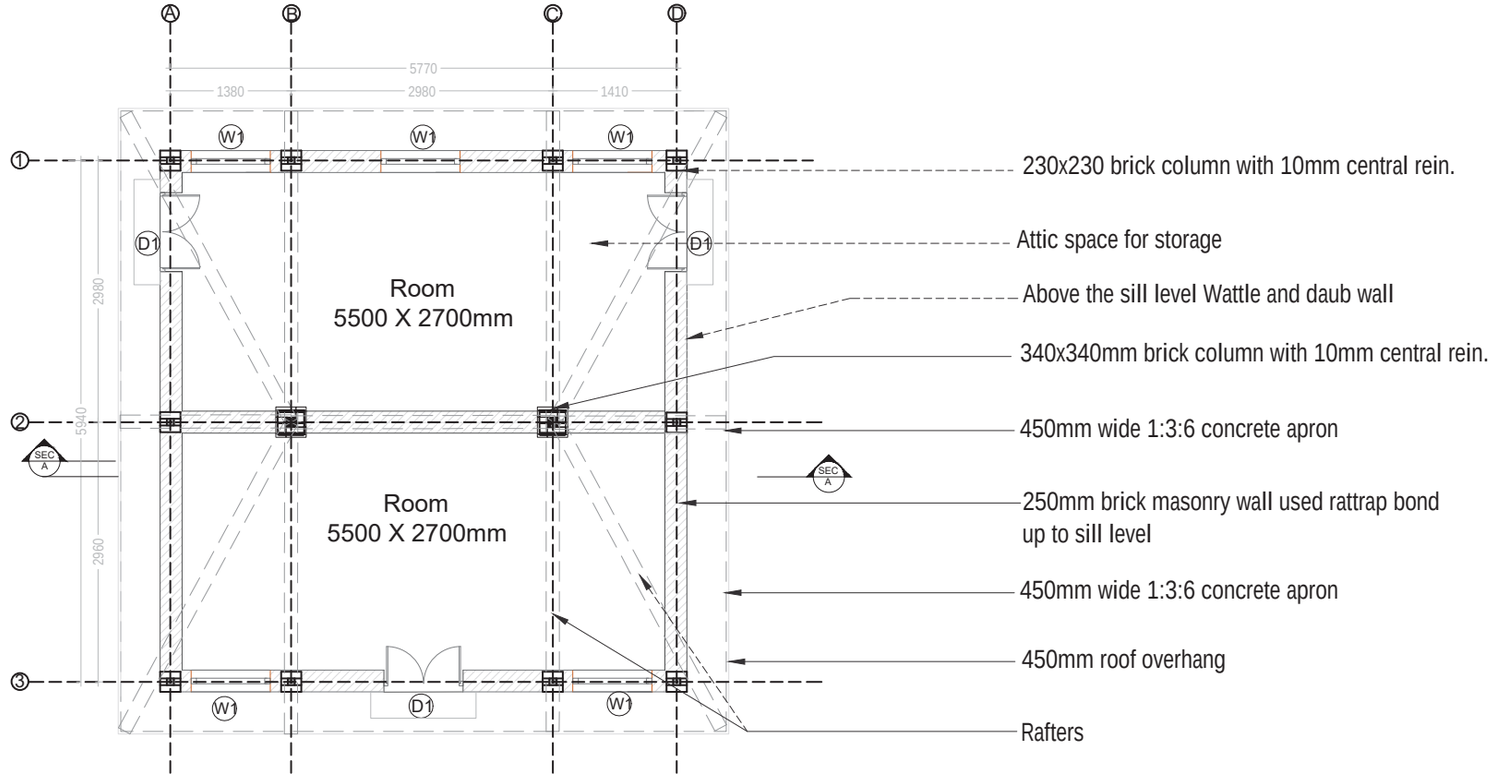
Item	Area	
	Sq.m	Sq.ft
Room 1	15.38	160.55
Room 2	15.04	161.89
Carpet Area	30.42	327.44
Built up Area	**37.02**	**398.48**

Konkan Zone C

MAHARASHTRA



TYPICAL SECTION AA'



TYPICAL PLAN

MH-K-03
Cost estimate

SR.NO.	ITEM OF WORK	Quantity	Unit	Rate (Rs)	Cost
a	**CORE HOUSE**				
A	**FOUNDATION WORK**				
1	**Excavation**-Excavation of trench/pit 0.6 m deep including and carting away as specified and stacking excavated mud for cob wall, etc. complete as directed	17.4	Cum.	277	4,820
2	**Uncoursed Stone masonry** in mud mortar 1'6" thick for foundation	7.6	Cum.	3,000	22,800
3	**Filling** in trench/pit with excavated mud to get a uniform base watered and compressed at intervals with top finished with addition of cowdung slurry.	36.3	Cum.	750	27,225
	TOTAL FOR FOUNDATION WORK				**54,845**
B	**SUPERSTRUCTURE**				
1	**Burnt Brick ledge wall in mud mortar 0'9" thick** till 3'0" level	6.7	Cum.	1,200	8,040
2	**Brick masonry PIERS** 0'-9" thick and 10'4" tall laid in mud mortar. Mud to be premixed/slaked with agricultural waste like husk, straw etc.	14	each	588	8,232
3	**Brick masonry wall 0'9" thick** laid in mud mortar. Mud to be premixed slaked to required consistency	1.62	Cum.	1,200	1,944
4	**Wattle and Daub** infill with bamboo as wattle 4" thick and mud mixed with cowdung etc. finished complete.	28.7	Sqm.	150	4,305
5	Roof RCC band	0.25	cu.m	4500	1,125
6	Lintel RCC band	0.25	cu.m	4500	1,125
7	Plinth RCC band	0.25	cu.m	4500	1,125
8	Steel in Roof RCC band	16	kg	58	928
9	Steel in Lintel RCC band	16	kg	58	928
10	Steel in Plinth RCC band	16	kg	58	928
	TOTAL FOR SUPER STRUCTURE				**28,680**
C	**PLASTERING & FINISHING**				
1	Finishing pier surfaces with mud plaster and rendering the surface	5.8	Sqm.	98	568
	TOTAL FOR PLASTERING & FINISHING				**568**
D	**Flooring**				
	Providing and laying polished Shahbad stone 1'0" X1'0", 25 to 30mm thick and 30cm wide laid on a bed of cement mortar 1:4 including levelling surface before laying, cement float,mortar bedding, striking joints, curing, polishing, cleaning complete	33.3	Sq.m.	640	21,312
	TOTAL FOR FLOORING				**21,312**
	TOTAL FOR CIVIL WORK				**105,405**
E	**Roofing**				
	Providing and fixing Mangalore tile roofs inclusive of securing lowermost tile on country wood battens inclusive of seasoned country wood, wall plates and posts as required etc. complete	44.5	Sq.m.	555	24,698
	TOTAL FOR ROOFING				**24,698**

F	**DOORS & WINDOWS**				
1	**Providing and fixing Country Wood Single leaf Door** including mouldings, rebating hold fasts and finished with primer and paint inclusive of country teak wood frame without ventilators, windows and fanlights	5.67	Sqm.	4,500	25,515
2	**Providing and fixing Country Wood windows double leaved** with panelled shutters 35 mm thick and panels 25mm thick with chromium plated fixtures and fastenings inclusive of frame exclusive of ventilators and fan lights, with one coat of primer etc. complete.	4.3	Sqm.	4,500	19,350
	TOTAL FOR DOORS &WINDOWS				**44,865**
	GRAND TOTAL				**174,968**
	TOTAL COST PER HOUSE (RS)				174,968
	AREA OF HOUSE (SQM)				42
	COST PER SQ.M (RS)				4165.89762

Konkan Zone C

MAHARASHTRA

MH-K-04A

Designed to suit conditions in Zone D in Konkan Division

This Zone is the coastal zone and the Konkan's coastal zone is one where the shelter constantly battles the sea sand and salt laden winds.

Local building construction technology::

- Wattle & Daub primary skills
- Conventional Construction materials

Konkan Zone D

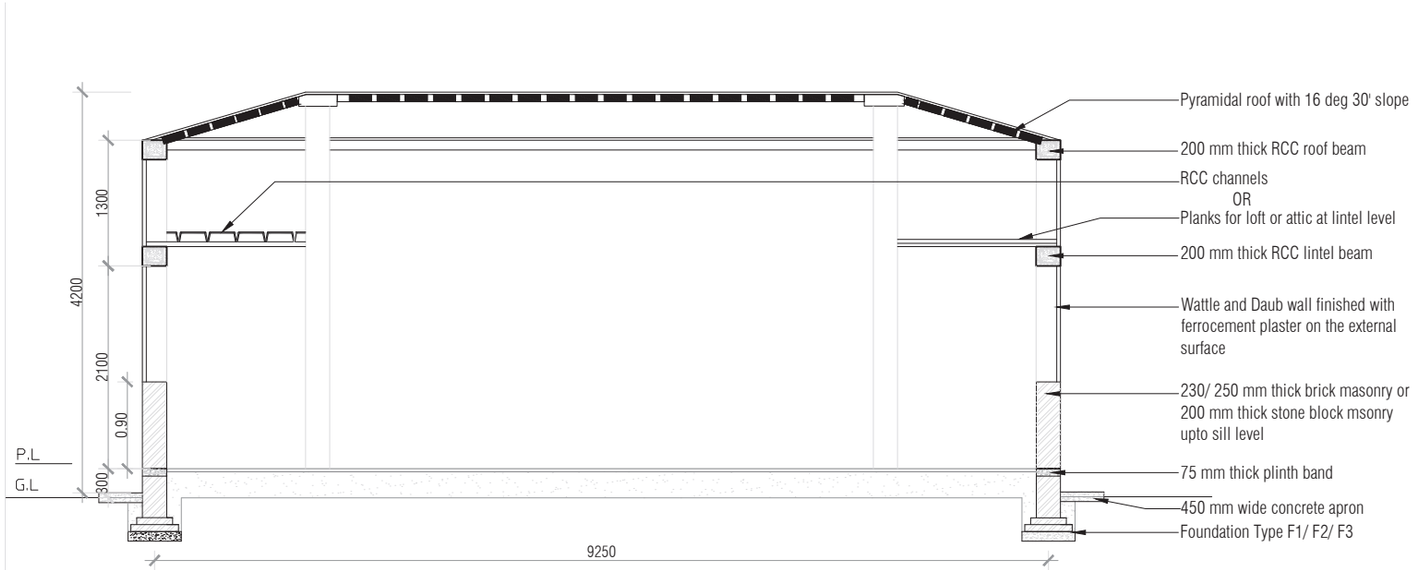
MAHARASHTRA

MH-K-04A

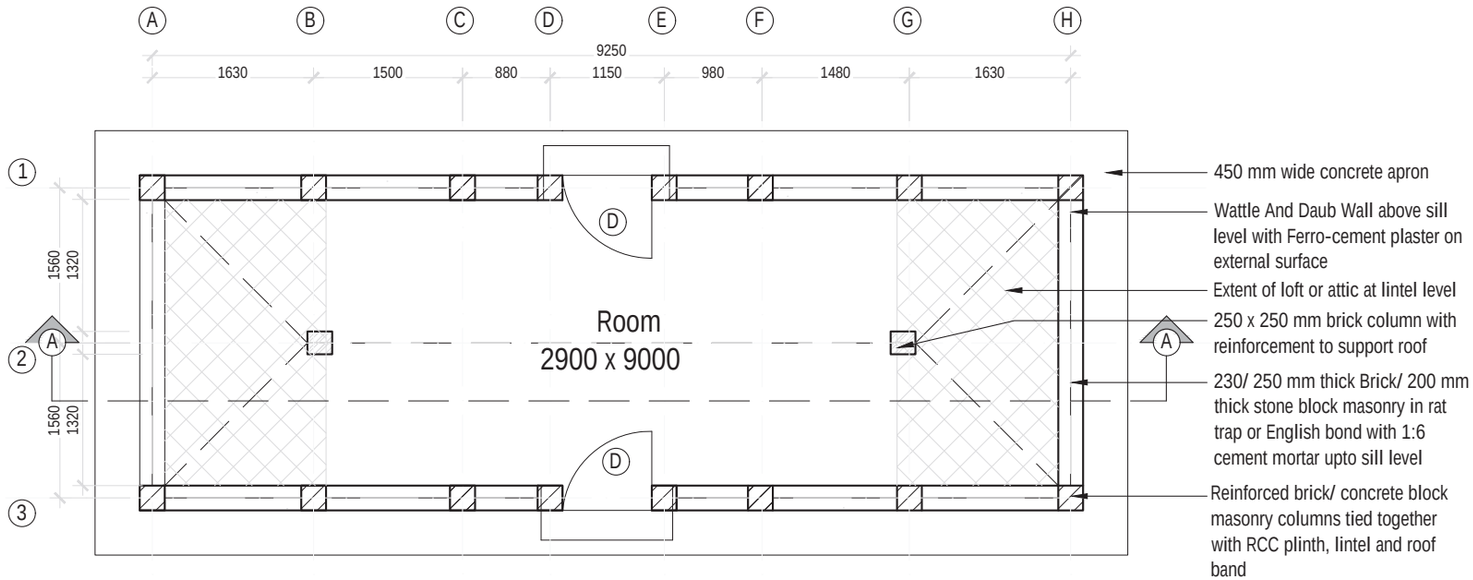
Highlights of the Prototype

- A raised stone plinth or chauthara stepped if the terrain demands it forms the base for the house so walls and piers do not rest on isolated footings or wall foundations.
- Wattle and daub as an infill and Mangalore tiles above ensure a completely breatheable house without openings which could bring in heat from the sun and driving rain.
- The hipped roof is stronger and reduces exposed wall surface. Use of mud mortar promotes recyclabity.
- . Stone is suggested for the plinth and foundation with mud mortar with local mud to minimize ground movement and damp movement.
- Brick piers with wattle and daub walls and mangalore tiles keep the house cool. Walls and piers rendered with are mud. Doors and windows are made of country wood.

Recommendations for construction systems	
Components	**Recommended Specifications**
Foundations	• Stone foundation with cement-sand packing • Brick foundation
Plinth	• Minimum (300 mm or 150mm more than last 50 year flood level) with Plinth Band
Wall	• Brick masonry with Rat trap bond till sill level • Wattle & Daub above sill level
Wall Finish	• Ferrocement plaster
Roof Structure	• Sloping pyramidal roofs with timber understructure
Roof Cover	• CGI sheets/Country tiles with thatch insulation/ any other insulation material
Floor	• Cement flooring/ brick paving
Door and Windows	• Mild steel door and window



TYPICAL SECTION AA'



TYPICAL PLAN

MH-K-04A

Area Statement:

Item	Area	
	Sq.m	Sq.ft
Room	26.32	283.30
Carpet Area	26.32	283.30
Built up Area	32.06	345.09

Konkan Zone D

MAHARASHTRA

MH-K-04A
Cost estimate

SR.NO.	ITEM OF WORK	Quantity	Unit	Rate (Rs)	Cost
a	**CORE HOUSE**				
A	**FOUNDATION WORK**				
1	**Excavation**-Excavation of trench/pit 0.6 m deep including and carting away as specified and stacking excavated mud for cob wall, etc. complete as directed	7.9	Cum.	277	2,188
2	**Filling** in trench/pit with excavated mud to get a uniform base watered and compressed at intervals with top finished with addition of cowdung slurry.	28.2	Cum.	750	21,150
	TOTAL FOR FOUNDATION WORK				**23,338**
B	**SUPERSTRUCTURE**				
1	**Uncoursed Stone masonry in mud mortar 2'0" thick** for foundation and 1'6" for plinth walls	15	Cum.	3,000	45,000
2	**Burnt Brick ledge wall 0'9" thick** till 3'0" level to protect from water spray	9.4	Cum.	1,200	11,280
3	**Brick masonry PIERS 0'-9" thick and 6'0"" tall** laid in mud mortar. Mud to be premixed/slaked with agriculturai waste like husk, straw etc.	16	each	500	8,000
4	**Wattle and Daub** infill with bamboo as wattle 4" thick and mud mixed with cowdung etc. finished complete.	32	Sqm.	150	4,800
5	Roof RCC band	0.5	cu.m	4500	2,250
6	Lintel RCC band	0.5	cu.m	4500	2,250
7	Plinth RCC band	0.25	cu.m	4500	1,125
8	Steel in Roof RCC band	32	kg	58	1,856
9	Steel in Lintel RCC band	32	kg	58	1,856
10	Steel in Plinth RCC band	16	kg	58	928
	TOTAL FOR SUPER STRUCTURE				**79,345**
C	**PLASTERING & FINISHING**				
1	Finishing external wall surfaces with mud plaster andrendering the surface with top coat mixed with cowdung	65	Sqm.	98	6,370
2	Finishing internal wall surfaces with mud plaster finished with lime wash	62.4	Sqm.	98	6,115
	TOTAL FOR PLASTERING & FINISHING				**6,115**
	TOTAL FOR CIVIL WORK				**108,799**
E	**Roofing**				
	Providing and fixing Mangalore tile roofs inclusive of securing lowermost tile on country wood battens inclusive of seasoned country wood, wall plates and posts as required etc. complete	40.5	Sq.m.	555	22,478
	TOTAL FOR ROOFING				**22,478**
F	**DOORS & WINDOWS**				
1	**Providing and fixing Country Wood Single leaf Door** including mouldings, rebating hold fasts and finished with primer and paint inclusive of country teak wood frame without ventilators, windows and fanlights	9.45	Sqm.	4,500	42,525
	TOTAL FOR DOORS &WINDOWS				**42,525**
	GRAND TOTAL				**173,801**
	TOTAL COST PER HOUSE (RS)				173,801
	AREA OF HOUSE (SQM)				44
	COST PER SQ.M (RS)				3950.02273

Konkan Zone D

MAHARASHTRA

MH-K-04B

MH-K-04B

Designed to suit conditions in Zone D in Konkan Division

This Zone is the coastal zone and the Konkan's coastal zone is one where the shelter constantly battles the sea sand and salt laden winds.

Local building construction technology::

- Wattle & Daub primary skills
- Conventional Construction materials

Highlights of the Prototype

- A raised stone plinth or chauthara stepped if the terrain demands it forms the base for the house so walls and piers do not rest on isolated footings or wall foundations.
- Wattle and daub as an infill and Mangalore tiles above ensure a completely breatheable house without openings which could bring in heat from the sun and driving rain.
- The hipped roof is stronger and reduces exposed wall surface. Use of mud mortar promotes recyclabity.
- . Stone is suggested for the plinth and foundation with mud mortar with local mud to minimize ground movement and damp movement.
- Brick piers with wattle and daub walls and mangalore tiles keep the house cool. Walls and piers rendered with are mud. Doors and windows are made of country wood.

Recommendations for construction systems	
Components	**Recommended Specifications**
Foundations	• Stone foundation with cement-sand packing • Brick foundation
Plinth	• Minimum (300 mm or 150mm more than last 50 year flood level) with Plinth Band
Wall	• Brick masonry with Rat trap bond till sill level • Wattle & Daub above sill level
Wall Finish	• Ferrocement plaster
Roof Structure	• Sloping pyramidal roofs with timber understructure
Roof Cover	• CGI sheets/Country tiles with thatch insulation/ any other insulation material
Floor	• Cement flooring/ brick paving
Door and Windows	• Mild steel door and window

Konkan Zone D

MAHARASHTRA

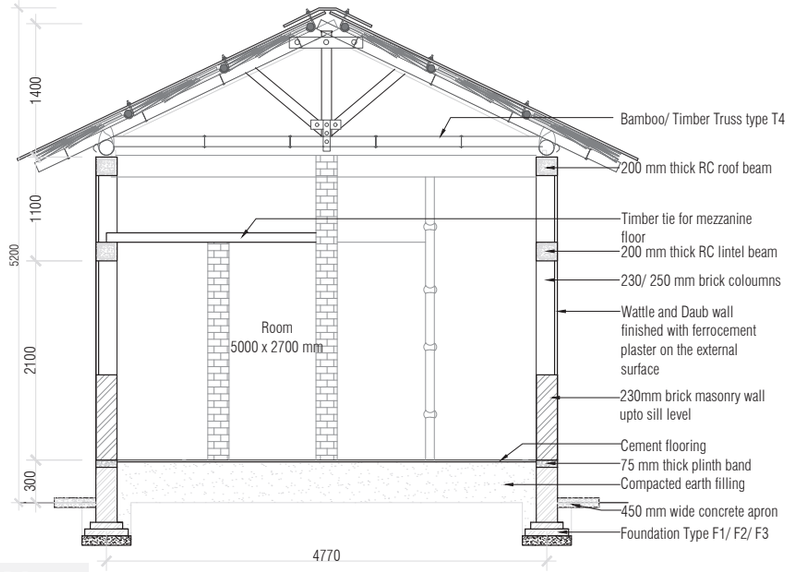
MH-K-04B

Area Statement:

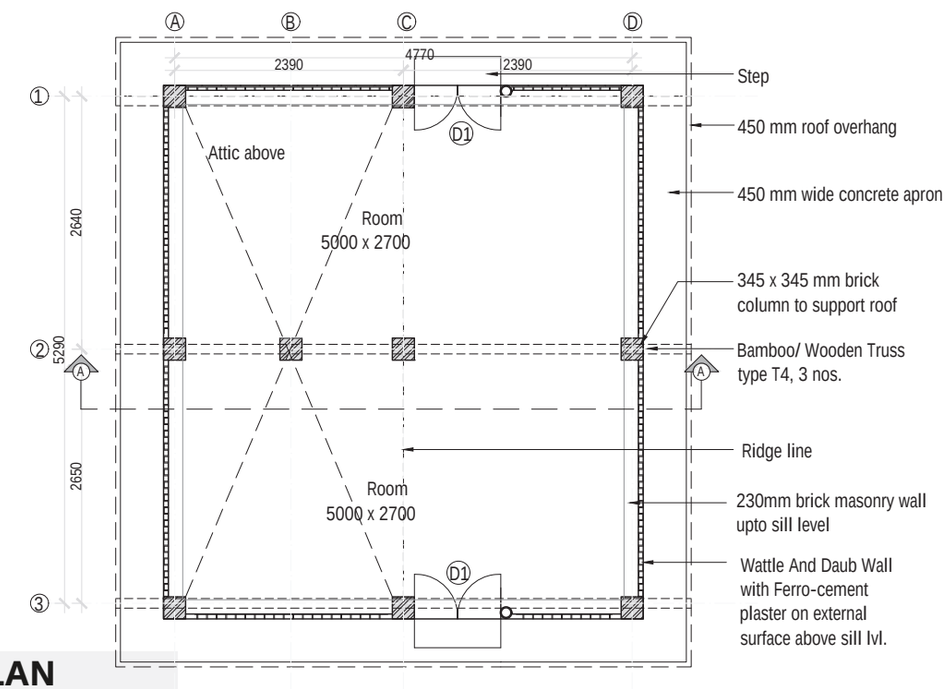
Item	Area	
	Sq.m	Sq.ft
Room 1+2	25.50	274.48
Carpet Area	25.50	274.48
Built up Area	27.81	299.35

Konkan Zone D

MAHARASHTRA



TYPICAL SECTION AA'



TYPICAL PLAN

MH-K-04B
Cost estimate

SR.NO.	ITEM OF WORK	Quantity	Unit	Rate (Rs)	Cost
a	**CORE HOUSE**				
A	**FOUNDATION WORK**				
1	**Excavation-**Excavation of trench/pit 0.6 m deep including and carting away as specified and stacking excavated mud for cob wall, etc. complete as directed	7.1	Cum.	277	1,967
2	**Uncoursed Stone masonry** in mud lime ash mortar 1'6" thick for retaining wall,foundation and plinth etc. complete	6.7	Cum.	3,000	20,100
3	**Filling** in trench/pit with excavated mud to get a uniform base watered and compressed at intervals with top finished with addition of cowdung slurry.	30	Cum.	750	22,500
	TOTAL FOR FOUNDATION WORK				**44,567**
B	**SUPERSTRUCTURE**				
2	**Burnt Brick ledge wall 0'9" thick** till 3'0" level to protect from water spray	9.4	Cum.	1,200	11,280
3	**Brick masonry PIERS 0'-9" thick and 6'0"" tall** laid in mud mortar. Mud to be premixed/slaked with agriculturai waste like husk, straw etc.	13	each	880	11,440
4	**Wattle and Daub** infill with bamboo as wattle 4" thick and mud mixed with cowdung etc. finished complete.	50	Sqm.	150	7,500
5	Roof RCC band	0.25	cu.m	4500	1,125
6	Lintel RCC band	0.25	cu.m	4500	1,125
7	Plinth RCC band	0.25	cu.m	4500	1,125
8	Steel in Roof RCC band	16	kg	58	928
9	Steel in Lintel RCC band	16	kg	58	928
10	Steel in Plinth RCC band	16	kg	58	928
	TOTAL FOR SUPER STRUCTURE				**36,379**
C	**PLASTERING & FINISHING**				
1	Finishing pier surfaces with mud plaster and rendering the surface	42	Sqm.	98	4,116
	TOTAL FOR PLASTERING & FINISHING				**4,116**
D	**Flooring**				
	Providing and laying polished Shahbad stone 1'0" X1'0", 25 to 30mm thick and 30cm wide laid on a bed of cement mortar 1:4 including levelling surface before laying, cement float,mortar bedding, striking joints, curing, polishing, cleaning complete	25	Sq.m.	640	16,000
	TOTAL FOR FLOORING				**16,000**
	TOTAL FOR CIVIL WORK				**101,062**
E	**Roofing**				
	Providing and fixing Mangalore tile roofs inclusive of securing lowermost tile on country wood battens inclusive of seasoned country wood, wall plates and posts as required etc. complete	45	Sq.m.	555	24,975
	TOTAL FOR ROOFING				**24,975**

F	**DOORS & WINDOWS**				
1	**Providing and fixing Country Wood Single leaf Door** including mouldings, rebating hold fasts and finished with primer and paint inclusive of country teak wood frame without ventilators, windows and fanlights	3.8	Sqm.	4,500	17,100
	TOTAL FOR DOORS &WINDOWS				**17,100**
	GRAND TOTAL				**143,137**
	TOTAL COST PER HOUSE (RS)				143,137
	AREA OF HOUSE (SQM)				17
	COST PER SQ.M (RS)				8419.80588

Konkan Zone D

MAHARASHTRA

MH-K-05A

Designed to suit conditions in Zone E in Konkan Division

The lateritic duricrust capped uplands of Ratnagiri and Sindhudurg and parts of Raigad

Local building construction technology::

- Laterite stone
- Mud
- timber

MH-K-05

Konkan Zone E

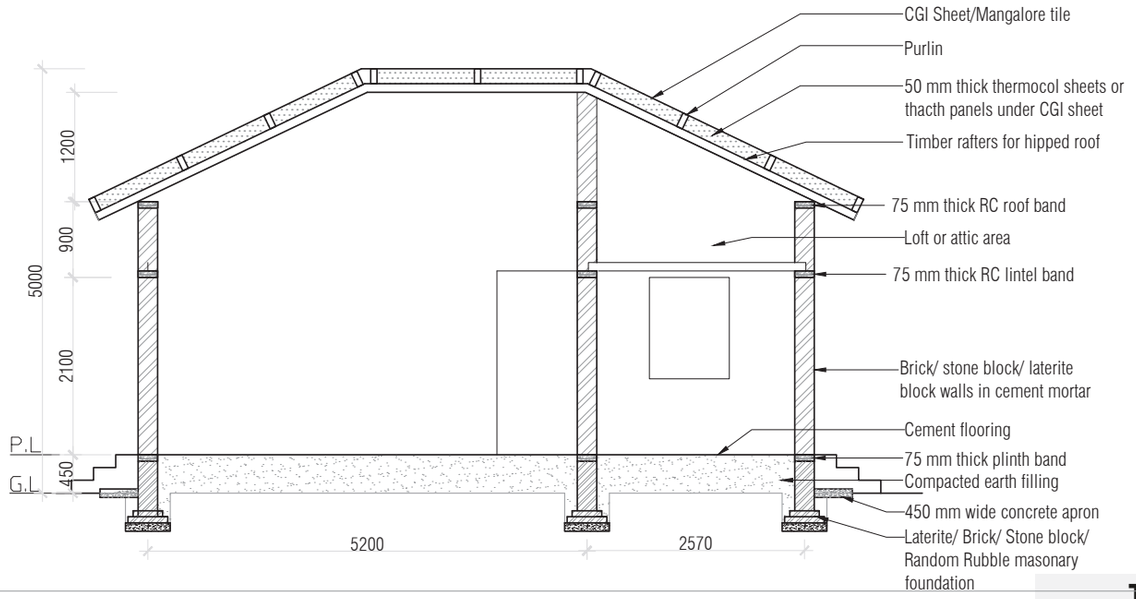
MAHARASHTRA

Highlights of the Prototype

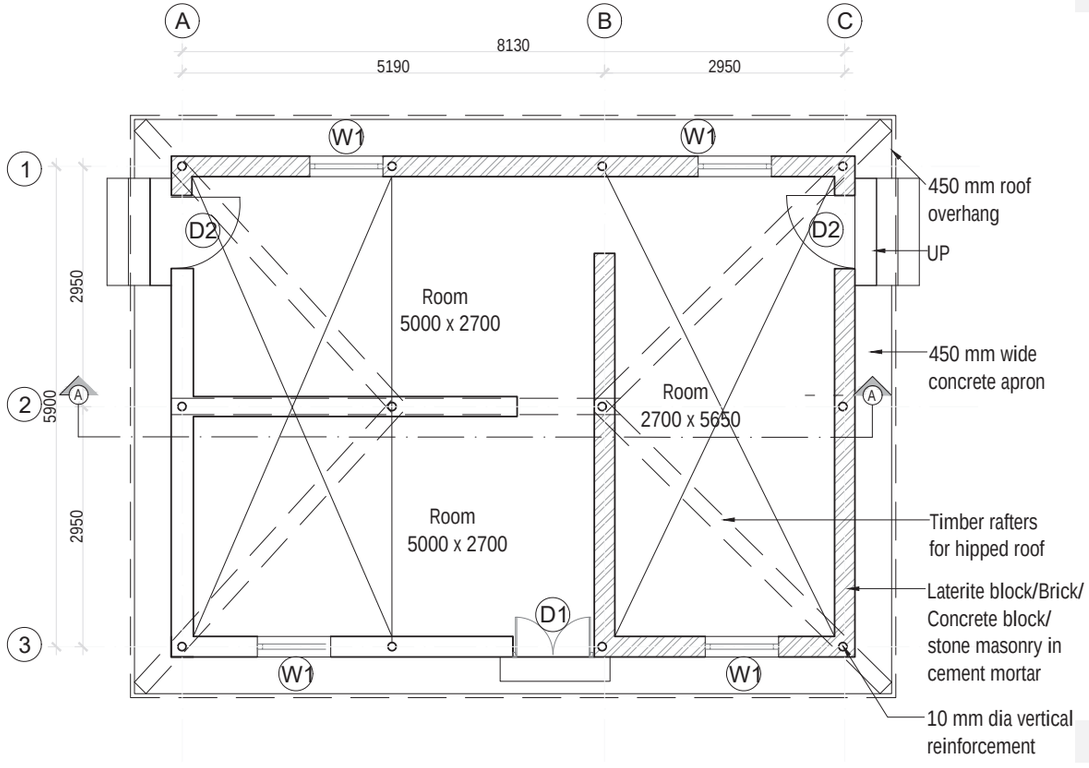
- Like most of the houses in the Konkan uplands the traditional houses of the region are also built on platforms known as 'chautharas' built up with the stone and mud of the region.
- The superstructure either has a timber framework with the sloping tiled roof resting on it or masonry structures supporting sloping roofs.
- Handcut laterite stone is stronger than machine cut laterite stone besides being less wasteful.
- The mud for construction is prepared with the mud from the same land on which the house stands included that excavated for the 'chauthara' which is then sieved.
- The timber framed roof built of jungle/country wood can also be dismantlable and members repaired/replaced if required.

Recommendations for construction systems	
Components	**Recommended Specifications**
Foundations	• Brick/stone/laterite stone masonry
Plinth	• Minimum (300 mm or 150mm more than last 50 year flood level) with Plinth Band
Wall	• Brick masonry/ Stone block/ laterite stone masonry
Wall Finish	• Ferrocement plaster
Roof Structure	• Sloping pyramidal roofs with timber understructure
Roof Cover	• CGI sheets/Mangalore tiles with thatch insulation/ any other insulation material
Floor	• Cement flooring/ brick paving
Door and Windows	• Mild steel/local timber door and window

MH-K-05A



TYPICAL SECTION AA'



TYPICAL PLAN

Area Statement:

Item	Area	
	Sq.m	Sq.ft
Room 1	13.78	148.33
Room 2	13.78	148.33
Room 3	15.47	166.52
Carpet Area	43.03	463.17
Built up Area	51.65	555.96

Konkan Zone E

MAHARASHTRA

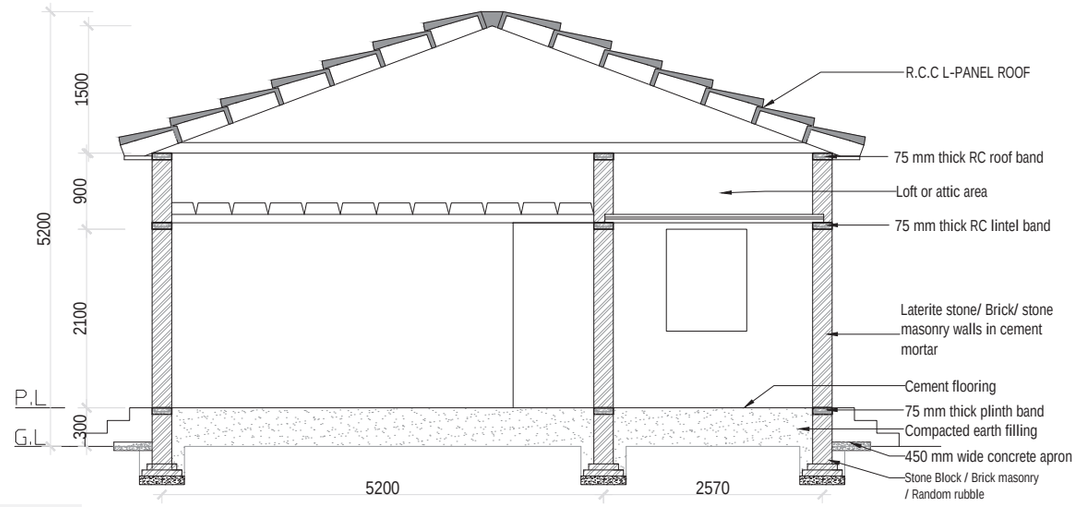
MH-K-05B

Area Statement:

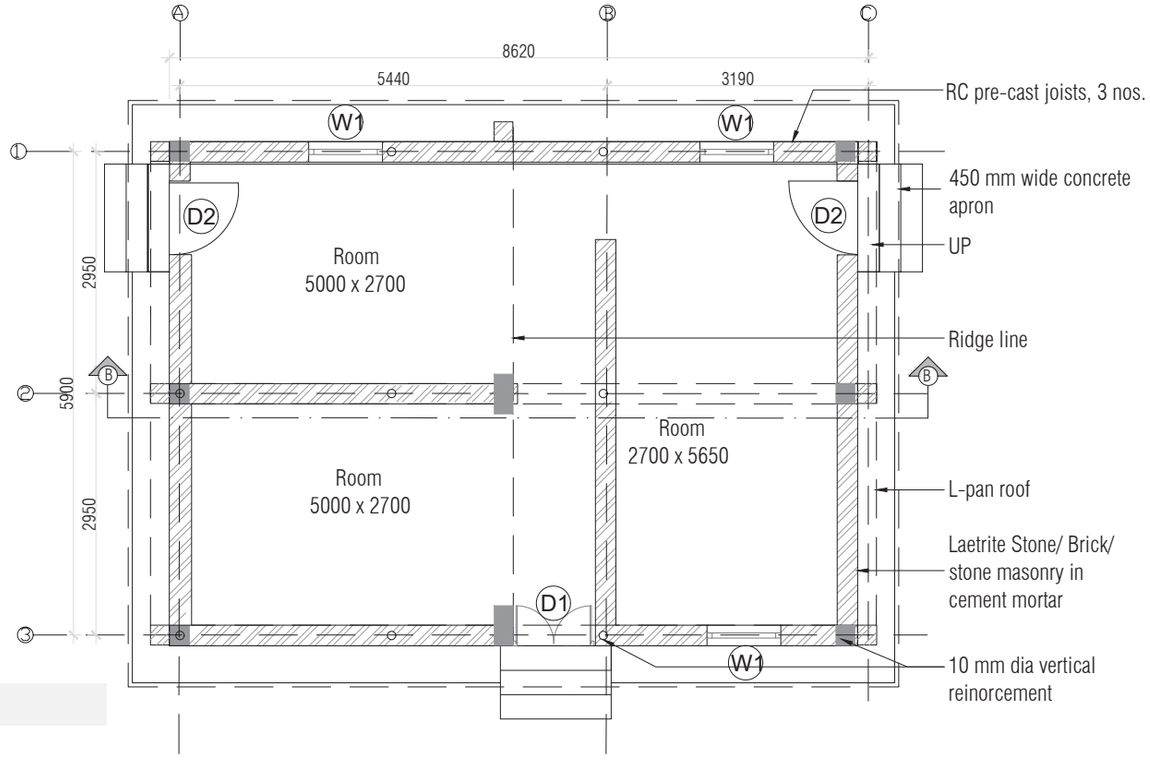
Item	Area	
	Sq.m	Sq.ft
Room 1	13.78	148.33
Room 2	13.78	148.33
Room 3	15.47	166.52
Carpet Area	43.03	463.17
Built up Area	51.65	555.96

Konkan Zone E

MAHARASHTRA



TYPICAL SECTION AA'



TYPICAL PLAN

MH-K-05
Cost estimate

SR.NO.	ITEM OF WORK	Quantity	Unit	Rate (Rs)	Cost
a	**CORE HOUSE**				
A	**FOUNDATION WORK**				
1	**Excavation**-Excavation of trench/pit 0.6 m deep including and carting away as specified and stacking excavated mud for cob wall, etc. complete as directed	17.3	Cum.	277	4,792
2	**Uncoursed Stone masonry** in mud lime ash mortar 1'6" thick for retaining wall,foundation and plinth etc. complete	6.75	Cum.	3,000	20,250
3	**Filling** in trench/pit with excavated mud to get a uniform base watered and compressed at intervals with top finished with addition of cowdung slurry.	32.6	Cum.	750	24,450
	TOTAL FOR FOUNDATION WORK				**49,492**
B	**SUPERSTRUCTURE**				
1	**Brick masonry**	5.5	Cum.	3,000	16,500
	TOTAL FOR SUPER STRUCTURE				**16,500**
C	**PLASTERING & FINISHING**				
1	Finishing pier surfaces wFinishing external wall vertical surfaces with mud plaster and rendering the surface with top coat mixed with cowdungith mud plaster and rendering the surface	9.99	Sqm.	98	979
2	Finishing pier surfaces Finishing internal vertical surfaces with mud plaster finished with lime washwith mud plaster and rendering the surface	9.99	Sqm.	22	220
	TOTAL FOR PLASTERING & FINISHING				**979**
	TOTAL FOR CIVIL WORK				**66,971**
E	**Roofing**				
	Providing and fixing Mangalore tile roofs inclusive of securing lowermost tile on country wood battens inclusive of seasoned country wood, wall plates and posts as required etc. complete	44.5	Sq.m.	555	24,698
	TOTAL FOR ROOFING				**24,698**
F	**DOORS & WINDOWS**				
1	**Providing and fixing Country Wood Single leaf Door** including mouldings, rebating hold fasts and finished with primer and paint inclusive of country teak wood frame without ventilators, windows and fanlights	5.67	Sqm.	4,500	25,515
2	**Providing and fixing Country Wood windows double leaved** with panelled shutters 35 mm thick and panels 25mm thick with chromium plated fixtures and fastenings inclusive of frame exclusive of ventilators and fan lights, with one coat of primer etc. complete.	4.3	Sqm.	4,500	19,350
	TOTAL FOR DOORS &WINDOWS				**44,865**
	GRAND TOTAL				**136,534**
	TOTAL COST PER HOUSE (RS)				136,534
	AREA OF HOUSE (SQM)				52
	COST PER SQ.M (RS)				2625.64654

Konkan Zone E

MAHARASHTRA

184

MARATHWADA HOUSING ZONES

Zone 1
Comprises of the hilly region of Marathwada. Trappean Landforms dominate. These hills are sparsely vegetated except for the comparatively moist river valleys. Water is extremely constrained and with it livelihood. Ideally these concerns should also be addressed. Energy from the sun could be a major resource.

Zone 2
This zone predominantly consists of stepped uplands dropping down from the hills in the North towards the Godawari. Evolving from the mud of the region, walls of adobe with mud mortar and cob are suitable bothe with respect to the soil typology and the contested situation of water. Stone quarried from the site is used for foundation and wall. For roofs the flat mud ''Dhaba'' roof. Houses are often built with common side walls and shaded courtyards.

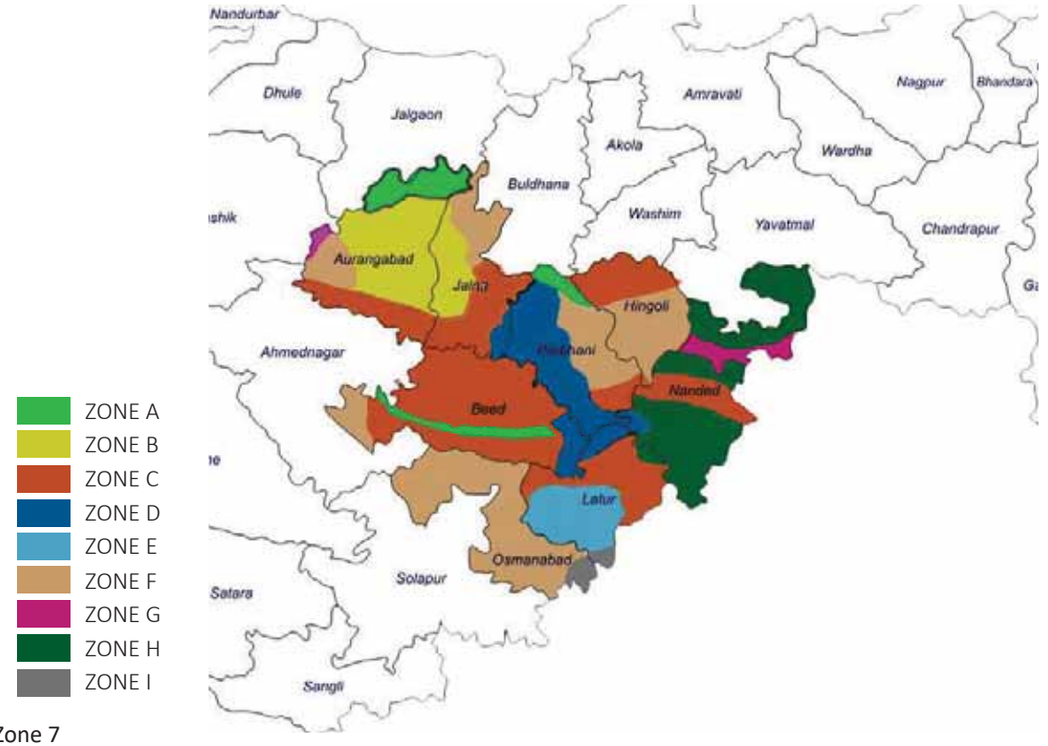
Zone 3
Most of this zone is located along the Godavari and the construction technologies and planning of houses and settlement seems more elaborate and diversified compounded structures and double storied structures are also seen. Timber structural grid is erected over the stone plinth. Brick walls are plastered using mud or cement.

Zone 4
This zone largely comprises of the Balaghat plateau dissected by the lower elevated river valleys of the Purna Godavari Manjra River systems. Stone and timber houses used to be the norm, but with timber usually neem and babul becoming an increasingly scarce resource and stone working skills getting lost with decrease of and the extreme climate especially the extreme heat of Marathwada an adaptation of the traditional stone vault in terms of a brick vault has been proposed.

Zone 5
This zone lies within south Latur and is more or less the area which suffered great damage during the earthquake of 1993. This stretch lies in the Terna Manjira basin which is a sub basin of the Godavari basin. When translated into what needs to be taken care of by house it translates into the weather being a larger determinant of the structure and planning of the house reasonable level of precautions built in to make the house earthquake resistant.

Zone 6
This zone consists of elevated flat uplands in various parts of Marathwada. Water is an extremely sharp constraint and with it livelihood. The extreme heat dictates the shell of the house where the best way to ensure indoor comfort is still thick stone walls with the 'Dhaba' mud flat roof. Windows are minimal. Rear courtyards also help in cooling down the houses and bringing in light. Openings are often towards the courtyards.

MAHARASHTRA



Zone 7
This zone largely comprises of the hilly forested regions of Nanded. The house is constructed along the contours with earth berming technique. The walls are built in random rubble masonry with black stone available on site and mortar of mud+lime+ash. The most commonly seen and cheaper technique of wall construction in Aandhwadi in this zone are wattle and daub walls supported with simple wooden framework.

Zone 8
This zone is largely in Nanded District. Zoning in Marathawada is largely based on human skill so with training most of the construction technologies could be applied across Marathawada.
Water is an extremely constrained and with it livelihoods. Ideally these concerns should also be addressed. Energy from the sun could be a major resource.

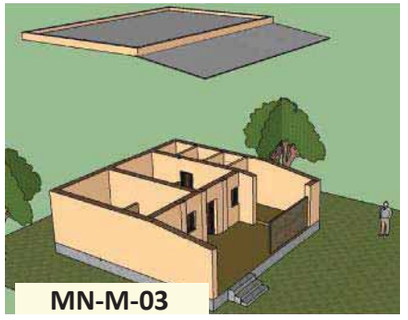
Zone 9
This zone adjoins Bidar in Karnataka and has laterite and lateritic soil. Climate is semi-arid and summers are extremes. Settlements are planned as per the profile of the land and are generally around narrow self-shading streets. Laterite is very often used as a material of construction though often this is laterite from neighbouring Karnataka which is found to be superior in quality to that which is found locally.

MARATHWADA HOUSING ZONES

TYPOLOGY	APPLICABLE HOUSING ZONES	TOTAL AREA Sq.m/Sq.ft	
MH-M-01	Zone A	48.18 Sq.m	**518.61** Sq.ft
MH-M-02	Zone B	**41.06** Sq.m	**441.97** Sq.ft
MH-M-03	Zone C	**76.67** Sq.m	**825.28** Sq.ft
MH-M-04	Zone D	**64.00** Sq.m	**688.90** Sq.ft
MH-M-05	Zone E	**31.25** Sq.m	**336.38** Sq.ft
MH-M-06	Zone F	**52.11** Sq.m	**560.91** Sq.ft
MH-M-07	Zone G	40.14 Sq.m	**432.06** Sq.ft
MH-M-08	Zone H	71.52 Sq.m	**769.84** Sq.ft
MH-M-09	Zone I	32.40 Sq.m	348.75 Sq.ft

MN-M-01

MN-M-02



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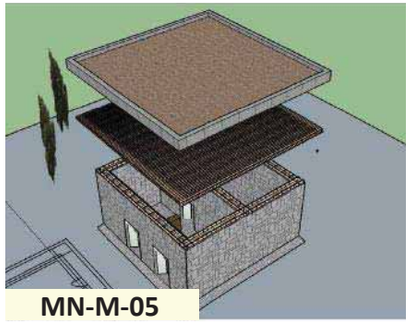
MN-M-04



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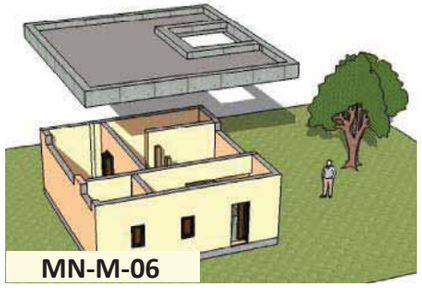

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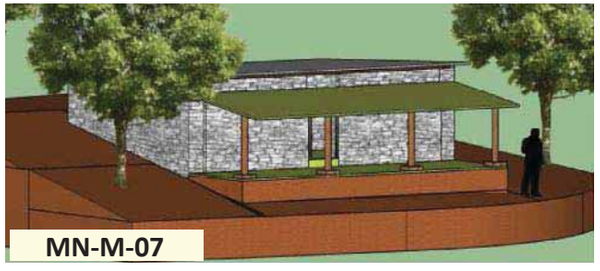

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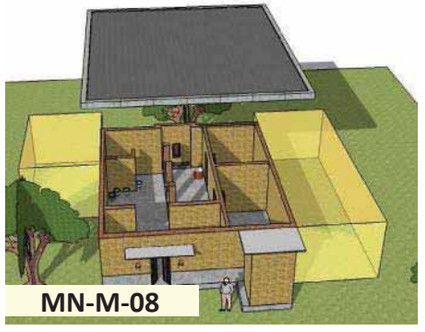

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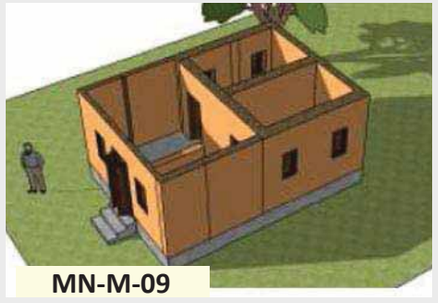


MN-M-09

MAHARASHTRA

MH-M-01

Designed to suit conditions in Zone A in Marathwada Division

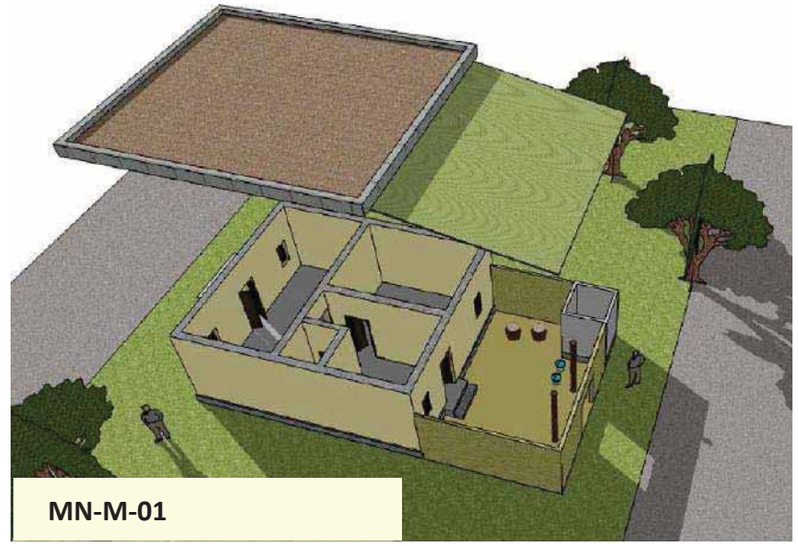
This Zone comprises of the hilly region of Marathwada.

Local building construction technology::

- Stone
- timber

Marathwada Zone A

MAHARASHTRA

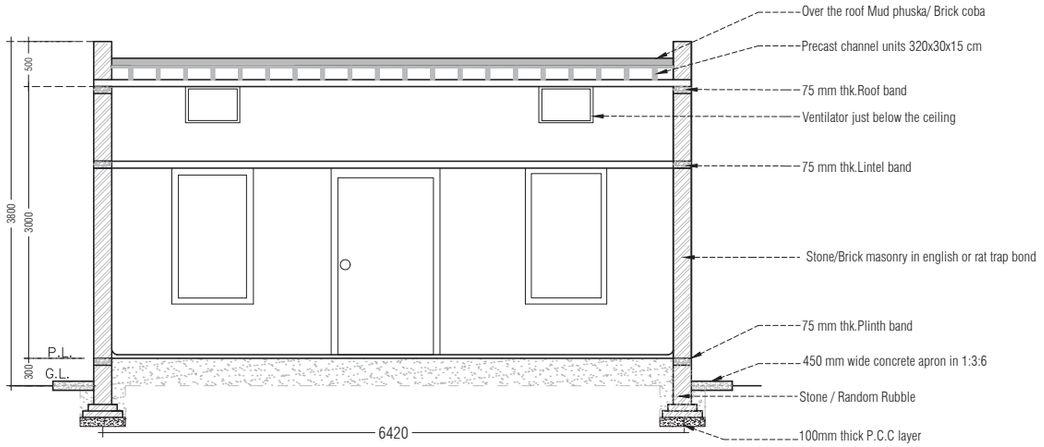


MN-M-01

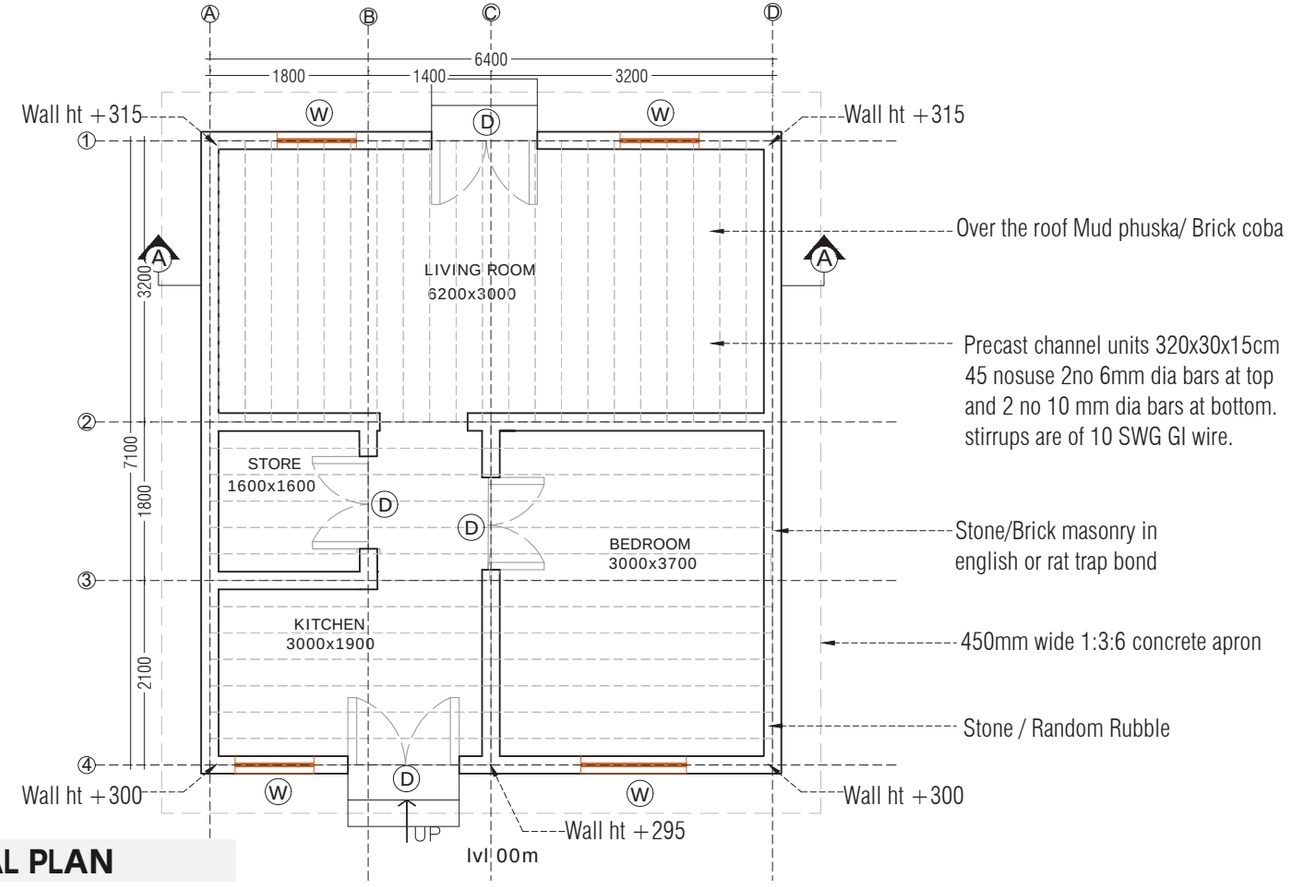
Highlights of the Prototype

- The Design Prototype for Zone 1 is a rectangular structure with absolutely simple house plan with rooms arranged one after another in a linear fashion with doors in front of each other usually or sometimes staggered. Internal partitions rarely exist and rooms are bigger in size.
- Walls are made up of random rubble stone with mud mortar masonry very few are seen with cobbed.Almost all the houses in village are ground floor structures with flat mud roof on the top.Functionally house is divided into kitchen cum storage, bigger, common room to rest, verandah for cattle or sometimes for chulha.Nowadays households require bedrooms, partitions in new house.
- Raised plinths of the house upto 3 feet and more protect from rains.
- The roof is of'Dhabha' type or flat mud roof laid on split bamboo with teak leaf mat and a 20mm thick slaked calcareous mud layer compacted with wooden mallet is laid over this.
- Stone is an easily available building material but skill in its working is lacking or expensive.

Recommendations for construction systems	
Components	**Recommended Specifications**
Foundations	• Stone/ Random rubble foundation
Plinth	• Minimum (300 mm or 150mm more than last 50 year flood level)
Wall	• Stone/brick masonry in rat trap bond
Wall Finish	• Stabilised mud plaster/ cement plaster/exposed brick wall with pointing
Roof Structure	• flat roofing system with Precast Rc channel
Roof Cover	• Brick Coba/ Mud Phuska
Floor	• cement flooring/ brick paving
Door and Windows	• local timber/Mild steel door and window



TYPICAL SECTION AA'



TYPICAL PLAN

MH-M-01

Area Statement:

Item	Area	
	Sq.m	Sq.ft
Living Room	18.6	200.21
Bedroom	11.10	119.48
Kitchen	5.70	61.35
Store room	2.56	27.56
Carpet Area	41.23	443.80
Built up Area	48.18	518.61

Marathwada Zone A

MAHARASHTRA

MH-M-01
Cost estimate

SR.NO.	ITEM OF WORK	Quantity	Unit	Rate (Rs)	Cost
a	**CORE HOUSE**				
A	**TERRACE CONSTRUCTION**				
1	**Cutting and excavation of slope of hill** to form terraces and stacking of excavated material after sorting for reuse within the premises etc. complete	81	Cum.	277	22,437
	TOTAL FOR TERRACE WORK				22,437
B	**FOUNDATION WORK**				
1	**Excavation**-Excavation of trench/pit 0.6 m deep including and carting away as specified and stacking excavated mud for cob wall, etc. complete as directed	10.08	Cum.	277	2,795
2	**Uncoursed Stone masonry** in mud lime ash mortar 1'6" thick for retaining wall,foundation and plinth etc. complete	11.97	Cum.	3,000	35,910
3	**Filling** in trench/pit with excavated mud to get a uniform base watered and compressed at intervals with top finished with addition of cowdung slurry	30.5325	Cum.	750	22,899
4	**Ramming base** with excavated mud to get a uniform platform for thatch roofed area 15cms high watered and compressed at intervals with top finished with addition of cowdung slurry.	4.875	Cum.	750	3,656
	TOTAL FOR FOUNDATION WORK				**65,260**
B	**SUPERSTRUCTURE**				
1	Brick masonry with Rat trap bond in super structure with cement mortar 1:4	20.8	Cum.	4,170	86,736
2	Roof RCC band	0.25	cu.m	4500	1,125
3	Lintel RCC band	0.25	cu.m	4500	1,125
4	Plinth RCC band	0.25	cu.m	4500	1,125
5	Steel in Roof RCC band	16	kg	58	928
6	Steel in Lintel RCC band	16	kg	58	928
7	Steel in Plinth RCC band	16	kg	58	928
	TOTAL FOR SUPER STRUCTURE				**90,111**
C	**PLASTERING & FINISHING**				
1	**Finishing external wall vertical surfaces** with mud plaster and rendering the surface .	56	Sqm.	98	5,488
2	**Finishing internal wall vertical surfaces** with mud plaster finished with lime wash .	51.2	Sqm.	98	5,018
	TOTAL FOR PLASTERING & FINISHING				**10,506**
	TOTAL FOR CIVIL WORK				**188,314**
D	**ROOFING**				
1	Precast piles of section 0.15mx0.15mx3m, with a 0.5mx0.5m flange	12	No.	1,000	12,000
2	Brick bats and mud phuska finishing over roof with cement dust mortar	6	Sqm.	650.00	3,900
	TOTAL FOR ROOFING				**15,900**
E	**DOORS & WINDOWS**				
1	**Providing and fixing country wood two leaved Door** including mouldings, rebating hold fasts and finished with primer and paint inclusive of country teak wood frame without ventilators, windows and fanlights	5.67	Sqm.	4,500	25,515
2	**Providing and fixing country wood single leaved Door** including mouldings, rebating hold fasts and finished with primer and paint inclusive of country teak wood frame without ventilators, windows and fanlights	1.89	Sqm.	4,500	8,505
	TOTAL FOR DOORS &WINDOWS				**34,020**
	GRAND TOTAL				**238,234**
	TOTAL COST PER HOUSE (RS)				238,234
	AREA OF HOUSE (SQM)				48.75
	COST PER SQ.M (RS)				4886.849

Marathwada Zone A

MAHARASHTRA

MH-M-02

MN-M-02

Designed to suit conditions in Zone B in Marathwada Division

This Zone predominantly consists of stepped uplands dropping down from the hills in the North towards the Godavari.

Local building construction technology::

- Stone
- timber
- Mud

Highlights of the Prototype

- The Design Prototype for Zone 2 is a rectangular structure with a rear courtyard adjoining the kitchen.
- Functional rooms have been considered here with a Living room and a bedroom and a store room.
- Shared walls and small shaded courtyards are considered with a view to minimizing openings.
- Mud walls which can absorb and release moisture and mud flat roofs keep the houses cool.
- Construction Technology recommended involves the use of adobe bricks in mud mortar for the walls.
- The roof is of'Dhabha' type or flat mud roof laid on split bamboo with teak leaf mat and a 20mm thick slaked calcareous mud layer compacted with wooden mallet is laid over this.

Recommendations for construction systems	
Components	**Recommended Specifications**
Foundations	• Stone/ Random rubble foundation
Plinth	• Minimum (300 mm or 150mm more than last 50 year flood level)
Wall	• Stone/brick masonry in rat trap bond
Wall Finish	• Stabilised mud plaster/ cement plaster/exposed brick wall with pointing
Roof Structure	• flat roofing system with RC joist and plank system reinforced with 6 mmand 8 mm dia rebars • lean to roofing system on the verandah with CGI sheet with timber understructure insulated with thatch
Roof Cover	• Brick Coba/ Mud Phuska
Floor	• cement flooring/ brick paving
Door and Windows	• local timber/Mild steel door and window

Marathwada Zone B

MAHARASHTRA

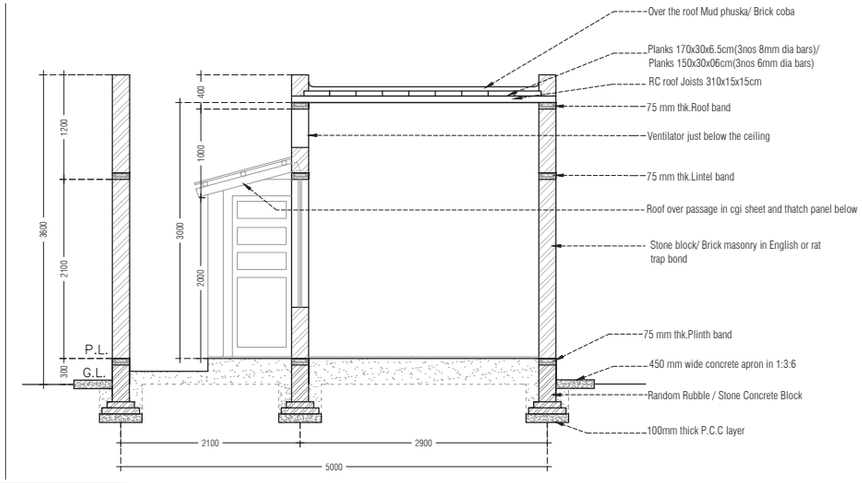
MH-M-02

Area Statement:

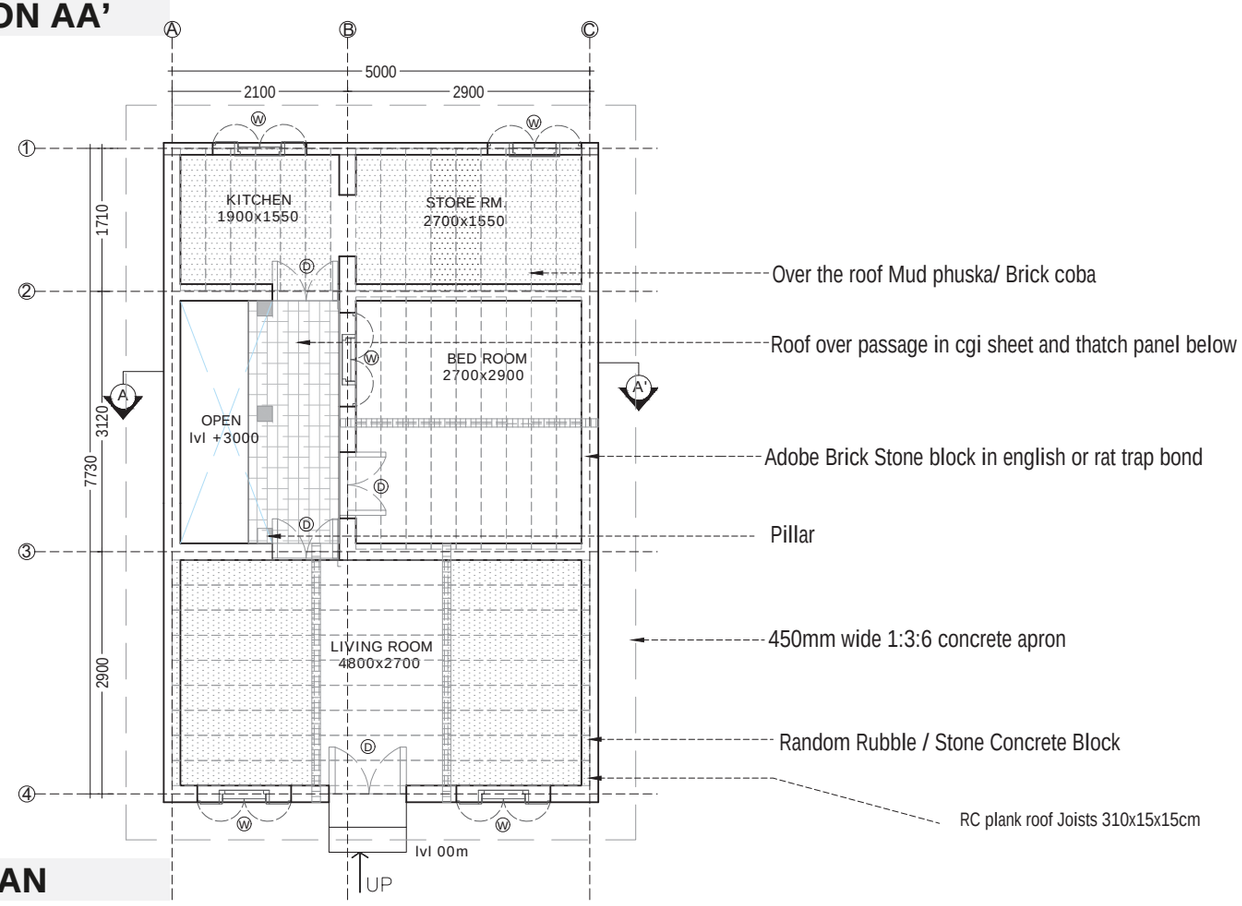
Item	Area	
	Sq.m	Sq.ft
Living Room	12.96	139.50
Bedroom	7.83	84.28
Kitchen	2.95	31.75
Store room	4.18	45.00
Carpet Area	28.58	307.64
Built up Area	41.06	441.97

Marathwada Zone B

MAHARASHTRA



TYPICAL SECTION AA'



TYPICAL PLAN

MH-M-02
Cost estimate

SR.NO.	ITEM OF WORK	Quantity	Unit	Rate (Rs)	Cost
a	**CORE HOUSE**				
A	**FOUNDATION WORK**				
1	**Excavation**-Excavation of trench/pit 0.6 m deep including and carting away as specified and stacking excavated mud for cob wall, etc. complete as directed	4.32	Cum.	277	1,197
2	**Uncoursed Stone masonry** in mud lime ash mortar 1'6" thick for retaining wall,foundation and plinth etc. complete	2.7	Cum.	3,000	8,100
3	**Filling** in trench/pit with excavated mud to get a uniform base watered and compressed at intervals with top finished with addition of cowdung slurry.	30.6	Cum.	750	22,950
	TOTAL FOR FOUNDATION WORK				**32,247**
B	**SUPERSTRUCTURE**				
1	Brick masonry with Rat trap bond in super structure with cement mortar 1:4	18	Cum.	4,170	75,060
2	Roof RCC band	0.25	cu.m	4500	1,125
3	Lintel RCC band	0.25	cu.m	4500	1,125
4	Plinth RCC band	0.25	cu.m	4500	1,125
5	Steel in Roof RCC band	16	kg	58	928
6	Steel in Lintel RCC band	16	kg	58	928
7	Steel in Plinth RCC band	16	kg	58	928
	TOTAL FOR SUPER STRUCTURE				**81,219**
C	**PLASTERING & FINISHING**				
1	**Finishing external wall vertical surfaces** with mud plaster and rendering the surface .	85	Sqm.	98	8,330
2	**Finishing internal wall vertical surfaces** with mud plaster finished with lime wash .	65	Sqm.	98	6,370
	TOTAL FOR PLASTERING & FINISHING				**14,700**
	TOTAL FOR CIVIL WORK				**128,166**
D	**Roof with precast RCC plank and joist**				
1	Precast RCC planks of size 1.5mx0.3m, with 1.6 kg 6mm steel per plank	24	No.	275	6,600
2	Precast RCC beam of size 0.15mx0.15m, 3.6m length	1	No.	2500	2,500
3	In-situ concrete mix 1:1.5:3 on top of planks and joist	0.25	cu.m	4500	1,125
4	Steel in in-situ concrete	13	kg	58	754
5	Mason	2	mandays	500	1,000
6	Labour	12	mandays	250	3,000
7	Bar bender	1	mandays	500	500
8	Brick bats and mud phuska finishing over roof with cement dust mortar	10	Sqm.	650.00	6,500
	TOTAL FOR ROOFING				**21,979**

E	**DOORS & WINDOWS**				
1	**Providing and fixing country wood two leaved Door** including mouldings, rebating hold fasts and finished with primer and paint inclusive of country teak wood frame without ventilators, windows and fanlights	4.85	Sqm.	4,500	21,825
2	**Providing and fixing country wood single leaved Door** including mouldings, rebating hold fasts and finished with primer and paint inclusive of country teak wood frame without ventilators, windows and fanlights	4.85	Sqm.	4,500	21,825
	TOTAL FOR DOORS &WINDOWS				**43,650**
	GRAND TOTAL				**193,795**
	TOTAL COST PER HOUSE (RS)				193,795
	AREA OF HOUSE (SQM)				46.8
	COST PER SQ.M (RS)				4140.91111

Marathwada Zone B

MAHARASHTRA

MH-M-03

Designed to suit conditions in Zone C in Marathwada Division

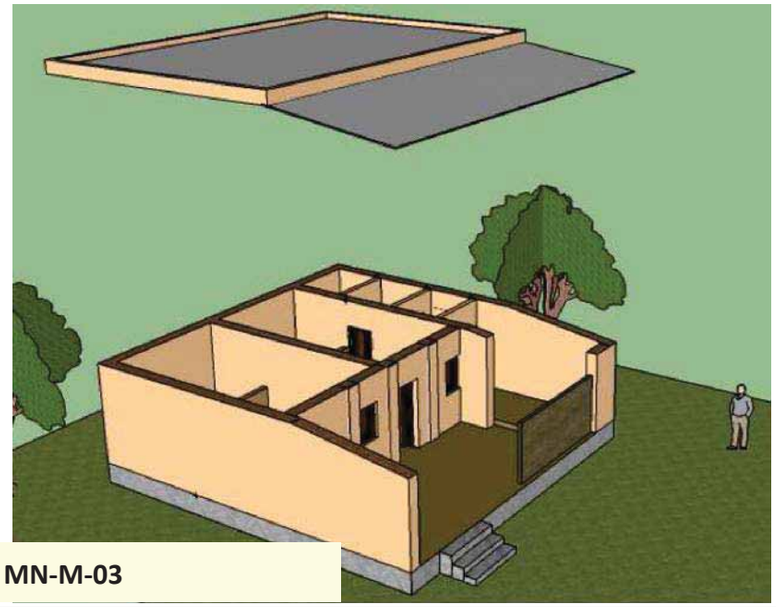
Most of this Zone is located along the Godavari and the construction technologies and planning of houses and settlement seems more elaborate and diversified. Compounded structures and double storeyed structures are also seen.

Local building construction technology::

- Stone
- timber
- Mud
- Conventional building materials

Marathwada Zone C

MAHARASHTRA

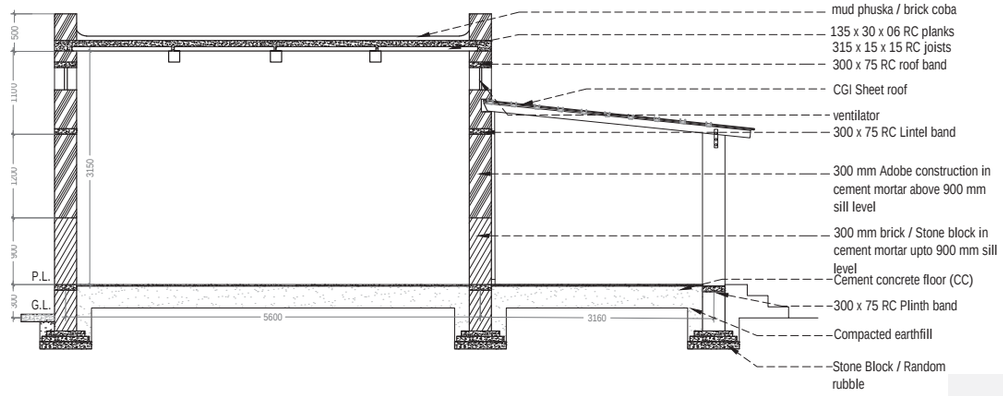


MN-M-03

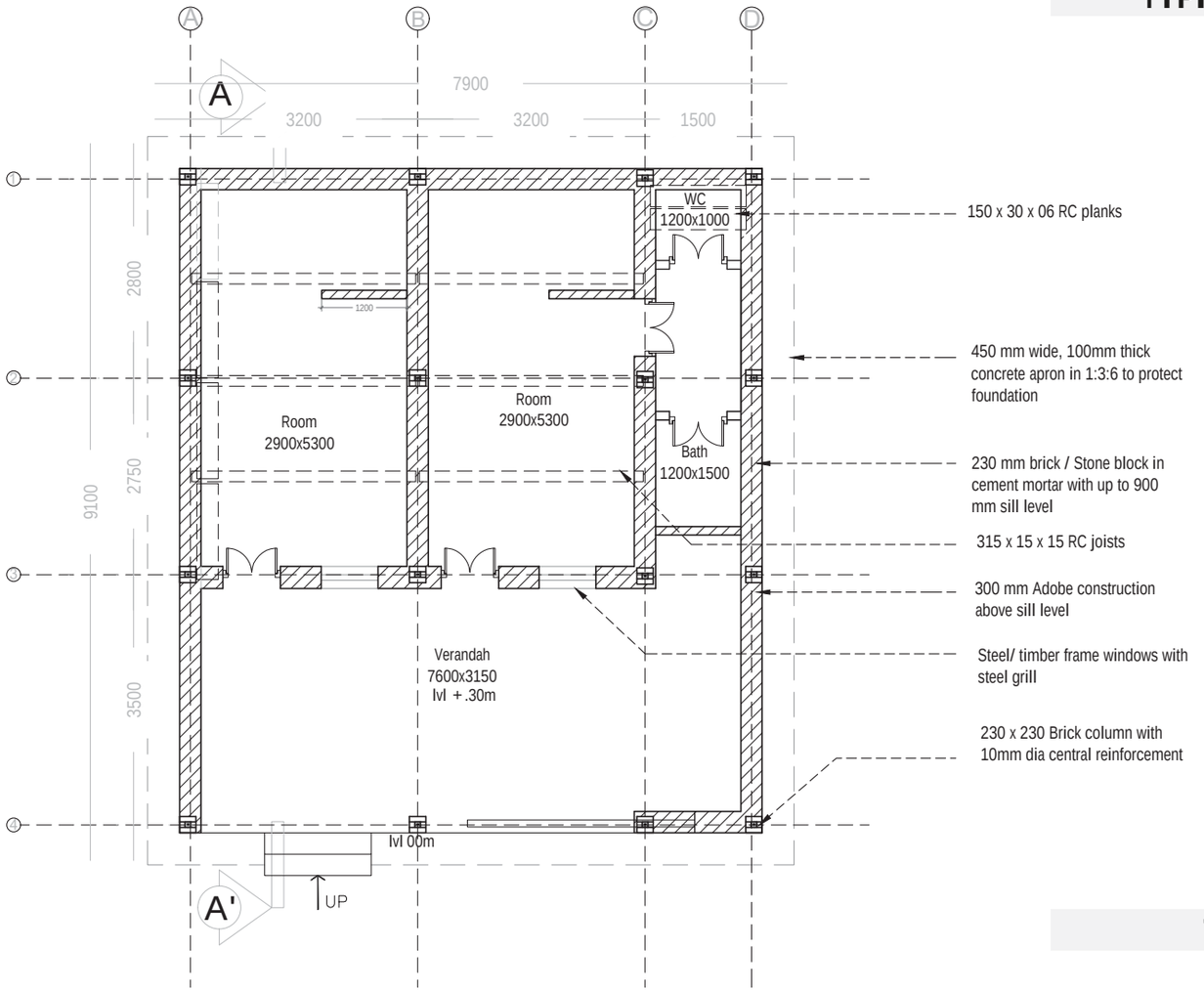
Highlights of the Prototype

- The Design Prototype for Zone 3 is a rectangular structure with a rear courtyard adjoining the kitchen.
- Functional rooms have been considered here with a Living room and a bedroom and a store room.
- Shared walls and small shaded courtyards are considered with a view to minimizing openings.
- Construction Technology recommended involves the use of adobe bricks in mud mortar for the walls.
- The roof is of'Dhabha' type or flat mud roof laid on split bamboo with teak leaf mat and a 20mm thick slaked calcareous mud layer compacted with wooden mallet is laid over this. Avisibility of the plastic sheet is also thus indicative of maintenance being required urgently.
- Front spaces which act as spaces for the chulha or house the cattle or both are roofed with thatch.

Recommendations for construction systems	
Components	**Recommended Specifications**
Foundations	• Stone block/ Random rubble foundation
Plinth	• Minimum (300 mm or 150mm more than last 50 year flood level)
Wall	• 300 mm thick brick/stone block masonry upto sill level • 300 mm thick adobe wall construction above sill level • with horizontal RCC bands at plinth, sill and lintel level
Wall Finish	• Stabilised mud plaster/ cement plaster/exposed brick wall with pointing/ferrocement plaster
Roof Structure	• flat roofing system with RC joist and plank system reinforced with 6 mmand 8 mm dia rebars • lean to roofing system on the verandah with CGI sheet with timber understructure insulated with thatch
Roof Cover	• Brick Coba/ Mud Phuska
Floor	• cement flooring/ brick paving
Door and Windows	• local timber/Mild steel door and window



TYPICAL SECTION AA'

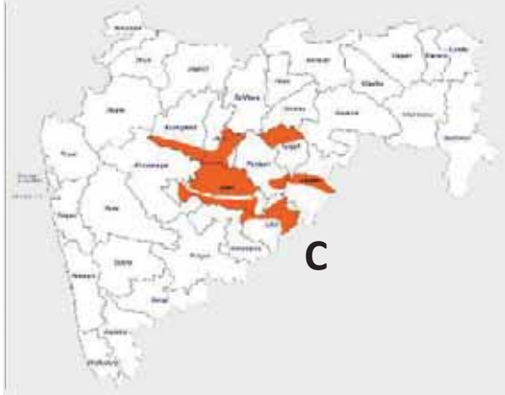


TYPICAL PLAN

MH-M-03

Area Statement:

Item	Area	
	Sq.m	Sq.ft
Room 1	15.48	166.63
Room 2	15.72	169.21
Verandah	26.59	286.21
Carpet Area	36.89	397.08
Built up Area	76.67	825.28



Marathwada Zone C

MAHARASHTRA

MH-M-03
Cost estimate

SR.NO.	ITEM OF WORK	Quantity	Unit	Rate (Rs)	Cost
a	**CORE HOUSE**				
A	**FOUNDATION WORK**				
1	**Excavation**-Excavation of trench/pit 0.6 m deep including and carting away as specified and stacking excavated mud for cob wall, etc. complete as directed	12.5	Cum.	277	3,463
2	**Uncoursed Stone masonry** in mud lime ash mortar 1'6" thick for retaining wall,foundation and plinth etc. complete	12.5	Cum.	3,000	37,500
3	**Filling** in trench/pit with excavated mud to get a uniform base watered and compressed at intervals with top finished with addition of cowdung slurry.	30.2	Cum.	750	22,650
4	**Ramming base** with excavated mud to get a uniform platform for thatch roofed area 15cms high watered and compressed at intervals with top finished with addition of cowdung slurry	3.6	Cum.	750	2,700
	TOTAL FOR FOUNDATION WORK				**63,613**
B	**SUPERSTRUCTURE**				
1	Brick masonry upto cill level	10	Cum.	3,000	30,000
2	Adobe masonry above cill level	15	Cum.	600	9,000
3	RBC columns	16	no.	700	11,200
4	Roof RCC band	0.25	cu.m	4500	1,125
5	Lintel RCC band	0.25	cu.m	4500	1,125
6	Plinth RCC band	0.25	cu.m	4500	1,125
7	Steel in Roof RCC band	16	kg	58	928
8	Steel in Lintel RCC band	16	kg	58	928
9	Steel in Plinth RCC band	16	kg	58	928
	TOTAL FOR SUPER STRUCTURE				**56,359**

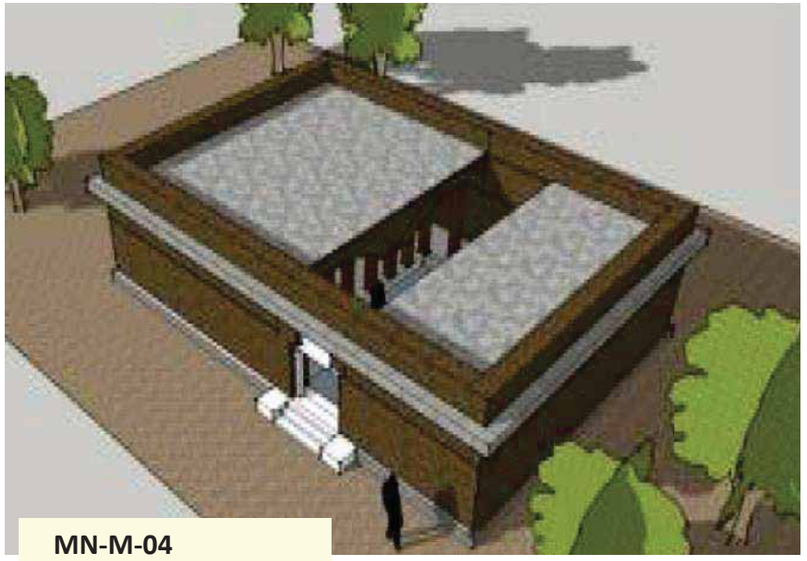
Marathwada Zone C

MAHARASHTRA

C	**PLASTERING & FINISHING**				
1	**Finishing external wall vertical surfaces** with mud plaster and rendering the surface .	56	Sqm.	98	5,488
2	**Finishing internal wall vertical surfaces** with mud plaster finished with lime wash .	120	Sqm.	98	11,760
	TOTAL FOR PLASTERING & FINISHING				**17,248**
	TOTAL FOR CIVIL WORK				**137,220**
D	**Roof with precast RCC plank and joist**				
1	Precast RCC planks of size 1.5mx0.3m, with 1.6 kg 6mm steel per plank	100	No.	275	27,500
2	Precast RCC beam of size 0.15mx0.15m, 3.6m length	2	No.	2500	5,000
3	In-situ concrete mix 1:1.5:3 on top of planks and joist	0.25	cu.m	4500	1,125
4	Steel in in-situ concrete	30	kg	58	1,740
5	Mason	2	mandays	500	1,000
6	Labour	12	mandays	250	3,000
7	Bar bender	1	mandays	500	500
8	GCI sheet roof - 0.5mm thick for verandah and kitchen				
8a	size 2740 x 900 (9'x3')	8	No.	500	4,000
8b	size 2135 x 900 (7'x3')	8	No.	425	3,400
8c	Bamboo understructure				
	75-100mm dia bamboo	25		130	3,250
	50-60mm dia bamboo	7		100	700
8d	Manpower				
	Skilled artisan/carpenter	3	mandays	500	1,500
	Labour	6	mandays	250	1,500
8e	Nails and hardware		lumsum		2000
9	Brick bats and mud phuska finishing over roof with cement dust mortar	10	Sqm.	650.00	6,500
	TOTAL FOR ROOFING				**62,715**
E	**DOORS & WINDOWS**				
1	**Providing and fixing country wood two leaved Door** including mouldings, rebating hold fasts and finished with primer and paint inclusive of country teak wood frame without ventilators, windows and fanlights	7.2	Sqm.	4,500	32,400
2	**Providing and fixing country wood single leaved Door** including mouldings, rebating hold fasts and finished with primer and paint inclusive of country teak wood frame without ventilators, windows and fanlights	1.2	Sqm.	4,500	5,400
	TOTAL FOR DOORS &WINDOWS				**37,800**

	GRAND TOTAL				**237,735**
	TOTAL COST PER HOUSE (RS)				237,735
	AREA OF HOUSE (SQM)				75
	COST PER SQ.M (RS)				3169.79333

MH-M-04



MN-M-04

Designed to suit conditions in Zone D in Marathwada Division

This zone largely comprises of the Balaghat Plateau dissected by the lower elevated river valleys of the Purna Godavari Manjra River systems.

Local building construction technology::

- Stone
- timber
- Mud
- Conventional building materials

Highlights of the Prototype

- The Design Prototype for Zone 4 is a set of rectangular structures roofed with a barrel vault roof in burnt brick.
- Construction Technology is recommended keeping local skills in mind. Due to the increased costs of stone, fired bricks are suggested as the common building material on a base plinth platform of stone built of uncoursed stone in mud mortar.
- Walls are built of fired brick and roofs of burnt brick vaults thus eliminating the use of timber. To tackle the intense heat of Marathwada alluvial earth with organic additives puddled and treated is spread over the vaults to create a smooth flat terrace.
- Fired bricks used in different ways to construct vertical walls and vaults spanning the distance.
- Shallow quarried or gathered hammer dressed external fair face stone for chauthara or platform edge with rammed earth floor.

Recommendations for construction systems	
Components	**Recommended Specifications**
Foundations	• Strip foundation with Stone block/ brick masonry in cement mortar
Plinth	• Minimum (300 mm or 150mm more than last 50 year flood level)
Wall	• 230 mm thk brick in english/rat trap bond or • 200 mm thk stone block/laterite block masonry in 1:6 cement mortar • with horizontal RCC bands at pinth/ sill and lintel level
Wall Finish	• Stabilised mud plaster/ cement plaster/exposed brick wall with pointing/ferrocement plaster
Roof Structure	• flat roofing system with RC ferrocement channels
Roof Cover	• Brick Coba/ Mud Phuska
Floor	• cement flooring/ brick paving
Door and Windows	• local timber/Mild steel door and window

Marathwada Zone D

MAHARASHTRA

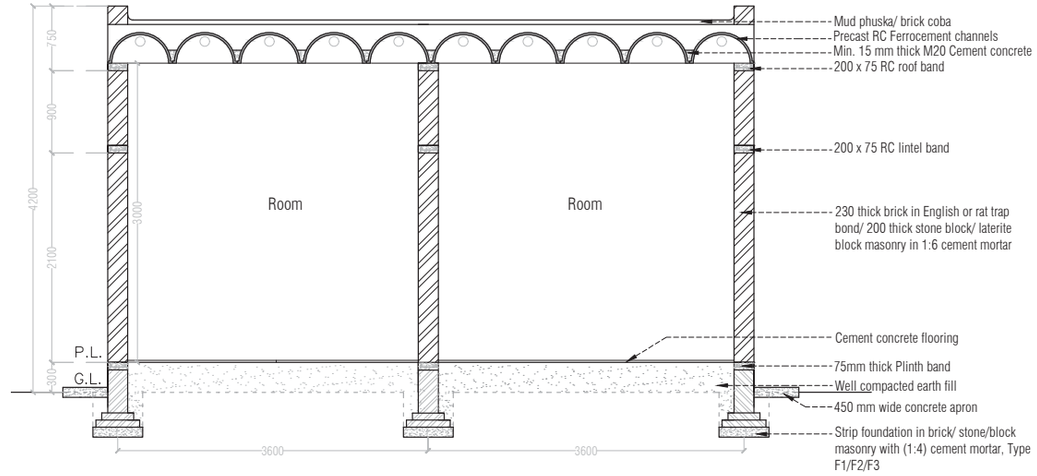
MH-M-04

Area Statement:

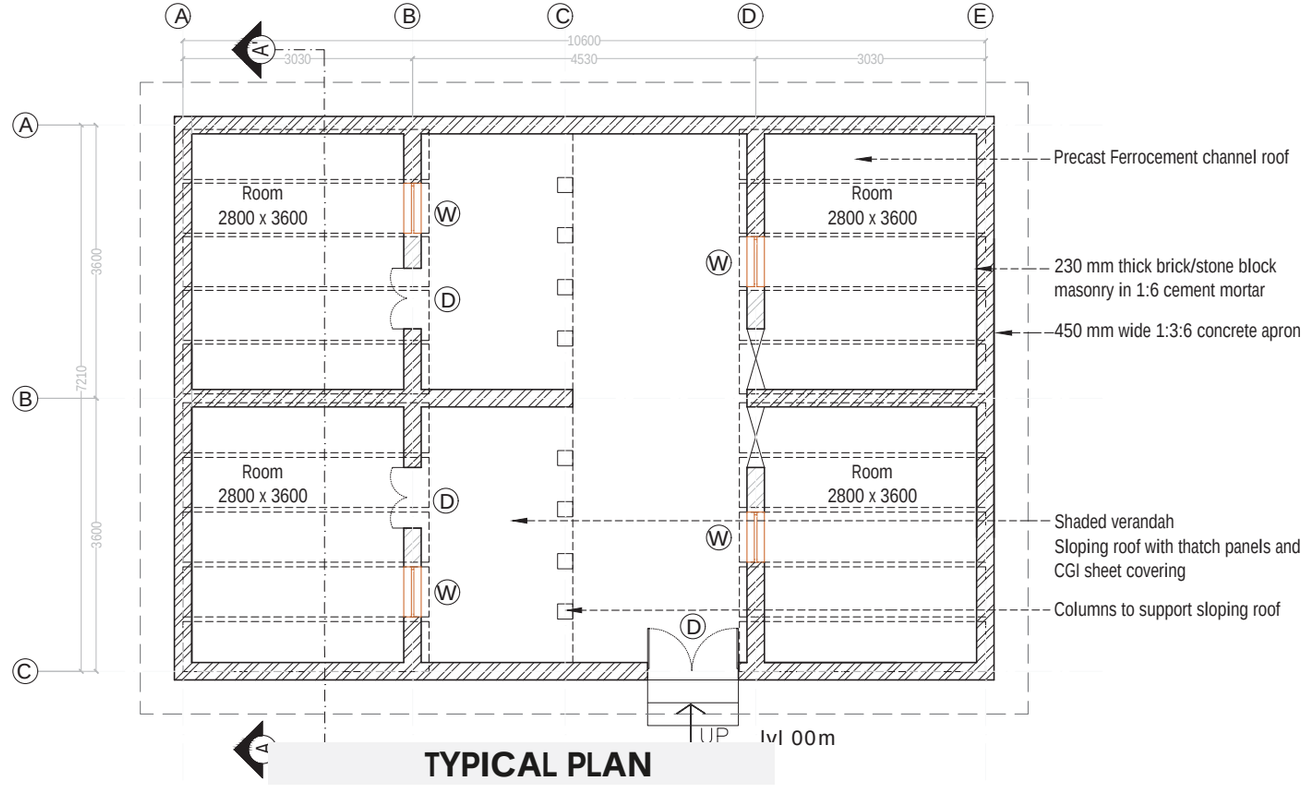
Item	Area	
	Sq.m	Sq.ft
Room 1	10.00	107.64
Room 2	10.00	107.64
Room 3	10.00	107.64
Room 4	10.00	107.64
Verandah	14.00	150.70
Carpet Area	39.00	419.80
Built up Area	64.00	688.90

Marathwada Zone D

MAHARASHTRA



TYPICAL SECTION AA'



TYPICAL PLAN

MH-M-04
Cost estimate

SR.NO.	ITEM OF WORK	Quantity	Unit	Rate (Rs)	Cost
a	**CORE HOUSE**				
A	**TERRACE CONSTRUCTION**				
1	**Cutting and excavation of slope of hill** to form terraces and stacking of excavated material after sorting for reuse within the premises etc. complete	75	Cum.	277	20775.0
2	**Conveying materials obtained from terrace cutting** including all lifts breaking clods, banking, benching,dressing to required lines, curves, grades, sections watering and compacting in layers not exceeding 20 to 30cm. including from site of excavation to site of deposition using wooden rammers etc. complete	47	Cum.	450	21150.0
	TOTAL FOR TERRACE WORK				0.0
A	**FOUNDATION WORK**				
1	**Excavation**-Excavation of trench/pit 0.6 m deep including and carting away as specified and stacking excavated mud for cob wall, etc. complete as directed	4.3	Cum.	277	1191.1
2	**Uncoursed Stone masonry** in mud lime ash mortar 1'6" thick for retaining wall,foundation and plinth etc. complete	2.7	Cum.	3,000	8100.0
3	**Filling** in trench/pit with excavated mud to get a uniform base watered and compressed at intervals with top finished with addition of cowdung slurry	30.6	Cum.	750	22950.0
	TOTAL FOR FOUNDATION WORK				**32241.1**
B	**SUPERSTRUCTURE**				
1	Brick masonry upto cill level	30	Cum.	3,000	90000.0
2	Roof RCC band	0.25	cu.m	4500	1125.0
3	Lintel RCC band	0.25	cu.m	4500	1125.0
4	Plinth RCC band	0.25	cu.m	4500	1125.0
5	Steel in Roof RCC band	16	kg	58	928.0
6	Steel in Lintel RCC band	16	kg	58	928.0
7	Steel in Plinth RCC band	16	kg	58	928.0
	TOTAL FOR SUPER STRUCTURE				**96159.0**
C	**PLASTERING & FINISHING**				
1	**Finishing external wall vertical surfaces** with mud plaster and rendering the surface .	56	Sqm.	98	5488.0
2	**Finishing internal wall vertical surfaces** with mud plaster finished with lime wash .	120	Sqm.	98	11760.0
	TOTAL FOR PLASTERING & FINISHING				**17248.0**
	TOTAL FOR CIVIL WORK				**145648.1**
D	**Ferrocement channel roof using precast channels of width 750mm, thickness 25mm and 3500mm length, cast in 1:2 cement mortar, reinforced with chicken mesh and weldmesh**				
1	Precast ferrocemement channel	14.0	No.	2000.0	28000.0
2	In-fill concrete 1:2:4 in valleys between channels	1.5	Cu.m	3000.0	4500.0
3	Manpower for lifting and placing channels and finishing in-situ valley concrete				
4	Skilled mason	2.0	Mandays	500.0	1000.0
5	Labour	15.0	Mandays	250.0	3750.0
6	Brick bats and mud phuska finishing over roof with cement dust mortar	70	Sqm.	600.00	42000.0
	TOTAL FOR ROOFING				**79250.0**

E	**DOORS & WINDOWS**				
1	**Providing and fixing country wood two leaved Door** including mouldings, rebating hold fasts and finished with primer and paint inclusive of country teak wood frame without ventilators, windows and fanlights	7.2	Sqm.	4,500	32400.0
2	**Providing and fixing country wood single leaved Door** including mouldings, rebating hold fasts and finished with primer and paint inclusive of country teak wood frame without ventilators, windows and fanlights	1.2	Sqm.	4,500	5400.0
	TOTAL FOR DOORS &WINDOWS				**37800.0**
	GRAND TOTAL				**262698.1**
	TOTAL COST PER HOUSE (RS)				262698.1
	AREA OF HOUSE (SQM)				70.0
	COST PER SQ.M (RS)				3752.8

Marathwada Zone D

MAHARASHTRA

MH-M-05

Designed to suit conditions in Zone E in Marathwada Division

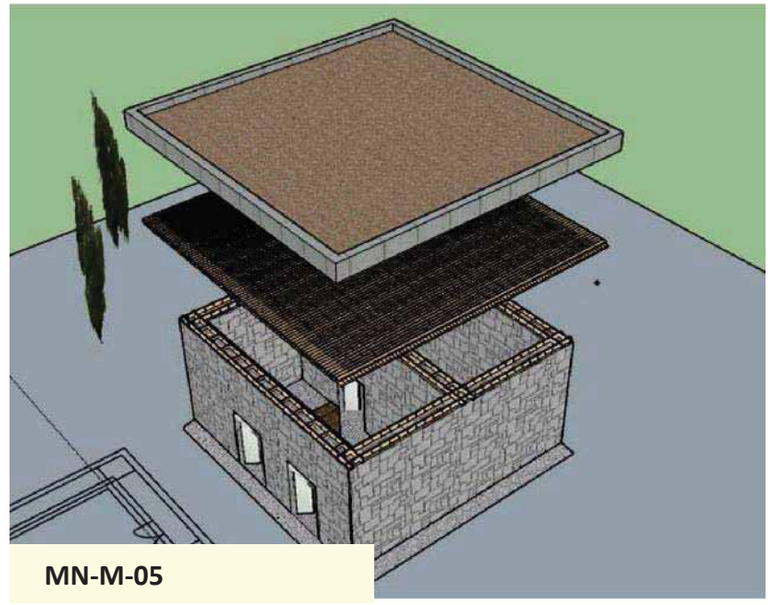
This Zone lies within South Latur and is more or less the area which suffered great damage during the earthquake of 1993. In terms of construction technology in the region at the time of the earthquake this did not differ greatly from that of other regions. This stretch lies in the Terna Manjira Basin which is a sub basin of the Godavari basin.

Local Local building construction technology::

- Stone
- Mud

Marathwada Zone E

MAHARASHTRA

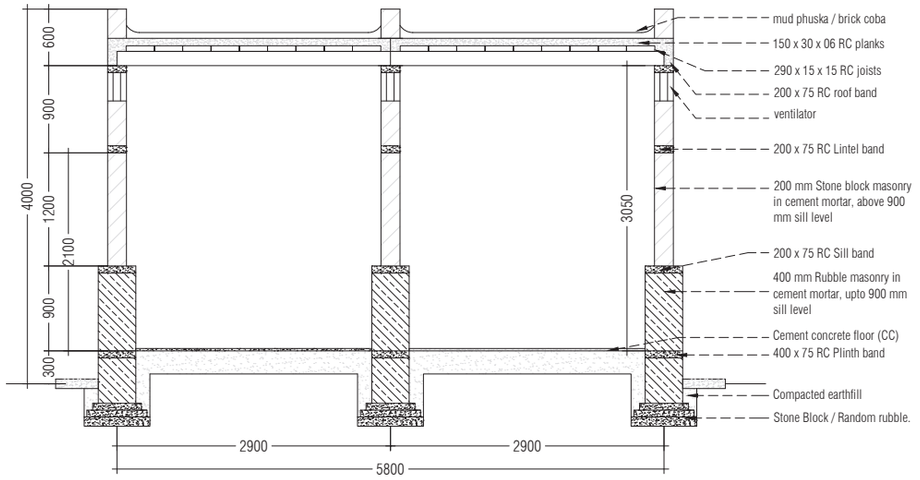


MN-M-05

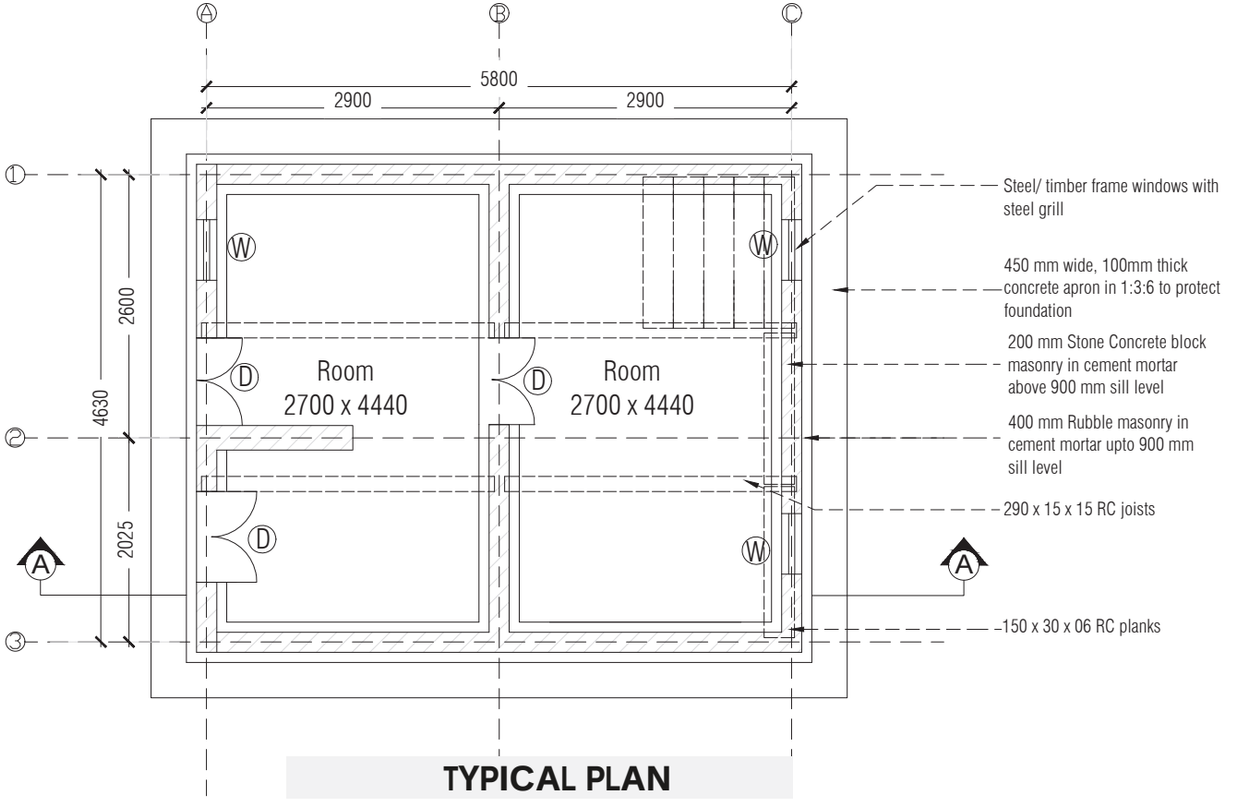
Highlights of the Prototype

- The Design Prototype for Zone 5 is square in plan. The walls are built with stone in mud mortar. Care is requested to ensure that it follows good construction in stone masonry by ensuring the presence of through stones to protect dimensional stability of the wall when subjected to lateral stress.
- Stone is an easily available material so its use with the strict precaution of using through stones is suggested one per sq. m of wall.
- Stone and mud with precautions built in are the primary construction materials. Stone masonry with through stones mandated. Mud flat roofs with limited depths and moisture protection and and limitations of thickness are also adviced. The plinth and foundation are built in with stone and puddled earth.

Recommendations for construction systems	
Components	**Recommended Specifications**
Foundations	• Stone block/ Random rubble foundation
Plinth	• Minimum (300 mm or 150mm more than last 50 year flood level)
Wall	• 400 mm thick RR masonry upto sill level • 200 mm thick stone block masonry construction above sill level • with horizontal RCC bands at plinth, sill and lintel level
Wall Finish	• Stabilised mud plaster/ cement plaster/exposed brick wall with pointing/ferrocement plaster
Roof Structure	• flat roofing system with RC joist and plank system reinforced with 6 mmand 8 mm dia rebars • lean to roofing system on the verandah with CGI sheet with timber understructure insulated with thatch
Roof Cover	• Brick Coba/ Mud Phuska
Floor	• cement flooring/ brick paving
Door and Windows	• local timber/Mild steel door and window



TYPICAL SECTION AA'



TYPICAL PLAN

MH-M-05

Area Statement:

Item	Area	
	Sq.m	Sq.ft
Room 1	11.98	128.95
Room 2	11.98	128.95
Carpet Area	21.95	236.27
Built up Area	31.25	336.38

Marathwada Zone E

MAHARASHTRA

MH-M-05
Cost estimate

SR.NO.	ITEM OF WORK	Quantity	Unit	Rate (Rs)	Cost
a	**CORE HOUSE**				
A	**FOUNDATION WORK**				
1	**Excavation-**Excavation of trench/pit 0.6 m deep including and carting away as specified and stacking excavated mud for cob wall, etc. complete as directed	6.7	Cum.	277	1,856
2	**Uncoursed Stone masonry** in mud lime ash mortar 1'6" thick for retaining wall,foundation and plinth etc. complete	7.5	Cum.	3,000	22,500
3	**Filling** in trench/pit with excavated mud to get a uniform base watered and compressed at intervals with top finished with addition of cowdung slurry	11.3	Cum.	750	8,475
	TOTAL FOR FOUNDATION WORK				**32,831**
B	**SUPERSTRUCTURE**				
1	Rubble masonry upto cill level 400mm thk	9	Cum.	1,200	10,800
2	Stone block masonry 200mm thk	5	Cum.	3,000	15,000
3	Roof RCC band	0.25	cu.m	4500	1,125
4	Lintel RCC band	0.25	cu.m	4500	1,125
5	Cill RCC band	0.5	cu.m	4500	2,250
6	Plinth RCC band	0.5	cu.m	4500	2,250
7	Steel in Roof RCC band	16	kg	58	928
8	Steel in Lintel RCC band	16	kg	58	928
9	Steel in Cill RCC band	32	kg	58	1,856
10	Steel in Plinth RCC band	32	kg	58	1,856
	TOTAL FOR SUPER STRUCTURE				**38,118**

Marathwada Zone E

MAHARASHTRA

C	**PLASTERING & FINISHING**				
1	**Finishing external wall vertical surfaces** with mud plaster and rendering the surface .	60	Sqm.	98	5,880
2	**Finishing internal wall vertical surfaces** with mud plaster finished with lime wash .	32	Sqm.	98	3,136
	TOTAL FOR PLASTERING & FINISHING				**9,016**
	TOTAL FOR CIVIL WORK				**79,965**
D	**Roof with precast RCC plank and joist**				
1	Precast RCC planks of size 1.5mx0.3m, with 1.6 kg 6mm steel per plank	60	No.	275	16,500
2	Precast RCC beam of size 0.15mx0.15m, 3.6m length	1	No.	2500	2,500
3	In-situ concrete mix 1:1.5:3 on top of planks and joist	1	cu.m	4500	4,500
4	Steel in in-situ concrete	25	kg	58	1,450
5	Mason	2	mandays	500	1,000
6	Labour	12	mandays	250	3,000
7	Bar bender	1	mandays	500	500
8	Brick bats and mud phuska finishing over roof with cement dust mortar	25	Sqm.	650.00	16,250
	TOTAL FOR ROOFING				**45,700**
E	**DOORS & WINDOWS**				
1	**Providing and fixing bamboo mat two leaved Door** including mouldings, rebating hold fasts and finished with primer and paint inclusive of country teak wood frame without ventilators, windows and fanlights	4.85	Sqm.	4,500	21,825
	TOTAL FOR DOORS &WINDOWS				**21,825**
	GRAND TOTAL				**147,490**
	TOTAL COST PER HOUSE (RS)				147,490
	AREA OF HOUSE (SQM)				31
	COST PER SQ.M (RS)				4757.73871

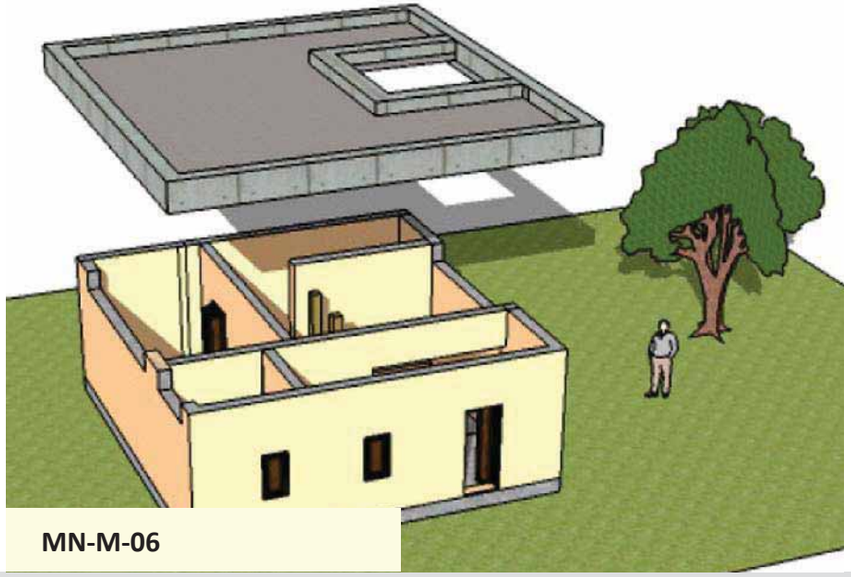
MH-M-06

Designed to suit conditions in Zone F in Marathwada Division

This zone consists of elevated flat uplands in various parts of Marathwada. Water is an extremely sharp constraint and with it livelihood. Ideally these concerns should also be addressed. Energy from the sun could be a major resource.

Local Local building construction technology::

- Stone
- Mud



MN-M-06

Highlights of the Prototype

- The Design Prototype for Zone 6 is a simple rectangular structure with the public area of the house wrapping itself around the private room.
- Stone is an easily available material so its use with the strict precaution of using through stones is suggested one per sq. m of wall.
- Stone and mud with precautions built in are the primary construction materials. Stone masonry with through stones mandated. Mud flat roofs with limited depths and moisture protection and and limitations of thickness are also adviced. The plinth and foundation are built in with stone and puddled earth.

Recommendations for construction systems	
Components	**Recommended Specifications**
Foundations	• Strip foundation in Stone block/ Random rubble foundation
Plinth	• Minimum (300 mm or 150mm more than last 50 year flood level)
Wall	• 200 mm thk stone block masonry in cement mortar
Wall Finish	• Stabilised mud plaster/ cement plaster/exposed brick wall with pointing/ferrocement plaster
Roof Structure	• flat roofing system with RC joist and plank system reinforced with 6 mmand 8 mm dia rebars • lean to roofing system on the verandah with CGI sheet/country tiles with timber understructure insulated with thatch
Roof Cover	• Brick Coba/ Mud Phuska
Floor	• cement flooring/ brick paving
Door and Windows	• local timber/Mild steel door and window

Marathwada Zone F

MAHARASHTRA

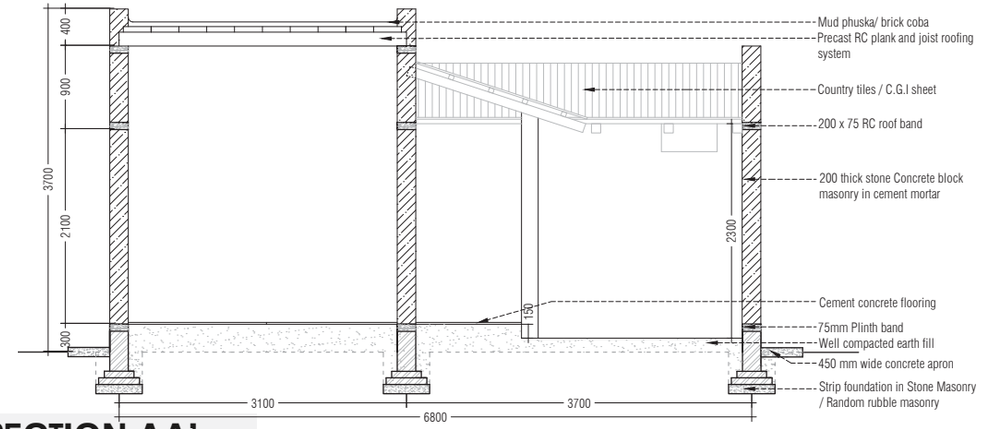
MH-M-06

Area Statement:

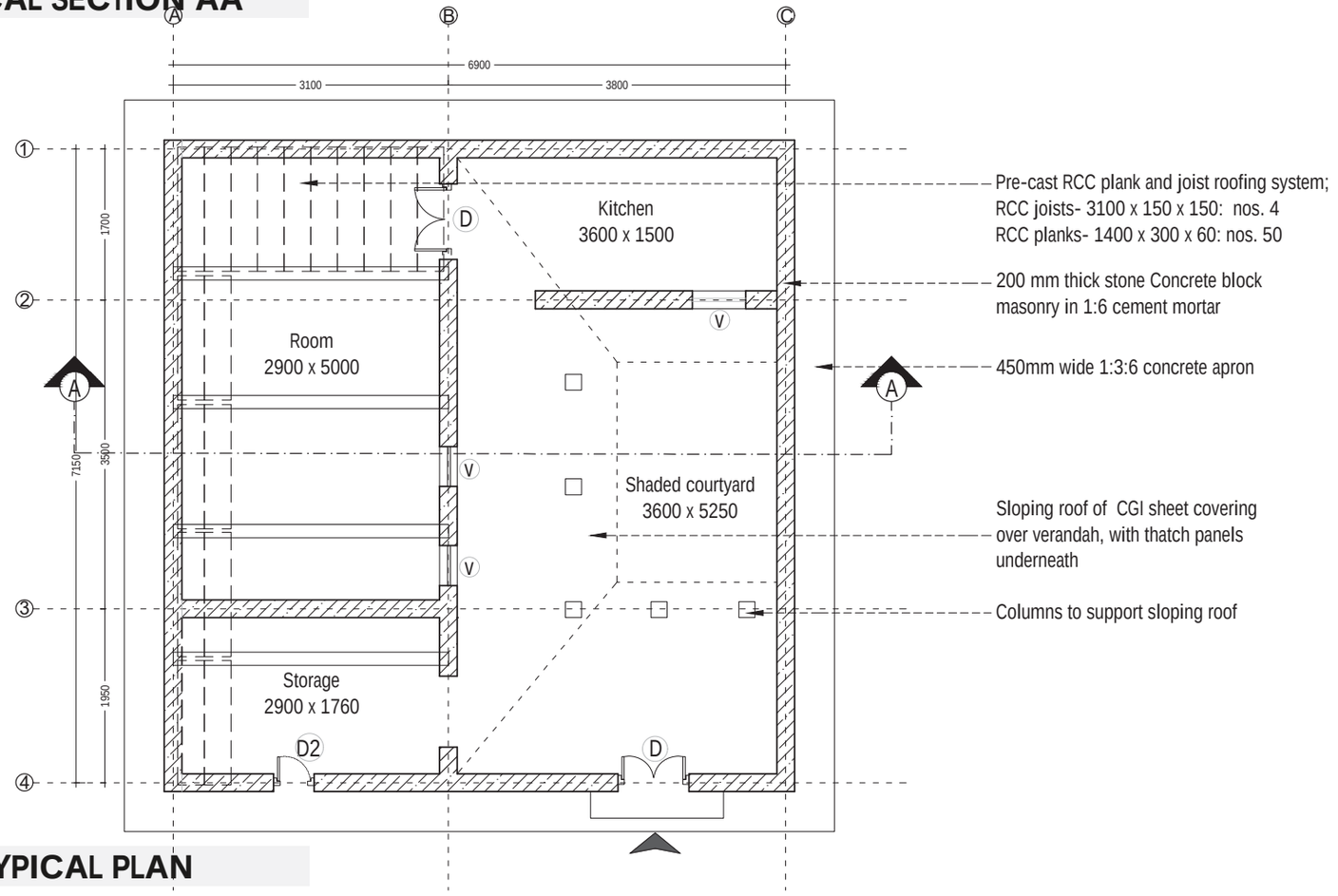
Item	Area	
	Sq.m	Sq.ft
Room	14.50	156.08
Storage	5.07	54.57
Kitchen	5.40	58.13
Verandah	11.76	126.58
Carpet Area	25.54	274.91
Built up Area	52.11	560.91

Marathwada Zone F

MAHARASHTRA



TYPICAL SECTION AA'



TYPICAL PLAN

MH-M-06
Cost estimate

SR.NO.	ITEM OF WORK	Quantity	Unit	Rate (Rs)	Cost
a	**CORE HOUSE**				
A	**FOUNDATION WORK**				
1	**Excavation-**Excavation of trench/pit 0.6 m deep including and carting away as specified and stacking excavated mud for cob wall, etc. complete as directed	10.8	Cum.	277	2,992
2	**Uncoursed Stone masonry** in mud lime ash mortar 1'6" thick for retaining wall,foundation and plinth etc. complete	10.8	Cum.	3,000	32,400
3	**Filling** in trench/pit with excavated mud to get a uniform base watered and compressed at intervals with top finished with addition of cowdung slurry.	35.6	Cum.	750	26,700
	TOTAL FOR FOUNDATION WORK				**62,092**
B	**SUPERSTRUCTURE**				
1	Brick masonry upto cill level	10	Cum.	3,000	30,000
2	Adobe masonry above cill level	15	Cum.	600	9,000
3	RBC columns	16	no.	700	11,200
4	Roof RCC band	0.25	cu.m	4500	1,125
5	Lintel RCC band	0.25	cu.m	4500	1,125
6	Plinth RCC band	0.25	cu.m	4500	1,125
7	Steel in Roof RCC band	16	kg	58	928
8	Steel in Lintel RCC band	16	kg	58	928
9	Steel in Plinth RCC band	16	kg	58	928
	TOTAL FOR SUPER STRUCTURE				**56,359**
C	**PLASTERING & FINISHING**				
1	**Finishing external wall vertical surfaces** with mud plaster and rendering the surface .	56	Sqm.	98	5,488
2	**Finishing internal wall vertical surfaces** with mud plaster finished with lime wash .	120	Sqm.	98	11,760
	TOTAL FOR PLASTERING & FINISHING				**17,248**
	TOTAL FOR CIVIL WORK				**135,699**
D	**Roof with precast RCC plank and joist**				
1	Precast RCC planks of size 1.5mx0.3m, with 1.6 kg 6mm steel per plank	80	No.	275	22,000
2	Precast RCC beam of size 0.15mx0.15m, 3.6m length	3	No.	2500	7,500
3	In-situ concrete mix 1:1.5:3 on top of planks and joist	0.5	cu.m	4500	2,250
4	Steel in in-situ concrete	50	kg	58	2,900
5	Mason	2	mandays	500	1,000
6	Labour	12	mandays	250	3,000
7	Bar bender	1	mandays	500	500
8	GCI sheet roof - 0.5mm thick for verandah and kitchen				
8a	size 2740 x 900 (9'x3')	7	No.	500	3,500
8b	size 2135 x 900 (7'x3')	0	No.	425	-
8c	Bamboo understructure				
	75-100mm dia bamboo	20		130	2,600
	50-60mm dia bamboo	7		100	700
8d	Manpower				
	Skilled artisan/carpenter	3	mandays	500	1,500
	Labour	6	mandays	250	1,500
8e	Nails and hardware		lumsum		2000
9	Brick bats and mud phuska finishing over roof with cement dust mortar	10	Sqm.	650.00	6,500
	TOTAL FOR ROOFING				**57,450**

E	DOORS & WINDOWS				
1	**Providing and fixing country wood two leaved Door** including mouldings, rebating hold fasts and finished with primer and paint inclusive of country teak wood frame without ventilators, windows and fanlights	4.3	Sqm.	4,500	19,350
2	**Providing and fixing country wood single leaved Door** including mouldings, rebating hold fasts and finished with primer and paint inclusive of country teak wood frame without ventilators, windows and fanlights	0.8	Sqm.	4,500	3,600
	TOTAL FOR DOORS &WINDOWS				**22,950**
	GRAND TOTAL				**216,099**
	TOTAL COST PER HOUSE (RS)				216,099
	AREA OF HOUSE (SQM)				56
	COST PER SQ.M (RS)				3858.90357

F

Marathwada Zone F

MAHARASHTRA

MH-M-07

Designed to suit conditions in Zone G in Marathwada Division

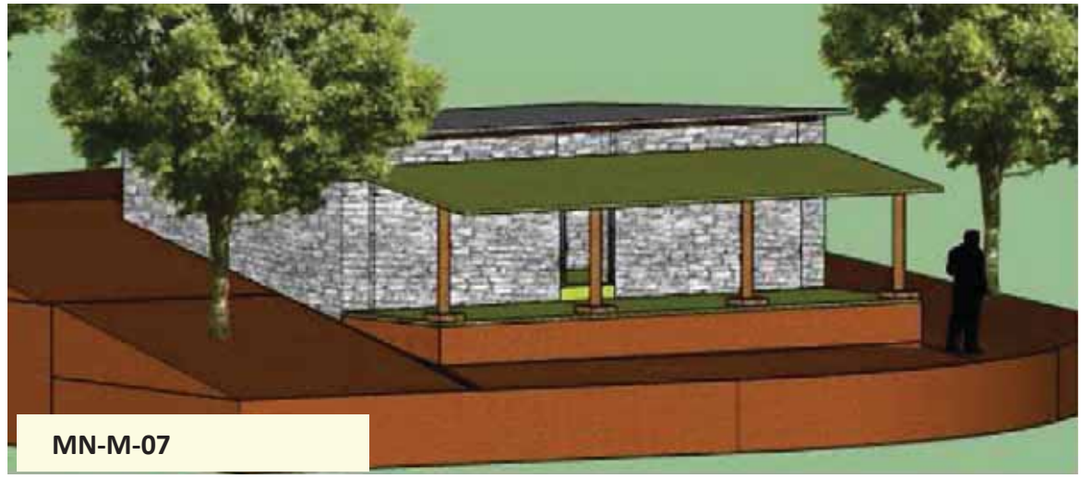
This zone largely comprises of the hilly forested regions of Nanded. Forest of Nanded can fall under two categories reserved and protected.

Local Local building construction technology::

- Stone
- Mud
- Wattle & Daub
- timber

Marathwada Zone G

MAHARASHTRA

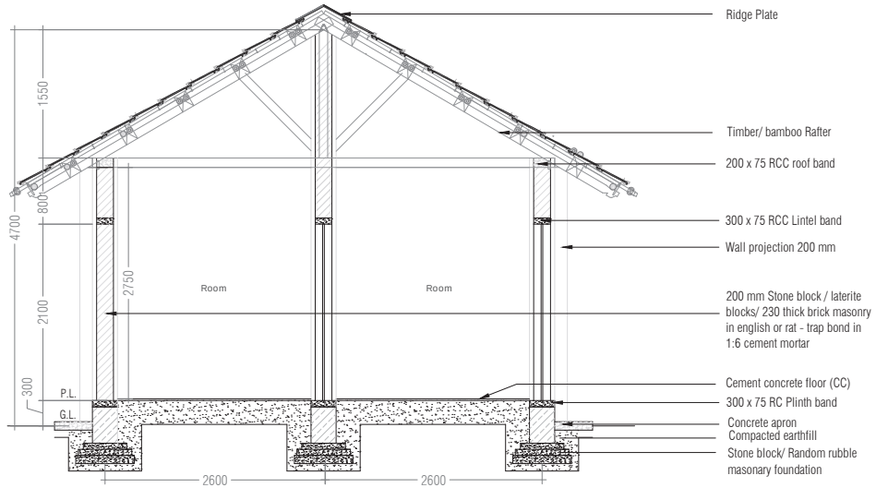


MN-M-07

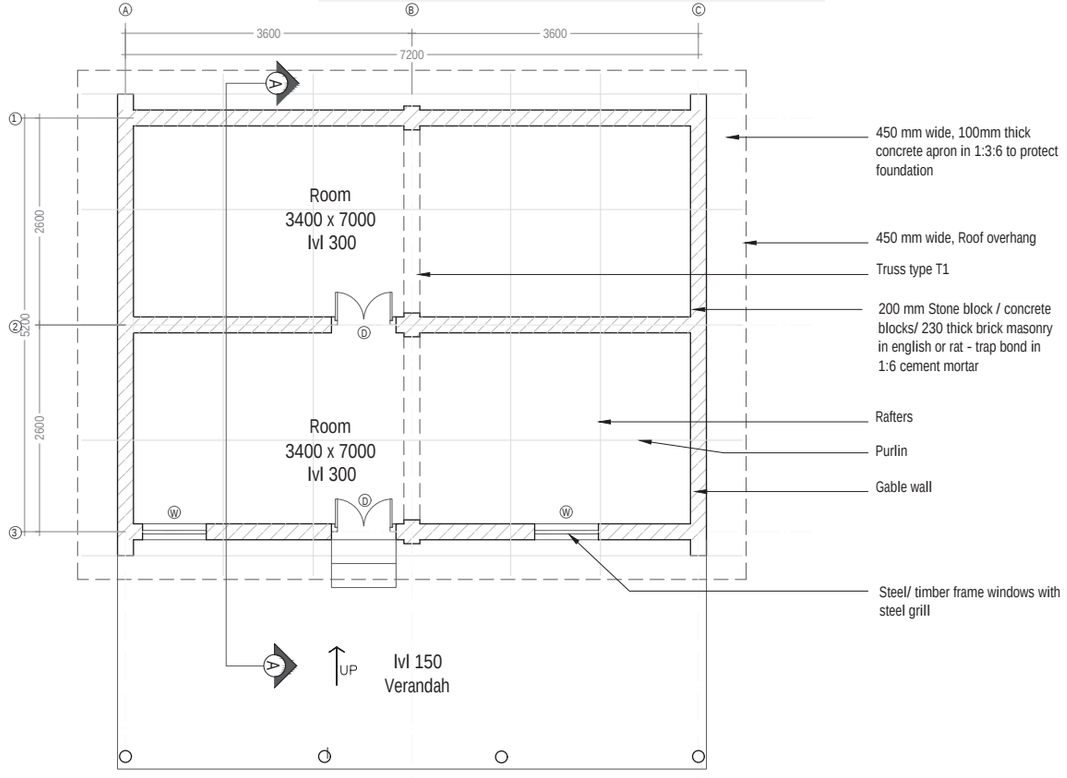
Highlights of the Prototype

- The Design Prototype for Zone 7 reflects the pattern of villages in the region which are situated on the gentler contours on hill. Terraced farmlands characterize the region.
- Most houses face and open towards the east i.e. towards the farmland.
- Stone walls in recent houses are built with random rubble masonry as skilful stone masons are scarce and expensive.
- stone walls foundation is also of stone and mud mortar.
- Northern hilly region of Nanded are rich in resources hence, construction materials are easily available making them cost efficient. Majority construction materials used are locally available stone, wood, mud and agricultural byproducts.

Recommendations for construction systems	
Components	**Recommended Specifications**
Foundations	• Strip foundation in Stone block/ Random rubble foundation
Plinth	• Minimum (300 mm or 150mm more than last 50 year flood level)
Wall	• 200 mm thk stone block/ Laterite stone in english or rat trap bond masonry in 1:6 cement mortar
Wall Finish	• Stabilised mud plaster/ cement plaster/exposed brick wall with pointing/ferrocement plaster
Roof Structure	• Sloping roof system with timber/bamboo understructure or • flat roofing system with RC joist and plank system reinforced with 6 mmand 8 mm dia rebars
Roof Cover	• Brick Coba/ Mud Phuska for flat roofs • or Mangalore tiles
Floor	• cement flooring/ brick paving
Door and Windows	• local timber/Mild steel door and window



TYPICAL SECTION AA'



TYPICAL PLAN

MH-M-07
Alternative roofing

Area Statement:

Item	Area	
	Sq.m	Sq.ft
Room 1	16.80	180.83
Room 2	16.80	180.83
Carpet Area	33.88	364.68
Built up Area	40.14	432.06

Marathwada Zone G

MAHARASHTRA

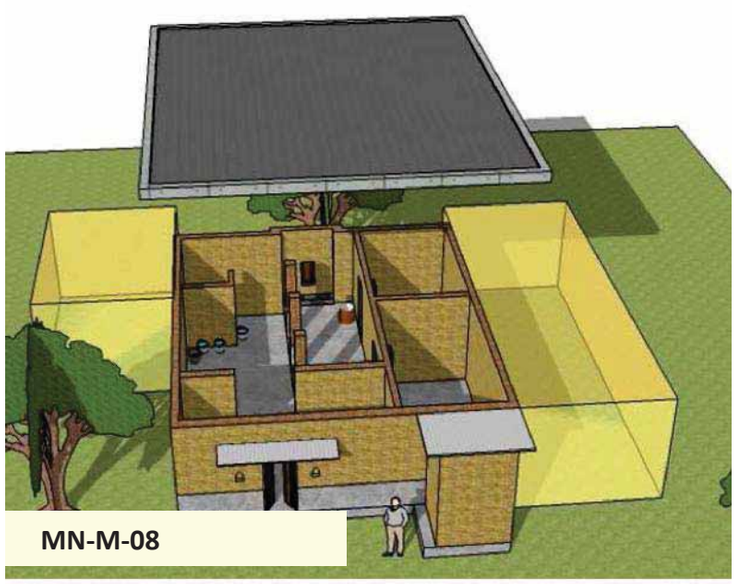
MH-M-07
Cost estimate

SR.NO.	ITEM OF WORK	Quantity	Unit	Rate (Rs)	Cost
a	**CORE HOUSE**				
A	**TERRACE CONSTRUCTION**				
1	**Cutting and excavation of slope of hill** to form terraces and stacking of excavated material after sorting for reuse within the premises etc. complete	75	Cum.	277	20775.0
2	**Conveying materials obtained from terrace cutting** including all lifts breaking clods, banking, benching,dressing to required lines, curves, grades, sections watering and compacting in layers not exceeding 20 to 30cm. including from site of excavation to site of deposition using wooden rammers etc. complete	47	Cum.	450	21150.0
	TOTAL FOR TERRACE WORK				0.0
A	**FOUNDATION WORK**				
1	**Excavation**-Excavation of trench/pit 0.6 m deep including and carting away as specified and stacking excavated mud for cob wall, etc. complete as directed	4.3	Cum.	277	1191.1
2	**Uncoursed Stone masonry** in mud lime ash mortar 1'6" thick for retaining wall,foundation and plinth etc. complete	2.7	Cum.	3,000	8100.0
3	**Filling** in trench/pit with excavated mud to get a uniform base watered and compressed at intervals with top finished with addition of cowdung slurry	30.6	Cum.	750	22950.0
	TOTAL FOR FOUNDATION WORK				**32241.1**
B	**SUPERSTRUCTURE**				
1	Brick masonry with Rat trap bond in super structure with cement mortar 1:6	10	Cum.	4,170	41700.0
2	Roof RCC band	0.25	cu.m	4500	1125.0
3	Lintel RCC band	0.25	cu.m	4500	1125.0
4	Plinth RCC band	0.25	cu.m	4500	1125.0
5	Steel in Roof RCC band	16	kg	58	928.0
6	Steel in Lintel RCC band	16	kg	58	928.0
7	Steel in Plinth RCC band	16	kg	58	928.0
	TOTAL FOR SUPER STRUCTURE				**47859.0**
C	**PLASTERING & FINISHING**				
1	**Finishing external wall vertical surfaces** with mud plaster and rendering the surface .	37.7	Sqm.	98	3694.6
2	**Finishing internal wall vertical surfaces** with mud plaster finished with lime wash .	46.4	Sqm.	98	4547.2
	TOTAL FOR PLASTERING & FINISHING				**8241.8**
	TOTAL FOR CIVIL WORK				**88341.9**
D	**GCI sheet roof**				
1	size 2740 x 900 (9'x3')	20	No.	500	10000.0
2	size 2135 x 900 (7'x3')	10	No.	425	4250.0
3	Bamboo understructure				
	75-100mm dia bamboo	30		130	3900.0
	50-60mm dia bamboo	10		100	1000.0
4	Manpower				
	Skilled artisan/carpenter	3	mandays	500	1500.0
	Labour	6	mandays	250	1500.0
5	Nails and hardware		lumsum		2000.0
	TOTAL FOR ROOFING				**19150.0**
E	**DOORS & WINDOWS**				
1	**Providing and fixing country wood two leaved Door** including mouldings, rebating hold fasts and finished with primer and paint inclusive of country teak wood frame without ventilators, windows and fanlights	3.8	Sqm.	4,500	17100.0
	TOTAL FOR DOORS &WINDOWS				**17100.0**
	GRAND TOTAL				**124591.9**
	TOTAL COST PER HOUSE (RS)				124591.9
	AREA OF HOUSE (SQM)				31.5
	COST PER SQ.M (RS)				3955.3

Marathwada Zone G

MAHARASHTRA

MH-M-08



MN-M-08

Designed to suit conditions in Zone H in Marathwada Division

This Zone is largely in Nanded District.

Local Local building construction technology::

- Adobe bricks
- Mud
- Stone

Highlights of the Prototype

- The Design Prototype for Zone 8 is a rectangular structure with Adobe mud walls over basalt stone plinths
- Mud excavated from site and even brought in is used to prepare adobe or sundried bricks. Adobe bricks can be prepared and kept beforehand unlike in rammed earth or cob techniques, an advantage in areas with relatively sparser populations and not so easy access.
- Adobe bricks are prepared from the relatively aluminium and iron rich sandy subsoil and local stabilisers are recommended. Shallow quarried or gathered stone for chauthara or platform edge with rammed earth floor.
- Walls are rendered with mud plaster and.
- Roofs are of Dhabha type.

Recommendations for construction systems	
Components	**Recommended Specifications**
Foundations	• Strip foundation in Stone block/ Random rubble foundation
Plinth	• Minimum (300 mm or 150mm more than last 50 year flood level)
Wall	• 200 mm thk stone block masonry in cement mortar upto sill level • 200 mm thk Adobe wall above sill level
Wall Finish	• ferrocement plaster
Roof Structure	• Core area has a flat roofing system with RCC plank and joist system • Verandha is covered with a lean-to roof system with CGI sheet in timber/bamboo understructure
Roof Cover	• Brick Coba/ Mud Phuska for flat roofs • CGI sheet on verandah
Floor	• cement flooring/ brick paving
Door and Windows	• local timber/Mild steel door and window

Marathwada Zone H

MAHARASHTRA

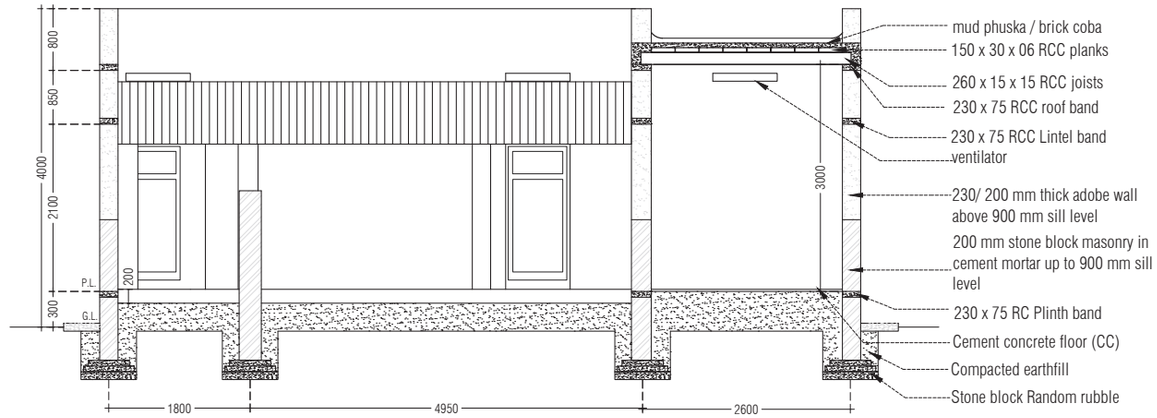
MH-M-08

Area Statement:

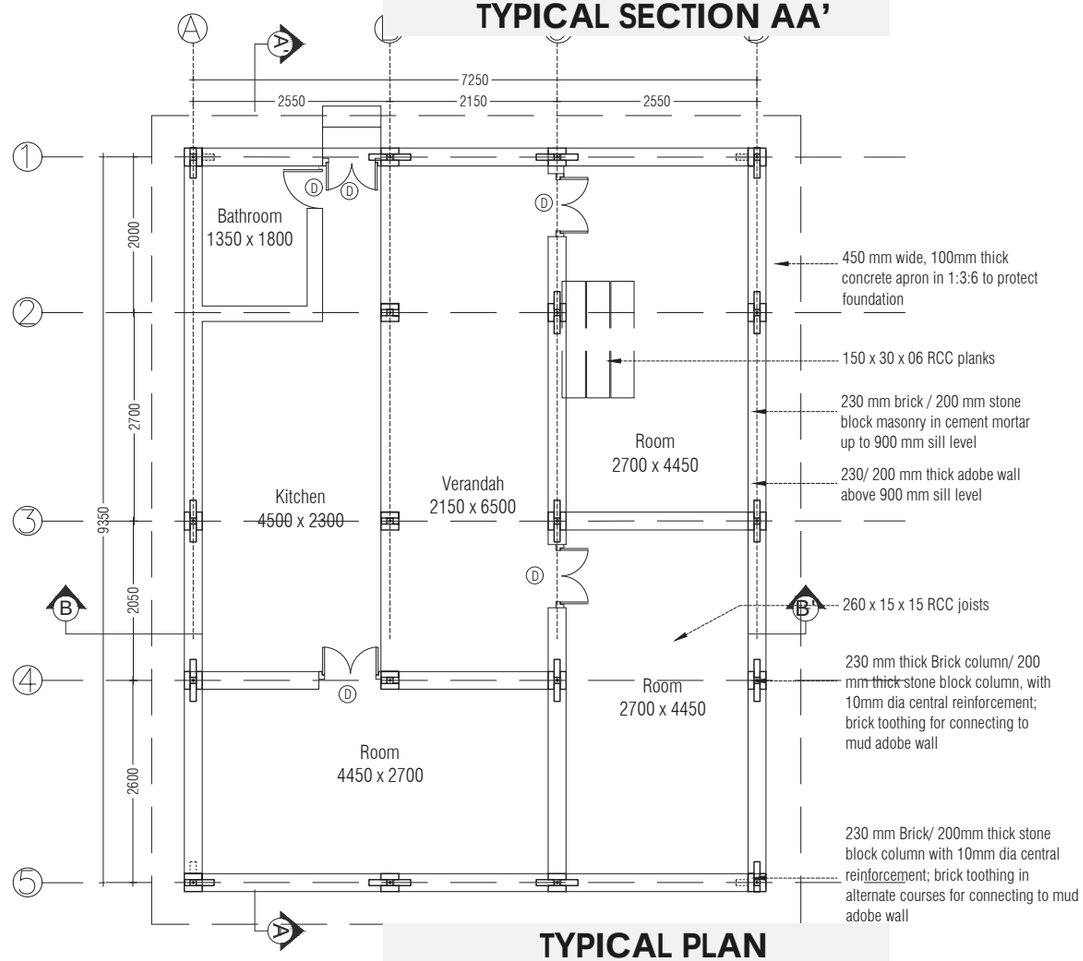
Item	Area	
	Sq.m	Sq.ft
Room 1	10.46	112.59
Room 2	10.35	111.41
Room 3	10.46	112.59
Kitchen	10.35	111.41
Bathroom	2.43	26.16
Verandah	13.97	150.37
Carpet Area	46.43	499.77
Built up Area	71.52	769.84

Marathwada Zone H

MAHARASHTRA



TYPICAL SECTION AA'



TYPICAL PLAN

MH-M-08
Cost estimate

SR.NO.	ITEM OF WORK	Quantity	Unit	Rate (Rs)	Cost
a	**CORE HOUSE**				
A	**FOUNDATION WORK**				
1	**Excavation-**Excavation of trench/pit 0.6 m deep including and carting away as specified and stacking excavated mud for cob wall, etc. complete as directed	6.7	Cum.	277	1,856
2	**Uncoursed Stone masonry** in mud lime ash mortar 1'6" thick for retaining wall,foundation and plinth etc. complete	7.5	Cum.	3,000	22,500
3	**Filling** in trench/pit with excavated mud to get a uniform base watered and compressed at intervals with top finished with addition of cowdung slurry.	11.3	Cum.	750	8,475
	TOTAL FOR FOUNDATION WORK				**32,831**
B	**SUPERSTRUCTURE**				
1	Brick masonry upto cill level	10	Cum.	3,000	30,000
2	Adobe masonry above cill level	20	Cum.	600	12,000
3	RBC columns	20	no.	700	14,000
4	Roof RCC band	0.25	cu.m	4500	1,125
5	Lintel RCC band	0.25	cu.m	4500	1,125
6	Plinth RCC band	0.25	cu.m	4500	1,125
7	Steel in Roof RCC band	16	kg	58	928
8	Steel in Lintel RCC band	16	kg	58	928
9	Steel in Plinth RCC band	16	kg	58	928
	TOTAL FOR SUPER STRUCTURE				**62,159**
C	**PLASTERING & FINISHING**				
1	**Finishing external wall vertical surfaces** with mud plaster and rendering the surface .	60	Sqm.	98	5,880
2	**Finishing internal wall vertical surfaces** with mud plaster finished with lime wash .	32	Sqm.	98	3,136
	TOTAL FOR PLASTERING & FINISHING				**9,016**
	TOTAL FOR CIVIL WORK				**104,006**
D	**Roof with precast RCC plank and joist**				
1	Precast RCC planks of size 1.5mx0.3m, with 1.6 kg 6mm steel per plank	72	No.	275	19,800
2	Precast RCC beam of size 0.15mx0.15m, 3.6m length	2	No.	2500	5,000
3	In-situ concrete mix 1:1.5:3 on top of planks and joist	0.5	cu.m	4500	2,250
4	Steel in in-situ concrete	50	kg	58	2,900
5	Mason	2	mandays	500	1,000
6	Labour	12	mandays	250	3,000
7	Bar bender	1	mandays	500	500
8	GCI sheet roof - 0.5mm thick for verandah and kitchen				
8a	size 2740 x 900 (9'x3')	15	No.	500	7,500
8b	size 2135 x 900 (7'x3')	0	No.	425	-
8c	Bamboo understructure				
	75-100mm dia bamboo	20		130	2,600
	50-60mm dia bamboo	7		100	700
8d	Manpower				
	Skilled artisan/carpenter	3	mandays	500	1,500
	Labour	6	mandays	250	1,500
8e	Nails and hardware		lumsum		2000
9	Brick bats and mud phuska finishing over roof with cement dust mortar	30	Sqm.	650.00	19,500
	TOTAL FOR ROOFING				**69,750**

E	**DOORS & WINDOWS**				
1	**Providing and fixing country wood two leaved Door** including mouldings, rebating hold fasts and finished with primer and paint inclusive of country teak wood frame without ventilators, windows and fanlights	4.9	Sqm.	4,500	22,050
	TOTAL FOR DOORS &WINDOWS				**22,050**
	GRAND TOTAL				**195,806**
	TOTAL COST PER HOUSE (RS)				195,806
	AREA OF HOUSE (SQM)				60
	COST PER SQ.M (RS)				3263.43167

Marathwada Zone H

MAHARASHTRA

MH-M-09

Designed to suit conditions in Zone I in Marathwada Division

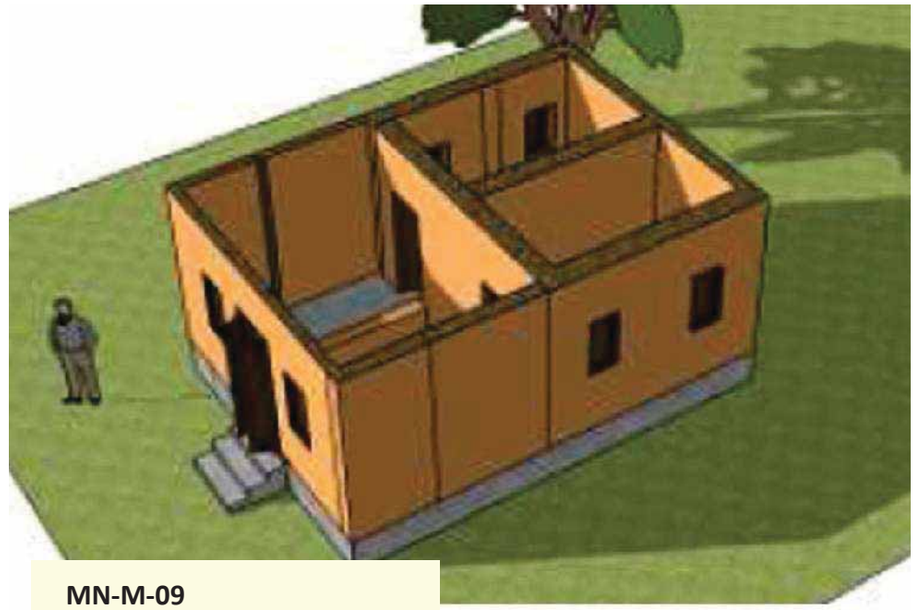
This zone adjoins Bidar in Karnataka and has laterite and lateritic soil.

Local Local building construction technology::

- Laterite stone
- Timber
- Mud

Marathwada Zone I

MAHARASHTRA

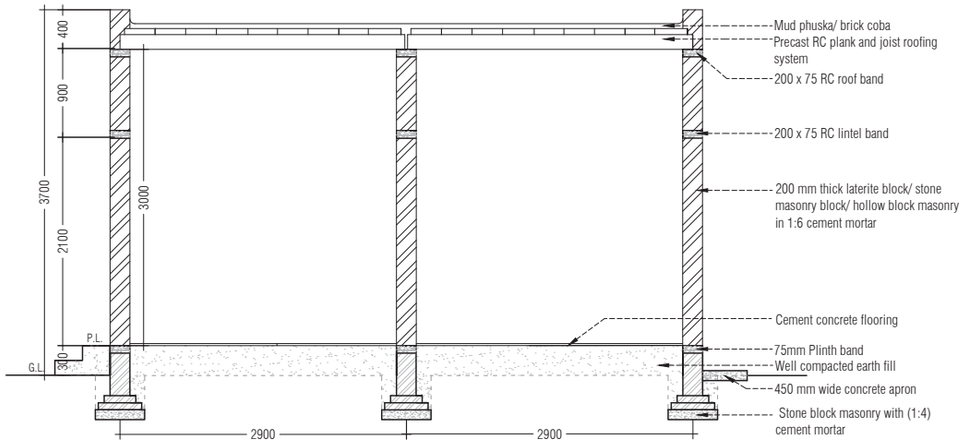


MN-M-09

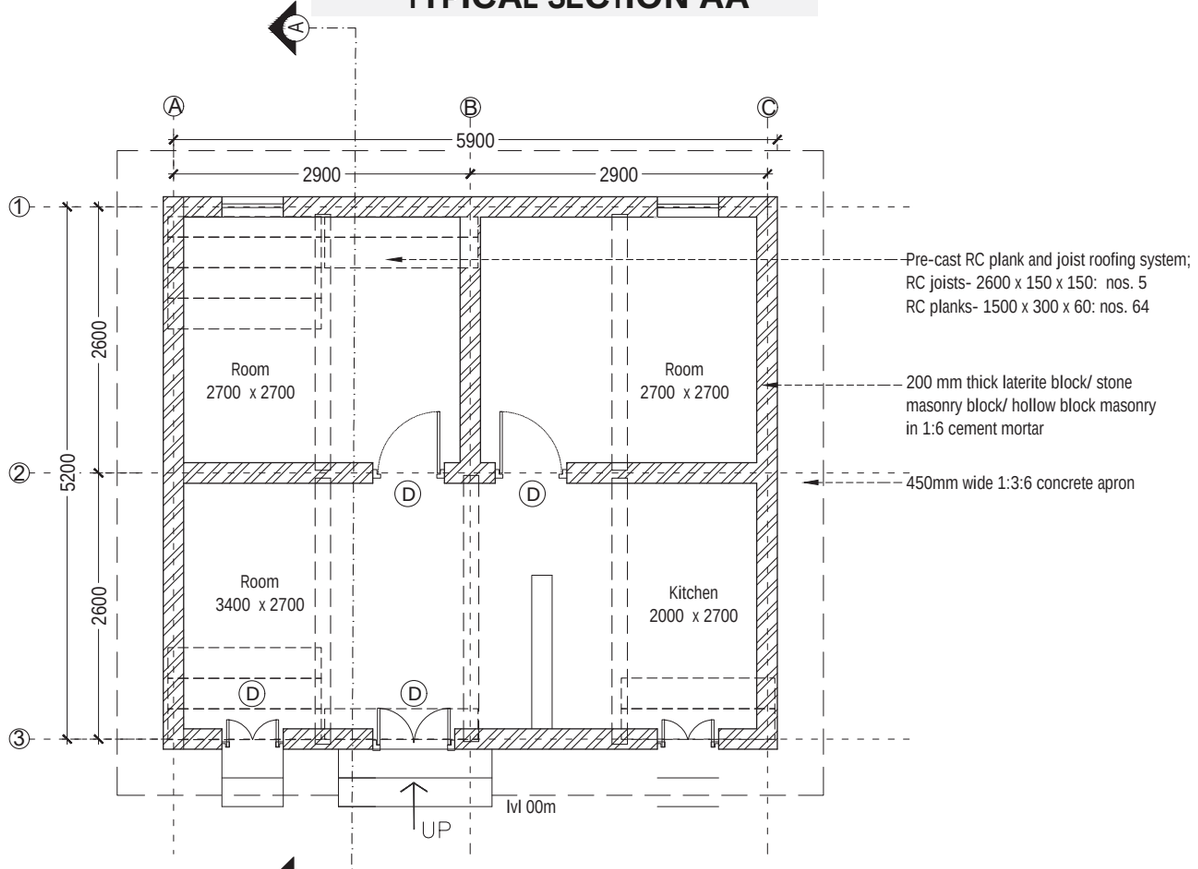
Highlights of the Prototype

- The Design Prototype for Zone 9 is a rectangular structure with the flat mud Dhabha Roof that is the traditional solution to the extreme heat of this region.
- Houses are arranged to shade the narrow streets. Cut blocks of Laterite, from the region but more often from neighbouring Bidar are used for wall building.
- Laterite blocks cut from from site and even brought in from neighbouring Bidar in Karnataka.
- Laterite blocks cut from from site and even brought in from neighbouring Bidar in Karnataka.

Recommendations for construction systems	
Components	**Recommended Specifications**
Foundations	• Strip foundation in Stone block/ Random rubble foundation
Plinth	• Minimum (300 mm or 150mm more than last 50 year flood level)
Wall	• 200 mm thk laterite/ stone block masonry in 1:6 cement mortar
Wall Finish	• ferrocement plaster/exposed with pointing
Roof Structure	• Flat roofing system with RC plank & joist system
Roof Cover	• Brick Coba/ Mud Phuska for flat roofs
Floor	• cement flooring/ brick paving
Door and Windows	• local timber/Mild steel door and window



TYPICAL SECTION AA'



TYPICAL PLAN

MH-M-09

Area Statement:

Item	Area	
	Sq.m	Sq.ft
Room 1	8.16	87.83
Room 2	6.48	69.75
Room 3	8.16	87.83
Kitchen	4.80	51.67
Carpet Area	26.78	288.26
Built up Area	32.40	348.75

Marathwada Zone I

MAHARASHTRA

MH-M-09
Cost estimate

SR.NO.	ITEM OF WORK	Quantity	Unit	Rate (Rs)	Cost
a	**CORE HOUSE**				
A	**FOUNDATION WORK**				
1	**Excavation-**Excavation of trench/pit 0.6 m deep including and carting away as specified and stacking excavated mud for cob wall, etc. complete as directed	7.6	Cum.	277	2,105
2	**Uncoursed Stone masonry** in mud lime ash mortar 1'6" thick for retaining wall,foundation and plinth etc. complete	7.6	Cum.	3,000	22,800
3	**Filling** in trench/pit with excavated mud to get a uniform base watered and compressed at intervals with top finished with addition of cowdung slurry	16.2	Cum.	750	12,150
	TOTAL FOR FOUNDATION WORK				**37,055**
B	**SUPERSTRUCTURE**				
1	Brick masonry	18	Cum.	3,000	54,000
2	Roof RCC band	0.25	cu.m	4500	1,125
3	Lintel RCC band	0.25	cu.m	4500	1,125
4	Plinth RCC band	0.25	cu.m	4500	1,125
5	Steel in Roof RCC band	16	kg	58	928
6	Steel in Lintel RCC band	16	kg	58	928
7	Steel in Plinth RCC band	16	kg	58	928
	TOTAL FOR SUPER STRUCTURE				**60,159**

Marathwada Zone I

MAHARASHTRA

C	**PLASTERING & FINISHING**				
1	**Finishing external wall vertical surfaces** with mud plaster and rendering the surface .	52.5	Sqm.	98	5,145
2	**Finishing internal wall vertical surfaces** with mud plaster finished with lime wash .	33.5	Sqm.	98	3,283
	TOTAL FOR PLASTERING & FINISHING				**8,428**
	TOTAL FOR CIVIL WORK				**105,642**
D	**Roof with precast RCC plank and joist**				
1	Precast RCC planks of size 1.5mx0.3m, with 1.6 kg 6mm steel per plank	76	No.	275	20,900
2	Precast RCC beam of size 0.15mx0.15m, 3.6m length	1	No.	2500	2,500
3	In-situ concrete mix 1:1.5:3 on top of planks and joist	0.5	cu.m	4500	2,250
4	Steel in in-situ concrete	25	kg	58	1,450
5	Mason	2	mandays	500	1,000
6	Labour	12	mandays	250	3,000
7	Bar bender	1	mandays	500	500
8	Brick bats and mud phuska finishing over roof with cement dust mortar	30	Sqm.	650.00	19,500
	TOTAL FOR ROOFING				**51,100**
E	**DOORS & WINDOWS**				
1	**Providing and fixing country wood two leaved Door** including mouldings, rebating hold fasts and finished with primer and paint inclusive of country teak wood frame without ventilators, windows and fanlights	1.44	Sqm.	4,500	6,480
2	**Providing and fixing country wood single leaved Door** including mouldings, rebating hold fasts and finished with primer and paint inclusive of country teak wood frame without ventilators, windows and fanlights	2.5	Sqm.	4,500	11,250
2	**Providing and fixing country wood two leaved window** including mouldings, rebating hold fasts and finished with primer and paint inclusive of country teak wood frame	0.96	Sqm.	4,500	4,320
	TOTAL FOR DOORS &WINDOWS				**22,050**
	GRAND TOTAL				**178,792**
	TOTAL COST PER HOUSE (RS)				178,792
	AREA OF HOUSE (SQM)				27
	COST PER SQ.M (RS)				6621.93333

pahal
Prakriti Hunar Lokvidya

Manipur

Forested hills of the state occupy about 90 percent of the land area. The use of timber and bamboo has been a predominant feature in construction of houses. Nearly 64% of the total geographical area of the state. Vegetation consists of plants ranging from short and tall grasses, reeds and bamboos, to trees. Manipur is richly endowed with bamboo forests and various timber yielding trees species. Its abundance and multiple uses has made bamboo play a pivotal role in the life of the people of the state.

The temperature ranges from sub-zero to 36° C. Average annual rainfall ranges from 1250 mm to 2700 mm. Various regions in the state are vulnerable to seismic activity, landslides and flooding.

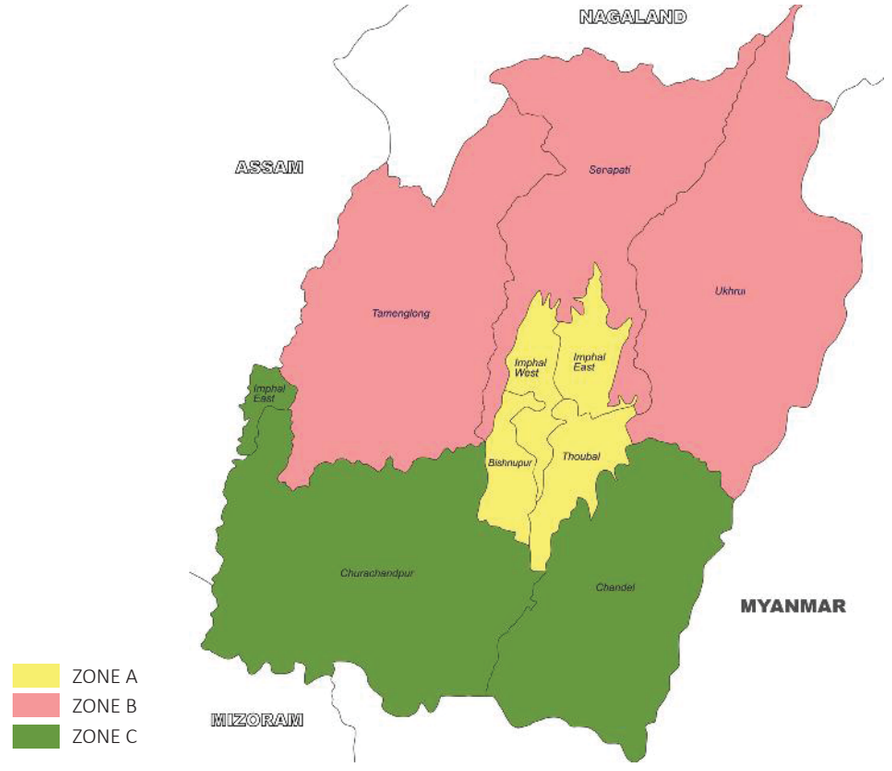
Manipur is graded zone V which means that this state is a region of high seismic activity and has a high probability of witnessing extremely strong earthquakes higher than 9.0 in the Richter scale. The months of the pre-monsoon period from March to May sees stormy weather and high wind speeds blowing across most of the state. Almost two thirds of the population of Manipur is concentrated in the Manipur Valley, which has only 8.2% area of the state. Rivers from these hills flow into the valley and very often lead to flash floods every year. Thus river flooding is a regular hazard faced by the State

Zone A

This area comprises the districts of Imphal West and East, Bishnupur and Thoubal. These districts nearly entirely comprise the valley areas and some adjoining hills that are in the centre of the state. As mentioned earlier, these areas have abundant availability of adobe which is reflected in the traditional and local architecture. The Meiteis are the predominant community that occupy these areas, with some other communities like the Kabui also calling this region home.

Zone B

This area comprises the districts of Tamenglong, Senapati and Ukhrul. These districts comprise of the higher hill areas and are areas with greater prevalence of timber based construction that is also reflective of the lack of good construction grade bamboo, or abundant adobe for construction. These areas are predominantly home to a number of Naga tribes.



Zone C

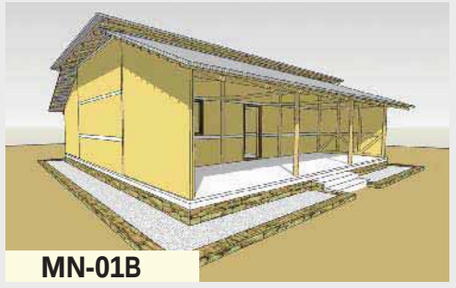
This area comprises the districts of Churachandpur and Chandel. These districts comprise of lower elevation hills (on average, and in comparison to the northern districts) and is in general an area where good construction grade bamboo with good wall thicknesses are found apart from timber. These areas are predominantly Kuki tribe belts.

MANIPUR

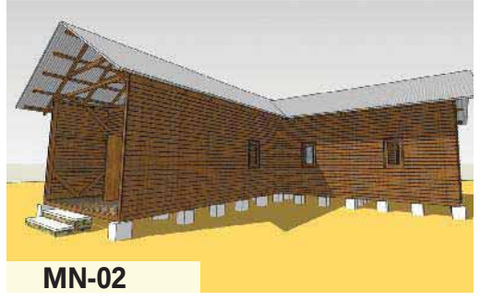
MANIPUR HOUSING TYPOLGIES AT A GLANCE

TYPOLOGY	APPLICABLE HOUSING ZONES	TOTAL AREA Sq.m/Sq.ft	
MN-01A	Zone A	68.25 Sq.m	734.64 Sq.ft
MN-01B	Zone A	66.00 Sq.m	710.42 Sq.ft
MN-02	Zone B	29.98 Sq.m	322.70 Sq.ft
MN-03	Zone C	70.39 Sq.m	757.67 Sq.ft

MN-01A



MN-01B



MN-02

MN-03

MN-01A

This typology is applicable to Zone A

Zone A highlights: Seismic zone V These districts nearly entirely comprise the valley areas and some adjoining hills that are in the centre of the state.

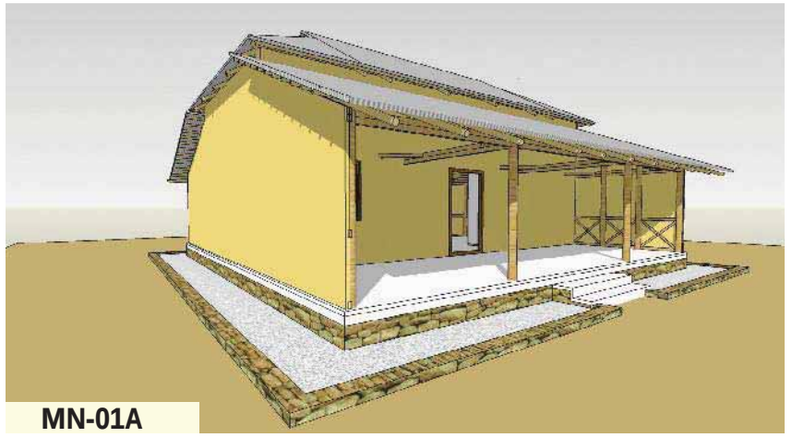
Zone A comprises of 3 districts :

1. Imphal West and East
2. Bishnupur
3. Thoubal

RESOURCES AVAILABLE:

- Timber and Bamboo

MANIPUR



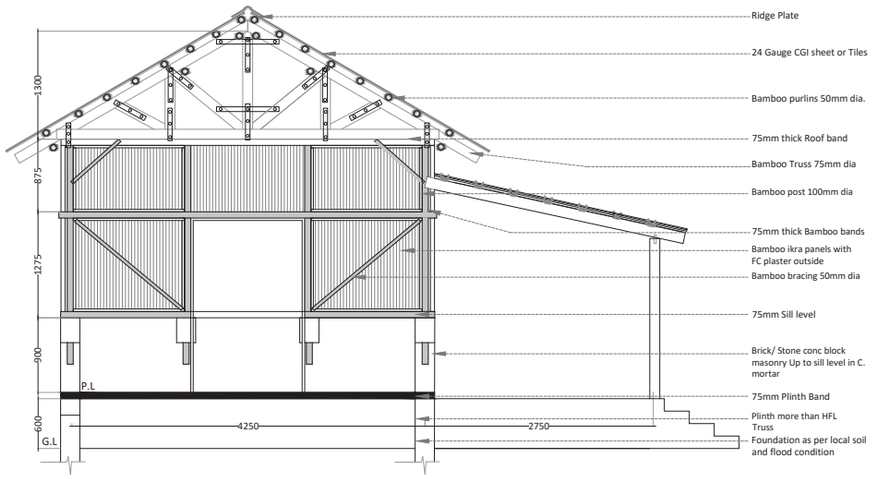
MN-01A

- The house essentially consists of a front verandah about 9 feet in width and which spans the entire frontage of the house.
- Sleeping quarters with a high roof, starting at about 10-11 feet in height from the floor level.
- A hipped or gable roof spans over the central bay. This further leads out into a rear bay that contains the cooking area, dining space and a store/granary.
- Horizontal and vertical structural members in timber/bamboo for main structure.
- This house is based closely on the traditional adobe masonry house one finds in the valley and adjoining areas.
- This prototype incorporates stabilized adobe block masonry and introduces reinforcement bands and masonry containment to ensure resilience to seismic forces.
- Similar to Valley House 1, this house too consists of a front verandah about 9 feet in width and which serves as the public interface of the residence.
- A hipped or gable roof spans over the central bay.
- A standalone toilet and bathing enclosure is provided in the rear yard of the house.

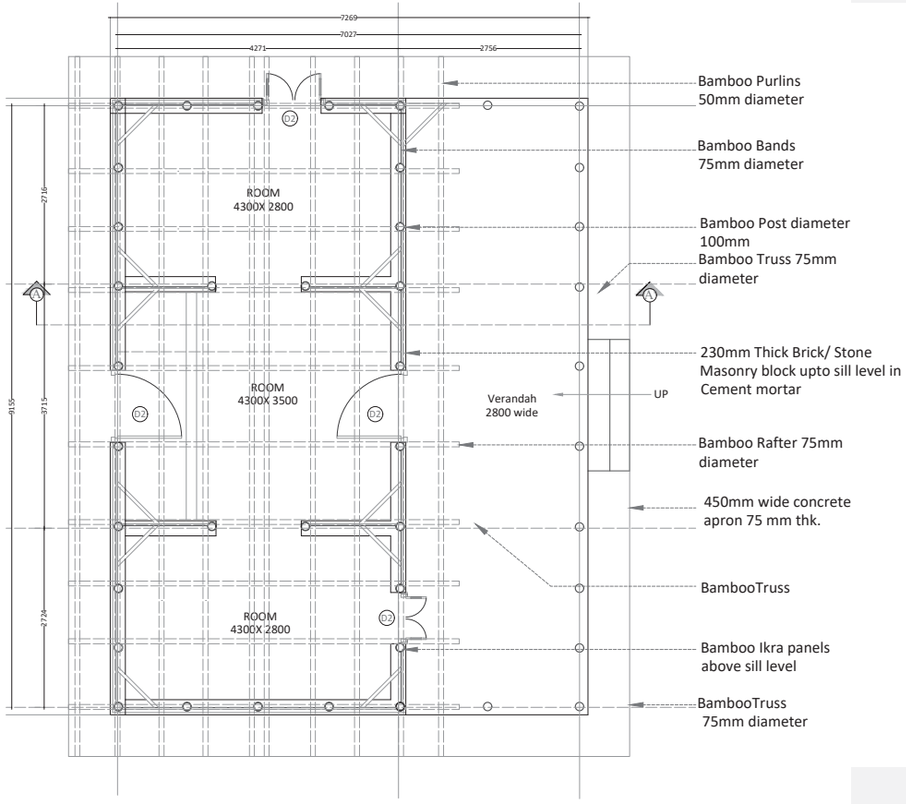
Recommendations for Built Form		
Plan Layout	**Plinth/Floor**	**Roof Profile**
The house essentially consists of a front verandah about 9 feet in width and which spans the entire frontage of the house.	The house has an earthen plinth that is about 450 mm high.	A hipped or gable roof spans over the central bay.

Recommendations for construction systems		
Components	**Recommended Specifications**	**Specific Comments**
Foundations	• Nominal Strip foundation to support the plinth retention masonry and concrete pedestals as vertical support anchors.	
Plinth	• Stone or Stabilized Adobe Block Masonry plinth with earth back-filling.	2, 8-mm rods with stirrups at every 200 mm can be provided as a plinth reinforcement band, on top of the plinth masonry.
Wall	• Brick/ Stone block masonry upto silllevel 750 mm • Ikra panelling system with bamboo frames	• The vertical supports can be either grouted into the concrete pedestals provided in the plinth or, can be rested on the pedestals with a bent 8 mm rod anchoring it to the pedestals.
Wall Finish	• Ferrocement plaster on Ikra panels	Optional: Cement based paint for external walls and lime rendering for internal walls.
Roof Structure	• Sloping roofs with bamboo understructure	
Floor	• Plain cement flooring over RCC bed on a back filled plinth. • Stabilized Soil cement flooring. and Earthen flooring.	

MN-01A



SECTION AA'



TYPICAL PLAN

Area Statement:

Item	Area	
	Sq.m	Sq.ft
Room 1	10.05	109.25
Room 2	14.07	151.45
Room 3	10.05	109.25
Veranda	**26.00**	**279.86**
Carpet Area	**35.68**	**384.06**
Built up Area	**68.25**	**734.64**

MANIPUR

MN-01A
Cost estimate

Cost breakup

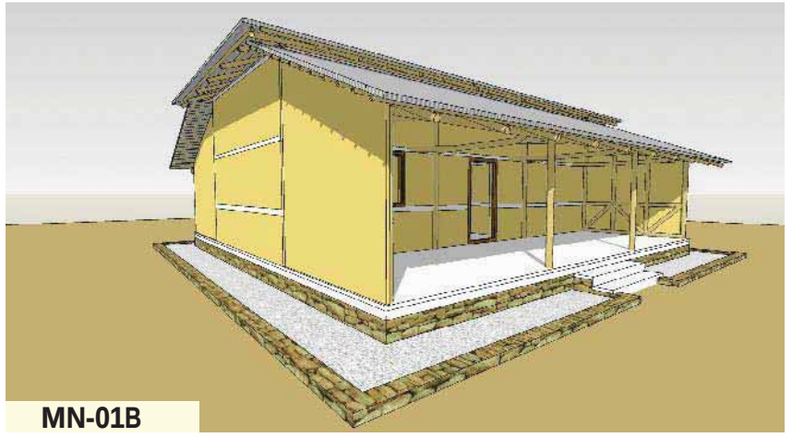
Item	Cost (INR)
Excavation	5,600
Foundation and Plinth	32,716
Walling and Walling structure	60,644
Doors and Windows	8,116
Roofing	53,032
Finishing works	19,048
Ext. Development	**576**
Electrical	**14,800**
Total	**194,532**

MANIPUR

S No	Work Head	Material	Labour	Transport	Total
1	Excavation	-	5,600	-	**5,600**
2	Foundation and Plinth	20,466	7,250	5,000	**32,716**
3	Walling and Walling structure	32,044	25,600	3,000	**60,644**
4	Raised flooring	-	-	-	**-**
5	Doors and Windows	4,116	4,000	-	**8,116**
6	Roofing	37,032	14,000	2,000	**53,032**
7	Finishing works	9,248	8,800	1,000	**19,048**
8	Ext. Development	576	-	-	**576**
9	Electrical	12,800	2,000	-	**14,800**
	Total	**116,282**	**67,250**	**11,000**	**194,532**
	Add cost of toilet				**12,000**
	Cost of Construction including toilet				**206,532**
	Total Area of Construction (Initial Built A)			Rs	**314.7**
	Rate of Construction			Rs/sft	656
	Pro-rata cost of Built area of 25 square metres				176,584

Potential areas of reduction in costs		
	Labour	
1	If excavation is done by the house owners	**(4,900)**
2	If backfilling of earthen plinth is done by the house owners	**(1,400)**
3	If split bamboo framework is fixed by the house owners	**(8,400)**
4	If stabilised mud plaster is done by the house owners	**(8,400)**
5	If stabilised earthen floor is laid by the house owners	**(4,800)**
	Material	
	If bamboo is used as reinforcement instead of steel	**(1,713)**
	If upper 1/3rd of mud plastered wall is not stabilised	**(2,894)**
	Net Cost of Construction of the Inifiat Built Area	**174,025**

MN-01B



- This house is based closely on the traditional adobe masonry house one finds in the valley and adjoining areas.
- This prototype incorporates stabilized adobe block masonry and introduces reinforcement bands and masonry containment to ensure resilience to seismic forces.
- Similar to Valley House 1, this house too consists of a front verandah about 9 feet in width and which serves as the public interface of the residence.
- A hipped or gable roof spans over the central bay.
- A standalone toilet and bathing enclosure is provided in the rear yard of the house.

Recommendations for Built Form		
Plan Layout	**Plinth/Floor**	**Roof Profile**
The house essentially consists of a front verandah about 9 feet in width and which spans the entire frontage of the house.	The house has an earthen plinth that is about 450 mm high.	A hipped or gable roof spans over the central bay.

Recommendations for construction systems		
Components	**Recommended Specifications**	**Specific Comments**
Foundations	• Nominal Strip foundation to support the plinth retention masonry and concrete pedestals as vertical support anchors.	
Plinth	• Stone or Stabilized Adobe Block Masonry plinth with earth back-filling.	2, 8-mm rods with stirrups at every 200 mm can be provided as a plinth reinforcement band, on top of the plinth masonry.
Wall	• 230 mm thk brick/ cement flyash brick masonry upto sill level • Adobe/CSMB masonry above sill level in ferrocement plaster • Horizontal bands at Plinth/ Sill/ Lintel level have been incorporated in the walls	
Wall Finish	• Ferrocement plaster	
Roof Structure	• Sloping roofs with bamboo understructure	
Floor	• Plain cement flooring over RCC bed on a back filled plinth. • Stabilized Soil cement flooring. and Earthen flooring.	

This typology is applicable to Zone A

Zone A highlights: Seismic zone V These districts nearly entirely comprise the valley areas and some adjoining hills that are in the centre of the state.

Zone A comprises of 3 districts :

1. Imphal West and East
2. Bishnupur
3. Thoubal

RESOURCES AVAILABLE:

- Timber and Bamboo

MANIPUR

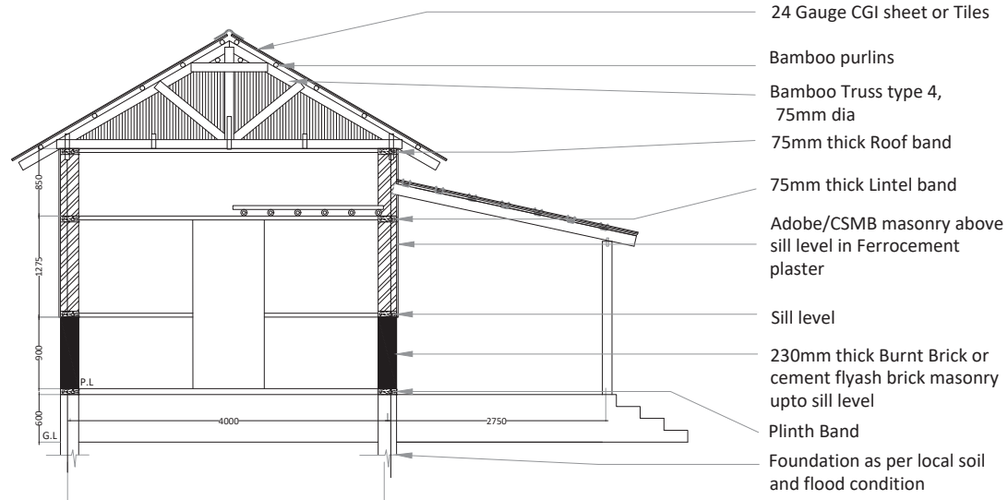
MN-01B

Area Statement:

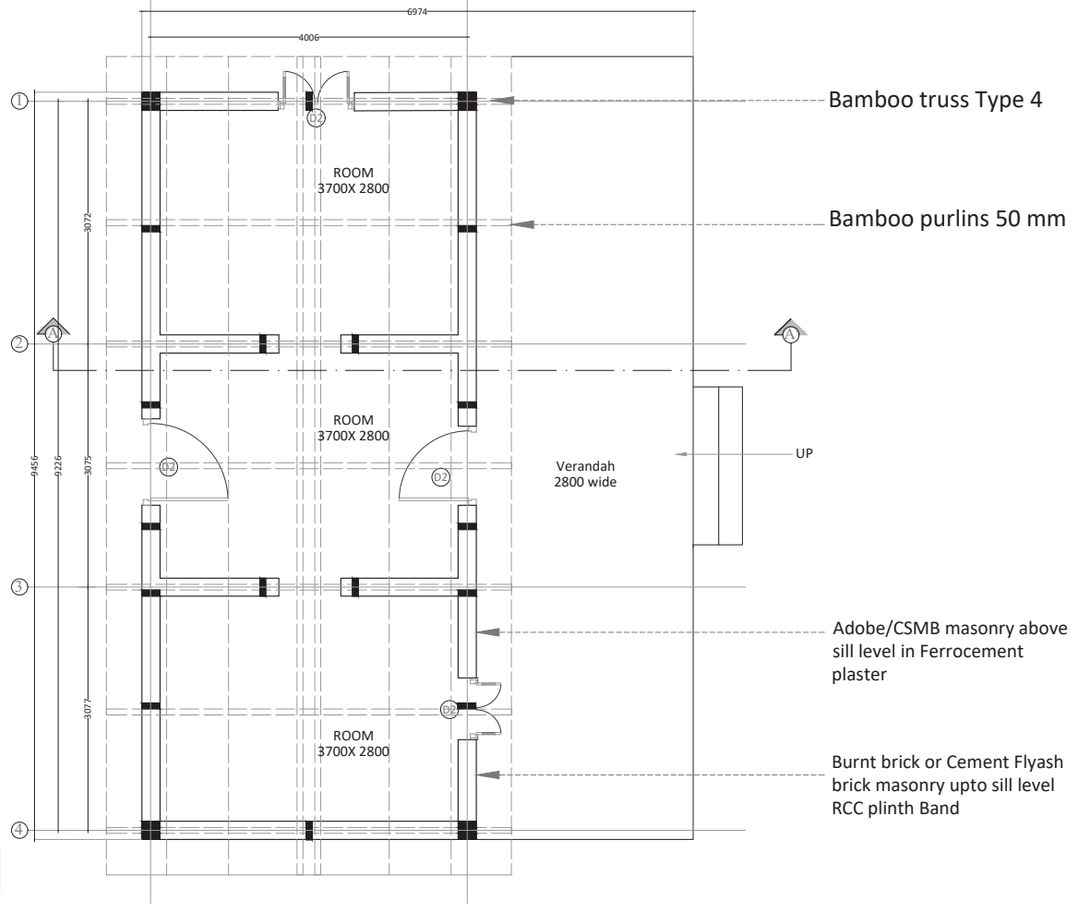
Item	Area	
	Sq.m	Sq.ft
Room 1	10.71	115.28
Room 2	10.76	115.49
Room 3	10.76	115.49
Veranda	**25.94**	**279.22**
Carpet Area	**33.42**	**359.73**
Built up Area	**66.00**	**710.42**

MANIPUR

SECTION AA'



TYPICAL PLAN



S No	Work Head	Material	Labour	Transport	Total
1	Excavation	-	5,600	-	**5,600**
2	Foundation and Plinth	13,539	7,250	5,000	**25,789**
3	Walling and Walling structure	47,332	24,800	2,000	**74,132**
4	Raised flooring	-	-	-	**-**
5	Doors and Windows	4,116	4,000	-	**8,116**
6	Roofing	36,632	14,000	2,000	**52,632**
7	Finishing works	5,817	8,800	1,000	**15,617**
8	Ext. Development	576	-	-	**576**
9	Electrical	12,800	2,000	-	**14,800**
	Total	**120,813**	**66,450**	**10,000**	**197,263**
	Cost of toilet construction				**12,000**
	Cost of Construction including toilet				**209,263**
	Total Area of Construction (Initial Built A)			Rs	**290.4**
	Rate of Construction			Rs/sft	721
	Pro-rata cost of Built area of 25 square metres				193,905

Potential areas of reduction in costs		
	Labour	
1	If excavation is done by the house owners	**(4,900)**
2	If backfilling of earthen plinth is done by the house owners	**(1,400)**
3	If making of stabilised adobe blocks is done by the house owners	**(15,600)**
4	If stabilised earthen floor is laid by the house owners	**(4,800)**
	Material	
5	If bamboo is used as reinforcement instead of steel	**(3,344)**
	Net Cost of Construction of the Initial Built Area	**179,218**

MN-01B
Cost estimate

Cost breakup

Item	Cost (INR)
Excavation	5,600
Foundation and Plinth	25,789
Walling and Walling structure	74,132
Doors and Windows	8,116
Roofing	52,632
Finishing works	15,617
Ext. Development	576
Electrical	**14,800**
Total	**197,263**

MANIPUR

MN-02

This typology is applicable to Zone B

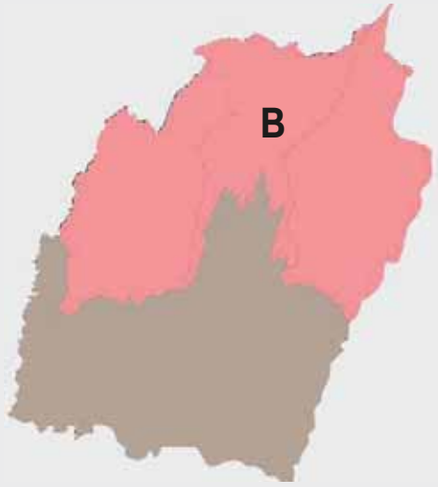
Zone B highlights: Seismic zone V : These districts comprise of the higher hill areas and are areas with greater prevalence of timber based construction

Zone B comprises of 3 districts :

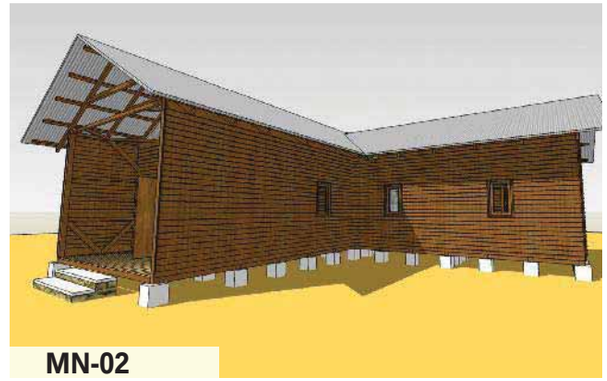
1. Tamenglong
2. Senapati
3. Ukhrul

RESOURCES AVAILABLE:

- Timber or Bamboo



MANIPUR

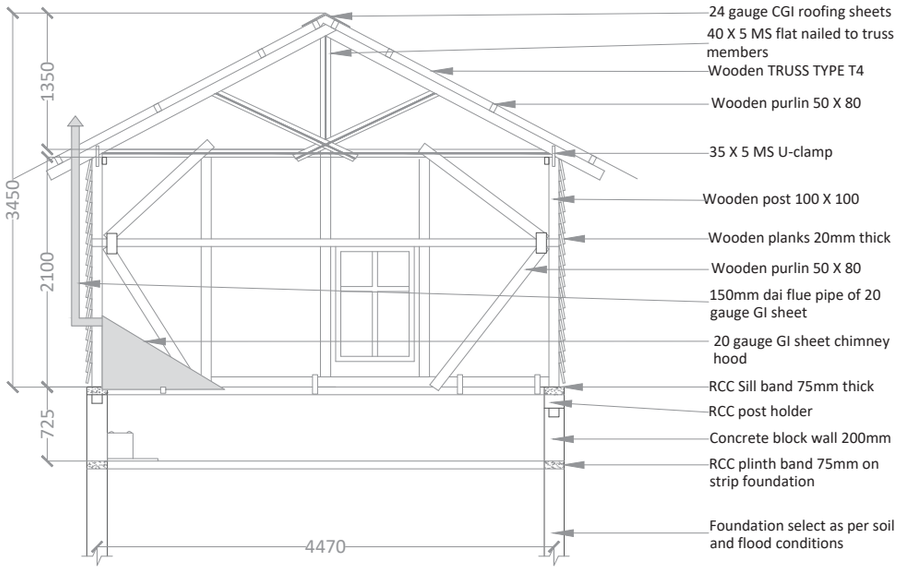


- The plan form is an L-shape, with the entry through a short verandah leading onto a common room (akin to the entry room in traditional Naga houses, which leads on to a dining space and then onto a cooking area and store.
- The roof form is a hipped roof that follows the plan form of the house.
- The cooking area is provided with a chimney.

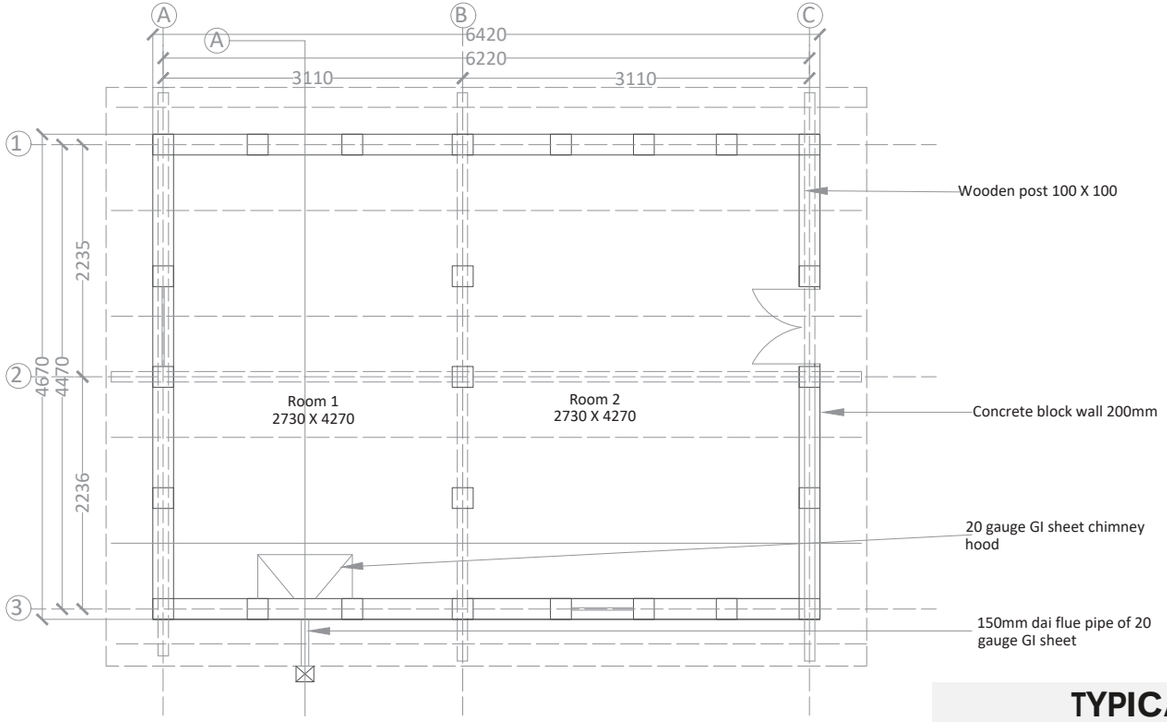
Recommendations for Built Form		
Plan Layout	**Plinth/Floor**	**Roof Profile**
The plan form is an L-shape, with the entry through a short verandah leading onto a common room (akin to the entry room in traditional Naga houses, which leads on to a dining space and then onto a cooking area and store.	Timber flooring on a raised floor with adequate lap joints and cement floor in the case of a masonry back-filled plinth.	A hipped or gable roof spans over the central bay.

Recommendations for construction systems		
Components	**Recommended Specifications**	**Specific Comments**
Foundations	• Concrete pedestals as anchors for all vertical timber/treated bamboo supports (both main vertical supports and additional flooring supports).	
Plinth	• Masonry plinth with back filled earth. • Raised floor supported on a two-layer system of primary and secondary timber members that support a wooden floor above.	
Wall	• 200 mm thk concrete wall • Wooden panel walling system on timber posts 100 x100 mm Cross section • timber struts have been incorporated in addition to the vertical timber posts. • RCC sill band acts as a base for the verticaltimber posts	• 1-inch-thick Timber planks between 150 mm to 200 mm in width fixed to the external side of the timber walling framework, with adequate overlaps. • Internal walls can be clad with bamboo mats, board etc.
Wall Finish	• Linseed Oil (or similar) polish	
Roof Structure	• Hipped roof following the L-shaped plan in timber unstructure	
Floor	• Timber plank flooring fixed onto a timber/treated bamboo under-structure.	• Cement floor on backfilled earth in the case of a masonry plinth.

223



SECTION AA'



TYPICAL PLAN

MN-02

Area Statement:

Item	Area	
	Sq.m	Sq.ft
Room 1+2	25.86	278.35
Carpet Area	**25.86**	**278.35**
Built up Area	**29.98**	**322.70**

MANIPUR

MN-02
Cost estimate

Cost breakup

Item	Cost (INR)
Excavation	4,200
Foundation and Plinth	12,912
Walling and Walling structure	72,151
Raised flooring	20,195
Doors and Windows	7,819
Roofing	42,888
Finishing works	5,000
Ext. Development	576
Electrical	14,800
Total	**180,541**

MANIPUR

SR. NO	ITEM OF WORK	Material	Labour	Transport	Total
1	Excavation	-	4,200	-	**4,200**
2	Foundation and Plinth	8,312	2,100	2,500	**12,912**
3	Walling and Walling structure	55,151	15,000	3,000	**72,151**
4	Raised flooring	12,195	8,000	-	**20,195**
4	Doors and Windows	3,819	4,000	-	**7,819**
5	Roofing	29,888	11,000	2,000	**42,888**
6	Finishing works	-	4,000	1,000	**5,000**
7	Ext. Development	576	-	-	**576**
8	Electrical	12,800	2,000	-	**14,800**
	Total	**122,741**	**50,300**	**8,500**	**180,541**
	Cost of toilet construction				**12,000**
	Cost of Construction including toilet				**192,541**
	Total Area of Construction (Initial Built A)			Rs	**283.3**
	Rate of Construction			Rs/sft	680
	Pro-rata cost of Built area of 25 square metres				182,885

Potential areas of reduction in costs		
	Labour	
1	If excavation is done by the house owners	**(4,200)**
2	If walling plank work is done by the house owners	**(4,000)**
3	If flooring plank work is done by the house owners	**(3,000)**
	Material	
4	If 9mm bamboo mat board or cement board is used as walling material instead of timber planks (needs assistance in procurement from the block office)	**(9,050)**
	Net Cost of Construction of the Initial Built Area	**172,291**

MN-03

- The lay of the house is roughly in an L-shape, with one extension of the L housing the sleeping quarters with a front verandah, and the other having a large cooking, storage, dining and guest sleeping platform.
- The roof form is a hipped roof that follows the plan form of the house.
- The cooking area is provided with a chimney.
- A standalone toilet and bathing enclosure is provided in the rear yard of the house.

Recommendations for Built Form		
Plan Layout	**Plinth/Floor**	**Roof Profile**
The lay of the house is roughly in an L-shape, with one extension of the L housing.	The house is provided with a raised timber floor that is supported on either timber or bamboo flooring supports.	A hipped or gable roof spans over the central bay.

Recommendations for construction systems		
Components	**Recommended Specifications**	**Specific Comments**
Foundations	• Concrete pedestals as anchors for all vertical timber/treated bamboo supports (both main vertical supports and additional flooring supports).	
Plinth	• No masonry plinth. • The flooring is supported on a two-layer system of primary and secondary timber/treated bamboo members that support a wooden floor above.	These members are supported by the main vertical members of the structure and an additional set of stub posts that provide additional support to the flooring members.
Wall	• Ikra wall panelling system • RCC stubs/pedestals casted to hold bamboo vertical posts at plinth level • Horizontal RCC bands are incorporated at plinth/ Sill level	• The vertical supports are grouted into the concrete pedestals provided. These vertical members are provided with a bitumen protective coating for those portions that are encased in the concrete.
Wall Finish	• Ferrocement plaster on Ikra panel	Optional: Cement based paint for external walls and lime rendering for internal walls.
Roof Structure	• Sloping roof with bamboo understructure	• Treated bamboo roofing members (trusses, ties and purlins) support a roof with an angle of slope of 30 degrees.
Floor	• Timber plank flooring fixed onto a timber/treated bamboo under-structure.	

This typology is applicable to Zone C

Zone C highlights: Seismic Zone V: This area comprises the districts of Churachandpur and Chandel. These districts comprise of lower elevation hills (on average, and in comparison to the northern districts) and is in general an area where good construction grade bamboo with good wall thicknesses are found apart from timber.

Zone C comprises of 2 districts :

1. Churachandpur
2. Chandel

RESOURCES AVAILABLE:

- Timber And Bamboo, adobe from valley areas.

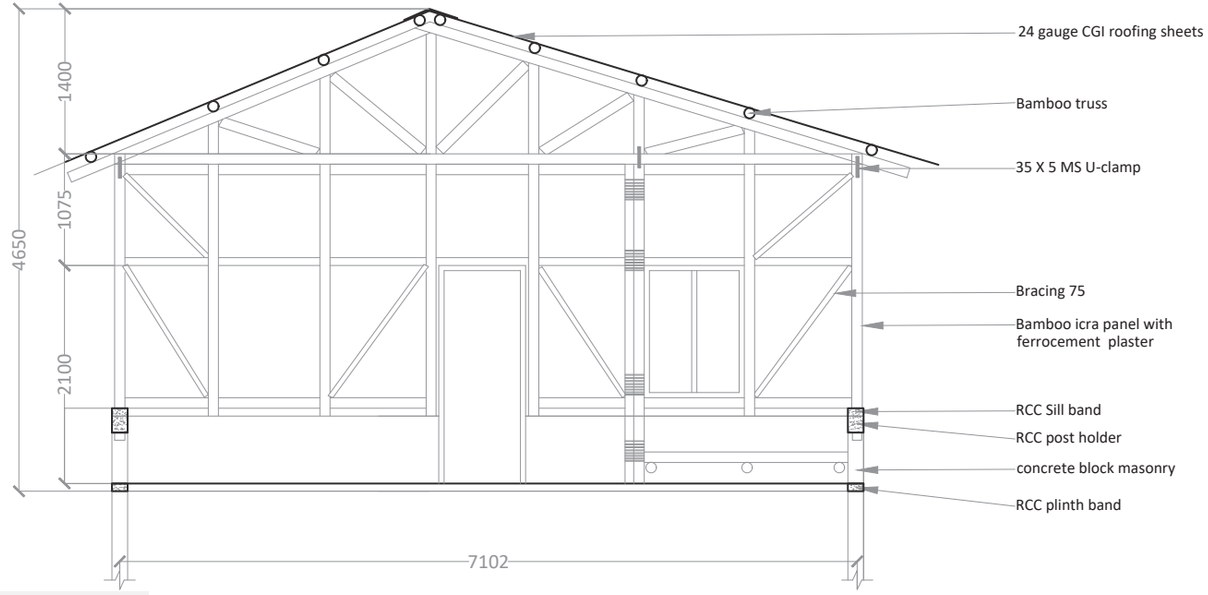
MANIPUR

MN-03

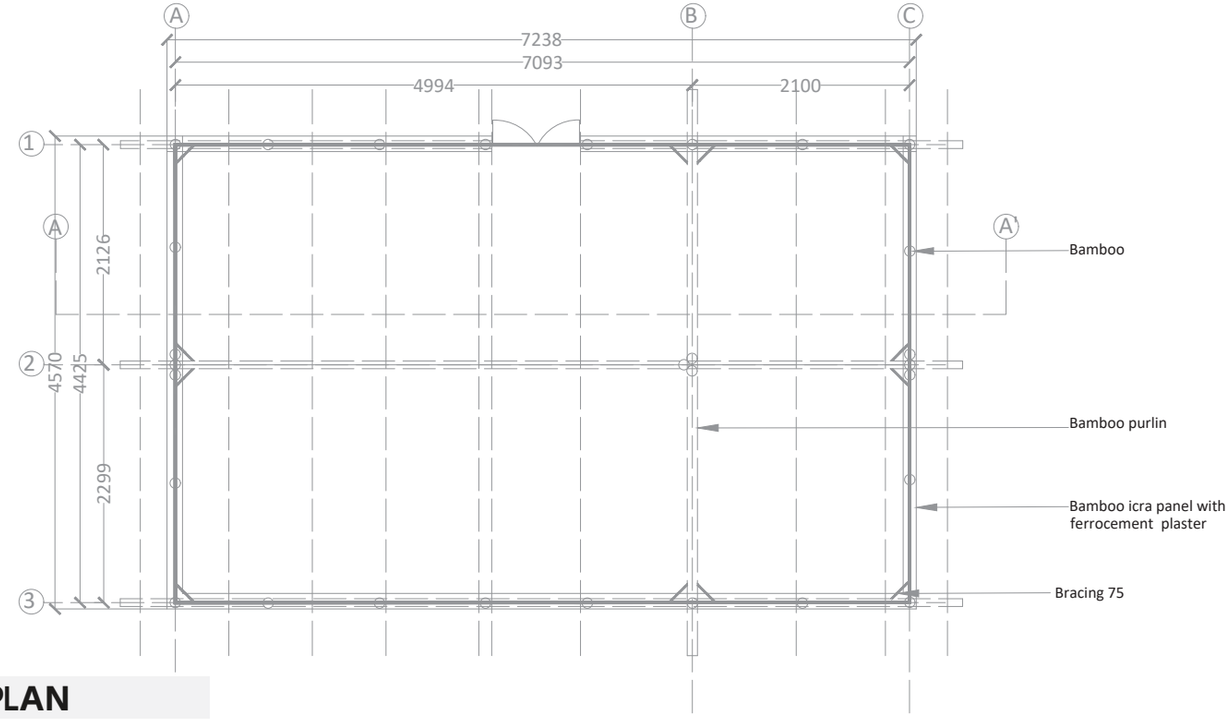
Area Statement:

Item	Area	
	Sq.m	Sq.ft
Extension Bedroom 1	8.41	90.52
Extension Bedroom 2	8.41	90.52
Extension Veranda	17.52	188.58
Kitchen & Dinning Room	25.3	272.33
Guest sleeping Platform	10.57	113.77
Carpet Area	**52.57**	**565.86**
Built up Area	**70.39**	**757.67**

MANIPUR



SECTION AA'



TYPICAL PLAN

SR. NO	ITEM OF WORK	Material	Labour	Transport	Total
1	Excavation	-	5,600	-	**5,600**
2	Foundation and Plinth	11,514	2,100	2,500	**16,114**
3	Walling and Walling structure	32,337	24,800	3,000	**60,137**
4	Raised flooring	14,861	6,000	2,000	**22,861**
5	Doors and Windows	4,917	4,000	-	**8,917**
6	Roofing	46,640	17,000	2,000	**65,640**
7	Finishing works	7,655	4,000	1,000	**12,655**
8	Ext. Development	576	-	-	**576**
9	Electrical	12,800	2,000	-	**14,800**
	Total	**131,300**	**65,500**	**10,500**	**207,300**
	Add cost of toilet				**12,000**
	Cost of Construction including toilet				**219,300**
	Total Area of Construction (Initial Built A)			Rs	**421.3**
	Rate of Construction			Rs/sft	521
	Pro-rata cost of Built area of 25 square metres				140,074

Potential areas of reduction in costs		
	Labour	
1	If excavation is done by the house owners	**(4,900)**
2	If split bamboo framework is fixed by the house owners	**(8,400)**
3	If stabilised mud plaster is done by the house owners	**(8,400)**
	Material	
4	If upper 1/3rd of mud plastered wall is not stabilised	**(2,893)**
	Net Cost of Construction of the Initial Built Area	**194,706**

MN-03
Cost estimate

Cost breakup

Item	Cost (INR)
Excavation	5,600
Foundation and Plinth	16,114
Walling and Walling structure	60,137
Raised flooring	22,861
Doors and Windows	8,917
Roofing	65,640
Finishing works	12,655
Ext. Development	576
Electrical	14,800
Total	**207,300**

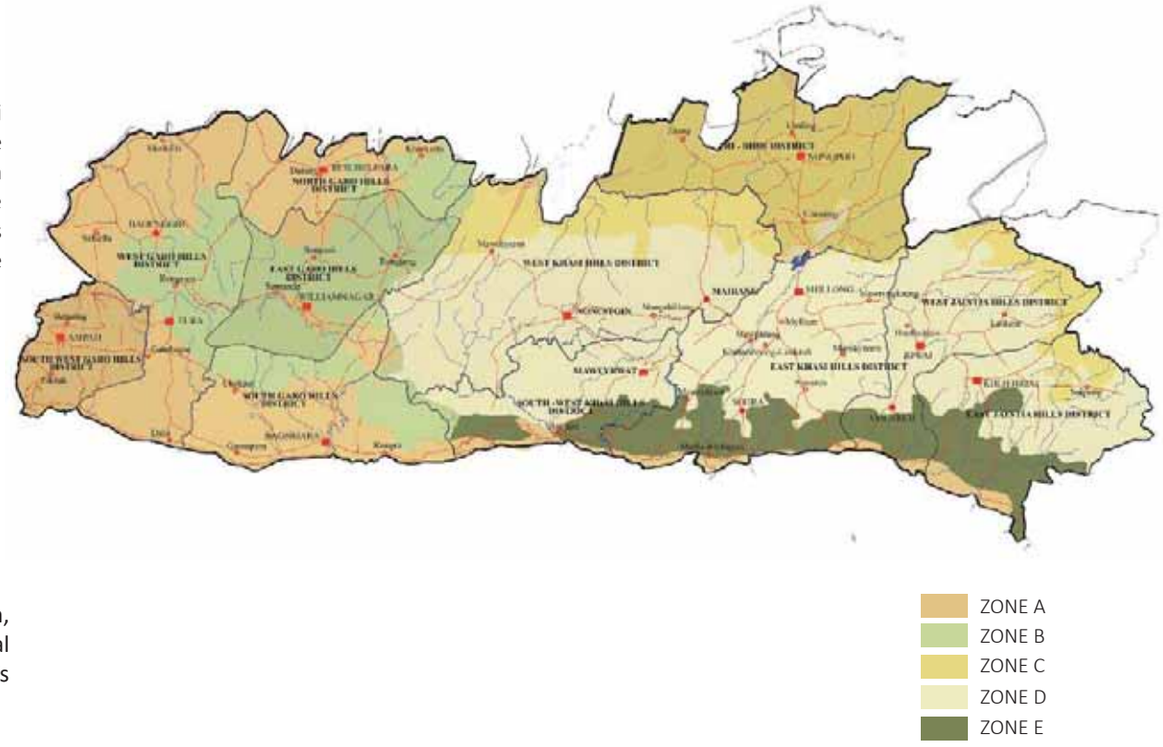
MANIPUR

pahal
Prakriti Hunar Lokvidya

Meghalaya

Meghalaya is a state in northeast India. The state is bounded to the south by the Bangladeshi divisions of Mymensingh and Sylhet, to the west by the Bangladeshi division of Rangpur, and to the north and east by India's State of Assam. Sandwiched between Assam in the north and Bangladesh to the south, and stretching from the Bangladesh plains in the West where it is bordered by the Brahmaputra, and the Cachar District of Assam in the East lies the State of Meghalaya. The state rises from the East, North and West to form the Meghalaya Plateau and falls sharply down towards the South where it forms a formidable wall to the Bangladeshi plains.

Meghalaya is in Zone V in terms of seismic vulnerability in India.



Zone A
This region has a proximity to the plains and random hillocks of neighbouring Bangladesh and Assam, and uses adobe walls, which maintain thermal comfort in the house. Readily available material includes Timber, Bamboo and Burnt Clay Bricks because of presence of various brick kilns in this zone.

Zone B
This region falls in hilly areas between 300 and 800m elevation in general, with hot and humid climate. Abundantly available materials are Bamboo and timber.

Zone C
This region is characterised by raised Assam type houses and variants that use timber/bamboo posts with bamboo ikra walling. This is also a region occupied by Khasi, Bhoi and Jaintia villages. Traditionally, this is not an area known for any masonry construction.
However, by the sheer proximity to most of the main Guwahati-Shillong-Jowai highways, a lot of transformation to the building stock has taken place, with evidence of concrete block work, and some brick work (along main arterial roads). Bamboo and timber skill-sets are still abundant, with a number of houses being built entirely in Bamboo.

Zone D
The geography of these regions is 600m in elevation in general, and forms the higher elevation of the state in Meghalaya. It is characterized by Assam type houses and is home to Traditional Khasi and Jaintia Huts.Its receives the highest rainfall towards south and also seems strongest cyclonic activity. Timber, stone are found in this region.

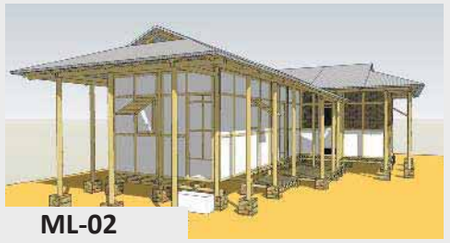
Zone E
This region has hilly tracts below 600m in elevation and occupies lowest elevation in the state of Meghalaya. It is amongst the humid areas of state because of very high rainfall. Bamboo, thatch and betel nut grow well in this region.

MEGHALAYA

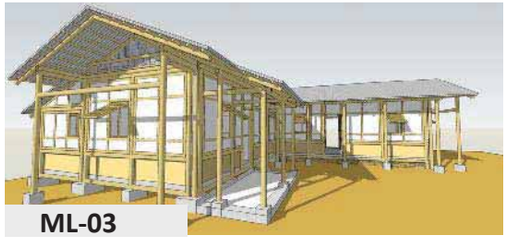
MEGHALAYA HOUSING TYPOLGIES AT A GLANCE

TYPOLOGY	APPLICABLE HOUSING ZONES	TOTAL AREA Sq.m/Sq.ft	
ML-01	**Zone A**	**35.19 Sq.m**	**378.79 Sq.ft**
ML-02	**Zone B**	**56.23 Sq.m**	**605.26 Sq.ft**
ML-03	**Zone C**	**43.81 Sq.m**	**471.57 Sq.ft**
ML-04A	**Zone D**	**34.97 Sq.m**	**376.42 Sq.ft**
ML-04B	**Zone D**	**35.55 Sq.m**	**382.66 Sq.ft**
ML-05	**Zone E**	**52.84 Sq.m**	**568.77 Sq.ft**

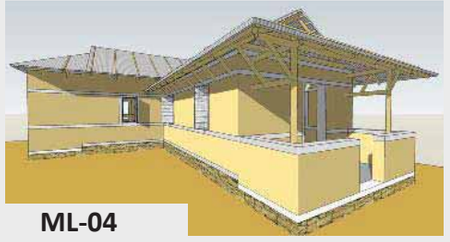
ML-01



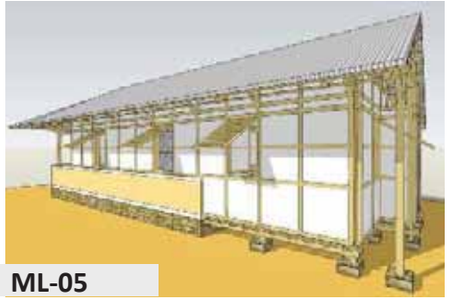
ML-02



ML-03



ML-04



ML-05

ML-01

This typology is applicable to Zone A

Zone A highlights: Readily available material includes Timber, Bamboo and Burnt Clay Bricks because of presence of various brick kilns in this zone.

Zone A covers areas falling in the districts of:

1.West Garo Hills -plains & scattered hillock
2.South West Garo Hills -plains & scattered hillocks
3.South Garo Hills - plains & scattered hillocks
4.North Garo Hills -plains & scattered hillocks
5.East Garo Hills -plains & scattered hillocks
6.South West Khasi Hills - southern fringes
7.East Khasi Hills -southern fringes
8.East Jaintia Hills -southern fringes
9.West Jaintia Hills -southern fringes

The Main skills recorded in this zone are:

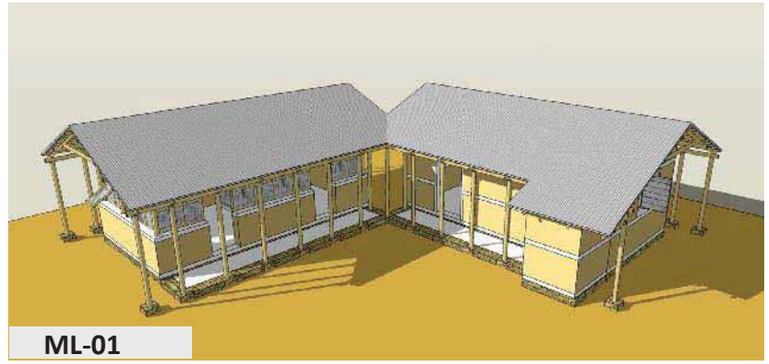
- Bamboo mat making
- Bamboo framework for structures, especially roofing
- Adobe wall erection

Resources Available:

- Alluvial and lateritic soil Stable soil such as 'moorum'.

A

MEGHALAYA

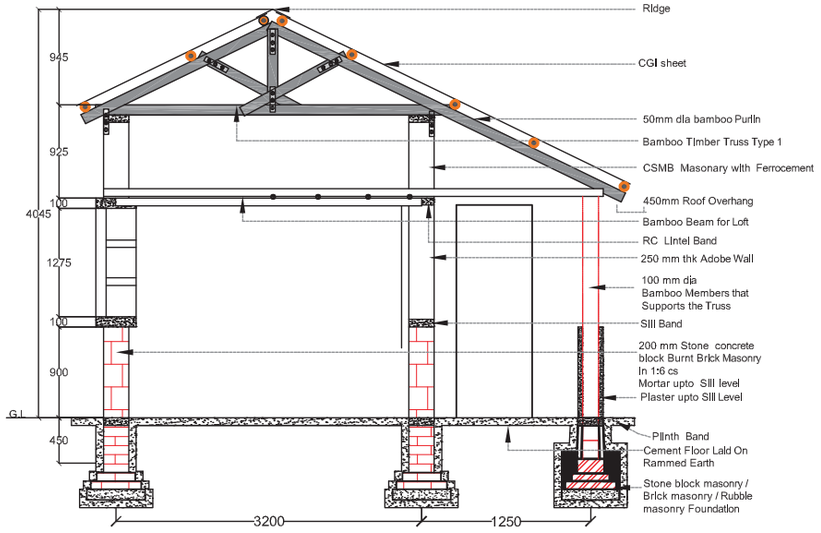


ML-01

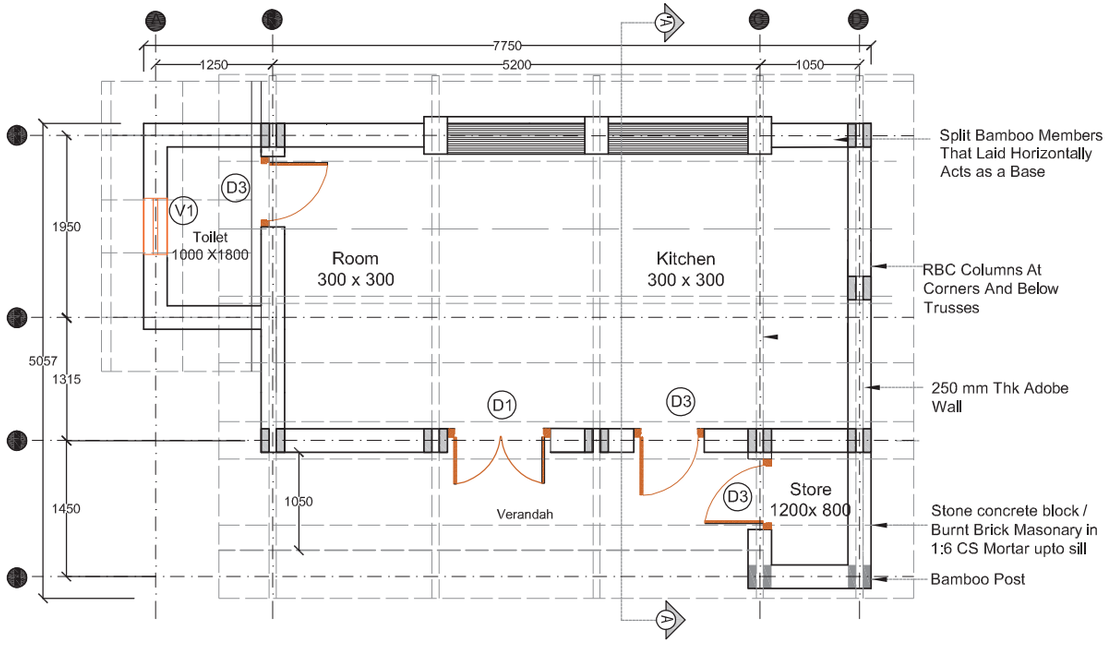
- The design is essentially a modification of both the 'Adobe block house' and the 'On ground Rectangular Timber post and beam house', both traditional housing types found in this region. Here are some salient aspects of this prototype:
- The structures can be built with on the ground stone masonry plinths, or with raised floors on stilts in flood prone areas.
- stabilised adobe blocks are used for the walls as they are similar to the unstabilised adobe blocks used locally, and can be made with the current skills in the area. One could build them either as full height or half height walls.
- Protection of the walling areas by providing deep roof overhangs is done.
- The roof is made of CGI sheets supported on a bamboo roofing structure. One could use an under layer tied to the roof of split bamboo to create an air gap which will help keep the home slightly cooler. Alternatively, one could create a loft to store materials or serve as an extra sleeping area.
- The house has also been provided with an attached toilet, a cooking alcove, utensils/clothes washing area and storage areas.

Recommendations for Built Form		
Plan Layout	**Plinth/Floor**	**Roof Profile**
The house essentially consists of a front verandah about 9 feet in width and which spans the entire frontage of the house.	The house has an earthen plinth that is about 450 mm high.	A hipped or gable roof spans over the central bay.

Recommendations for construction systems		
Components	**Recommended Specifications**	**Specific Comments**
Foundations	• Stone block/ brick/rubble masonry	
Plinth	• 450 mm raised plith with rammed earth	
Wall	• 200 mm Stone/concrete/brick mason in 1:6 upto sill level • 250 mm thk Adobe wall above sill level • RCC horizontal bands are incorporated at plinth/sill and lintel level	• The vertical supports can be either grouted into the concrete pedestals provided in the plinth or, can be rested on the pedestals with a bent 8 mm rod anchoring it to the pedestals.
Wall Finish	• Ferrocement plaster on Adobe wall • cement plaster upto sillllevel	Optional: Cement based paint for external walls and lime rendering for internal walls.
Roof Structure	• Sloping roof with bamboo/timber understructure • covered with CGI sheet	
Floor	• Plain cement flooring over RCC bed on a back filled plinth. • Stabilized Soil cement flooring. and Earthen flooring.	



TYPICAL SECTION AA'



TYPICAL PLAN

ML-01

Area Statement:

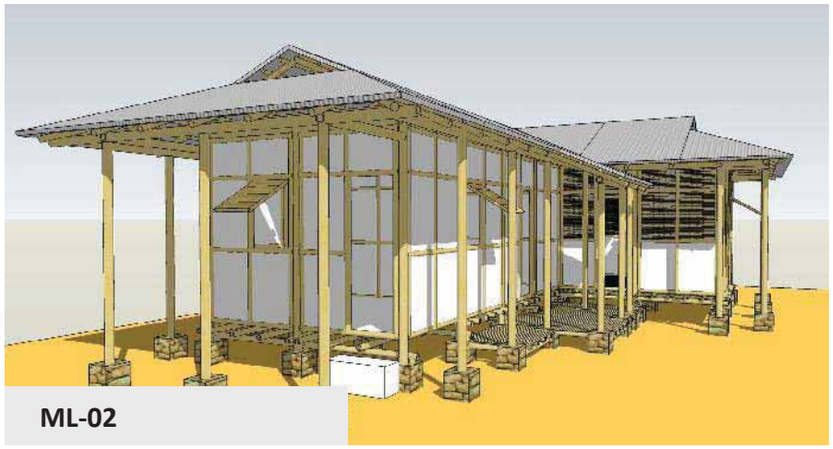
Item	Area	
	Sq.m	Sq.ft
Room	9.00	96.88
Kitchen	9.00	96.88
Store	0.97	10.44
Toilet	**1.69**	**18.19**
Verandah	**7.52**	**80.95**
Carpet Area	**21.22**	**228.41**
Built up Area	**35.19**	**378.79**

A

MEGHALAYA

ML-01
Cost estimate

S No	Item	Quantity	Unit	Rate (Rs)	Cost (Rs)
1	Excavation				
	For plinth	7.2	cum		-
	For stub footings (bamboo bases and raised floors)	3.9	cum		-
	Labor	8.0	man days	300	2,400
2	PCC bed in foundation		cum		
	concrete (1:4:8)	1.8	cum		
	sand	0.6	cum	500	324
	aggregate	1.3	cum		-
	cement	3.8	bags	350	1,335
	Labor	2.0	man days	300	600
	Transport				2,500
3	Erection of Stub Footings				
	concrete (1:2:4)	10.7	cum		-
	sand	3.1	cum	500	1,550
	aggregate	6.1	cum		-
	cement	35.2	bags	350	12,336
	Labor	1.0	man days	450	450
4	Construction of a Stone plinth	6.3	cum		-
	concrete (1:2:4)	0.6	cum		-
	sand	0.2	cum	500	91
	aggregate	0.4	cum		-
	cement	2.1	bags	350	727
	Labor	4.0	man days	450	1,800
	Transport				2,500
5	Provision of RCC reinforcement bands at plinth, sill, lintel and top of wall				-
	Steel	142.9	kg	45	6,429
	concrete (1:2:4)	0.5	cum		-
	sand	0.1	cum	500	73
	aggregate	0.3	cum		-
	cement	1.6	bags	350	577
	Labor	2.0	man days	450	900
	Transport				2,500
6	Construction of walls				-
	RBC columns	10.0	nos	700	7,000
	Brick masonry upto cill level	700.0	nos	5	3,500
	adobe blocks	1564.0	nos		-
	cement mortar	0.9	cum		-
	sand	0.7	cum	500	347
	aggregate	0.0	cum		-
	cement for mortar	4.1	bags	350	1,430
	cement for blocks	15.6	bags	350	5,455
	Labor	12.0	man days	450	5,400
7	Making and fixing of Doors and Windows				
	windows	3.0	nos	300	900
	doors	2.0	nos	300	600
	nails & hardware	2.0	LS	500	1,000
	Labor	12.0	man days	300	3,600
	4 inch dia Bamboos	26.0	nos	50	1,300
	nails & hardware	1.0	LS	1000	1,000
	Labor	8.0	man days	300	2,400
	Transport				2,500
9	Making and erecting the Bamboo roof framework				
	3 inch dia bamboos	27.0	nos	30	810
	2 inch dia bamboos	40.0	nos	20	800
	nails & hardware	1.0	LS	1000	1,000
	Labor	8.0	man days	300	2,400
10	Provision and fixing of CGI sheet roofing, inclusive of all hardware				
	CGI sheets	23.3	nos	510	11,900
	Ridge members	7.0	nos	350	2,450
	nails & hardware	1.0	LS	1000	1,000
	Labor	2.0	man days	300	600
	Transport				2,500
11	laying of Plain cement flooring				
	cement floor	0.7	cum		-
	sand	0.5	cum	500	270
	cement	4.2	bags	350	1,483
	Labor	2.0	man days	450	900
12	Plastering of walls				-
	Internal				
	cement mortar		cum		-
	sand	0.0	cum	500	-
	cement	0.0	bags	350	-
	Labor	1.0	man days	450	450
	external				
	cement mortar	0.4	cum		-
	sand	0.3	cum	500	168
	cement	2.0	bags	350	692
	Labor	2.0	man days	450	900
13	Painting and polishing				-
	Oil for bamboos	5.1	lts	100	506
	Paint for plastered surfaces	6.1	lts	100	612
	Painting of doors and windows		lts		-
	Labor	4.0	man days	300	1,200
	Total cost				**104,166**



ML-02

- The design takes cues from both the ‘Garo Long house’ and the ‘On ground Rectangular Timber post and beam house’, both traditional housing types found in the region. Here are some salient aspects of this prototype:
- The house is a rectangular structure and linear in the arrangement of the interior spaces. The Living room is in the centre as in traditional Garo houses. Space for storage can be provided under the roof overhangs on the side. Verandahs to be provided in both the short sides.
- In this prototype we have demonstrated a raised bamboo flooring structure which is in-turn supported on short stub columns. A cement floor over a tightly laid split bamboo-chicken mesh framework (on the flooring supports) is shown as an option, or, and as an alternative, we have shown a betel nut wood flooring in the extension.
- Bamboo panels made with split bamboo in bamboo frames between the main vertical members form the walling. These are plastered with a soil-cement plaster and protected from the rain by providing deep roof overhangs which are supported using external bamboo posts that are embedded in the ground.
- We have shown the house to have a hipped roof (four sided), which fares well in strong cyclonic winds. The roof cover is CGI sheets supported on a bamboo roofing structure. One could use an under layer tied to the roof of split bamboo to create an air gap which will help keep their home slightly cooler.
- This house has also been provided with an attached toilet, a cooking alcove, utensils/clothes washing area and storage.

Recommendations for construction systems		
Components	**Recommended Specifications**	**Specific Comments**
Foundations	• Random stone masonry in CM or CC (40 cm) in 1:8 cement sand mortar	
Plinth	• Raised on back fill • Plinth beam provided	
Wall	• 200 mm Stone/concrete/brick mason in 1:6 upto sill level • Ikra wall panelling in bamboo framing structure	• The vertical supports can be either grouted into the concrete pedestals provided in the plinth or, can be rested on the pedestals with a bent 8 mm rod anchoring it to the pedestals.
Wall Finish	• Ferrocement plaster on Adobe wall • cement plaster upto sillllevel	Optional: Cement based paint for external walls and lime rendering for internal walls.
Roof Structure	• Sloping roof with bamboo/timber understructure • covered with CGI sheet held down with J bolts etc to counter wind loads	
Floor	• Plain cement flooring over RCC bed on a back filled plinth. • Stabilized Soil cement flooring. and Earthen flooring.	

ML-02

This typology is applicable to Zone B

Zone B highlights: Seismic zone V: This region falls in hilly areas between 300 and 800m elevation in general, with hot and humid climate. Abundantly available materials are Bamboo and timber.

Zone B covers areas falling in the districts of:

1. West Garo Hills
2. South Garo Hills
3. North Garo Hills
4. East Garo Hills
5. South West Khasi Hills - Western borders with the Rongra block.

The Main skills recorded in this zone are:

- **Bamboo mat making**
- **Bamboo and timber framework for structures– walling, roofing, flooring, etc.**
- **Rough timber works**

MEGHALAYA

ML-02

Area Statement:

Item	Area	
	Sq.m	Sq.ft
Room 1	9.00	96.88
Room 2	9.00	96.88
Room 3	9.00	96.88
Kitchen	**9.87**	**106.24**
Storage	**4.11**	**44.24**
Toilet	**1.32**	**14.21**
Verandah 1	**5.32**	**57.26**
Verandah 2	**5.26**	**56.62**
Carpet Area	**32.13**	**345.85**
Built up Area	**56.23**	**605.26**

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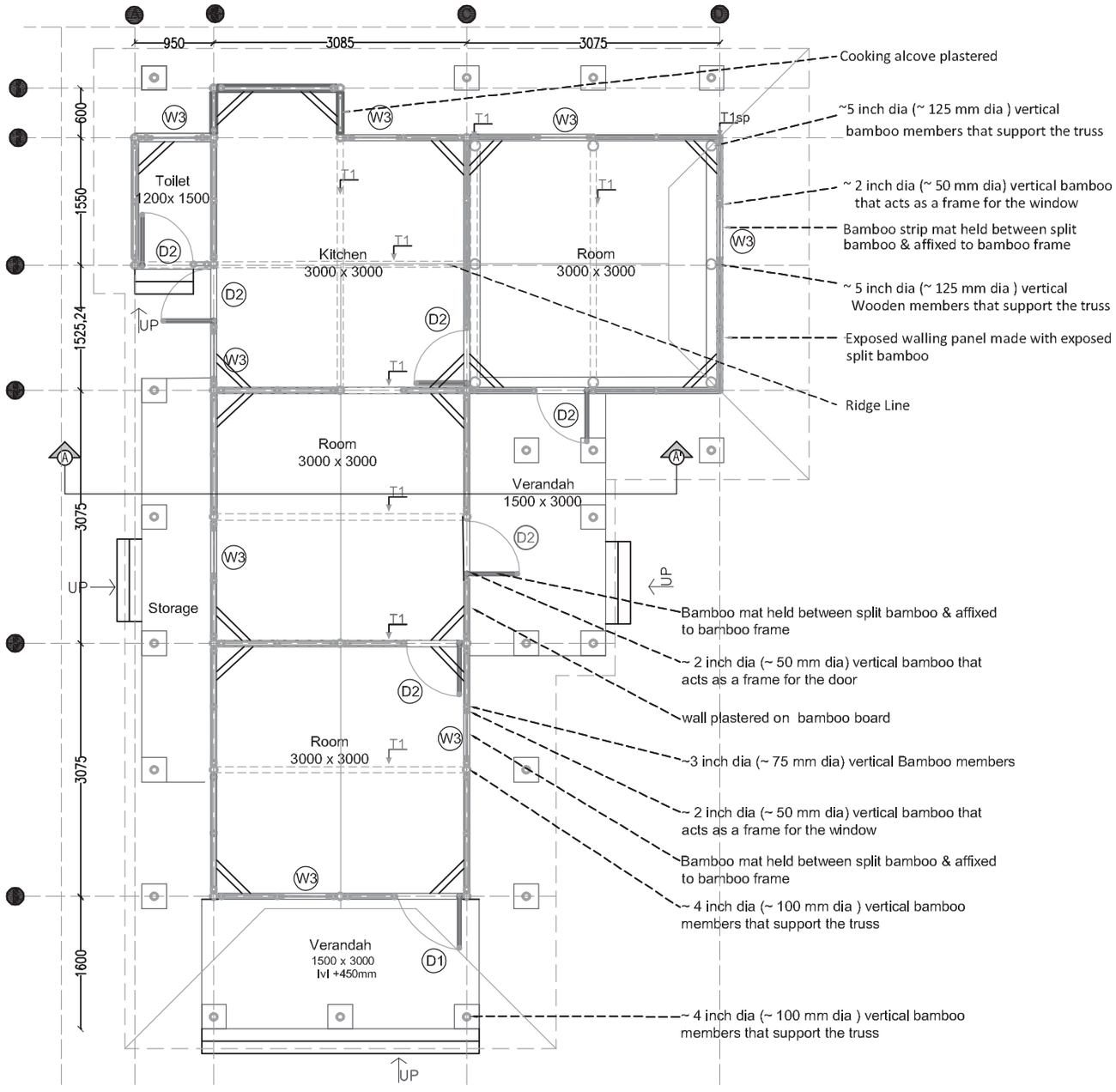
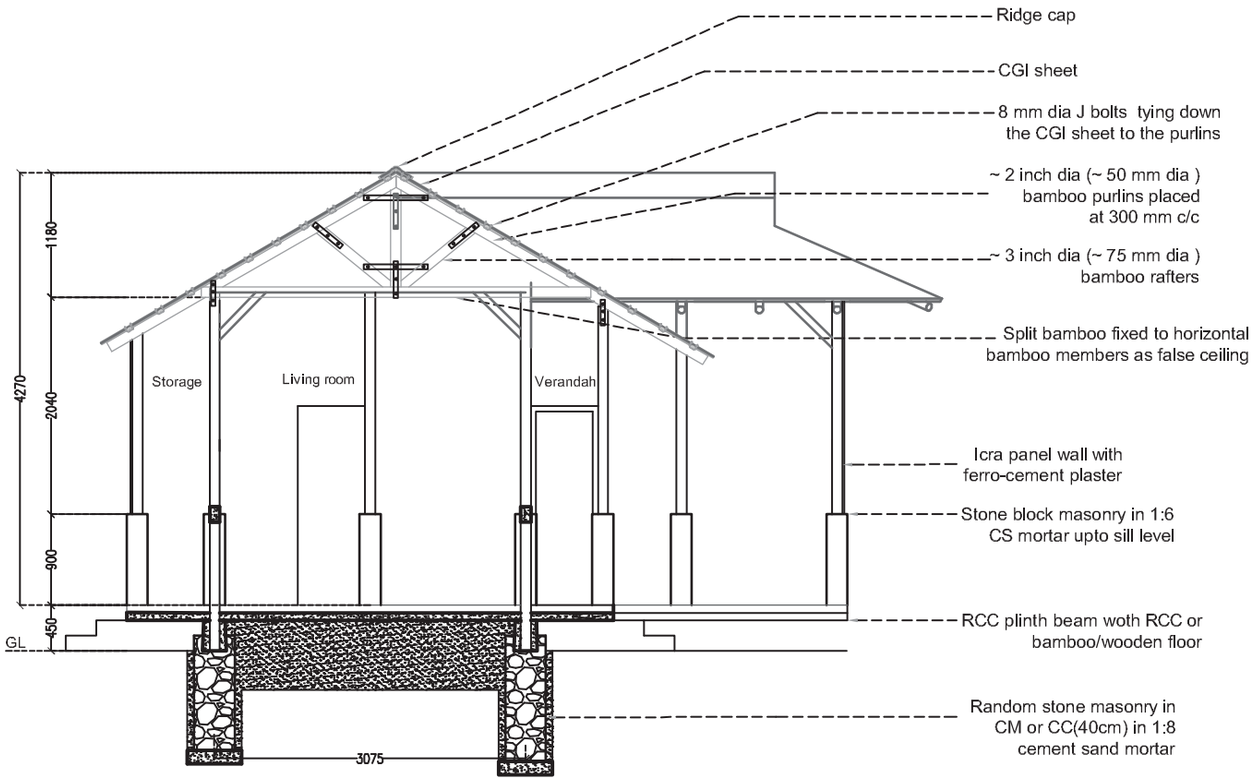


TYPICAL PLAN

ML-02



TYPICAL SECTION AA'

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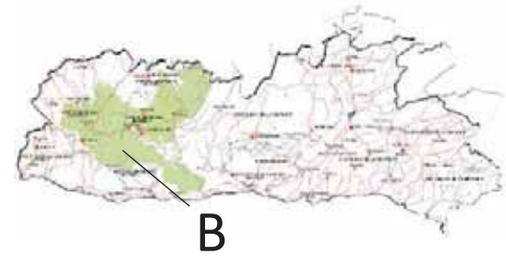
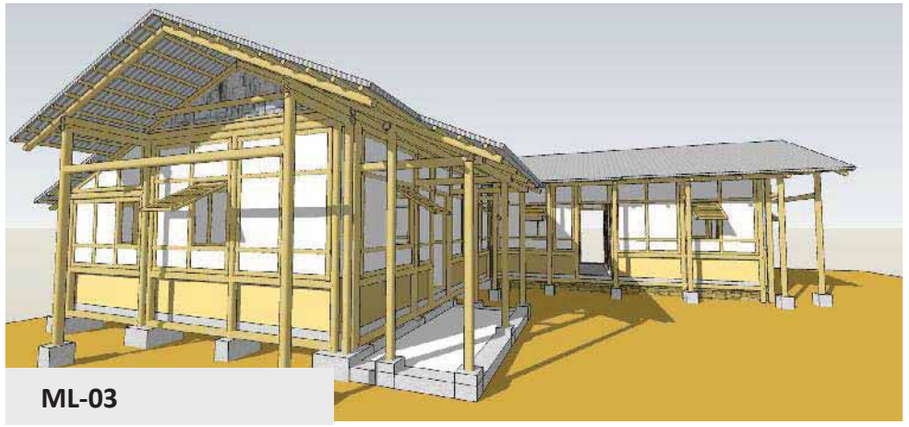
ML-02
Cost estimate



SR.NO.	ITEM OF WORK	Quantity	unit	Rate	Cost
1	Excavation				
	For stub footings (bamboo bases and raised floors)	6.0	cum		-
	Labor	4.0	mandays	150	600
2	PCC bed for column footings		cum		
	concrete (1:4:8)	1.5	cum		
	sand	0.5	cum	500	272
	aggregate	1.1	cum		-
	cement	3.2	bags	350	1,121
	Labor	2.0	mandays	150	300
3	Erection of Stub Footings				
	Steel		kg	45	-
	concrete (1:2:4)	1.9	cum		-
	sand	0.5	cum	500	274
	aggregate	1.1	cum		-
	cement	6.2	bags	350	2,181
	Labor	3.0	mandays	450	1,350
	Transport				2,500
	Brick masonry upto cill level	700.0	nos	5	3,500
4	Bamboo walling panels that is fixed on to the main bamboo frame work				
	3 inch dia Bamboos	70.0	nos	30	2,100
	Split bamboo infill	61.0	nos	100	6,100
	Plastering of walling panels	1.0	cum		-
	sand	0.8	cum	500	395
	cement	4.7	bags	350	1,629
	Labor	9.0	mandays	300	2,700
5	Making and erecting the vertical and horizontal bamboo members				
	4 inch dia Bamboos	42.0	nos	50	2,100
	3 inch dia Bamboos	45.0	nos	30	1,350
	nails & hardware	1.0	LS	1000	1,000
	Labor	4.0	mandays	300	1,200
6	Making and fixing of Doors and Windows				
	windows	3.0	nos	300	900
	doors	3.0	nos	300	900
	nails & hardware	2.0	LS	500	1,000
	Labor	12.0	mandays	300	3,600
7	Making and erecting the Bamboo roof framework				
	3 inch dia bamboos	41.0	nos	30	1,230
	2 inch dia bamboos	30.0	nos	20	600
	nails & hardware	1.0	LS	1000	1,000
	Labor	8.0	mandays	300	2,400
	Transport				2,500
8	Provision and fixing of CGI sheet roofing, inclusive of all hardware				
	CGI sheets	23.3	nos	510	11,872
	Ridge members	6.0	nos	350	2,100
	nails & hardware	1.0	LS	1000	1,000
	Labor	2.0	mandays	300	600
	Transport				2,500
9	laying of cement flooring on top of split bamboo & chicken mesh				
	cement floor	0.7	cum		-
	chicken mesh	18.0	sqm	15	270
	Split bamboo	60.0	nos	15	900
	sand	0.5	cum		-
	cement	4.2	bags	350	1,483
	Labor	4.0	mandays	450	1,800
10	Painting of doors and windows				-
	Total cost				**67,328**

MEGHALAYA



ML-03

- The house is a rectangular structure and linear in the arrangement of the interior spaces. Space for storage can be provided under the roof overhangs on the side. Verandahs to be provided in both the short sides.
- Raised bamboo flooring structure which is in-turn supported on short stub columns and a masonry plinth variant in the extension structure. A cement floor over a tightly laid split bamboo-chicken mesh framework (on the flooring supports) is shown as an option, and as a variation we have shown a cement floor on a back-filled plinth.
- Stabilised Soil Blocks form a low height walling till sill height. Bamboo panels made with split bamboo in bamboo frames between the main vertical members form the walling above sill height. These are plastered with a soil-cement plaster and protected from the rain by providing deep roof overhangs which are supported using external bamboo posts.
- This house has also been provided with an attached toilet, a cooking alcove, utensils/clothes washing area and storage.

Recommendations for construction systems		
Components	**Recommended Specifications**	**Specific Comments**
Foundations	• Random stone masonry foundation in Cement mortar or CC(40 CM) in 1:8 cement sand mortar	
Plinth	• Masonry plinth with back filled earth. • Raised floor supported on a two-layer system of primary and secondary timber members that support a wooden floor above. • Plinth beams incorporated	
Wall	• Stone block masonry upto sill level • Ikra wall panelling above sill level	
Wall Finish	• ferrocement plaster	
Roof Structure	• Sloping roofs with timber/bamboo understructure	• Treated bamboo roofing members (trusses, ties and purlins) support a roof with an angle of slope of 30 degrees
Floor	• Timber plank flooring fixed onto a timber/treated bamboo under-structure.	• Cement floor on backfilled earth in the case of a masonry plinth.

ML-03

This typology is applicable to Zone C

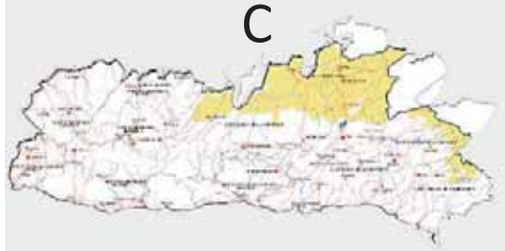
Zone C highlights: his region is characterised by raised Assam type houses and variants that use timber/bamboo posts with bamboo ikra walling.

Zone C covers areas falling in the districts of:

1. Ri-Bhoi
2. West Khasi Hills -northern hills towards Assam
3. East Khasi Hills - Northern fringes of the district
4. West Jaintia Hills -Easter borders with Assam
5. East Jaintia Hills - Eastern borders with Assam.

The Main skills recorded in this zone are:

- Bamboo mat making
- Bamboo and timber framework for structures– walling, roofing, flooring, etc.
- Carpentry



MEGHALAYA

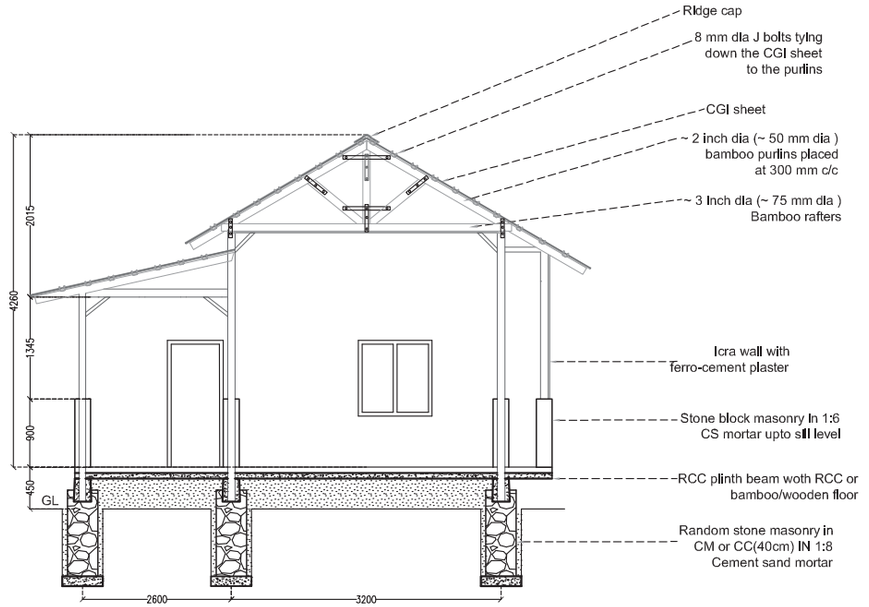
ML-03

Area Statement:

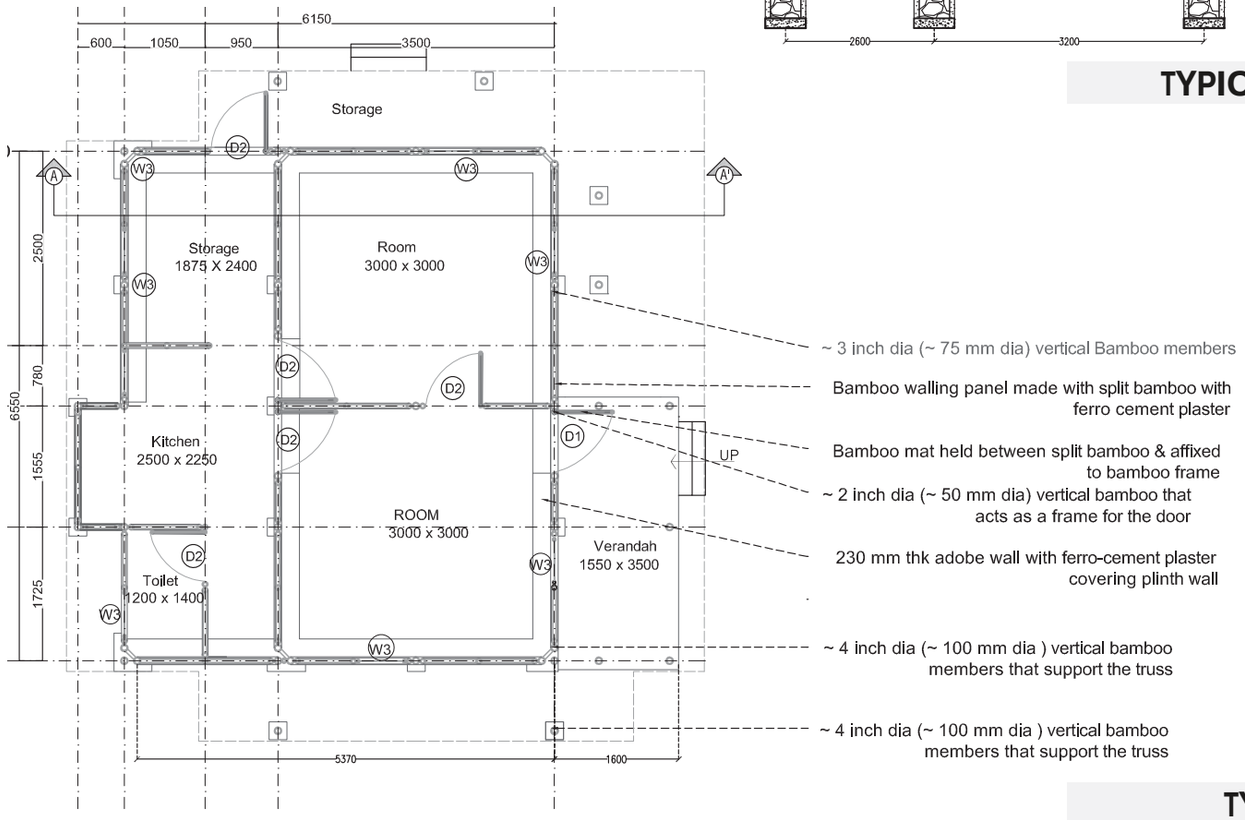
Item	Area	
	Sq.m	Sq.ft
Room 1	11.03	118.73
Room 2	11.03	118.73
Room 3	10.05	108.18
Storage	**4.58**	**49.30**
Kitchen	**5.16**	**55.54**
Toilet	**1.57**	**17.00**
Verandah	**10.00**	**107.64**
Carpet Area	**35.33**	**380.29**
Built up Area	**43.81**	**471.57**

C

MEGHALAYA



TYPICAL SECTION AA'



TYPICAL PLAN

ML-03
Cost estimate

SR.NO.	ITEM OF WORK	Quantity	Unit	Rate	Cost
1	Excavation				
	For stub footings (bamboo bases and raised floors)	3.5	cum		-
	For stub footings (bamboo bases and raised floors)	4.3	cum		-
	Labor	4.0	mandays	300	1,200
2	PCC bed for column footings and in stone plinth trenches				
	concrete (1:4:8)	1.2	cum		
	sand	0.4	cum	500	214
	aggregate	0.9	cum		-
	cement	2.5	bags	350	883
	Labor	2.0	mandays	300	600
	Transport				2,500
3	Erection of Stub Footings				
	Steel		kg	45	-
	concrete (1:2:4)	1.9	cum		-
	sand	0.5	cum	500	271
	aggregate	1.1	cum		-
	cement	6.2	bags	350	2,160
	Labor	4.0	mandays	450	1,800
	Transport				2,500
4	Construction of a Stone plinth	6.9	cum		
	concrete (1:2:4)	0.7	cum		
	sand	0.2	cum	500	101
	aggregate	0.4	cum		
	cement	2.3	bags	350	801
	Labor	2.0	mandays	450	900
5	Provision of an RCC plinth beam and sill horixontal reinforcement				
	Steel	71.9	kg	45	3,236
	concrete (1:2:4)	3.6	cum		-
	sand	1.0	cum	500	517
	aggregate	2.0	cum		-
	cement	11.8	bags	350	4,117
	Labor	4.0	mandays	450	1,800
6	Construction of CSEB walls upto cill level				-
	CSEBs	529.4	nos	5	2,647
	cement mortar	0.3	cum		-
	sand	0.2	cum		-
	aggregate	0.0	cum		-
	cement for mortar	1.5	bags		-
	cement for blocks	5.3	bags		-
	Labor	4.0	mandays	450	1,800
7	Bamboo walling panels that is fixed on to the main bamboo frame work				
	3 inch dia Bamboos	36.0	nos	30	1,080
	Split bamboo infill	39.0	nos	100	3,900
	Plastering of walling panels	0.7	cum		-
	Sand	0.6	cum	500	281
	Cement	3.3	bags	350	1,157
	Labor	9.0	mandays	300	2,700
8	Making and erecting the vertical and horizontal bamboo members				
	4 inch dia Bamboos	67.0	nos	50	3,350
	3 inch dia Bamboos	41.0	nos	30	1,230
	nails & hardware	1.0	LS	1000	1,000
	Labor	4.0	mandays	300	1,200
9	Making and fixing of Doors and Windows				
	windows	3.0	nos	300	900
	doors	4.0	nos	300	1,200
	nails & hardware	2.0	LS	500	1,000
	Labor	12.0	mandays	300	3,600
10	Making and erecting the bamboo roof framework				
	3 inch dia bamboos	40.0	nos	30	1,200
	2 inch dia bamboos	47.0	nos	20	940
	nails & hardware	2.0	LS	1000	2,000
	Labor	8.0	mandays	300	2,400
	Transport				2,500
11	Provision and fixing of CGI sheet roofing, inclusive of all hardware				
	CGI sheets	25.7	nos	510	13,102
	Ridge members	7.0	nos	350	2,450
	nails & hardware	1.0	LS	1000	1,000
	Labor	2.0	mandays	300	600
	Transport				2,500
12	laying of Plain cement flooring				
	cement floor	0.9	cum		-
	sand	0.7	cum	500	335
	cement	5.3	bags	350	1,842
	Labor	2.0	mandays	450	900
13	Plastering of walls				-
	Internal				
	cement mortar	0.1	cum		-
	sand	0.1	cum	500	54
	cement	0.6	bags	350	223
	Labor	2.0	mandays	450	900
	external				
	cement mortar	0.1	cum		-
	sand	0.1	cum	500	54
	cement	0.6	bags	350	223
	Labor	2.0	mandays	450	900
14	Painting of walls				-
	internal paint		lts	100	-
	external paint		lts	100	-
	Total cost				**84,770**

MEGHALAYA

ML-04A

This typology is applicable to Zone D

Zone D highlights: The geography of these regions is 600m in elevation in general, and forms the higher elevation of the state in Meghalaya.

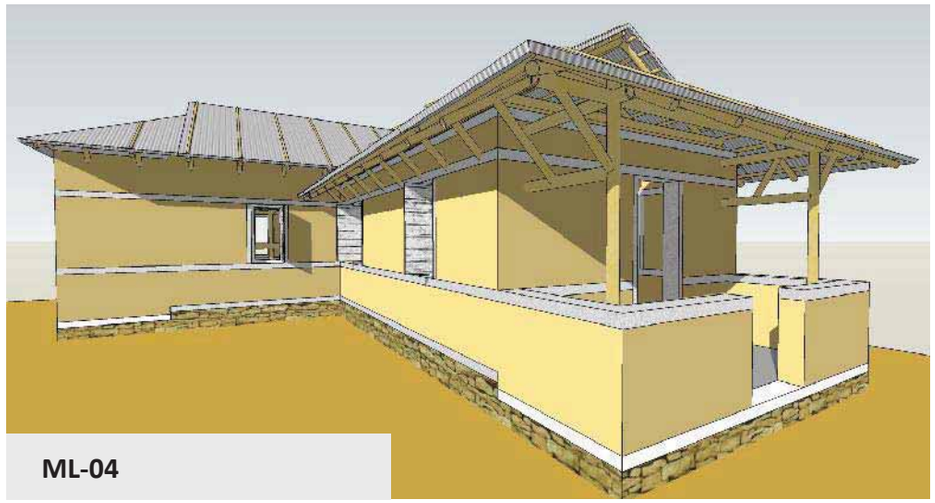
Zone D covers areas falling in the districts of:

1. **West Khasi Hills**
2. **South West Khasi Hills**
3. **Ri-Bhoi - Southern fringes bordering East Khasi Hills**
4. **East Khasi Hills**
5. **West Jaintia Hills**
6. **East Jaintia Hills .**

The Main skills recorded in this zone are:

- **Carpentry**
- **Stone masonry**
- **Bamboo mat making & bamboo framework**

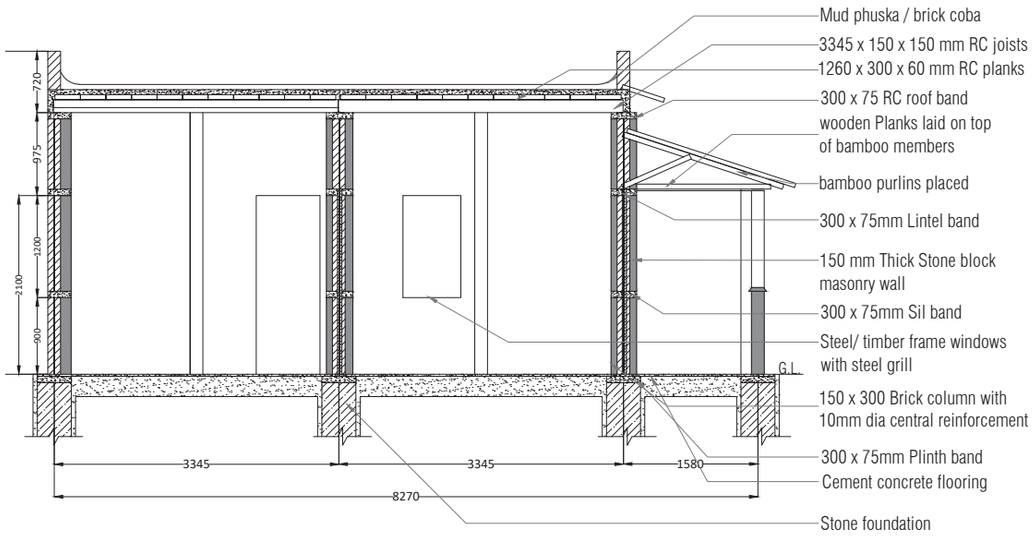
MEGHALAYA



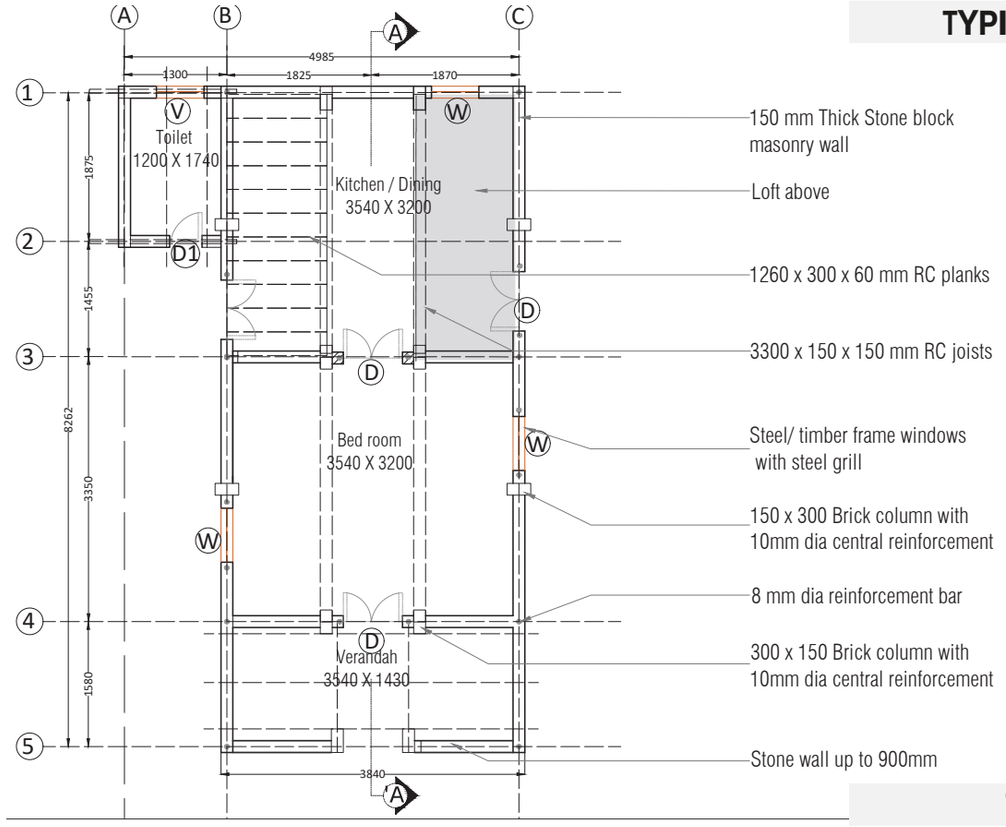
ML-04

- The design borrows heavily from certain aspects of the Khasi Oval Hut, the iconic traditional housing type of this region, without taking the obvious oval plan form. Here are some salient aspects of this prototype:
- The house is a rectangular structure preferably laid out in the SW-NW direction. Verandahs to be provided in both the short sides.
- In this prototype we have shown a raised structure on plinth beams which are in turn supported on short stub columns and a masonry plinth variant in the extension structure. A cement floor over a back-filled plinth is shown as an option, and as a variation we have shown a timber plank floor supported on stub columns.
- The walls are full height Cement Stabilised block masonry. Reinforcement bands run at plinth, sill, lintel and roof springing point levels.
- The roof is essentially a gable roof form with 30° slopes, to ensure greater resistance to strong winds which this zone experiences, especially in the pre-monsoon months of March and April. Taking inspiration from other traditional structures across the state, an additional set of bamboo members are provided above the CGI roofing sheets and tied down with the rafters below, securing the sheets from getting dislodged due to gale force winds. One could create a loft to store materials or serve as an extra sleeping area.
- This house has also been provided with an attached toilet, a cooking alcove, utensils/clothes washing area and storage.

Recommendations for construction systems		
Components	**Recommended Specifications**	**Specific Comments**
Foundations	• Random stone masonry foundation in Cement mortar or CC(40 CM) in 1:8 cement sand mortar	
Plinth	• Masonry plinth with back filled earth. . • Plinth beams incorporated	
Wall	• 200 mm thk Stone block / hollow concrete block masonry upto lintel level with Horizontal RCC bands incorporated	
Wall Finish	• Ferrocement plaster	
Roof Structure	• Sloping roofs with timber/bamboo understructure	• Treated bamboo roofing members (trusses, ties and purlins) support a roof with an angle of slope of 30 degrees
Floor	• Cement concrete flooring	• Cement floor on backfilled earth in the case of a masonry plinth.



TYPICAL SECTION AA'



TYPICAL PLAN

ML-04A

Area Statement:

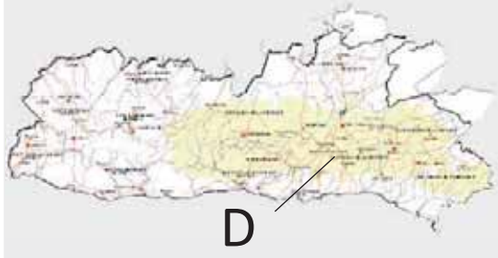
Item	Area	
	Sq.m	Sq.ft
Bed Room	11.31	121.74
Kitchen & Dining	11.31	121.74
Toilet	1.98	21.31
Veranda	**5.06**	**54.47**
Carpet Area	**25.11**	**270.28**
Built up Area	**34.97**	**376.42**

MEGHALAYA

ML-04B
Alternative layout

Area Statement:

Item	Area	
	Sq.m	Sq.ft
Bed Room	10.98	118.19
Kitchen & Dining	10.98	118.19
Toilet	1.84	19.81
Veranda	**4.90**	**52.74**
Carpet Area	**24.47**	**263.40**
Built up Area	**35.55**	**382.66**



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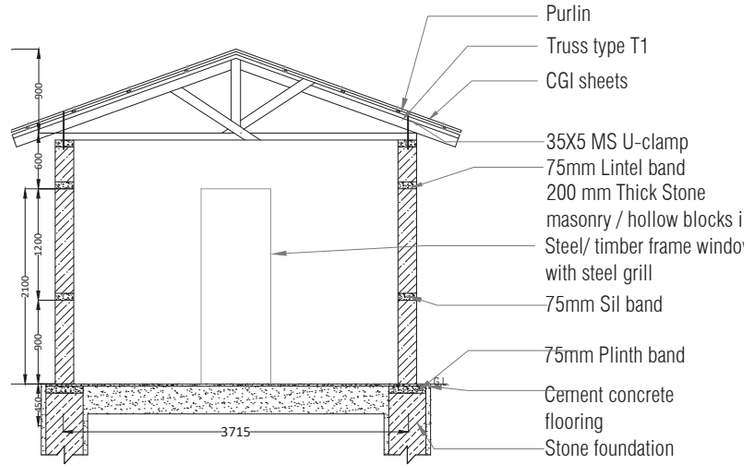
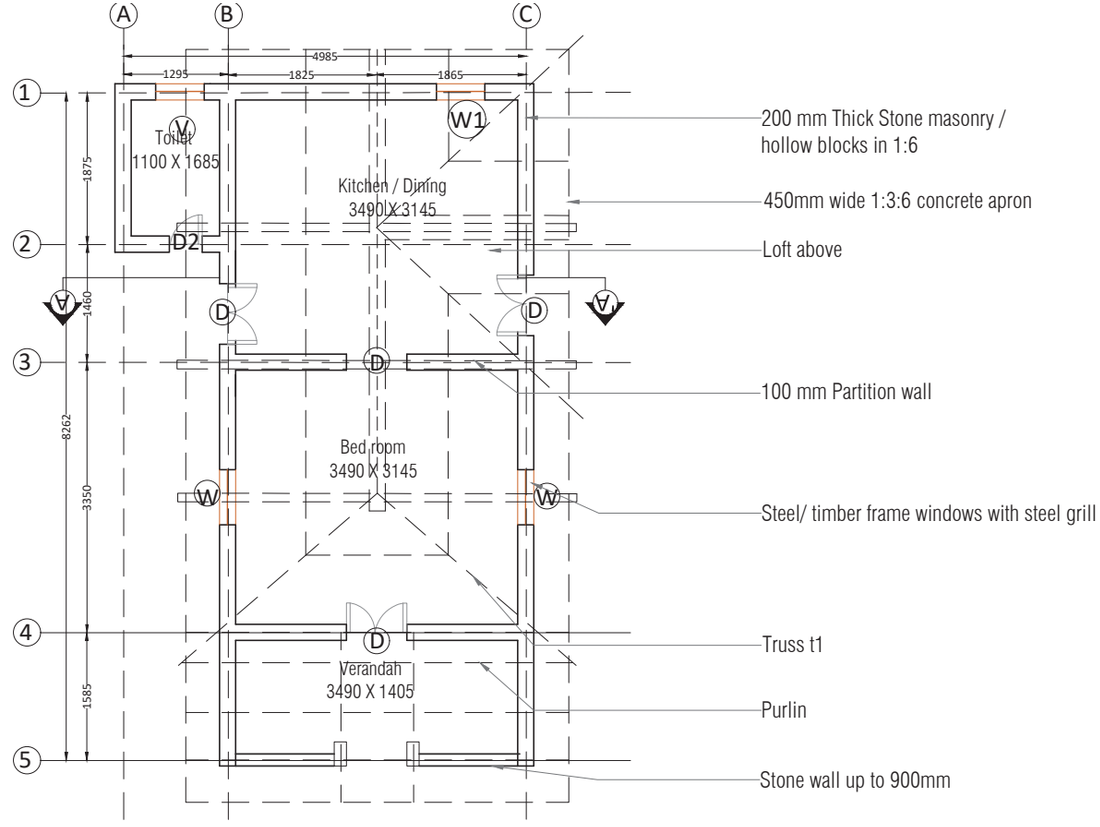
TYPICAL SECTION AA'



TYPICAL PLAN



ML-04
Cost estimate

SR.NO.	ITEM OF WORK	Quantity	Unit	Rate	Cost
1	Excavation				
	For plinth	10.0	cum		-
	For stub footings (bamboo bases and raised floors)	0.4	cum		-
	Labor	5.0	mandays	300	1,500
2	PCC bed in foundation		cum		
	concrete (1:4:8)	1.7	cum		
	sand	0.6	cum	500	305
	aggregate	1.2	cum		-
	cement	3.6	bags	350	1,259
	Labor	2.0	mandays	300	600
	Transport				2,500
3	Erection of Stub Footings				
	concrete (1:2:4)	0.2	cum		-
	sand	0.1	cum	500	31
	aggregate	0.1	cum		-
	cement	0.7	bags	350	249
	Labor	1.0	mandays	450	450
4	Construction of a Stone plinth	12.7	cum		-
	concrete (1:2:4)	1.3	cum		-
	sand	0.4	cum	500	184
	aggregate	0.7	cum		-
	cement	4.2	bags	350	1,463
	Labor	4.0	mandays	450	1,800
	Transport				2,500
5	Provision of an RCC plinth, sill, lintel and wall top reinforcement bands				-
	Steel	189.0	kg	45	8,505
	concrete (1:2:4)	1.9	cum		-
	sand	0.6	cum	500	280
	aggregate	1.1	cum		-
	cement	6.4	bags	350	2,224
	Labor	2.0	mandays	450	900
	Transport				2,500
6	Construction of 200mm thk stone masonry	1.8	cum	3000	5,400
	Labor	14.0	mandays	450	6,300
7	Making and fixing of Doors and Windows				
	windows	4.0	nos	300	1,200
	doors	2.0	nos	300	600
	nails & hardware	2.0	LS	500	1,000
	Labor	12.0	mandays	300	3,600
8	Making and erecting the vertical and horizontal bamboo members				
	4 inch dia Bamboos	48.0	nos	50	2,400
	nails & hardware	1.0	LS	1000	1,000
	Labor	8.0	mandays	300	2,400
9	Making and erecting the Bamboo roof framework				
	3 inch dia bamboos	45.0	nos	30	1,350
	2 inch dia bamboos	72.0	nos	20	1,440
	nails & hardware	1.0	LS	1000	1,000
	Labor	8.0	mandays	300	2,400
10	Provision and fixing of CGI sheet roofing, inclusive of all hardware				
	CGI sheets	26.7	nos	510	13,614
	Ridge members	6.7	nos	350	2,333
	nails & hardware	1.0	LS	1000	1,000
	Labor	2.0	mandays	300	600
	Traansport				2,500
11	laying of Plain cement flooring				
	cement floor	1.2	cum		-
	sand	0.9	cum	500	447
	cement	7.0	bags	350	2,455
	Labor	2.0	mandays	450	900
12	Plastering of walls				-
	Internal				
	cement mortar		cum		-
	sand	0.0	cum	500	-
	cement	0.0	bags	350	-
	external				
	cement mortar	0.2	cum		-
	sand	0.1	cum	500	62
	cement	0.7	bags	350	254
	Labor	2.0	mandays	450	900
13	Painting and polishing				-
	Oil for bamboos		lts	100	-
	Paint for plastered surfaces		lts	100	-
	Painting of doors and windows		lts		-
	Total cost				**82,405**

MEGHALAYA

ML-05

This typology is applicable to Zone E

Zone E highlights: This region has hilly tracts below 600m in elevation and occupies lowest elevation in the state of Meghalaya. It is amongst the humid areas of state because of very high rainfall. Bamboo, thatch and betel nut grow well in this region.

Zone E covers areas falling in the districts of:

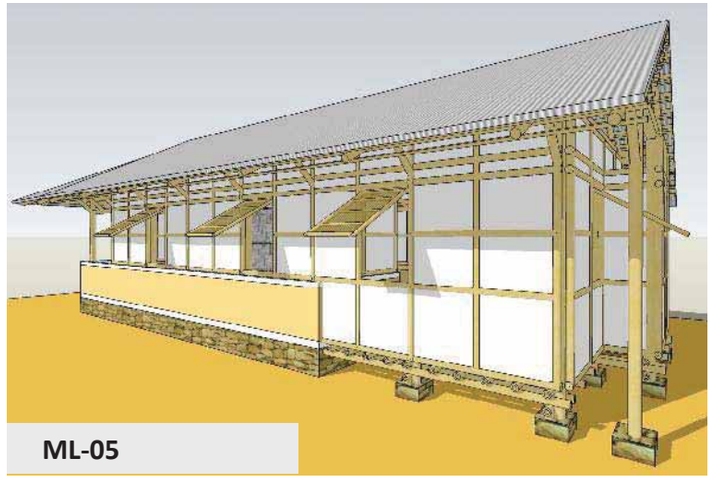
1. **South West Khasi Hills**
2. **East Khasi Hills**
3. **West Jaintia Hills**
4. **East Jaintia Hills**

The Main skills recorded in this zone are:

- **Bamboo mat making**
- **Bamboo framework**
- **Carpentry, with additional skills in fashioning palm wood for flooring and reapers.**

E

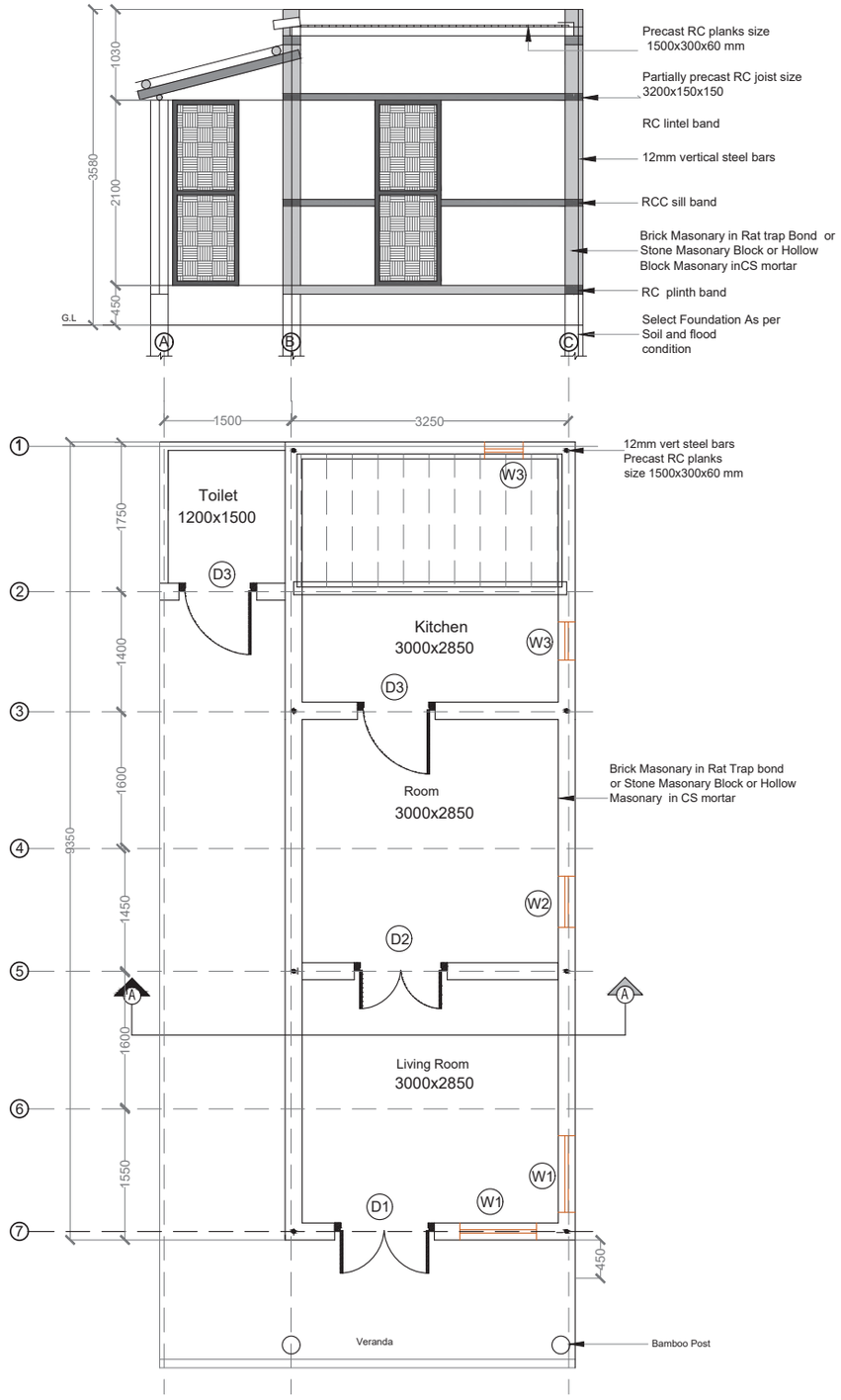
MEGHALAYA



ML-05

- The design reflects the strong bamboo architecture of this zone and takes some inspiration from Jaintia Huts. Here are some salient aspects of this prototype:
- The house is a rectangular structure preferably laid out in the SW-NW direction. Verandahs are to be provided in both a short and a long side.
- Both a masonry plinth and raised bamboo flooring framework has been used in this structure and its extension. The main unit has a cement floor, while the extension sees the use of a palm wood (thlu) floor.
- Low walls till sill height are provided on the outer faces. A bamboo structure is housed within this. Cross bracing of every vertical support is done to provide greater stability to the structure. The entire structure is tied at various levels with horizontal bamboo members.
- Modular bamboo wall panels with split bamboo held within a bamboo framework and plastered from both sides form the walling surface above sill level. The rear has a simple bamboo mat held between split bamboos.
- Here too the roof has slopes of 30° and is a hipped roof towards the entry and has a gable end to the rear. Bamboo brackets support the weight of a deeper overhang. You could use an under ceiling layer tied to the roof of split bamboo to create an air gap to keep your home slightly cooler, or create a loft to store materials or serve as an extra sleeping area.
- This house has also been provided with an attached toilet, a cooking alcove, utensils/clothes washing area and storage.

Recommendations for construction systems		
Components	**Recommended Specifications**	**Specific Comments**
Foundations	• Random stone masonry foundation in Cement mortar or CC(40 CM) in 1:8 cement sand mortar	
Plinth	• Masonry plinth with back filled earth. . • Plinth beams incorporated	
Wall	• Brick masonry in Rat trap bond or stone masonry block or hollow concrete block masonry in cement sand mortar • Alternatively Ikar wall panelling can be done with timber framing • CGI sheet panelling with insultaion • Stone block upto sill level	
Wall Finish	• Ferrocement plaster	
Roof Structure	• Sloping roofs with timber/bamboo understructure	• Treated bamboo roofing members (trusses, ties and purlins) support a roof with an angle of slope of 30 degrees
Floor	• Cement concrete flooring	• Cement floor on backfilled earth in the case of a masonry plinth.



ML-05

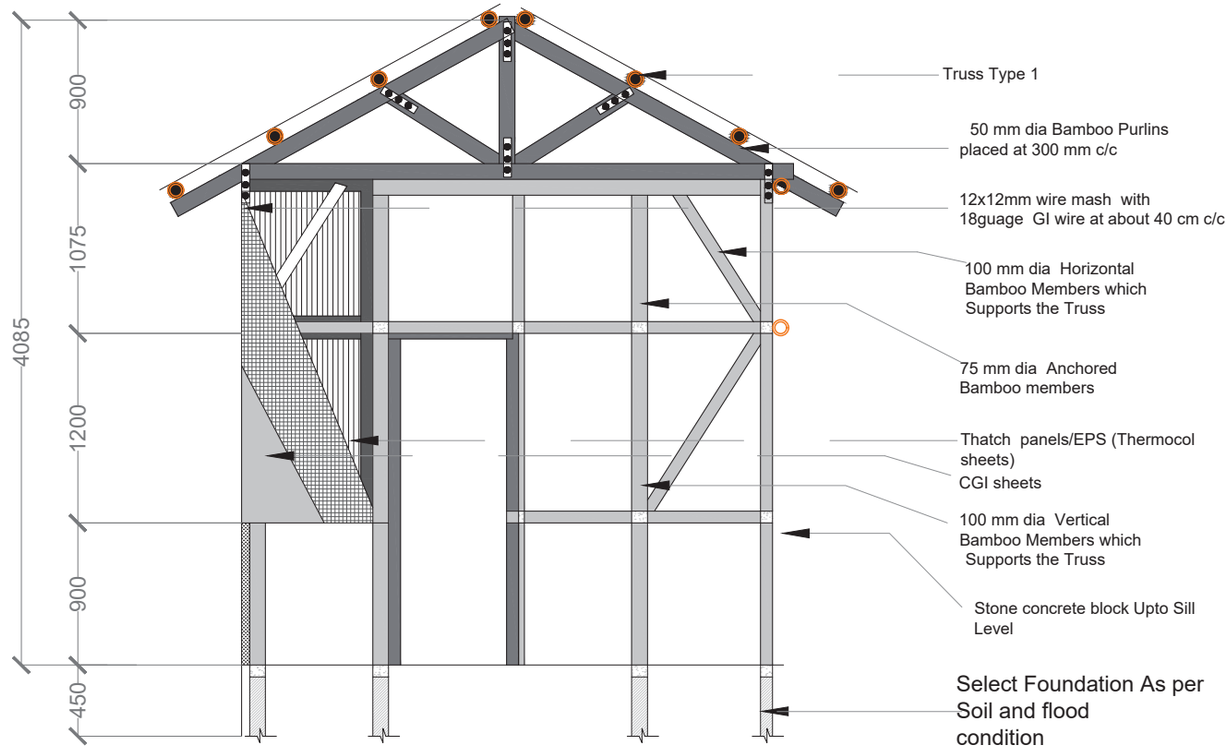
Area Statement:

Item	Area	
	Sq.m	Sq.ft
Living	8.55	92.03
Room	8.55	92.03
Kitchen	8.55	92.03
Toilet	**2.13**	**22.93**
Veranda	**18.32**	**197.20**
Carpet Area	**28.59**	**307.74**
Built up Area	**52.84**	**568.77**

E

MEGHALAYA

ML-05
Alternative
Roofing system



E

MEGHALAYA

ML-05
Cost estimate

SR.NO.	ITEM OF WORK	Quantity	Unit	Rate	Cost
1	Excavation				
	For plinth	6.9	cum		-
	Labor	4.0	mandays	300	1,200
2	PCC bed in foundation		cum		
	concrete (1:4:8)	1.7	cum		
	sand	0.6	cum	500	309
	aggregate	1.3	cum		-
	cement	3.6	bags	350	1,275
	Labor	2.0	mandays	300	600
	Transport				2,500
3	Erection of Stub Footings				
	concrete (1:2:4)		cum		-
	sand	0.0	cum	500	-
	aggregate	0.0	cum		-
	cement	0.0	bags	350	-
4	Construction of a Stone plinth	7.0	cum		-
	concrete (1:2:4)	0.7	cum		-
	sand	0.2	cum	500	101
	aggregate	0.4	cum		-
	cement	2.3	bags	350	804
	Labor	4.0	mandays	450	1,800
	Transport				2,500
5	Provision of an RCC plinth, sill, lintel and wall top reinforcement bands				-
	Steel	103.2	kg	45	4,646
	concrete (1:2:4)	0.9	cum		-
	sand	0.3	cum	500	129
	aggregate	0.5	cum		-
	cement	2.9	bags	350	1,023
	Labor	2.0	mandays	450	900
	Transport				2,500
6	Construction of Stabilised adobe walls				-
	adobe blocks	686.9	nos		-
	cement mortar	0.2	cum		-
	sand	0.2	cum	500	77
	aggregate	0.0	cum		-
	cement for mortar	0.9	bags	350	318
	cement for blocks	3.6	bags	350	1,250
	Labor	6.0	mandays	450	2,700
7	Bamboo walling panels that is fixed on to the main bamboo frame work				
	CGI sheets	20.0	nos	510	10,200
	3 inch dia Bamboos	40.0	nos	30	1,200
	Split bamboo infill	40.0	nos	100	4,000
	Plastering of walling panels	0.6	cum		
	Sand	1.8	cum	500	919
	Cement	10.8	cum	350	3,788
	Labor	9.0	mandays	300	2,700
8	Making and fixing of Doors and Windows				
	windows	4.0	nos	300	1,200
	doors	3.0	nos	300	900
	nails & hardware	2.0	LS	500	1,000
	Labor	12.0	mandays	300	3,600
9	Making and erecting the vertical and horizontal bamboo members				
	4 inch dia Bamboos	53.0	nos	50	2,650
	nails & hardware	1.0	LS	1000	1,000
	Labor	8.0	mandays	300	2,400
10	Making and erecting the Bamboo roof framework				
	3 inch dia bamboos	21.0	nos	30	630
	2 inch dia bamboos	39.0	nos	20	780
	nails & hardware	1.0	LS	1000	1,000
	Labor	8.0	mandays	300	2,400
11	Provision and fixing of CGI sheet roofing, inclusive of all hardware				
	CGI sheets	27.5	nos	510	14,025
	Ridge members	6.7	nos	350	2,333
	nails & hardware	1.0	LS	1000	1,000
	Labor	2.0	mandays	300	600
	Transport				2,500
12	laying of Plain cement flooring				
	cement floor	0.9	cum		-
	sand	0.7	cum	500	336
	cement	5.3	bags	350	1,847
	Labor	2.0	mandays	450	900
13	Plastering of walls				-
	Internal				
	cement mortar		cum		-
	sand	0.0	cum		-
	cement	0.0	bags	350	-
	external				
	cement mortar	0.1	cum		-
	sand	0.1	cum	500	50
	cement	0.6	bags	350	204
	Labor	2.0	mandays	450	900
14	Painting and polishing				-
	Oil for bamboos		lts	100	-
	Paint for plastered surfaces		lts	100	-
	Total cost				**89,695**

E

MEGHALAYA

pahal
Prakriti Hunar Lokvidya

Odisha

ODISHA

Odisha is the 9th largest state of India. The state is divided into 30 districts, 58 sub-divisions, 314 blocks and 103 urban local bodies. The varied geography of Odisha includes extensive hill ranges clad with forests, rolling uplands, coastal plains, extensive river systems and brackish waters and mangroves. Based on homogeneity, physiographical characteristics and ecosystems of the region, Odisha has four major regions-Coastal plains in the east, Central plateaus, Northern uplands and South western hilly region. The hills and mountains of Eastern Ghats cover more than half of the area of Odisha, with steep eastern slope running through.

The diverse set of conditions in Odisha pose different constraints and, in some cases, incentives for the rural housing sector. The state can be classified into 4 different zones, each with its own predominant characteristics. The zones may not necessarily be contiguous- there will be similar conditions present in different parts of the state. There are parameters for zoning of housing practices in Odisha such as Vulnerability to disaster, Geography and climate and Prevalent building practices.

ZONE A

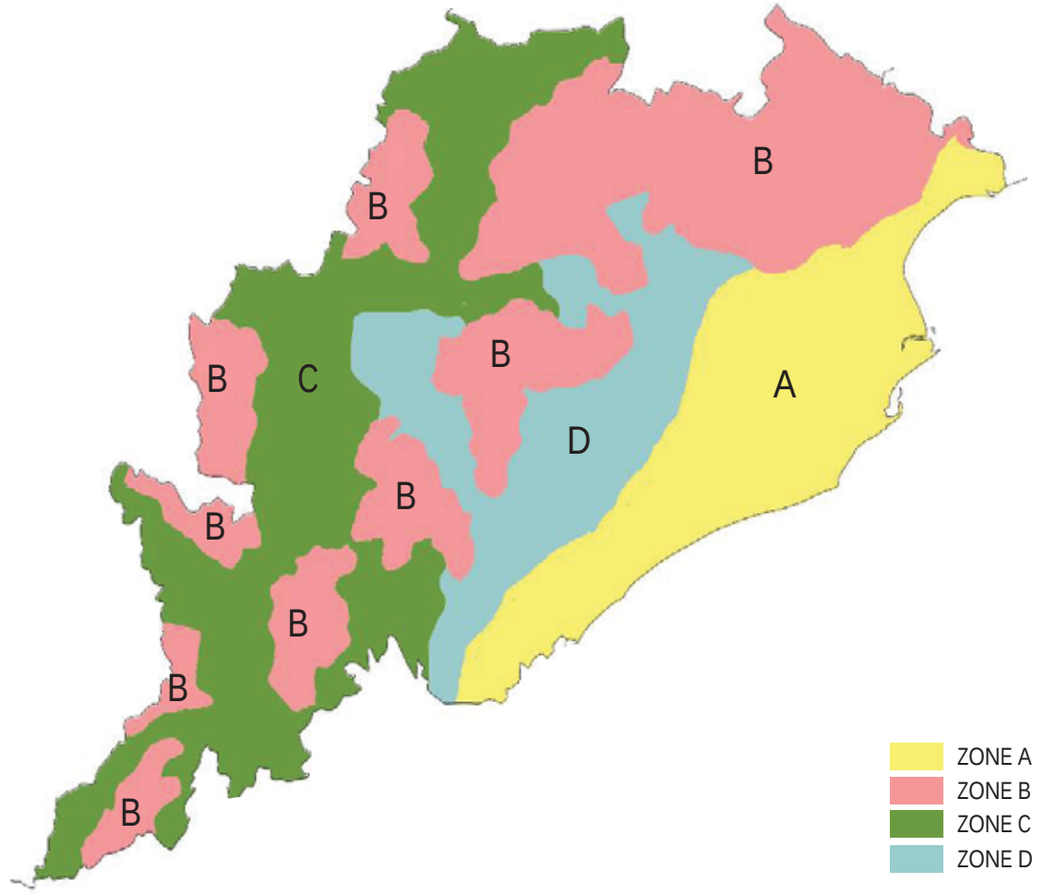
The coastal plains till about 50km inland from the sea-covering Kendrapara, Jagatsinghpur, Puri, Ganjam and parts of Cuttack, Jajpur and Balasore. Very high vulnerability to wind and cyclone and flooding-prone to cyclonic storm surges accompanied with strong rain and high velocity winds in the range of 30 m/s(severe cyclonic storm) to 45 m/s(very severe storm).

ZONE B

The coastal plains covering Kendrapara, Jagatsinghpur, Puri, Balasore, Bhadrak Cuttack and parts of Cuttack.The deltaic river basins of Mahanadi, Burha Balanga, Baitarani, Brahmani and Subarnarekha are the most flooding prone areas. Vulnerability to regular flooding 2-4 times in a year resulting in inundation till about 300mm above plinth for upto 24 hours. There is severe flooding once in 1 or 2 years resulting in inundation of more than 900mm above plinth level for a period of 24-72 hours.

ZONE C

Predominantly consist of hilly areas of the Schedule V districts of Odisha – Mayurbhanj, Sundargarh, Koraput, Rayagada, Nagarangpur and Malkangiri and also parts of Kandhamal, Gajapati and Keonjhar. Although, there is a good rainy spell from June to September, there is high water run-off die to the hilly terrain and therefore mostly no flooding. There is low risk of earthquakes.



ZONE D

Predominant parts of Koraput, Nabarangpur, Kalahandi, Bolangir, Baragarh, Sambalpur, Jharsuguda and Sundergarh. Mostly, this region has low vulnerability to earth quake and high velocity winds. However, the region is vulnerable to heat waves as it experiences very hot and dry summers, with temperatures shooting above 45 degrees in Balangir, Sambalpur, Jharsuguda and Koraput. Also, there is risk of eco-system degradation and physical displacement from industrialization.

ODISHA HOUSING TYPOLGIES AT A GLANCE

TYPOLOGY	APPLICABLE HOUSING ZONES	TOTAL AREA Sq.m/Sq.ft	
OD-01	Zone A	40.79 sq.m	439.06 sq.ft
OD-02	Zone B	42.23 sq.m	454.56 sq.ft
OD-03	Zone C	69.00 sq.m	742.72 sq.ft
OD-04	Zone B	56.00 sq.m	602.78 sq.ft
OD-05	Zone C	50.79 sq.m	546.70 sq.ft
OD-06	Zone D	41.75 sq.m	449.40 sq.ft

OD-01

OD-02

OD-03

OD-04

OD-05

OD-06

OD-01

This typology is applicable to Zone A
Zone A highlights: very high vulnerability to wind and cyclone and flooding- prone to cyclonic storm surges accompanied with strong rain and high velocity winds in the range of 30 m/s(severe cyclonic storm) to 45 m/s(very severe storm).

Zone A comprises of the following districts:

1. Kendrapara
2. Puri
3. Gunjam
4. Cuttack
5. Jajpur
6. Balasore

Resources Available:

- Alluvial and lateritic soil Stable soil such as 'moorum'.

ODISHA

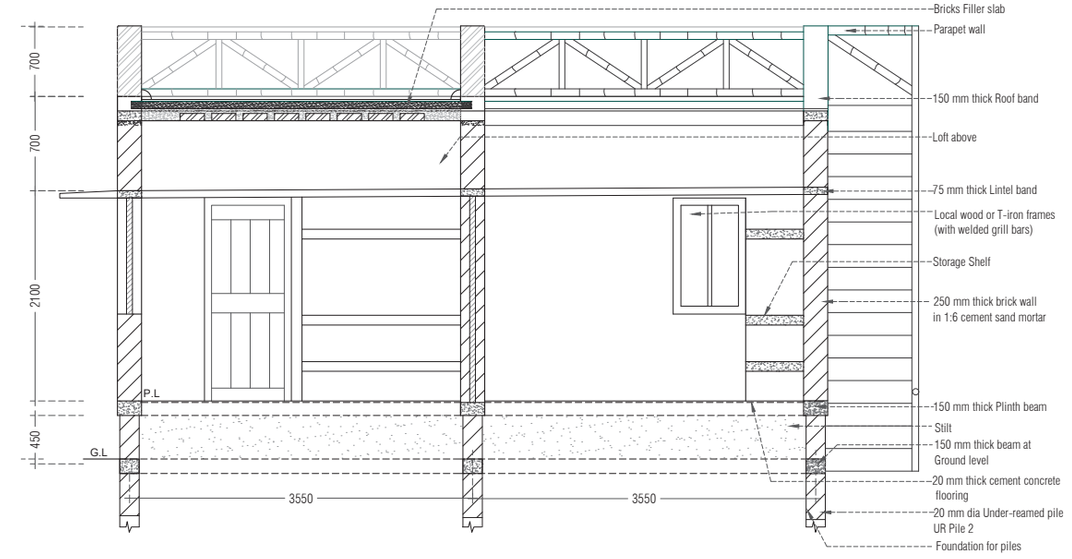
OD-01

- 2 rooms staggered in plan, so as to create 2 semi-open spaces at front & back.
- The verandah is kept small as the staircase can be incorporated externally. low height walls provided for the kitchen enclosure.
- Precast roofing technology.
- Foundation is to be provided for both rooms at the initial stage.
- Walls are mostly constructed in brick masonry in cement mortar.

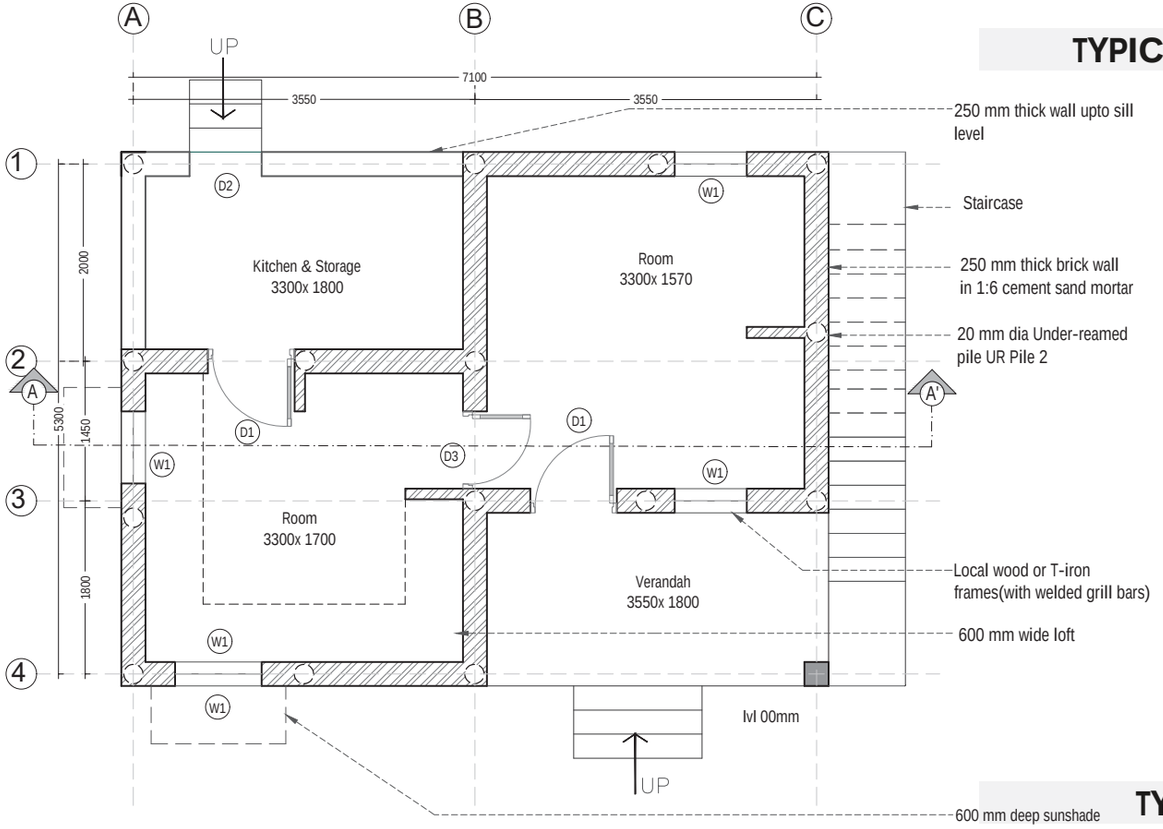
Recommendations for Built Form		
Plan Layout	**Plinth/Floor**	**Roof Profile**
Mostly 2 rooms with a veranda on the front.There is a large concentration of tribes in the region and there is a clear preference for mud houses on foundations of random rubble masonry. In some cases, stepped footings in brick masonry are used. 300-450mm thick mud walls with colourful plasters, often derived from natural sources, are a common practice.	High Plinth level recommended	Light Weight Roof Recommended. Clay tiles on a wood and bamboo understructure are commonly used in roofs.

Recommendations for construction systems		
Components	**Recommended Specifications**	**Specific Comments**
Foundations	• Reinforced brick pedestal • The pedestal is provided at not more than 6' spacing. The structure is tied at the plinth level with a minimum 6" deep plinth beam.	• Brick pedestal of 10"x10" size and 5' depth, reinforced with 1 No. 12mmbar. • In case of cohesive soils, such as clayey/ silty clay/ clayey silt, reinforced.
Plinth	• Minimum 30 cm and 30 cm projected from the walls to protect the foundation and provide stability to the structure.	
Wall	• 2 brick thick column with rat trap bonded brick wall . • Reinforcing bars embedded in brick masonry at the corners of all the rooms	• Fly ash bricks of minimum 35 kg/cm2 strength in 1:4 cement mortar. Seismic bands provided at sill level, lintel level and ceiling level.
Wall Finish	• No wall finish required	
Roof Structure	• Brick filler slab	• RCC filler slab 150mm thick using brick filler, provided as a pair of bricks

OD-01



TYPICAL SECTION AA'



TYPICAL PLAN

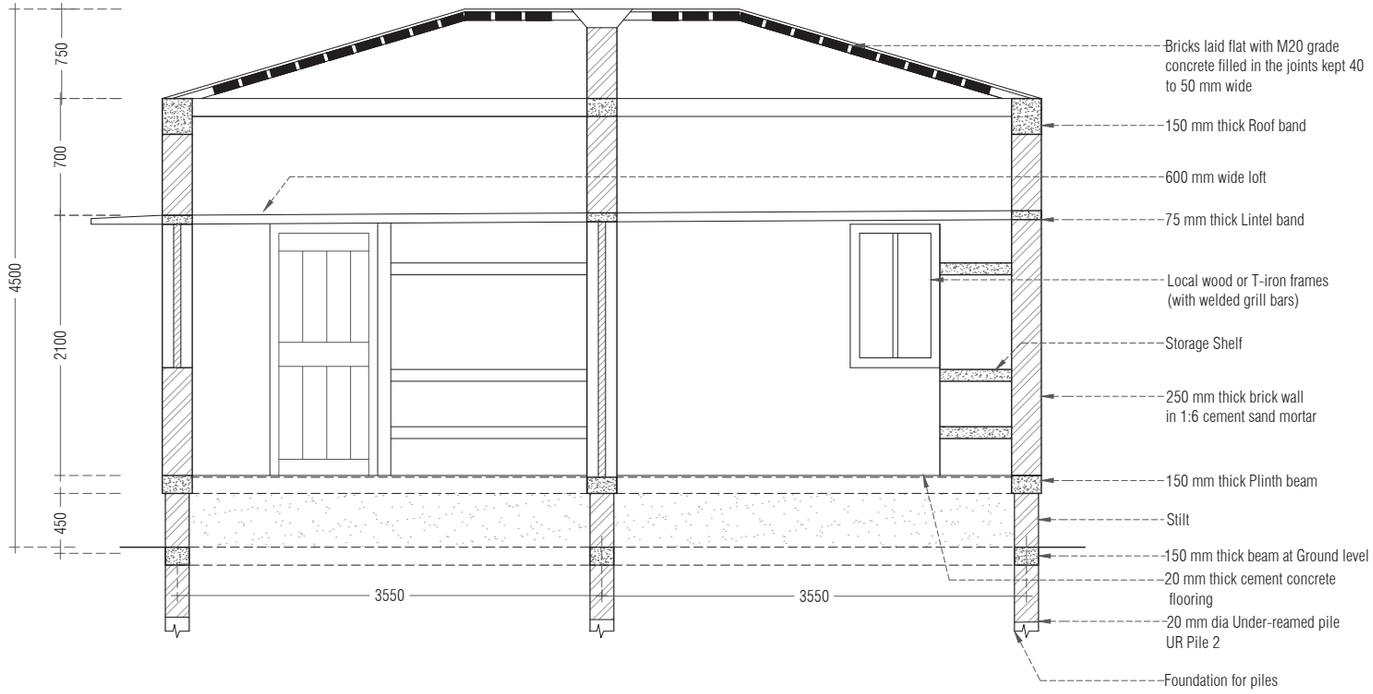
Area Statement:

Item	Area	
	Sq.m	Sq.ft
Room 1	9.75	104.95
Room 2	9.90	106.56
Kitchen & Storage	5.94	63.94
Verandah	**6.39**	**68.78**
Carpet Area	**27.23**	**293.10**
Built up Area	**40.79**	**439.06**

ODISHA

OD-01

ODISHA



SECTION AA' - ALTERNATE ROOFING

S.No	Item	Quantity	Unit	Rate	Amount
1	Excavation for brick pedestal 1.2m depth	15	cu.m	80	1200
2	Brickwork with burnt clay bricks in foundation upto plinth				
2a	Brick pedestal in cement mortar 1:4	1.5	cu.m	3000	4500
2b	Brick wall between ground level and plinth beam in cement mortar 1:6	3.5	cu.m	2700	
2c	Brick Khoa 0.75mx0.75m, 75mm thick	1	cu.m	1800	1800
3	Brickwork in superstructure using Flyash bricks of min wet compressive strength of 50 kg/cq.cm - in rat-trap bond, in cement mortar 1:4	17	cu.m	3200	54400
4	Plain Cement Concrete in foundation				
4a	Mix 1:4:8	0.6	cu.m	2700	1620
4b	Mix 1:2:4	0.2	cu.m	3000	600
5	Reinforced cement concrete of 1:1.5:3 mix in superstructure				
5a	Plinth beam of 0.25mx0.25m size	1.7	cu.m	4500	7650
5b	Sill level band	0.5	cu.m	4500	2250
5c	Lintel level band	0.5	cu.m	4500	2250
5d	Roof level band	0.5	cu.m	4500	2250
5e	Front verandah roof	0.5	cu.m	4500	2250
5f	Concrete core of 100mmx100mm in corners and mid span of walls	0.7	cu.m	3000	2100
6	Steel				
6a	In Plinth beam	165	kg	58	9570
6b	In Sill band	33	kg	58	1914
6c	In lintel band	33	kg	58	1914
6d	In front verandah roof	45	kg	58	2610
6e	single 12mm bar in concrete core	62	kg	58	3596
7	Ferrocement channel roof using precast channels of width 750mm, thickness 25mm and 3500mm length, cast in 1:2 cement mortar, reinforced with chicken mesh and weldmesh				
7a	Precast ferrocemement channel	8	No.	2000	16000
7b	In-fill concrete 1:2:4 in valleys between channels	1.5	Cu.m	3000	4500
7c	Manpower for lifting and placing				

OD-01
cost estimate

Cost breakup

Item	Cost (INR)
Excavation	1,200/-
Brickwork with burnt clay bricks in foundation up to plinth	6,300/-
Brickwork in superstructure	54,400/-
PCC Foundation	2,220/-
RCC 1:1.5:3	18,750/-
Steel	23,604/-
Ferrocement Channel Roof	20,500/-
Openings	13,300/-
Flooring	16,800/-
Total	**157,854/-**

ODISHA

OD-01
Cost estimate

	channels and finishing in-situ valley concrete				
	Skilled mason	2	Mandays	500	1000
	Labour	15	Mandays	250	3750
8	Openings				
8a	precast RCC door-window frames 60mmx100mm	22	R.M	115	2530
8b	Door shutter - solid core panel door 35mm thick	2.2	sq.m	1500	3300
	Window shutter - local timber	0.15	cu.m	50000	7500
9	Flooring				
	Rooms - CC tiles 300x300x15 on a 20mm cement mortar bed, sub-base of compacted brick bats	20	sq.m	450	9000
	Verandah - Cement Concrete flooring - base floor of 1:2:4 concrete and finishing layer 0f 1:2 cement mortar	12	sq.m	650	7800
				Total	**157854**
				cost/sq.m	**4510**

ODISHA

259

OD-02

- RCC frame structure on pile foundations with 300mm grade beam and 150mm lintel bands are constructed.

Recommendations for Built Form		
Plan Layout	**Plinth/Floor**	**Roof Profile**
Rectangular structure and liner in the arrangement of their interior spaces. Entry to the building is from longer side. Open to sky verandah is provided in one long side. Future expansion proposed vertically. Future expansion proposed vertically.	High Plinth level recommended.	Light Weight Roof Recommended.

Recommendations for construction systems		
Components	**Recommended Specifications**	**Specific Comments**
Foundations	• Alternatively, the earthen plinth can be plastered with a cement-sand (by volume of soil) • RCC grade beam of 1:1.5:3 mix.	• Toe wall in brick masonry in cement mortar 1:6 till plinth level. • Alternatively, laterite blocks can be used as strip footing.
Plinth		
Wall	• Rat-trap bond masonry in 1:4 cement-mortar using burnt clay bricks of minimum 35 kg/cm2 strength. 3" thick RCC bands to be provided at sill, lintel and roof level.	• The frame is braced with diagonal bamboo from plinth to attic level at wall corners.
Wall Finish	• The wall is plastered with a mud plaster made with clayey soil, sand, straw, dung and rice husk ash.	• Wherever affordable, the external plaster can be a cement-sand plaster
Roof Structure	• Precast RCC planks of size 1500 x 300 x 30mm placed adjacent to each other supported on RCC joist 150 x 150mm (upto a length of 3.5m) and wall.	• Corrugated Galvanized Iron sheet of minimum 0.35mm thickness tied to bamboo understructure through J bolts with galvanized and bitumen washers.
Roof Cover	• Country Tiles with Timber Understructure.	• Woven reed mats can be used below the tiles as false ceiling for thermal insulation.

OD-02

This typology is applicable to Zone B

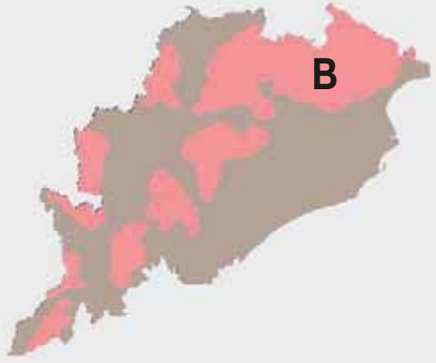
Zone B highlights: Vulnerability to regular flooding 2-4 times in a year resulting in inundation till about 300mm above plinth for upto 24 hours. There is severe flooding once in 1 or 2 years resulting in inundation of more than 900mm above plinth level for a period of 24-72 hours.

Zone B comprises of the following districts :

1. Kendrapara
2. Jagatsinghpur
3. Puri
4. Balasore
5. Bhadrak Cuttack
6. Parts of Cuttack

Resources Available:

- Flat tracks of alluvial soil River deltas of varied sizes formed by Mahanadi, Burha Balanga, Baitarani, Brahmani Subarnarekha and Rushikulya

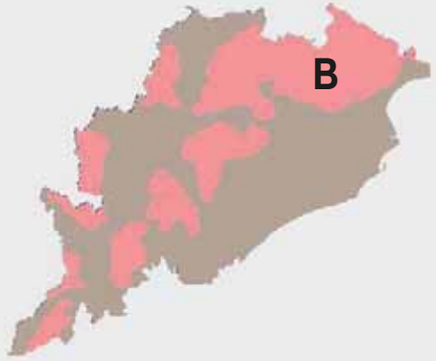


ODISHA

OD-02

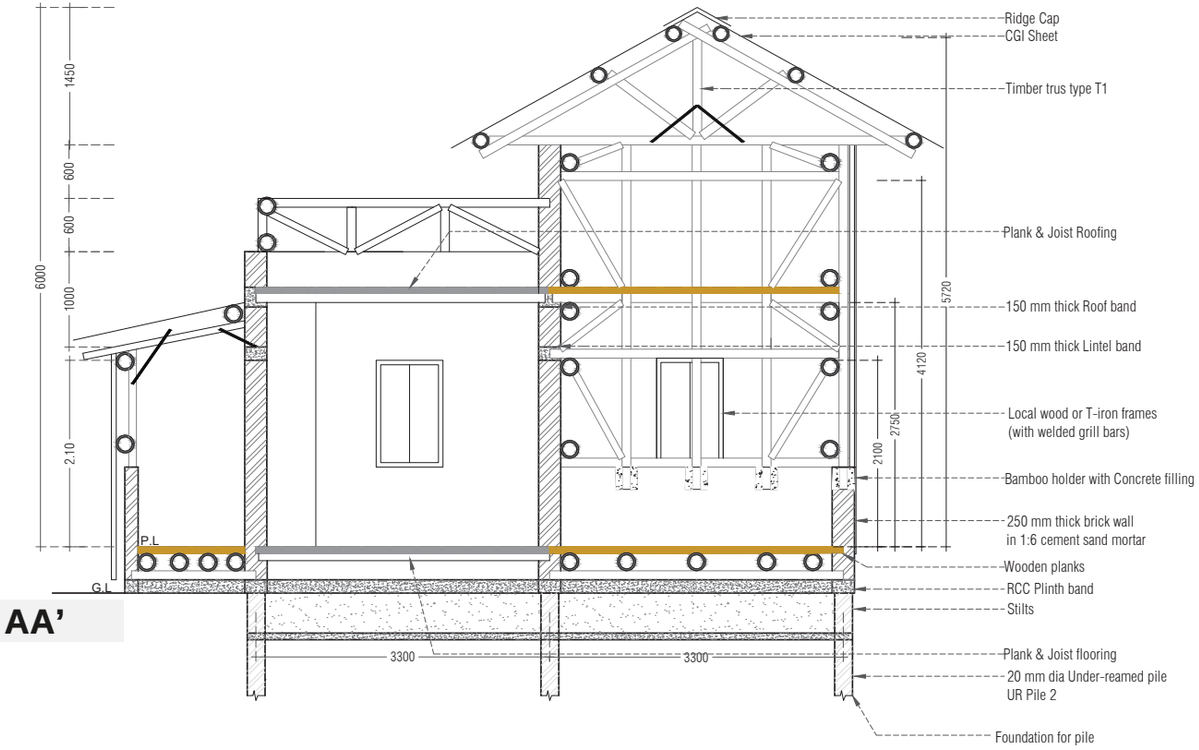
Area Statement:

Item	Area	
	Sq.m	Sq.ft
Room 1	9.30	100.10
Room 2	9.30	100.10
Kitchen	6.10	65.66
Toilet	**1.97**	**21.21**
Verandah	**7.41**	**79.76**
Carpet Area	**27.64**	**297.52**
Built up Area	**42.23**	**454.56**

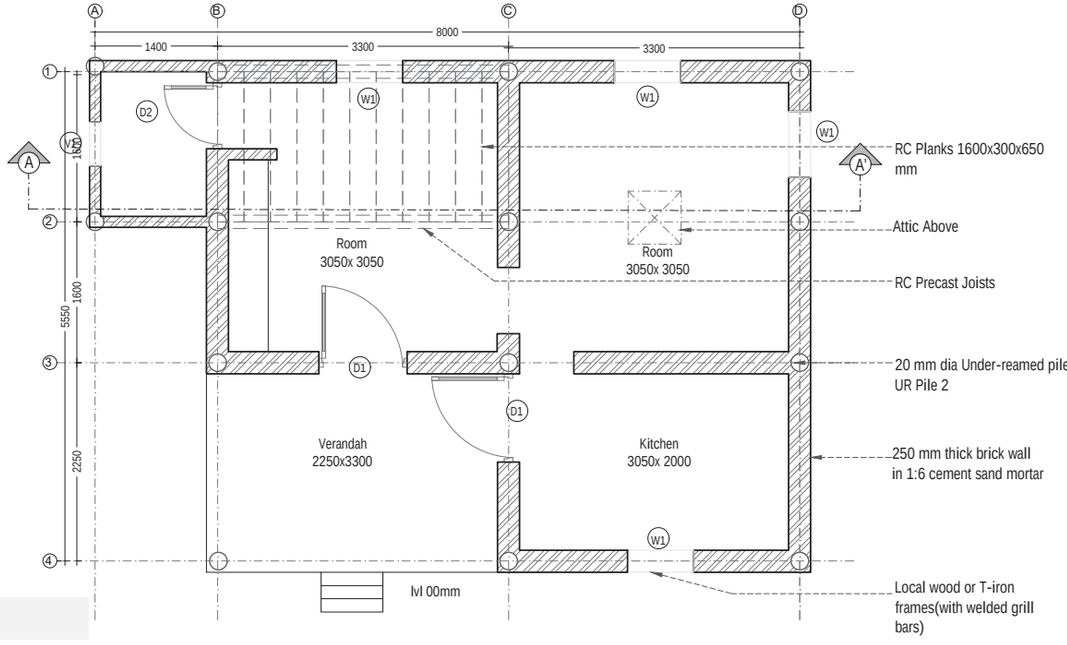


ODISHA

TYPICAL SECTION AA'



TYPICAL PLAN

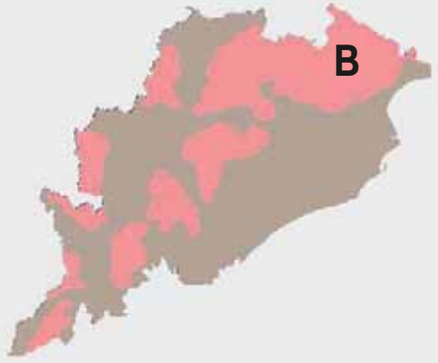


S.No	Item	Quantity	Unit	Rate	Amount
1	Excavation				
	For both rooms with pile foundation	12	cu.m	80	960
	For kitchen,verandah and toilet	3	cu.m	80	240
3	Sand fill and compaction	2	cu.m	450	900
4	Concrete work				
4a	PCC 75mm thick in foundation masonry, Mix 1:4:8	0.75	cu.m	2700	2025
4b	Mix 1:2:4 in concrete base 0.1x0.1x0.45 to support bamboo posts	0.1	cu.m	2700	270
5	RCC work, mix 1:1.5:3				
5a	Plinth beam, 0.25mx0.15m	1	cu.m	4500	4500
5b	Lintel band, 75mm thick	0.25	cu.m	4500	1125
5c	Filler slab over one room with bricks used as filler material	1.4	cu.m	5500	7700
5d	Precast piles of section 0.15mx0.15mx3m, with a 0.5mx0.5m flange	12	No.	1000	12000
6	Brickwork in cement mortar				
6a	Brickwork in 1:6 cement mortar in between piles upto plinth	3.5	cu.m	3000	10500
6b	Brickwork upto plinth in 1:6 CM for verandah and toilet	2.4	cu.m	3000	7200
6c	Brickwork 0.25m thick in superstructure in 1:4 cement mortar	8.7	cu.m	3500	30450
6d	Half brickwork till 600mm height in cement mortar 1:6	10	sq.m	550	5500
6e	Brickwork in parapet	0.3	cu.m	2500	750
7	Reinforcement steel				
7a	Steel in Plinth beam	132	kg	58	7656
7b	Steel in Lintel band	16	kg	58	928
7c	Steel in filler slab roof	72	kg	58	4176
8	Wattle and daub wall - bamboo frame and weave with mud plaster				
8a	75-100mm dia bamboo - for main frame in rooms, kitchen and verandah				
	Vertical frame	16	No.	130	2080
	Horizontal bamboo at attic level and top of kitchen	4	No.	130	520
	For diagonal ties	6	No.	130	780

OD-02
Cost estimate

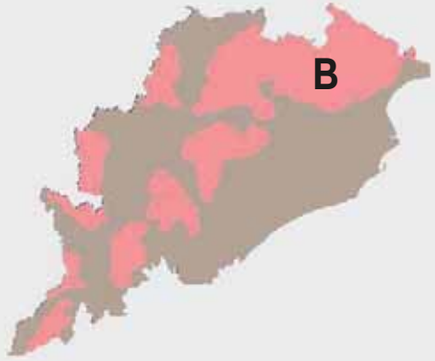
Cost breakup

Item	Cost (INR)
Foundation	18,056/-
Flooring	36,950/-
Walls	63,034/-
Attic & Roof	30,806/-
Doors & Windows	9,242/-
Total	**158,088/-**



ODISHA

OD-02
Cost estimate



ODISHA

8b	75-100mm dia bamboo for Woven mat for walls in room and kitchen	32	No.	130	4160
8c	Nails and hardware		lumsum		1500
9	Plastering bamboo wall - 1.5 m high, total surface area 15sq.m, 100mm thick				
9a	Clayey soil for mud plaster	3.5	cu.m	500	1750
9b	Cement for stabilization of soil for external plaster	4	bags	350	1400
9c	Manpower for plastering	8	mandays	300	2400
10	Attic floor				
10a	75-100mm dia bamboo				
	Primary beam of bundled bamboo	2	No.	130	260
	Secondary beams at 0.6m spacing	3	No.	130	390
10b	50-60mm dia bamboo				
	Bamboo lattice work for attic floor	5	No.	100	500
11	CGI sheet gable roof over room and verandah with bamboo understructure				
11a	Bamboo for roof understructure				
	75-100mm bamboo for rafter (sloping)	4	No.	130	520
	75-100mm bamboo for vertical support of rafter	3	No.	130	390
	50-60mm bamboo for purlins	8	No.	130	1040
11b	GCI sheet roof - 0.5mm thick for room				
	size 2740 x 900 (9'x3')	9	No.	500	4500
11c	GCI sheet roof - 0.5mm thick for verandah and kitchen				
	size 2133 x 900 (7'x3')	9	No.	400	3600
11d	Nails and hardware		lumsum		1000
12	Manpower for bamboo structure and roof				
	Main frame for wall,roof and attic				
	Artisan/carpenter	4	Mandays	500	2000
	Labour	6	Mandays	300	1800
	Lattice work for walls and attic	15	Mandays	350	5250
13	Doors and windows				
13a	precast RCC door-window frames 60mmx100mm	9.5	R.M	115	1092.5
13b	Door shutter - solid core panel door 35mm thick	3.5	sq.m	1500	5250
13c	Window shutter - local timber	0.03	cu.m	50000	1500
13d	Bamboo jaali of 0.75mx0.75m, made of bamboo splits and framed by bamboo	4	No.	200	800
13e	Manpower for installation	2	mandays	300	600
14	Flooring				
14a	Rooms - CC tiles 300x300x15 on a 20mm cement mortar bed, sub-base of compacted brick bats	20	sq.m	450	9000
14b	Verandah - Cement Concrete flooring - base floor of 1:2:4 concrete and finishing layer 0f 1:2 cement mortar	7.5	sq.m	650	4875
14c	Earthen floor using red clayey soil stabilized with rice husk ash	15	sq.m	150	2250
				Total	**158087.5**
				cost/sq.m	**3755**


OD-03

- 1 room is proposed for construction in rat-trap bong masonry,with a flat RCC filler slab as an accessible roof.
- Masonry is tied together with RCC at the plinth & lintel level.

Recommendations for Built Form		
Plan Layout	**Plinth/Floor**	**Roof Profile**
Mostly 2 rooms with a veranda on the front. 300-450mm thick mud walls with colourful plasters, often derived from natural sources, are a common practice.		Clay tiles on a wood and bamboo understructure are commonly used in roofs.

Recommendations for construction systems		
Components	**Recommended Specifications**	**Specific Comments**
Foundations	• In areas where soil with minimum 10T/sq.m bearing capacity is found at shallow depths, strip foundations in brick masonry 2'6" wide at base may be used.	• The structure is tied at the plinth level with a minimum 6" deep plinth beam.
Plinth		
Wall	• 250 mm thick earthen walls in traditional cob technique. • 400 mm RR masonry upto sill level	• The frame is braced with diagonal bamboo from plinth to attic level at wall corners.
Wall Finish	• The wall is plastered with a mud plaster made with clayey soil, sand, straw, dung and rice.	• Wherever affordable, the external plaster can be a cement-sand plaster.
Roof Structure	• Sloping roofs with timber/bamboo understructure	• Primary rafters to rest on wall plate fixed to a brick course or a cement concrete base.
Roof Cover	• CGI sheets	
Floor	• 30mm concrete base 1:4:8 on flat brick soling, finished with cement screed.	• Earthen floor using red clayey soil stabilized with rice husk ash or 7%.

OD-03

This typology is applicable to Zone C

Zone C highlights: There is a good rainy spell from June to September, there is high water run-off die to the hilly terrain and therefore mostly no flooding. There is low risk of earthquakes.

Zone C comprises of the following districts:

1. Mayurbhanj,
2. Sundargarh,
3. Koraput,
4. Rayagada,
5. Nagarangpur
6. Malkangiri
7. Parts of Kandhamal, Gajapati and Keonjhar.

Resources Available:

- Red and yellow soil with good clayey fraction.

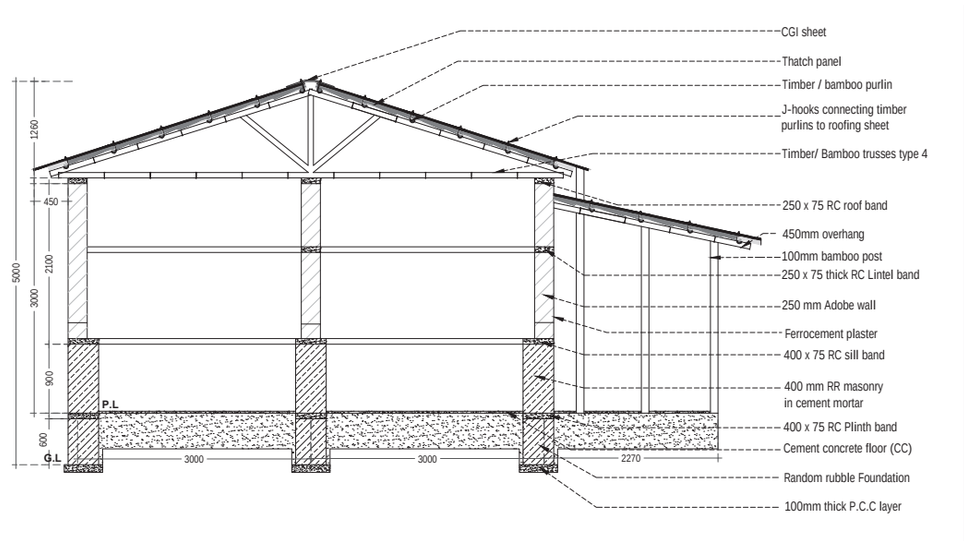
ODISHA

OD-03

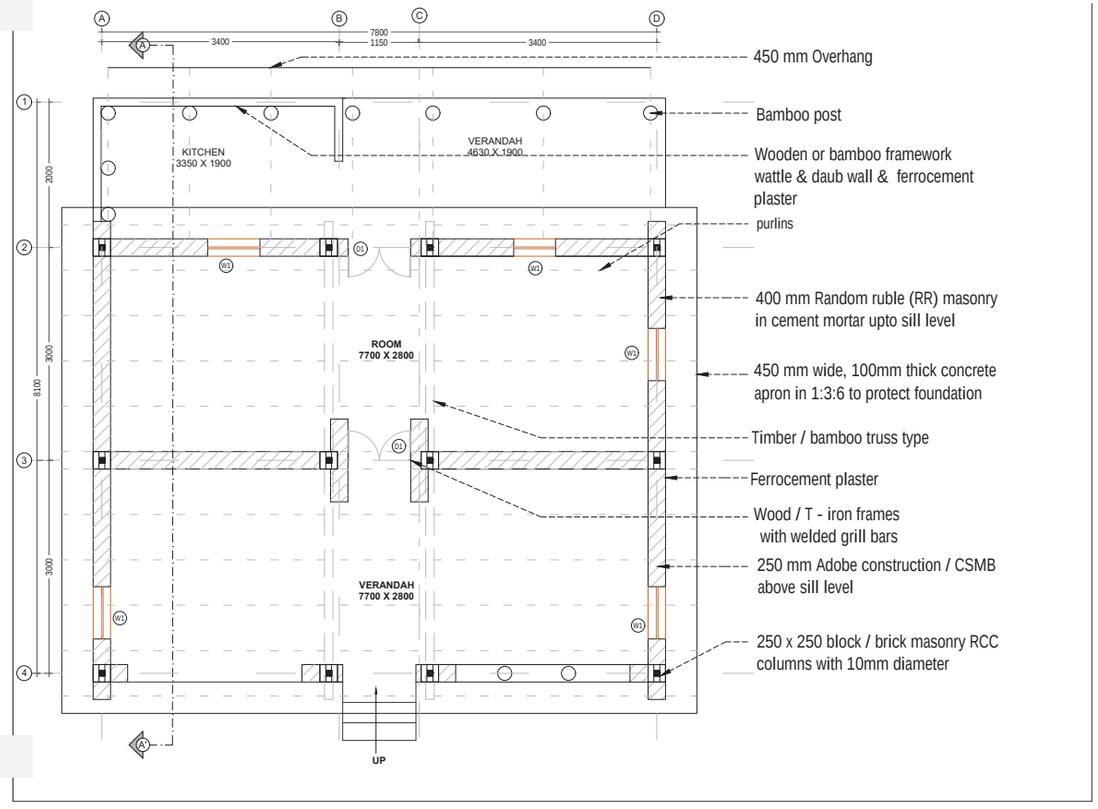
Area Statement:

Item	Area	
	Sq.m	Sq.ft
Room	21.55	231.96
Front Veran-dah	22.00	236.81
Kitchen	6.00	64.58
Back Veran-dah	**9.00**	**96.88**
Carpet Area	**28.00**	**301.39**
Built up Area	**69.00**	**742.72**

ODISHA



TYPICAL SECTION AA'

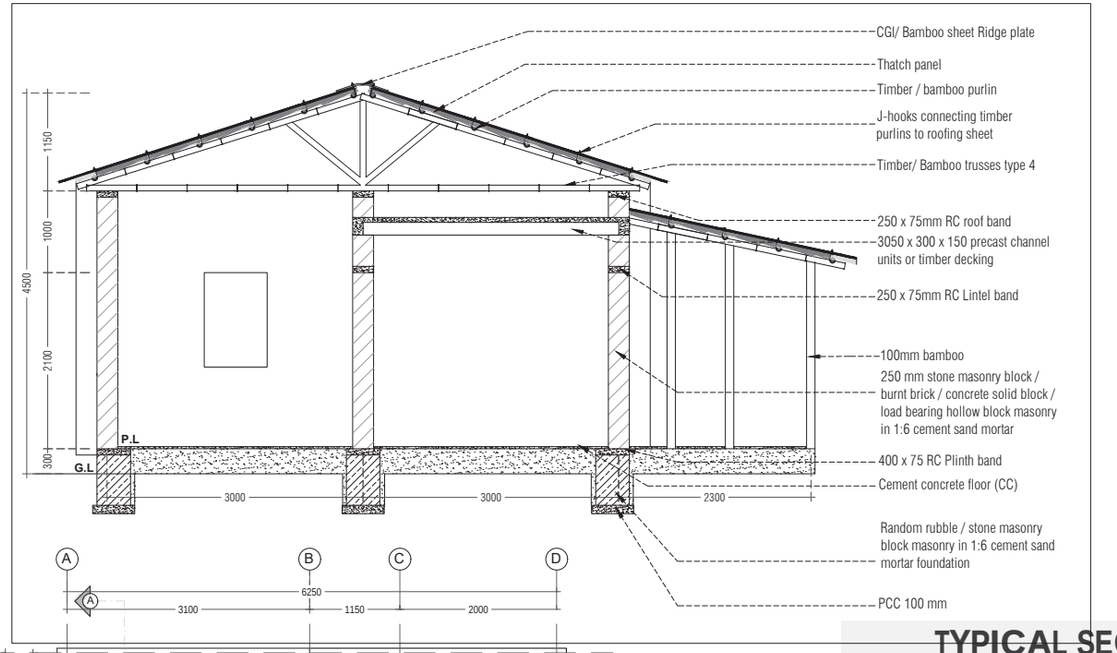


TYPICAL PLAN

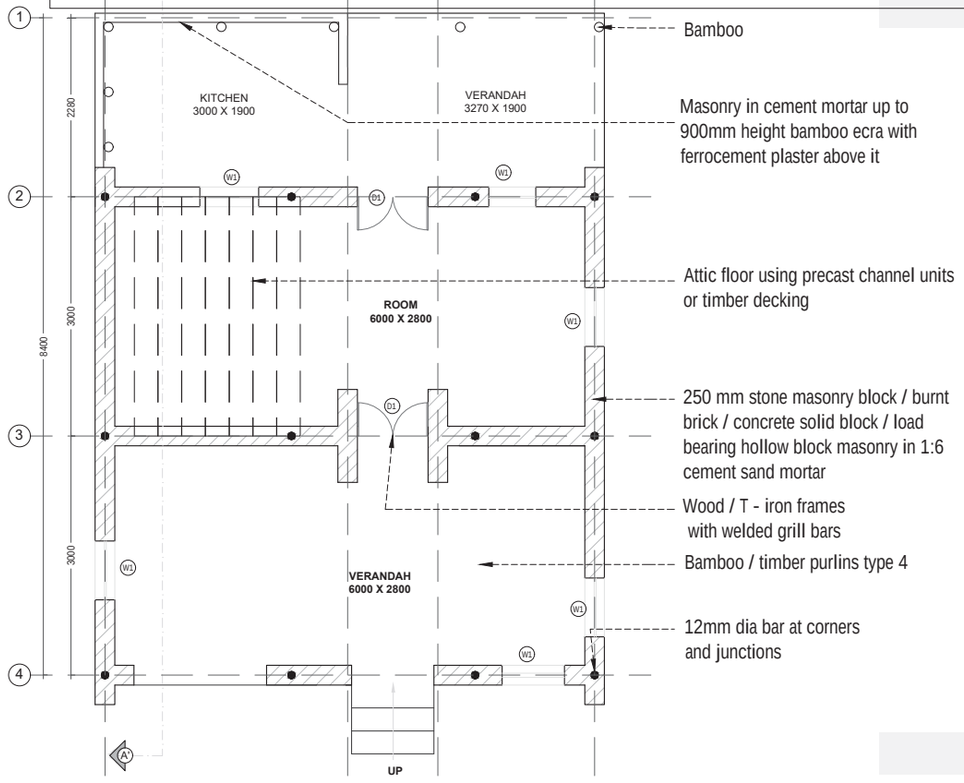
OD-03
Alternative layout

Area Statement:

Item	Area	
	Sq.m	Sq.ft
Room	16.80	180.84
Front Veran-dah	16.80	180.84
Kitchen	6.00	64.58
Back Veran-dah	**6.00**	**64.58**
Carpet Area	**23.00**	**247.57**
Built up Area	**56.00**	**602.78**



TYPICAL SECTION AA'



TYPICAL PLAN

ODISHA

OD-03
Cost estimate

Cost breakup

Item	Cost (INR)
Foundation	14,900
Walls	60,816
Roof	35,079
Doors & windows	4725.0
Flooring	21490.0
Total	**137,010**

ODISHA

S.No	Item	Quantity	Unit	Rate	Amount
	Foundation				
1	Excavation				
	For room and 600mm high half brick walls	14	cu.m	80	1120
	For precast columns	0.5	cu.m	80	40
2	Random rubble stone masonry in mud mortar - foundation of room	5	cu.m	1200	6000
3	Sand fill and compaction	2	cu.m	450	900
4	Concrete work in foundation				
4a	PCC, Mix 1:4:8	2.2	cu.m	2700	5940
4b	Damp proof course 50mm thick in 1:2:4 concrete	3.6	sq.m	250	900
5	Brickwork in cement mortar				
5a	Brickwork in 1:6 cement mortar with burnt clay bricks in foundation upto plinth	0.6	cu.m	3000	1800
5b	Brickwork in superstructure in 1:6 cement mortar	10.5	cu.m	3500	36750
5c	Half brickwork till 600mm height in cement mortar 1:6	11	sq.m	550	6050
5d	Brickwork in parapet	0.3	cu.m	3500	1050
6	RCC				
6a	Concrete 1:1.5:3 in RCC loft	0.3	cu.m	4500	1350
6b	Steel in RCC loft	22	kg	58	1276
6c	Precast RCC post of size 0.125mx0.125m, length 2.5m, mix 1:1.5:3, 5kg steel in 1 post	10	No.	800	8000
7	Roof with precast RCC plank and joist				
7a	Precast RCC planks of size 1.5mx0.3m, with 1.6 kg 6mm steel per plank	24	No.	275	6600
7b	Precast RCC beam of size 0.15mx0.15m, 3.6m length	1	No.	2500	2500
7c	In-situ concrete mix 1:1.5:3 on top of planks and joist	0.25	cu.m	4500	1125
7d	Steel in in-situ concrete	13	kg	58	754
7e	Manpower				
	Mason	2	mandays	500	1000
	Labour	12	mandays	250	3000
	Bar bender	1	mandays	500	500

8	GCI sheet roof - 0.5mm thick for verandah and kitchen				
8a	size 2740 x 900 (9'x3')	13	No.	500	6500
8b	size 2135 x 900 (7'x3')	6	No.	425	2550
8c	Bamboo understructure				
	75-100mm dia bamboo	35		130	4550
	50-60mm dia bamboo	10		100	1000
8d	Manpower				
	Skilled artisan/carpenter	3	mandays	500	1500
	Labour	6	mandays	250	1500
8e	Nails and hardware		lumsum		2000
9	Mud plastered bamboo wall - 1.5 m high, total surface area 15sq.m,				
9a	75-100mm dia bamboo	8	No.	130	1040
9b	50-60mm dia bamboo	25	No.	100	2500
9c	Clayey soil for mud plaster	2	cu.m	500	1000
10	Openings				
10a	precast RCC door-window frames 60mmx100mm	15	R.M	115	1725
10b	Window shutter 30mm thick - local timber	0.06	cu.m	50000	3000
11	Flooring				
11a	Rooms - CC tiles 300x300x15 on a 20mm cement mortar bed, sub-base of	11.2	sq.m	450	5040
11b	Verandah - Cement Concrete flooring - base floor of 1:2:4 concrete and	23	sq.m	650	14950
11c	Earthen floor using red clayey soil stabilized with rice husk ash	10	sq.m	150	1500
	GRAND TOTAL				**137010**
	AREA (sqm)				48
	RATE OF CONSTRUCTION (per sqm)				2854.4
	AREA (sqft)				513.6
	RATE OF CONSTRUCTION (per sqft)				266.8

ODISHA

OD-04

This typology is applicable to Zone B

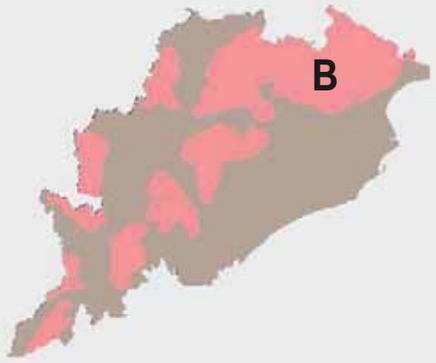
Zone B highlights: Vulnerability to regular flooding 2-4 times in a year resulting in inundation till about 300mm above plinth for upto 24 hours. There is severe flooding once in 1 or 2 years resulting in inundation of more than 900mm above plinth level for a period of 24-72 hours.

Zone B comprises of the following districts :

1. Kendrapara
2. Jagatsinghpur
3. Puri
4. Balasore
5. Bhadrak Cuttack
6. Parts of Cuttack

Resources Available:

- Flat tracks of alluvial soil River deltas of varied sizes formed by Mahanadi, Burha Balanga, Baitarani, Brahmani Subarnarekha and Rushikulya



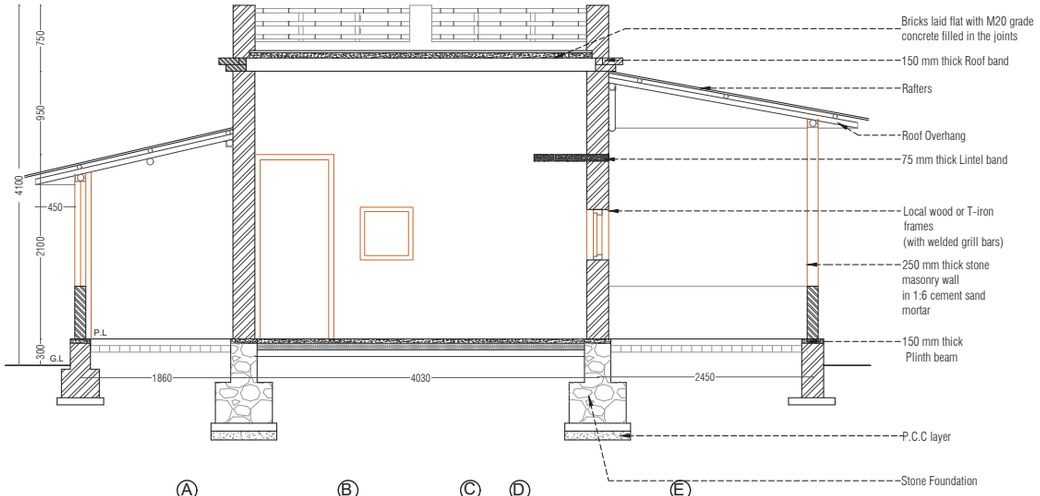
ODISHA

- RCC frame structure on pile foundations with 300mm grade beam and 150mm lintel bands are constructed.
- Walls are mostly constructed in brick masonry in cement mortar

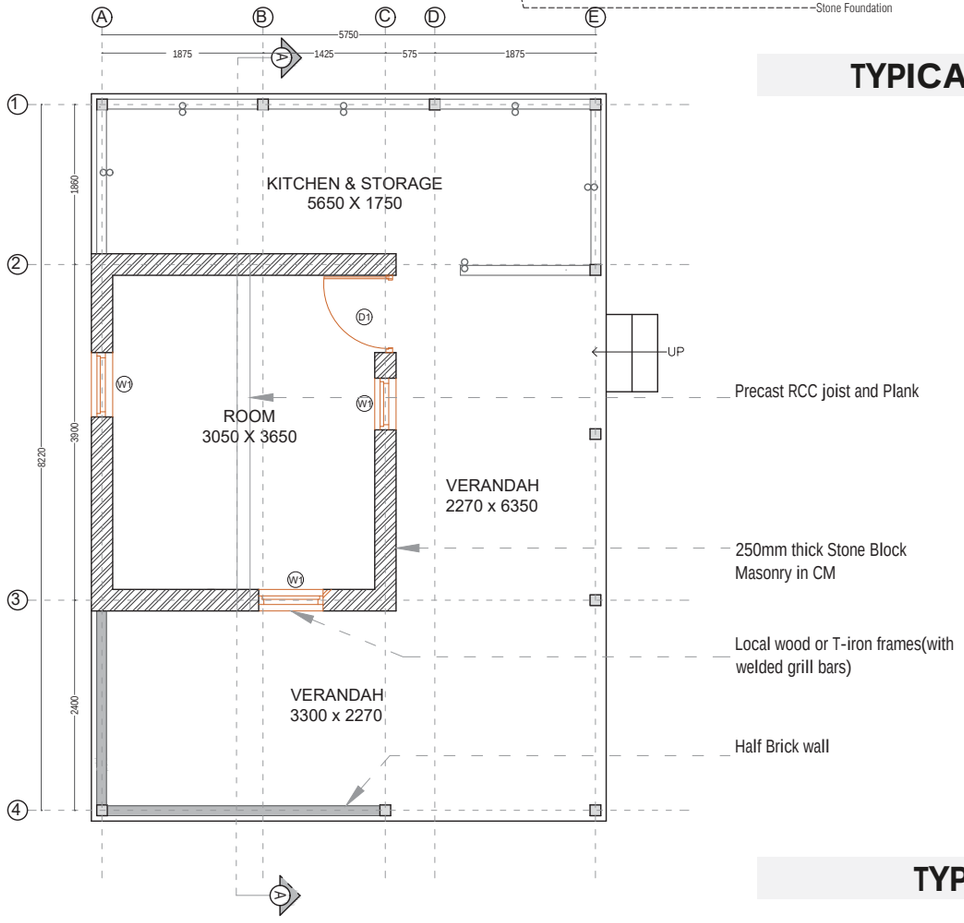
Recommendations for Built Form		
Plan Layout	**Plinth/Floor**	**Roof Profile**
Rectangular structure and liner in the arrangement of their interior spaces. Entry to the building is from longer side. Open to sky verandah is provided in one long side. Future expansion proposed vertically. Future expansion proposed vertically.	High Plinth level recommended.	Light Weight Roof Recommended.

Recommendations for construction systems		
Components	**Recommended Specifications**	**Specific Comments**
Foundations	• Alternatively, the earthen plinth can be plastered with a cement-sand (by volume of soil) • RCC grade beam of 1:1.5:3 mix.	• Toe wall in brick masonry in cement mortar 1:6 till plinth level. • Alternatively, laterite blocks can be used as strip footing.
Plinth		
Wall	• 250 mm thk stone masonry wall in 1:6 cement mortar	
Wall Finish	• The wall is plastered with a mud plaster made with clayey soil, sand, straw, dung and rice husk ash.	• Wherever affordable, the external plaster can be a cement-sand plaster
Roof Structure	• Precast RCC planks of size 1500 x 300 x 30mm placed adjacent to each other supported on RCC joist 150 x 150mm (upto a length of 3.5m) and wall.	• Corrugated Galvanized Iron sheet of minimum 0.35mm thickness tied to bamboo understructure through J bolts with galvanized and bitumen washers.
Roof Cover	• Country Tiles with Timber Understructure on verandah	• Woven reed mats can be used below the tiles as false ceiling for thermal insulation.

OD-04



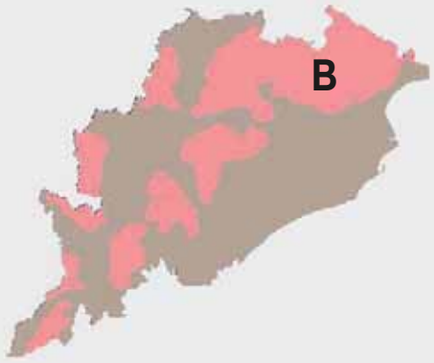
TYPICAL SECTION AA'



TYPICAL PLAN

Area Statement:

Item	Area	
	Sq.m	Sq.ft
Room	11.13	119.80
Kitchen & Storage	9.51	102.36
Veranda	24.25	261.03
Carpet Area	**21.28**	**229.06**
Built up Area	**50.79**	**546.70**
Built up Area	**56.00**	**602.78**

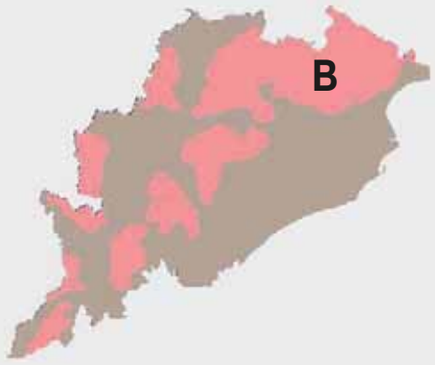


ODISHA

OD-04
Cost estimate

Cost breakup

Item	Cost (INR)
Foundation	44,835
Walls	43,200
Roof	58,660
Doors & windows	6500.0
Flooring	6750.0
Total	**159,945**

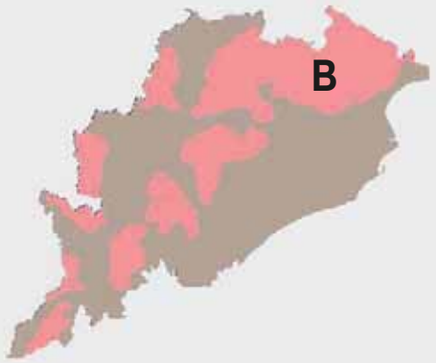


ODISHA

SR.NO.	Item	Quantity	Unit	Rate	Cost
	Foundation				
1	Excavation in soft soil upto 1 metre depth	12	cu.m	80	960
2	Random rubble masonry in mud mortar till plinth level	25	cu.m	1200	30000
3	Plain Cement Concrete 1:4:8 in foundation	3	cu.m	2750	8250
4	Providing a sand bed below random rubble masonry	2.5	cu.m	450	1125
5	Damp proof course 50mm thick in 1:2:4 concrete	18	sq.m	250	4500
	Walls				
6	Earthen walls 0.45m thick, using locally available soil - using clayey sandy soil with 10% gravel content, including labour and self-help from family	60	cu.m	600	36000
	Precast RCC beam of mix 1:1.5:3, cross section 150mm, 150mm, 3m long	6	No.	1200	7200
7	Clay tile roof(area 76 sq.m)				
7a	Clay tiles, semi-cylindrical shape of approx.size	900	No.	10	9000
7b	Wood - for roof understructure				
	0.1mx0.125m, less than 3.5m length -for primary rafters	0.6	cu.m	25000	15000
	0.1mx0.1m, for vertically supporting the primary rafter in its span	0.05	cu.m	25000	1250
	0.06mx0.075m, 4.5m length for secondary rafter	0.5	cu.m	25000	12500
	bamboo splits for roof purlins, made from 50mm dia	35	No.	100	3500
7c	Manpower				
	Carpenter	2	mandays	500	1000
	Labour	4	mandays	250	1000
7d	Nails and hardware		lumsum		1500
8	Attic floor				
	Wooden planks - size 300mm x 1000mm, 75mm thick for	30	No.	400	12000

OD-04
Cost estimate

9	CGI sheet roof over verandah				
9a	Bamboo posts of min 80mm dia, 2.5 m high	7	No.	130	910
9b	Bamboo rafter min 60mm dia for CGI sheet roof	5	No.	100	500
9c	Manpower				
	Skilled artisan	1	mandays	500	500
10	Openings				
10a	Door-window frame in non-sal timber 80x60mm	0.12	cu.m	25000	3000
10b	Shutter of wooden planks 30mm thick	0.07	cu.m	50000	3500
11	Flooring				
	Earthen floor using red clayey soil stabilized with rice husk ash	45	sq.m	150	6750
	GRAND TOTAL			**Total**	**159945**
	AREA (sqm)				75
	RATE OF CONSTRUCTION (per sqm)				2132.6
	AREA (sqft)				802.5
	RATE OF CONSTRUCTION (per sqft)				199.3



ODISHA

OD-05

This typology is applicable to Zone C

Zone C highlights: There is a good rainy spell from June to September, there is high water run-off die to the hilly terrain and therefore mostly no flooding. There is low risk of earthquakes.

Zone C comprises of the following districts:

1. Mayurbhanj,
2. Sundargarh,
3. Koraput,
4. Rayagada,
5. Nagarangpur
6. Malkangiri
7. Parts of Kandhamal, Gajapati and Keonjhar.

Resources Available:

- Red and yellow soil with good clayey fraction.

ODISHA

OD-05

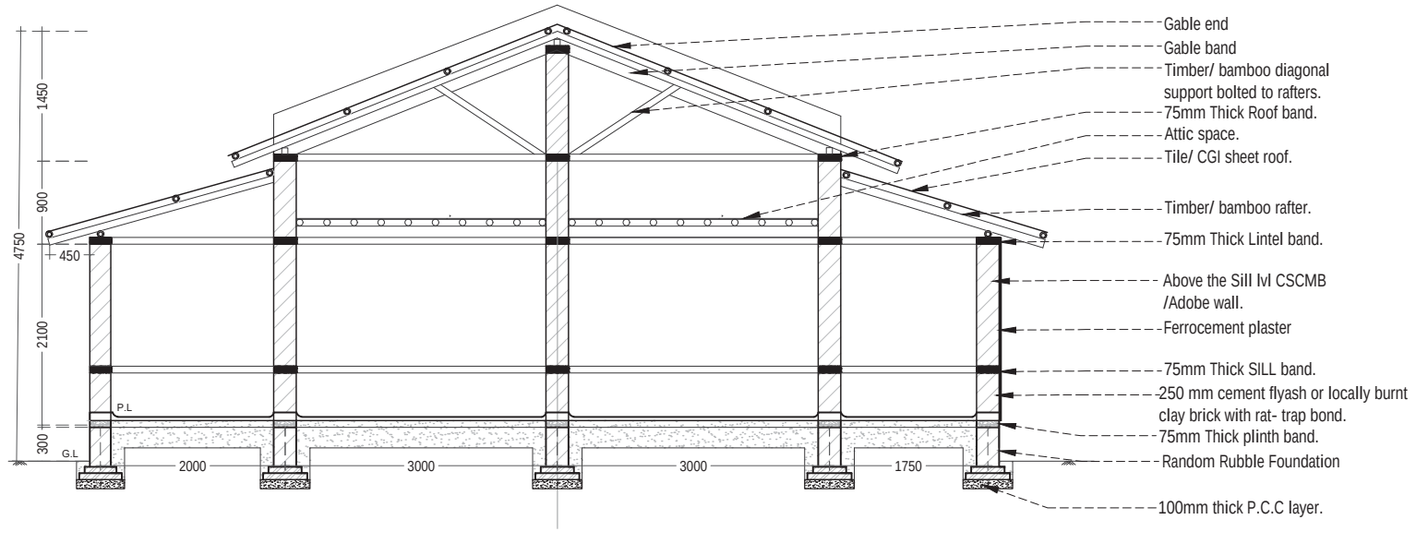
- 1 room is proposed for construction in rat-trap bong masonry,with a flat RCC filler slab as an accessible roof.
- Masonry is tied together with RCC at the plinth & lintel level.
- The verandah & kitchen are provided at the front side with a single continuous CGI sheet roof.
- A strong foundation using precast RCC piles & plinth beamis provided in rooms.

Recommendations for Built Form		
Plan Layout	**Plinth/Floor**	**Roof Profile**
Mostly 2 rooms with a veranda on the front. 300-450mm thick mud walls with colourful plasters, often derived from natural sources, are a common practice.		Clay tiles on a wood and bamboo understructure are commonly used in roofs.

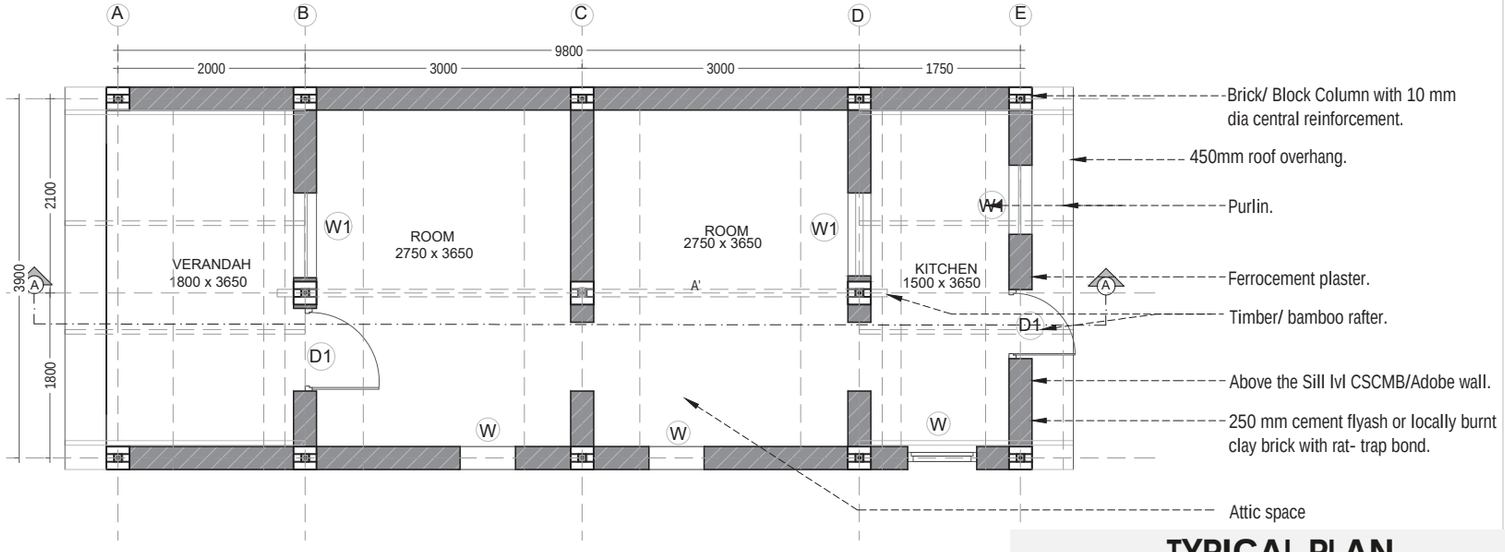
Recommendations for construction systems		
Components	**Recommended Specifications**	**Specific Comments**
Foundations	• In areas where soil with minimum 10T/sq.m bearing capacity is found at shallow depths, strip foundations in brick masonry 2'6" wide at base may be used.	• The structure is tied at the plinth level with a minimum 6" deep plinth beam.
Plinth		
Wall	• 450mm thick earthen walls in traditional cob technique. • Bamboo frame using miminum 80mm dia-bamboo posts and bamboo splits.	• The frame is braced with diagonal bamboo from plinth to attic level at wall corners.
Wall Finish	• The wall is plastered with a mud plaster made with clayey soil, sand, straw, dung and rice.	• Wherever affordable, the external plaster can be a cement-sand plaster.
Roof Structure	• Gable roofs of at least 25 degree slope on timber rafters and bamboo split purlins.	• Primary rafters to rest on wall plate fixed to a brick course or a cement concrete base.
Roof Cover		
Floor	• 30mm concrete base 1:4:8 on flat brick soling, finished with cement screed.	• Earthen floor using red clayey soil stabilized with rice husk ash or 7%.

273

OD-05



TYPICAL SECTION AA'



TYPICAL PLAN

Area Statement:

Item	Area	
	Sq.m	Sq.ft
Room 1	10.08	108.50
Room 2	10.08	108.50
Kitchen	5.48	59.00
Verandah	**7.43**	**80.00**
Carpet Area	**26.43**	**284.49**
Built up Area	**41.75**	**449.40**

ODISHA

OD-05
Cost estimate

Cost breakup

Item	Cost (INR)
Foundation	20,930
Walls	97,815
Roof	31,895
Doors & windows	11570.0
Flooring	19600.0
Total	**181,810**

ODISHA

SR.NO.	Item	Quantity	Unit	Rate	Cost
	Foundation				
1	Excavation				
	For both rooms	17.5	cu.m	80	1400
	For kitchen,verandah	5.4	cu.m	80	432
2	Sand fill compacted	1	cu.m	450	450
3	Concrete work				
4a	PCC 1:4:8 75mm thick in foundation masonry, Mix 1:4:8	1.8	cu.m	2700	4860
4b	DPC 1:2:4, 50mm thick				
	Two rooms	10.6	sq.m	250	2650
	Verandah , kitchen	3.75	sq.m	250	937.5
5	Random rubble masonry in mud mortar in foundation, till 0.45m plinth	8.5	cu.m	1200	10200
	Walls				
6	Pointing in 1:3 cement mortar external, above ground	9	sq.m	120	1080
7	Burnt brick masonry till plinth in 1:6 cement mortar	3	cu.m	3000	9000
8	Brickwork in superstructure using Flyash bricks of min wet compressive strength of 50 kg/cq.cm - in rat-trap bond, in cement mortar 1:4				
	Two rooms	15	cu.m	3200	48000
	Verandah, kitchen	2.5	cu.m	3200	8000
	Cement Stabilized Earth Block masonry in superstructure - English bond masonry in 1:2:6 cement-soil-sand mortar. Blocks are stabilized with 7% (by weight) cement				
	Two rooms	7	cu.m	2500	17500
	Verandah, kitchen	2	cu.m	2500	5000

9	RCC work -1:1.5:3				
	Concrete in lintel band	0.5	cu.m	4500	2250
	Concrete in 0.6m wide loft	0.65	cu.m	4500	2925
10	Steel				
	Steel in lintel band	30	kg	58	1740
	Steel in loft	40	kg	58	2320
11	Roof in Micro Concrete Roofing(MCR) tiles of size 240mmx480mm on				
11a	MCR tiles	750	No.	14	10500
11b	Timber wall plate 100mmx60mm	0.125	cu.m	25000	3125
11c	Timber purlins @400mm spacing, 60x40mm	0.35	cu.m	25000	8750
11d	Bamboo 80-100mm dia for roof understructure	24	No.	130	3120
11e	Manpower				
	Carpenter	3	Mandays	500	1500
	Skilled mason	4	Mandays	350	1400
	Labour	4	Mandays	250	1000
11f	Nails, binding wire and hardware		lumsum		2500
12	Attic floor				
12a	Precast beam 150x150, mix 1:1.5:3, 3m long	1	No.	1200	1200
12b	Bamboo rafters 80-100mm dia	6	No.	130	780
12c	Bamboo 50-60mm dia for lattice work	6	No.	100	600
	Horizontal bamboo at attic level and top of kitchen	4	No.	130	520
12d	Manpower - skilled artisan	2	Mandays	500	1000
13	Doors and windows				
13a	2 Rooms				
	precast RCC frame 60mmx100mm	13	R.M	115	1495
	Door shutter 35mm solid core panel	3	sq.m	1500	4500
	Window shutter 30mm - local timber	0.02	cu.m	50000	1000
	precast concrete jaali 0.6mxm0.6m	8	No.	150	1200
13b	Kitchen				
	precast RCC frame 60mmx100mm	5	R.M	115	575
	Door shutter 35mm solid core panel	1.6	sq.m	1500	2400
	precast concrete jaali 0.75mxm0.75m	2	No.	200	400
14	Flooring				
14a	Rooms - CC tiles 300x300x15 on a 20mm cement mortar bed, sub-base of	20	sq.m	450	9000
14b	Verandah, kitchen- Cement Concrete flooring - base floor of 1:2:4 concrete and finishing layer 0f 1:2 cement mortar	10	sq.m	650	6500

	GRAND TOTAL			**Total**	**181809.5**
	AREA (sqm)				40
	RATE OF CONSTRUCTION (per sqm)				4545.2
	AREA (sqft)				428.0
	RATE OF CONSTRUCTION (per sqft)				424.8

ODISHA

OD-06

This typology is applicable to Zone D

Zone D highlights: Mostly, this region has low vulnerability to earth quake and high velocity winds. However, the region is vulnerable to heat waves as it experiences very hot and dry summers,

Zone D comprises of the following districts:

1. Koraput
2. Nabarangpur
3. Kalahandi
4. Bolangir
5. Baragarh
6. Sambalpur
7. Jharsuguda
8. Sundergarh

Resources Available:

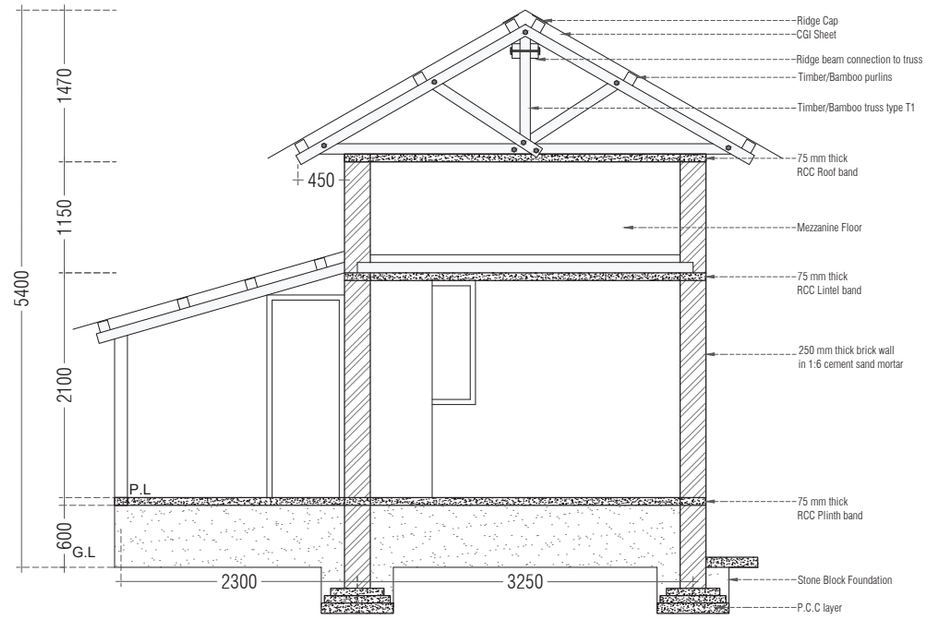
- The soil is a predominantly Red soil.
- Stones are abundantly availabvle in the region due to the geology of the region.

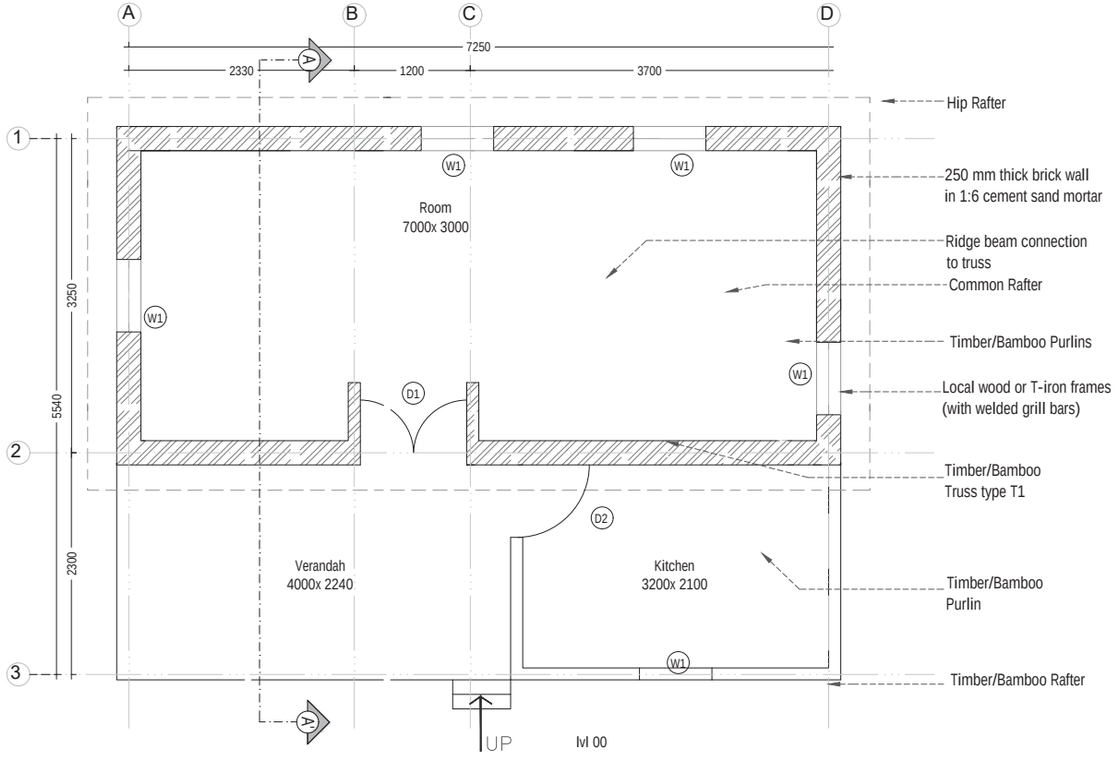
ODISHA

- One large room of 20m.sq partitioned by 2-3
- Hipped roof.
- The front of the house has a lean-to-roof & serves as a verandah

Recommendations for Built Form		
Plan Layout	**Plinth/Floor**	**Roof Profile**
• Mostly 2 rooms with a veranda on the front and a rear kitchen along with other services such as drying space, toilets, hand-pumps, etc. Often, the houses have a linear design and arranged in rows, sharing one wall with the adjacent house.		• Gable roofs using asbestos roofing sheets are the most common roofing material

Recommendations for construction systems		
Components	**Recommended Specifications**	**Specific Comments**
Foundations	• In areas where soil with minimum 10T/sq.m bearing capacity is found at shallow depths, strip foundations in brick masonry 2'6" wide at base may be used.	• The structure is tied at the plinth level with a minimum 6" deep plinth beam.
Wall	• Rat-trap bond masonry in 1:4 cement-mortar using burnt clay bricks of minimum 35 kg/cm2 strength. 3" thick RCC bands to be provided at sill, lintel and roof level. • The masonry should be strengthened with single 12mm bars at corners, T-junctions and mid-span of walls.	• Rat-trap bond masonry in 1:4 cement-mortar • The frame is braced with diagonal bamboo.
Wall Finish	• The wall is plastered with mud plaster made with clayey soil, sand, straw, dung and rice husk ash.	• Wherever affordable, the external plaster can be a cement-sand plaster.
Roof Structure	• Corrugated Galvanized Iron sheet of minimum 0.35mm thickness tied to bamboo understructure through J bolts with galvanized and bitumen asher	• An underlayer of premade panels of bamboo mat (indicative size 1200x1800)





OD-06

Area Statement:

Item	Area	
	Sq.m	Sq.ft
Room	20.97	225.72
Kitchen	6.65	71.58
Verandah	9.06	97.52
Carpet Area	**27.83**	**299.56**
Built up Area	**42.88**	**461.56**

ODISHA

OD-06
Cost estimate

Cost breakup

Item	Cost (INR)
Foundation	42,245
Walls	55,300
Roof	37,660
RCC	24520.0
Doors & windows	14305.5
Flooring	8750.0
Total	**182,781**

ODISHA

SR.NO.	Item	Quantity	Unit	Rate (Rs)	Cost
	Foundation				
1	Excavation				
	Room	12	cu.m	80	960
	Kitchen,verandah	2	cu.m	80	160
2	Sand fill in foundation and plinth	4	cu.m	450	1800
3	PCC 1:4:8 100mm thick in foundation				
	Room	1.6	cu.m	2700	4320
	Kitchen,verandah	0.4	cu.m	2700	1080
4	Burnt brick masonry in foundation till plinth in 1:5 cement mortar				
	Room	8	cu.m	3000	24000
	Kitchen,verandah	2.7	cu.m	3000	8100
5	DPC 1:2:4, 50mm thick				
	Room	5.3	sq.m	250	1325
	Kitchen	2	sq.m	250	500
6	Superstructure masonry				
	Brickwork in superstructure in 1:6 cement mortar				
	Room	14.65	cu.m	3500	51275
	Kitchen	1.15	cu.m	3500	4025
	RCC work -1:1.5:3				
	Concrete in lintel band	0.5	cu.m	4500	2250
	Concrete in roof band	0.5	cu.m	4500	2250
	Concrete in plinth band	0.5	cu.m	4500	2250
	Concrete in loft	1.5	cu.m	4500	6750
	Steel				
	Steel in lintel band	30	kg	58	1740
	Steel in roof band	30	kg	58	1740
	Steel in plinth band	30	kg	58	1740
	Steel in loft	100	kg	58	5800

OD-06
Cost estimate

7	Roof in Micro Concrete Roofing(MCR) tiles of size 240mmx480mm on				
7a	MCR tiles				
	Room	600	No.	14	8400
	Kitchen,verandah	300	No.	14	4200
7b	Bamboo 80-100mm dia for roof understructure				
	Room	35	No.	130	4550
	Kitchen,verandah	2	No.	130	260
7c	Timber purlins @400mm spacing, 60x40mm				
	Room	0.35	cu.m	25000	8750
	Kitchen,verandah	0.15	cu.m	25000	3750
7d	Bamboo 50-60mm dia for rafters				
	Single slope roof in kitchen,verandah	5	No.	100	500
7e	Manpower				
	For Room				
	Carpenter	2	Mandays	500	1000
	Skilled mason	4	Mandays	350	1400
	Labour	4	Mandays	250	1000
	Kitchen, verandah				
	Carpenter	1	Mandays	500	500
	Skilled mason	1	Mandays	350	350
	Labour	2	Mandays	250	500
7f	Nails, binding wire and hardware		lumsum		2500
	GRAND TOTAL			**Total**	**182780.5**
	AREA (sqm)				42
	RATE OF CONSTRUCTION (per sqm)				4351.9
	AREA (sqft)				449.4
	RATE OF CONSTRUCTION (per sqft)				406.7

ODISHA

pahal
Prakriti Hunar Lokvidya

Rajasthan

Based on the field study, the recommendation recognizes the need for convergence of schemes to fulfill the basic shelter need of the people of the above mentioned districts based.

ZONE A

This type design is recommended for in districts Barmer, Pali Jodhpur, and Jaisalmer. Based on the field study, the proposal recognizes the need for convergence of schemes to fulfill the basic shelter need of the people of the above mentioned districts based.

ZONE B

This type design in districts Dungarpur, Udaipur, Bhilwara, Pratapgarh, Banswara Sirohi. Based on the field study, the proposal recognizes the need for convergence of schemes to fulfill the basic shelter need of the people of the above mentioned districts based.

ZONE C

This type design is recommended for districts Alwar, Bharatpur, Dausa, Jaipur, Dhaulpur, Karauli, Sawai Madhopur, Tonk, Bundi, Kota, Baran, and Jhalawar. Based on the field study, the proposal recognizes the need for convergence of schemes to fulfill the basic shelter need of the people of the above mentioned districts based.

ZONE D

This type design is recommended for districts Ganganagar, Hanumangarh, Churu, Bikaner, Jhunjhunun, and Sikar. Based on the field study, the proposal recognizes the need for convergence of schemes to full fill the basic shelter need of the people of the above-mentioned districts based.

RAJASTHAN

RJ-01A

Zone A includes 6 Districts :

1. Barmer District
2. Jodhpur District
3. Jaisalmer District
4. Pali District
5. Nagaur District
6. Jalor District

Resources:
Stone and steel

Zone A has two typologies
RJ-A-01
RJ-A-02

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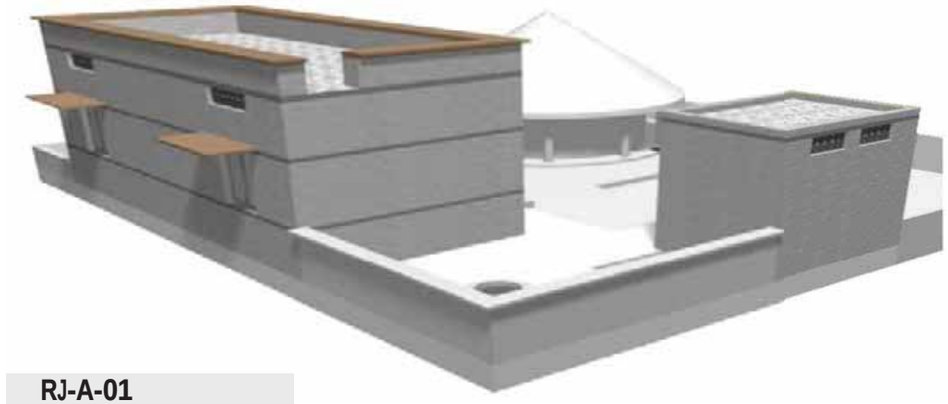


RJ-A-01

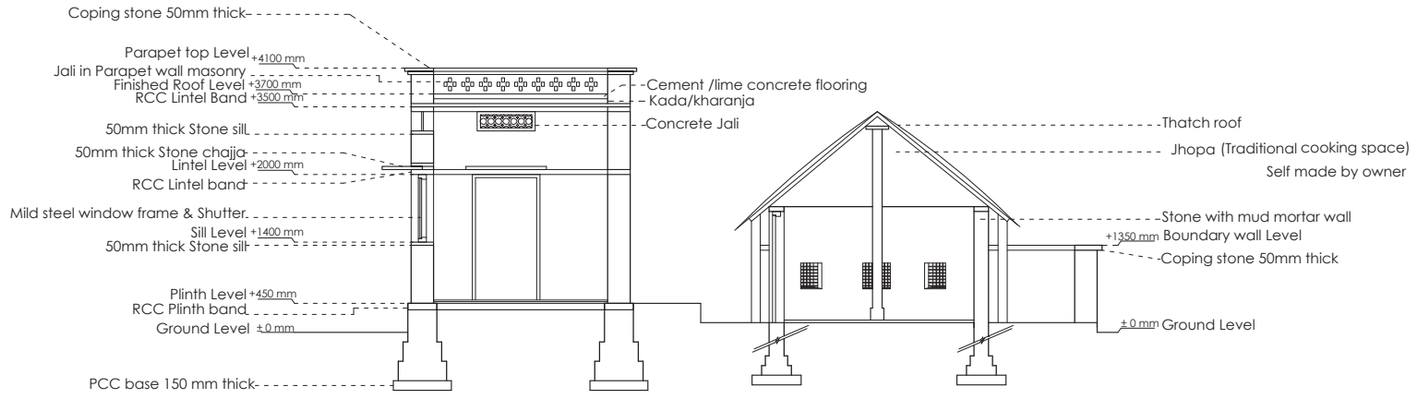
- The spaces are arranged in L-shape around the aangan to provide a sense of enclosure. This typology is observed in areas where houses are built in isolated clusters. Ventilators are provided above the door openings for effective cross ventilation. Aala, a traditional feature observed as being widely used, is provided on both sides of the door.
- The house is proposed to be provided with detached toilet in a manner that which encloses the aangan from one side. Water can be stored in underground water tank. Seismic bands are proposed at plinth, lintel and roof level.
- It is observed that traditional jhopa is widely used as kitchen which is detached from the main house. The entrance of jhopa is facing the house and hence maintains the privacy of women while using this space. The space between the Jhopa and house is serving as extended cooking space, space for leisure activities etc. While recognizing the jhopa as an integral part of the homestead, the cost of jhopa is not included in the proposed type design for PMAY-G.

Recommendations for Built Form		
Plan Layout	**Plinth/Floor**	**Roof Profile**
A compact symmetrical rectangular layout has been proposed which is a typical layout for timber houses within the state. The shape of the core house is rectangle and is accessed through a semi covered verandah.	Normal Plinth Design	

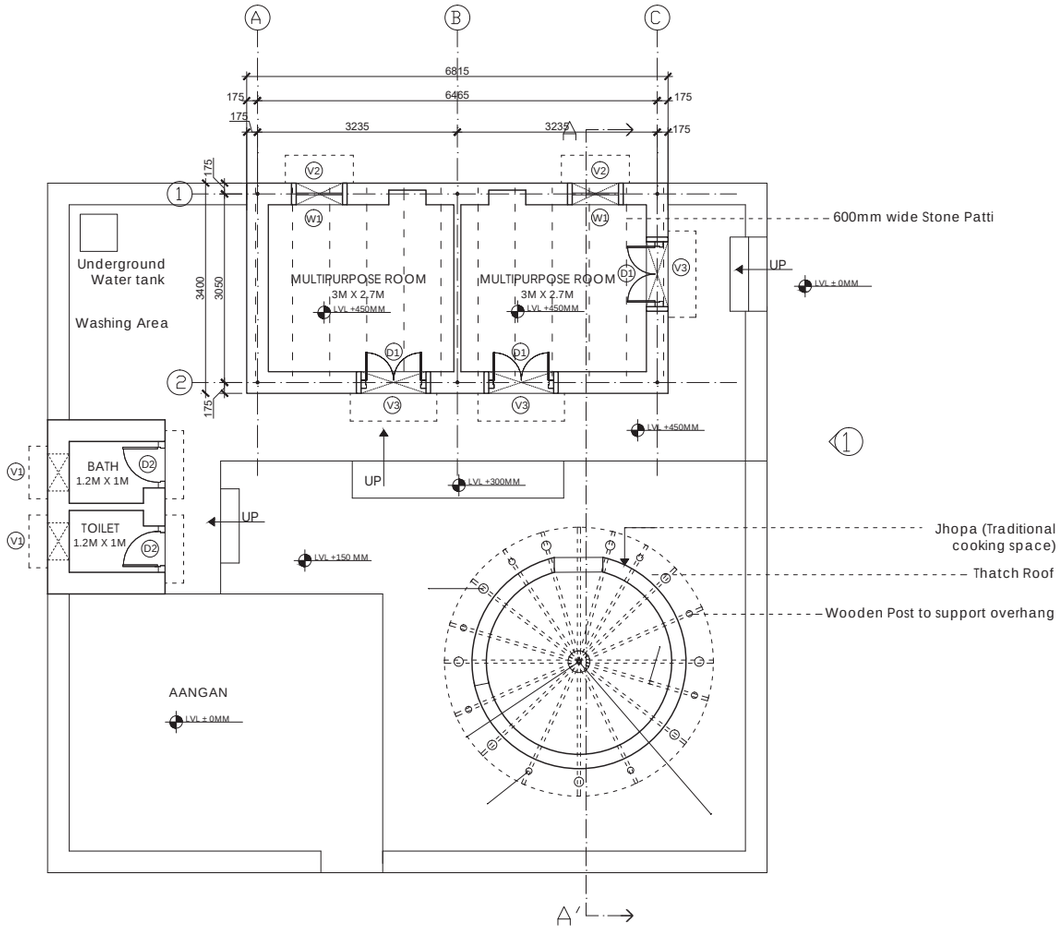
Recommendations for construction systems		
Components	**Recommended Specifications**	**Specific Comments**
Foundations	• Isolated footings with large stone pieces and cement soil mixture.	• Used primarily as protection and weight transfer for bamboo/timber supports.
Bracings	• Bracings are provided at the stilt level and between the timber frames of the walls as per detail.	
Wall	• Wooden frame structure as per specifications. Infill material- improved bamboo dap, Ekra, play board (internal partitions), CGI sheet, bamboo board.	
Wall Finsih	• Cement plaster with pointing.	
Roof Structure	• Timber under structure as per detail. • Joinery of the roof to the main structure is provided using metal/wooden clamps/cleats as per specifications.	
Roof Cover	• CGI sheet roofing as per specifications	
Floor	• Wooden Plank flooring as per detail	
Door and Windows	• Wooden frame and shutter as per specifications	
Tie Beams	• Tie-Beam is provided at the floor level as per detail.	

RJ-01A

Total Cost ` 167343/-



TYPICAL SECTION AA'



TYPICAL PLAN

RAJASTHAN

RJ-01A

Cost breakup

Item	Cost (INR)
Foundation	39979/-
Walls	70552/-
Roof	28289/-
Doors,Windows and Chajja	15688/-
Flooring	12835/-
Total	**167343/-**

RAJASTHAN

Cost Estimate for ZONE-A Design 01

S. NO.	BUILDING COMPONENT	LABOR COST(₹)	TOTAL (LABOR +MATERIAL) (₹)
1.	Foundation	8390	39979
2.	RCC wall bands	1448	10883
	Plinth , Lintel and Roof band		
3.	Walling	11640	53373
4.	Roof structure	9336	28289
5.	Roof finish		
6.	Doors and windows	766	12895
7.	Chajja (Shading device)	959	2793
8.	Flooring	928	12835
9.	Wall finishes	2356	6296
		35824	167343
	ESTIMATED COST OF CORE HOUSE		**167343**
	Toilet block (Toilet + Bath)		**36000**

SECTION

RJ-01B

RJ-A-02

- Organization of space around the open space for sense of enclosure is critical in this region where population is sparsely populated. Spaces arranged in L-shape around the open space were observed in villages of Jodhpur and Jaisalmer.
- Covered kitchen was observed in parts of Jodhpur, Jaisalmer & Bikaner. This space attached to the house, sharing a common wall and can be accessed from the open space. Comparatively big openings are observed in this space which is covered with jali for ventilation.
- Visitors are entertained outside the house in a semi-covered space provided in aangan to maintain the privacy of the women of the household while performing household chores.
- Underground water tank for storage of water was observed in most of the houses in this region.
- Concrete Jali was observed covering the opening above door and window for ventilation of the inside spaces.
- Dressed/semi-dressed stones are predominantly used in this area for construction of masonry walls with stone patti roof with cement mortar.

Recommendations for construction systems

Components	Recommended Specifications	Specific Comments
Foundations	• Continuous Coursed Rubble foundation in cement-sand mortar as per specifications.	
RCC Wall Bands	• Plinth bands 1. 100 mm RCC Plinth band is provided at plinth level as per specifications. • Eave Bands 1. 75 mm RCC Plinth band is provided at eave level as per specifications.	
Wall	• Compressed Stabilized Earth block wall in mud mortar as per specifications	
Wall Finsih	• Cement pointing on external surfaces and cement plaster on internal wall surfaces as per detail.	
Roof Structure	• C.G.I. Steel tubes as per specifications.	
Roof Finish	• CGI sheets tied to purlins with J/U hooks.	
Floor	• Unpolished kota stone/ Karegi flooring as per detail.	
Door and Windows	• Mild Steel frame and shutter as per specifications.	
Tie Beams	• Tie-Beam is provided at the floor level as per detail.	

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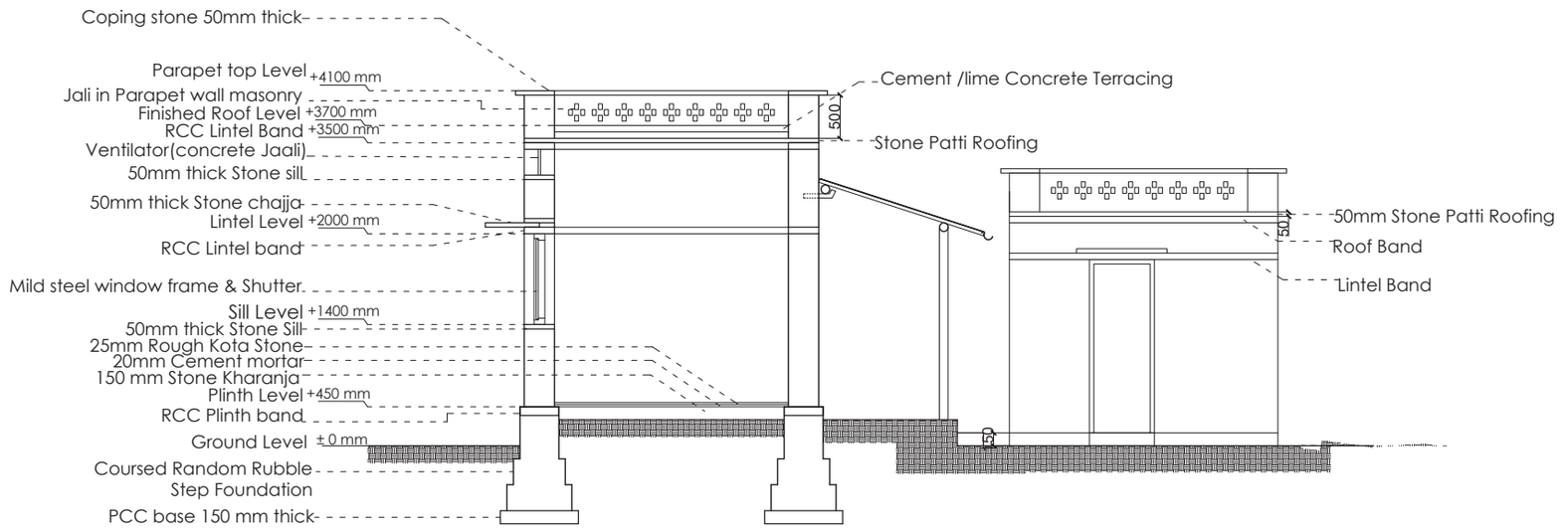
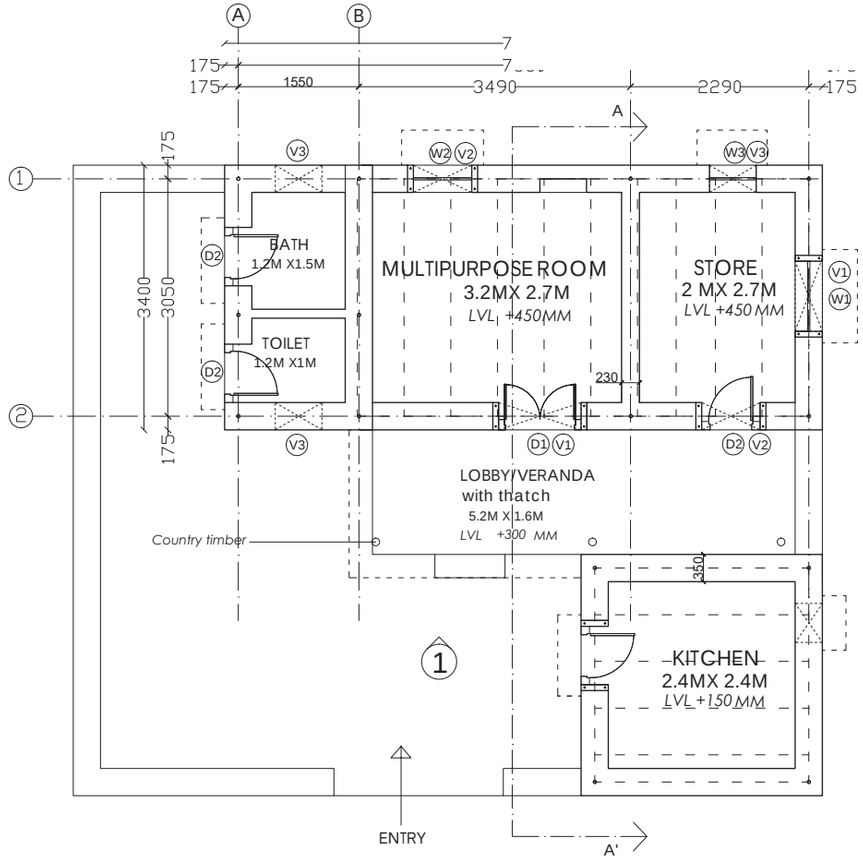
RJ-01B

area statement:

RAJASTHAN



TYPICAL SECTION AA'



TYPICAL PLAN

RJ-01B

Total Cost ` 159146/-

Cost Estimate for ZONE-A Design 02

SL. NO.	BUILDING COMPONENT	LABOR COST(₹)	TOTAL (LABOR +MATERIAL) (₹)
1.	Foundation	7282	34083
2.	RCC wall bands	1332	11361
	Plinth band		
	Lintel band		
	Roof band		
3.	Walling	7839	48369
4.	Roof structure	347	18933
5.	Roof finish	3103	7452
6.	Doors and windows	408	10028
7.	Chajja (Shading device)	57	368
8.	Flooring	1401	8702
9.	Wall finishes	5937	19349
10.	Embellishment		500
		27705	159146
	ESTIMATED COST OF CORE HOUSE		**159146**

RAJASTHAN

RJ-02A

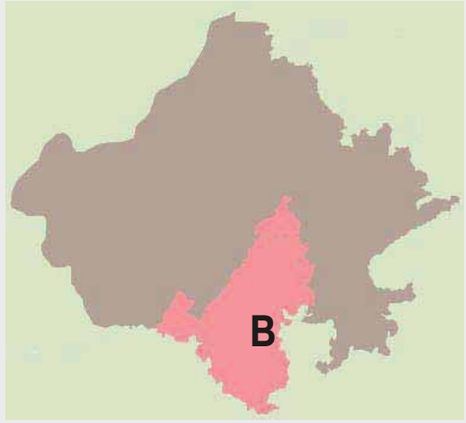
Zone B includes 9 Districts :

1. Dungarpur District
2. Udaipur District
3. Bhilwara District
4. Pratapgarh District
5. Banswara District
6. Sirohi District
7. Rajsamand District
8. Chittaurgarh District
9. Ajmer District

Resources Available

- Stone and steel

Zone B has two typologies
RJ-B-01
RJ-B-02



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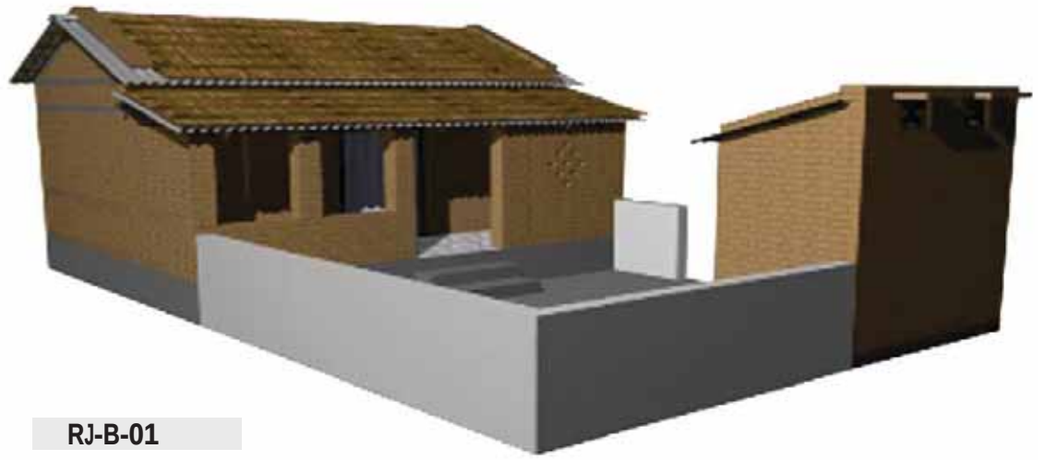
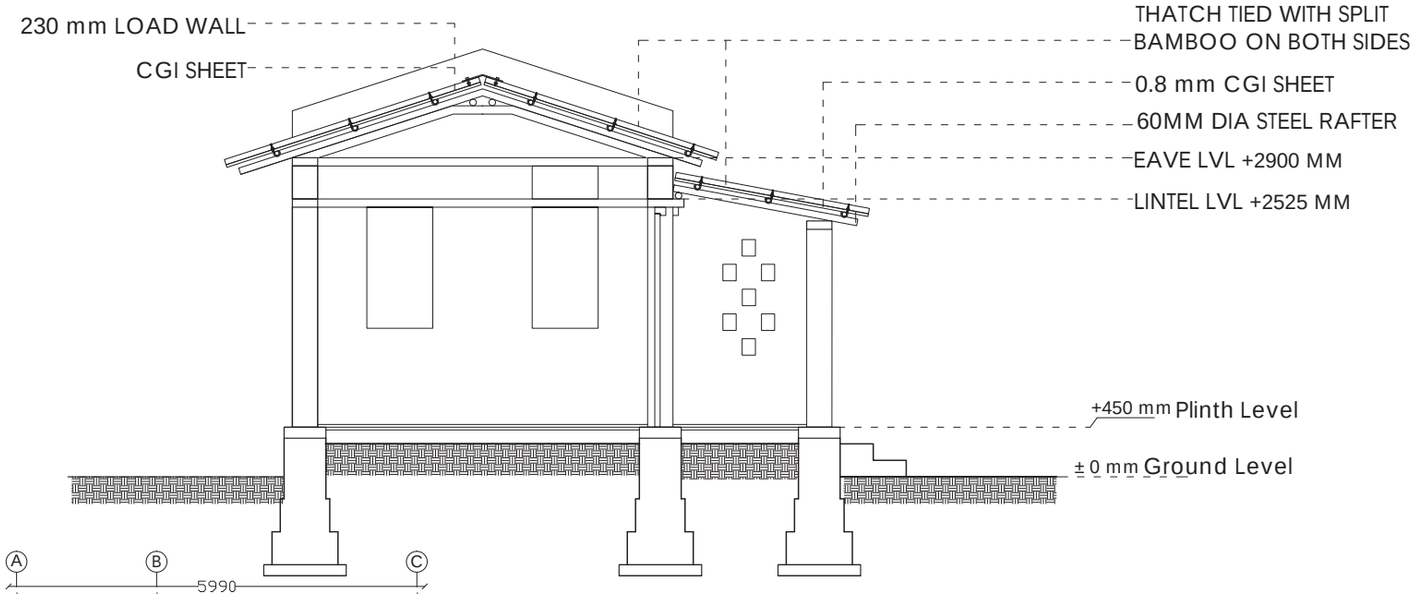


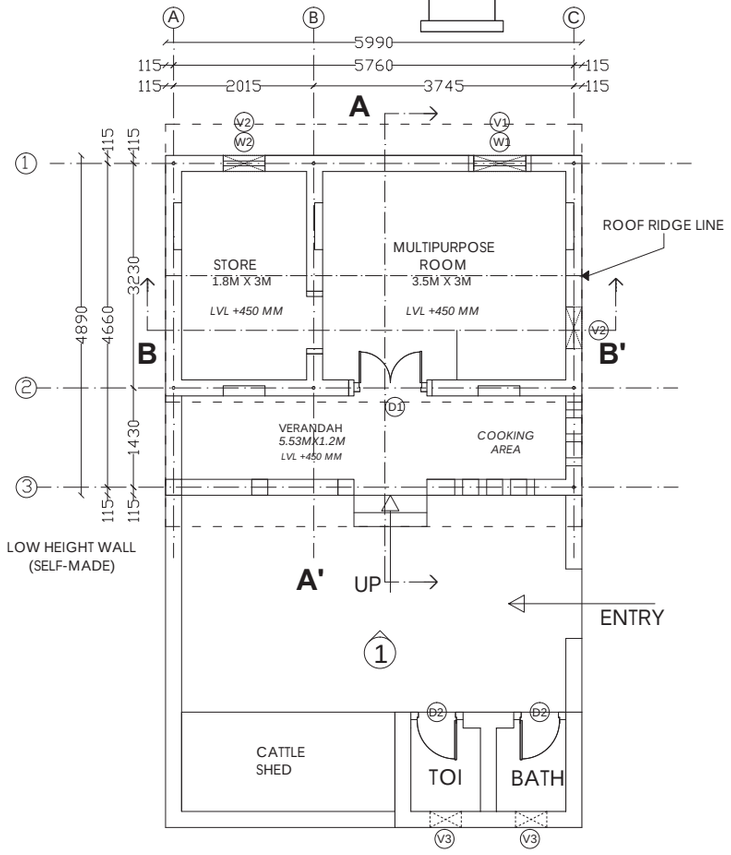
RJ-B-01

- The prototype design has a semi-covered enclosed verandah acting as buffer space between the house and outside. Cooking space is proposed in the verandah which is enclosed from three sides. Jali, which is also a traditional building element in Rajasthan, is provided for ventilation of this cooking space. This jail wall also maintains the privacy of the women working in the cooking area.
- The entrance to the main living area, which is also a multipurpose space, is aligned with the entrance to the verandah. A small storage space is proposed which can be accessed from the multipurpose room.
- The entrance to the main living area, which is also a multipurpose space, is aligned with the entrance to the verandah. A small storage space with no window opening is proposed at the end of the house which only households can access. It is the interior most part of the house as observed in traditional houses.Space for cattle/fodder storage is proposed inside the core house which can be accessed from the aangan.

Recommendations for construction systems		
Components	**Recommended Specifications**	**Specific Comments**
Foundations	• Continuous Coursed Rubble foundation in cement-sand mortar as per specifications.	
RCC Wall Bands	• Plinth bands 1. 100 mm RCC Plinth band is provided at plinth level as per specifications. • Eave Bands 1. 75 mm RCC Plinth band is provided at eave level as per specifications.	
Wall	• Compressed Stabilized Earth block wall in mud mortar as per specifications	
Wall Finsih	• Cement pointing on external surfaces and cement plaster on internal wall surfaces as per detail.	
Roof Structure	• C.G.I. Steel tubes as per specifications.	
Roof Finish	• CGI sheets tied to purlins with J/U hooks.	
Floor	• Unpolished kota stone/ Karegi flooring as per detail.	
Door and Windows	• Mild Steel frame and shutter as per specifications.	
Tie Beams	• Tie-Beam is provided at the floor level as per detail.	



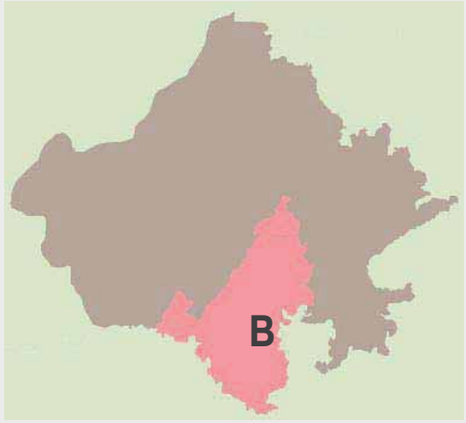
TYPICAL SECTION AA'



TYPICAL PLAN

RJ-02A

Area Statement:

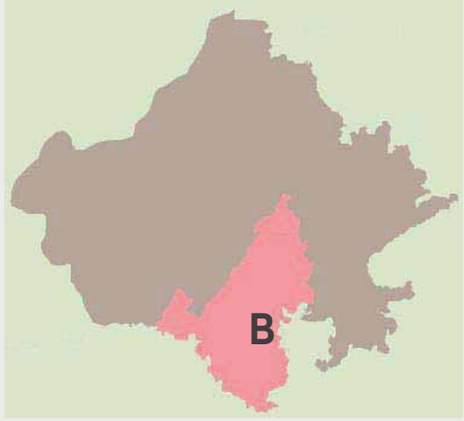


RAJASTHAN

RJ-02A

Cost breakup

Item	Cost (INR)
Foundation	56427/-
Walls	56458/-
Roof	32438/-
Doors, Windows and Embellishments	12098/-
Flooring	6341/-
Total	**163762/-**



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Cost Estimate for ZONE-B Design 01

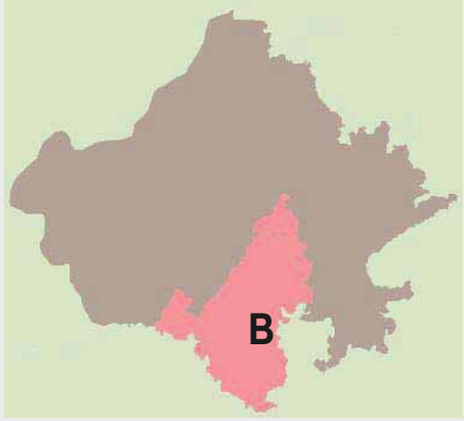
S. NO.	COMPONENT	LABOR COST (₹)	TOTAL(LABOR +MATERIAL) (₹)
1.	Foundation	9704	56427
2.	RCC wall bands	1313	11148
	Plinth band		
	Lintel band		
	Roof band		
3.	Walling	6595	36590
4.	Roof structure	747	10943
5.	Roof finish	1389	21495
6.	Doors and windows	1288	8298
7.	Flooring	1221	6341
8.	Wall finishes	6312	8720
9.	Embellishment		3800
		28570	163765
	ESTIMATED COST OF CORE HOUSE		**163765**

RJ-02B

RJ-B-02

- Organization of space around the open space for sense of enclosure is critical in this region where population is sparsely populated. Spaces arranged in L-shape around the open space were observed in villages of Jodhpur and Jaisalmer.
- Covered kitchen was observed in parts of Jodhpur, Jaisalmer & Bikaner. This space attached to the house, sharing a common wall and can be accessed from the open space. Comparatively big openings are observed in this space which is covered with jali for ventilation.
- Visitors are entertained outside the house in a semi-covered space provided in aangan to maintain the privacy of the women of the household while performing household chores.
- Underground water tank for storage of water was observed in most of the houses in this region.
- Concrete Jali was observed covering the opening above door and window for ventilation of the inside spaces.
- Dressed/semi-dressed stones are predominantly used in this area for construction of masonry walls with stone patti roof with cement mortar.

Recommendations for construction systems		
Components	**Recommended Specifications**	**Specific Comments**
Foundations	• Continuous Coursed Rubble foundation in cement-sand mortar as per specifications.	
RCC Wall Bands	• Plinth bands 1. 100 mm RCC Plinth band is provided at plinth level as per specifications. • Eave Bands 1. 75 mm RCC Plinth band is provided at eave level as per specifications.	
Wall	• Compressed Stabilized Earth block wall in mud mortar as per specifications	
Wall Finsih	• Cement pointing on external surfaces and cement plaster on internal wall surfaces as per detail.	
Roof Structure	• C.G.I. Steel tubes as per specifications.	
Roof Finish	• CGI sheets tied to purlins with J/U hooks.	
Floor	• Unpolished kota stone/ Karegi flooring as per detail.	
Door and Windows	• Mild Steel frame and shutter as per specifications.	
Tie Beams	• Tie-Beam is provided at the floor level as per detail.	



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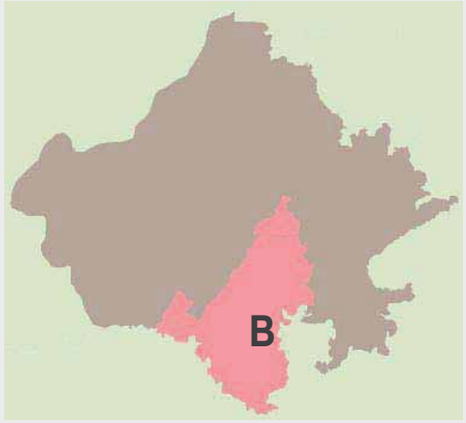
RJ-02B

Total Cost ` 148285/-



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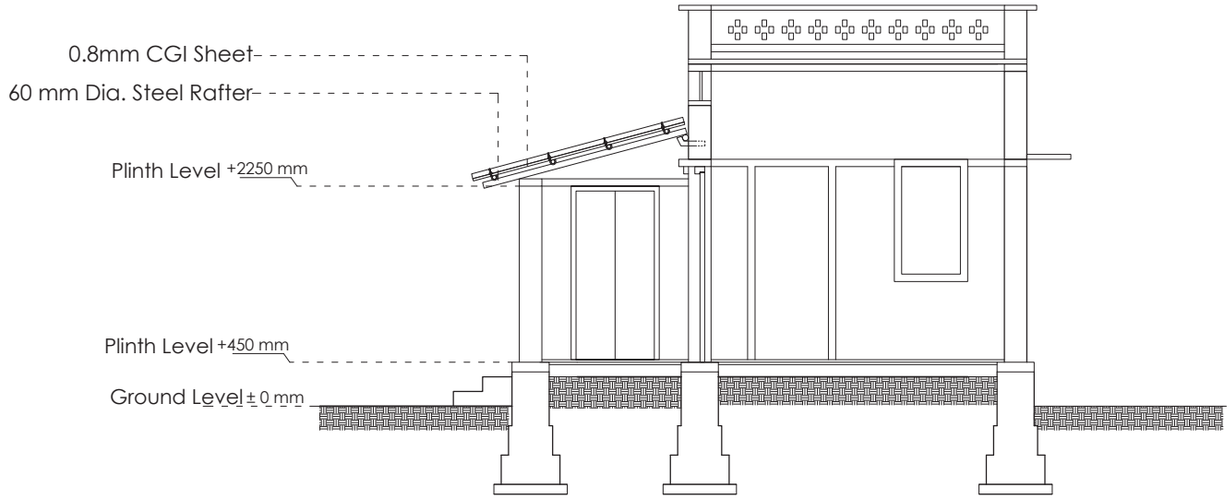
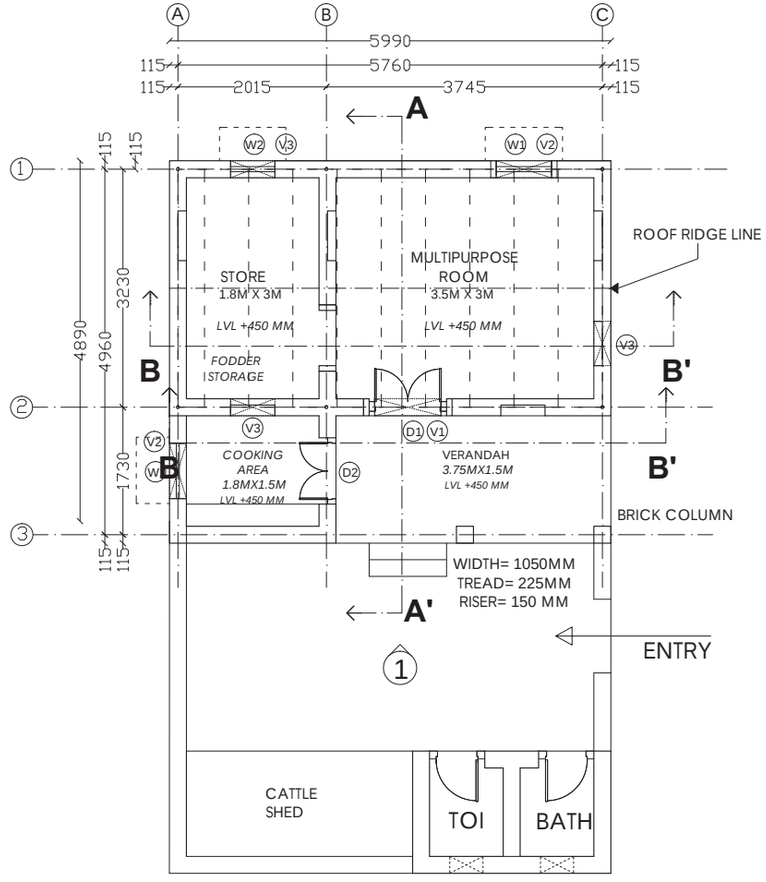


TYPICAL SECTION AA'



TYPICAL PLAN

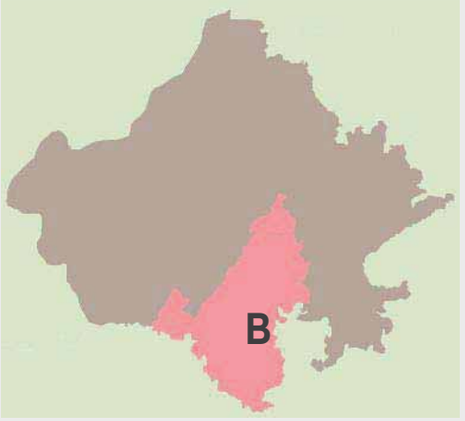
Cost Estimate for ZONE-B Design 02

S. NO.	BUILDING COMPONENT	LABOR COST (₹)	TOTAL (LABOR +MATERIAL) (₹)
1	Foundation	7052	33023
2	RCC wall bands	1011	8922
	Plinth band		
	Lintel band		
	Roof band		
3	Walling	3198	41715
4	Roof structure	346	18921
5	Roof finish	3101	7448
6	Doors and windows	408	10028
7	Chajja (Shading device)	57	368
8	Flooring	1401	8702
9	Wall finishes	5725	18658
10	Embellishment	0	500
		22298	148285
	ESTIMATED COST OF CORE HOUSE		148285

RJ-02B

Cost breakup

Item	Cost (INR)
Foundation	33023/-
Walls	69295/-
Roof	26369/-
Doors, Chajja, Windows and Embellishments	10896/-
Flooring	8702/-
Total	**148285/-**



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RJ-03A

Zone C includes 12 Districts :

1. Alwar district
2. Bharatpur district
3. Dausa district
4. Jaipur district
5. Dhaulpi district
6. Tonk district
7. Sawai Madhoper district
8. Bundi district
9. Baran district
10. Kota district
11. Jhalwar district
12. Karauli district

Resources Available

- Fly ash

Zone C has two typologies
RJ-C-01
RJ-C-02

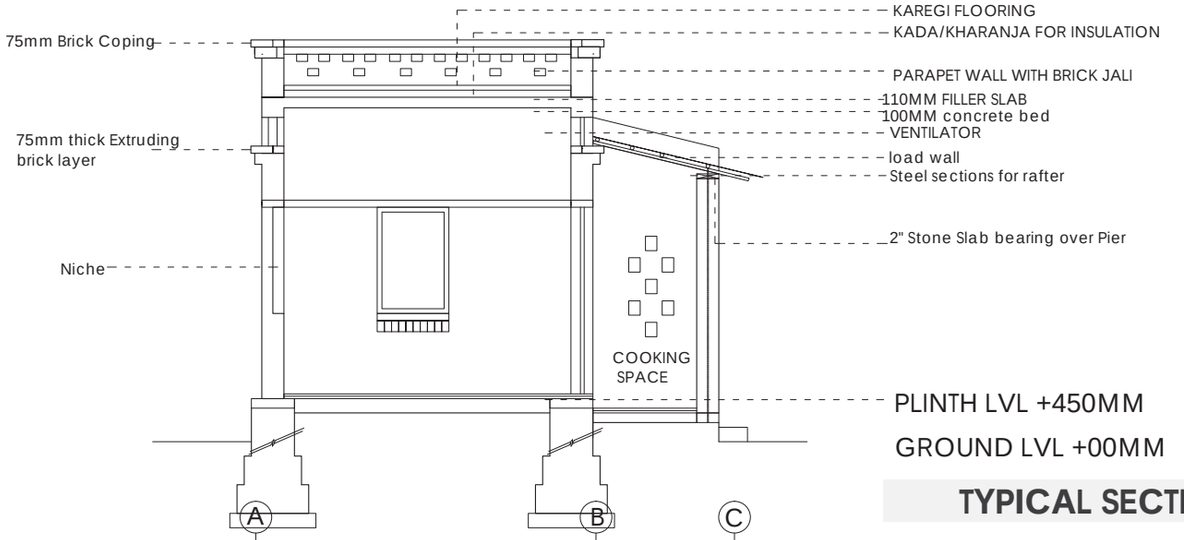
RAJASTHAN

RJ-C-01

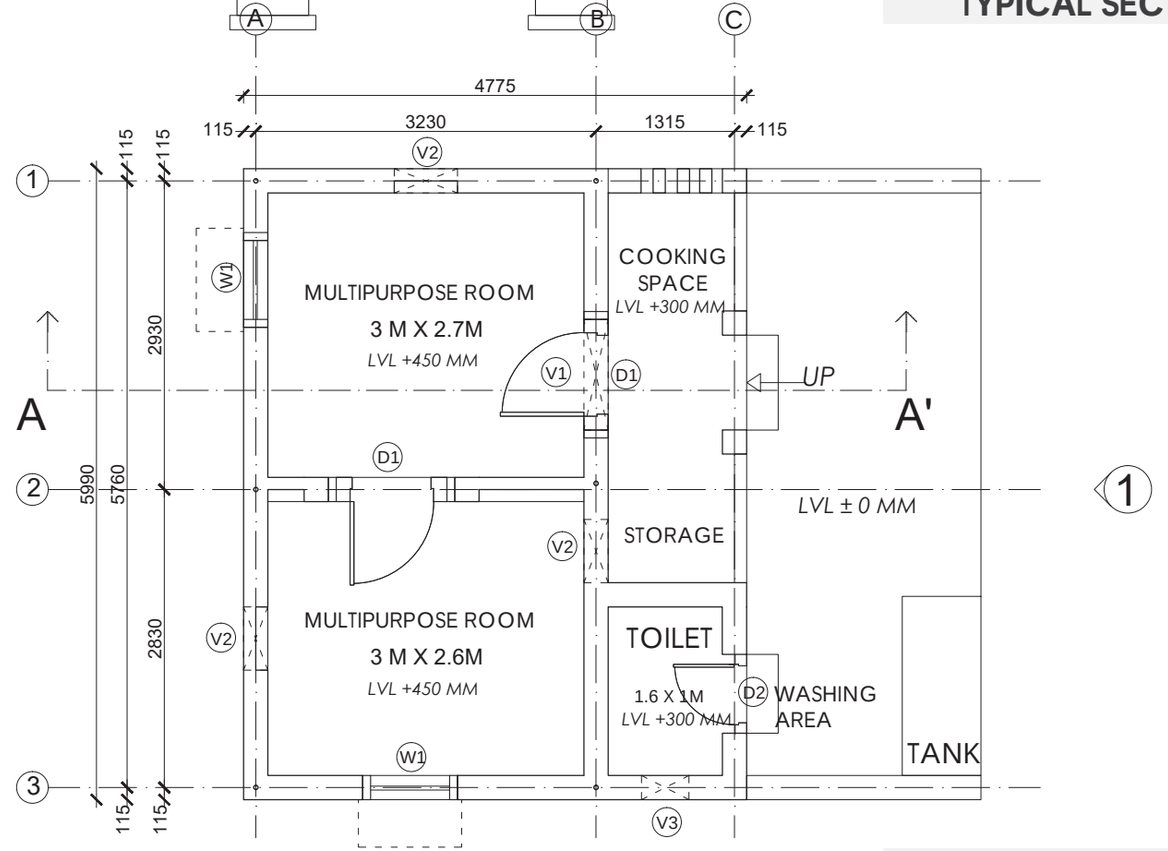
- The recommended type design is compact inform with two rooms and a semi-covered verandah. The house is proposed to be provided with attached toilet which can be accessed from the aangan in front of the house. Two posts at the verandah edge are marking the entrance to the house. The access to the rooms is aligned with the verandah entrance. Cooking space is provided at one side of the verandah whereas the other side can be used to store fodder/firewood.
- Lean to roof is proposed over verandah for easy drainage of the rainwater. Rain water harvesting system can also be incorporated with the house. The low height wall in verandah is proposed to have jali for effective ventilation of the cooking space and to provide a sense of enclosure. Jali in parapet wall enhances the aesthetics of the house. Other aesthetic features which are incorporated in the type design are coping stone on top of parapet and verandah enclosure wall.

Recommendations for construction systems		
Components	**Recommended Specifications**	**Specific Comments**
Foundations	• Fly ash arch foundation in cement-sand/cement-lime-sand mortar as per specifications	
RCC Wall Bands	• Plinth bands 1. Plinth band 75 mm RCC Plinth band is provided at plinth level as per specifications • Lintel Bands 1. 75 mm RCC Plinth band is provided at lintel level as per specifications • Roof Bands 1. 75 mm RCC Plinth band is provided at roof level as per specifications	
Wall	• Fly ash rat trap wall in cement mortar's per Specifications	
Wall Finsih	• Cement pointing on external surfaces as per detail.	
Roof Structure	• RCC Filler slab with fly ash brick as filler material. CGI sheet over steel under-structure in verandah.	
Roof Finish	• China mosaic laid on P.C.C/ lime terracing as per detailed specifications	
Floor	• Unpolished kota stone/ Karegi flooring as per detail.	
Door and Windows	• Mild Steel frame and shutter as per specifications.	
Tie Beams	• Tie-Beam is provided at the floor level as per detail.	

RJ-03A



TYPICAL SECTION AA'



TYPICAL PLAN

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RJ-03A

Cost breakup

Item	Cost (INR)
Foundation	32670/-
Walls	76606/-
Roof	32034/-
Doors, Chajja, Windows and Embellishments	15144/-
Flooring	6798/-
Total	**163252/-**

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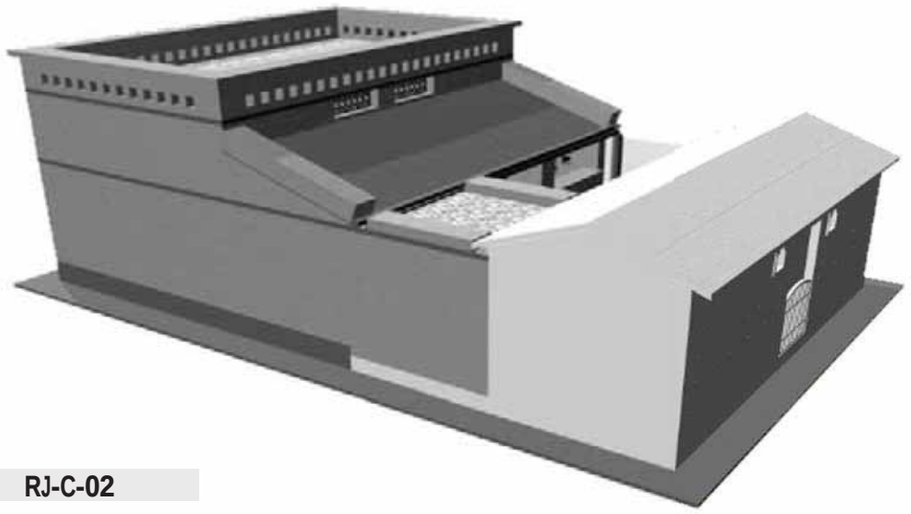
Cost Estimate for ZONE-C Design 01

S. NO.	COMPONENT	LABOR COST (₹)	TOTAL (LABOR +MATERIAL) (₹)
1	Foundation	7029	32670
2	RCC wall bands	800	9754
	Plinth band		
	Lintel band		
3	Walling	3980	43759
4	Roof structure	1776	22415
5	Roof finish	3719	9619
6	Doors and windows	565	11921
7	Chajja (Shading device)	22	141
8	Flooring	801	6798
9	Wall finishes	7105	23093
10	Embellishment	576	3076
		26371	163244
	ESTIMATED COST OF CORE HOUSE		**163244**

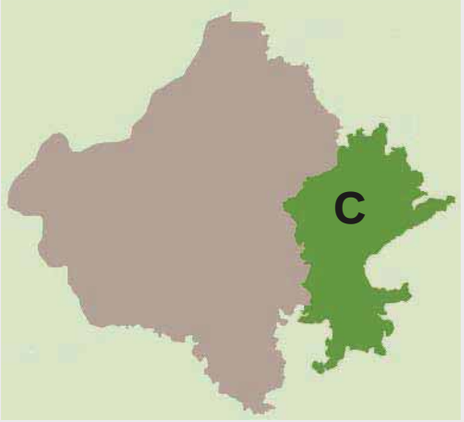
RJ-03B



RJ-C-02

- The type design is developed by taking cue from the traditional housing typology observed where separate sitting space is provided at the entrance to receive visitors. The house is proposed to be provided with attached toilet and bathroom which can be accessed from the semi-covered space in front.
- The access to the core house aligns with the entrance to the plot. The two rooms in the core house are provided separate entrances from the semi-covered verandah. Cooking space is provided on one side of the verandah and fodder can be stored on the other side. Ventilators are provided above the door openings for effective cross ventilation. Aala, a traditional feature observed as being widely used, is provided on both sides of the door.
- The semi-covered space in front, before entering aangan, acting as false façade is observed in many traditional houses. While recognizing this space an integral part of the homestead to maintain the hierarchy of spaces, the cost of this space is not included in the proposed type design for LAY.

Recommendations for construction systems		
Components	Recommended Specifications	Specific Comments
Foundations	• Brick arch foundation in cement-sand/ cement-lime-sand mortar as per specifications	
RCC Wall Bands	• Plinth bands 1. Plinth band 75 mm RCC Plinth band is provided at plinth level as per specifications • Lintel Bands 1. 75 mm RCC Plinth band is provided at lintel level as per specifications • Roof Bands 1. 75 mm RCC Plinth band is provided at roof level as per specifications	
Wall	• Coursed rubble masonry in cement/cement-lime-sand mortar as per specifications	
Wall Finsih	• Cement pointing on external surfaces as per detail.	
Roof Structure	• Stone patti with cement-sand pointing	
Roof Finish	• China mosaic laid on P.C.C/ lime terracing as per detailed specifications	
Floor	• Unpolished kota stone/ Karegi flooring as per detail.	
Door and Windows	• Mild Steel frame and shutter as per specifications.	
Tie Beams	• Tie-Beam is provided at the floor level as per detail.	



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RJ-03B

Total Cost ` 171846/-

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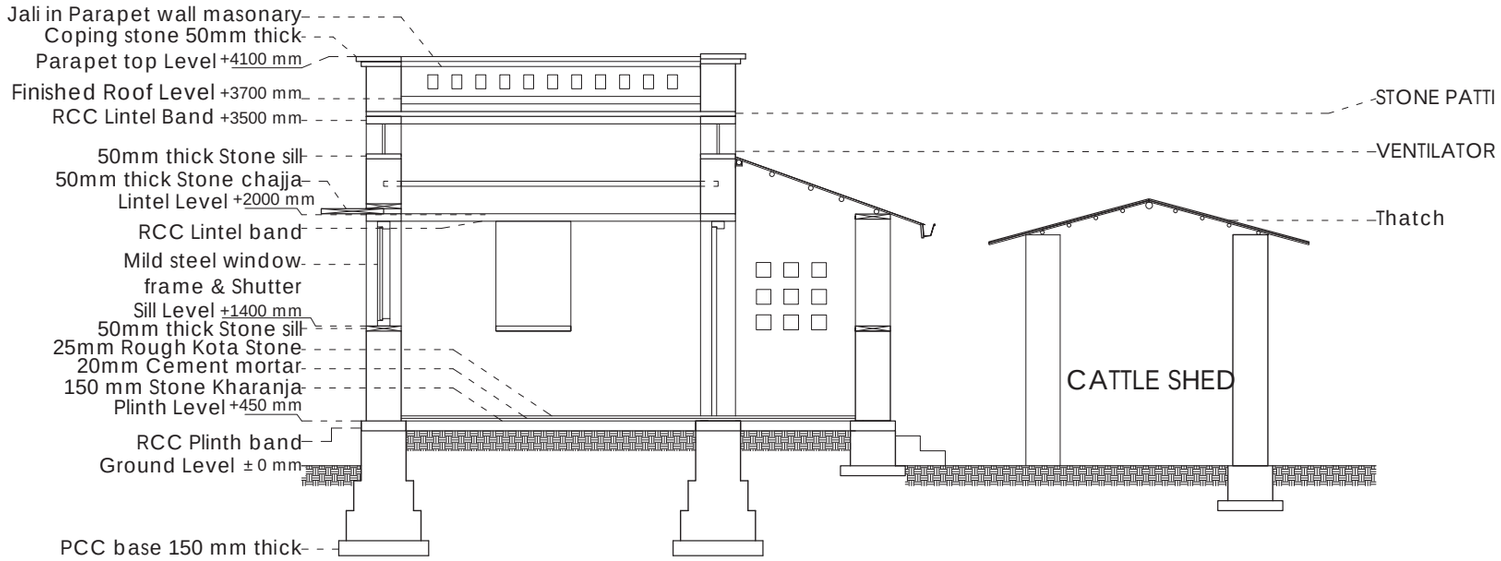
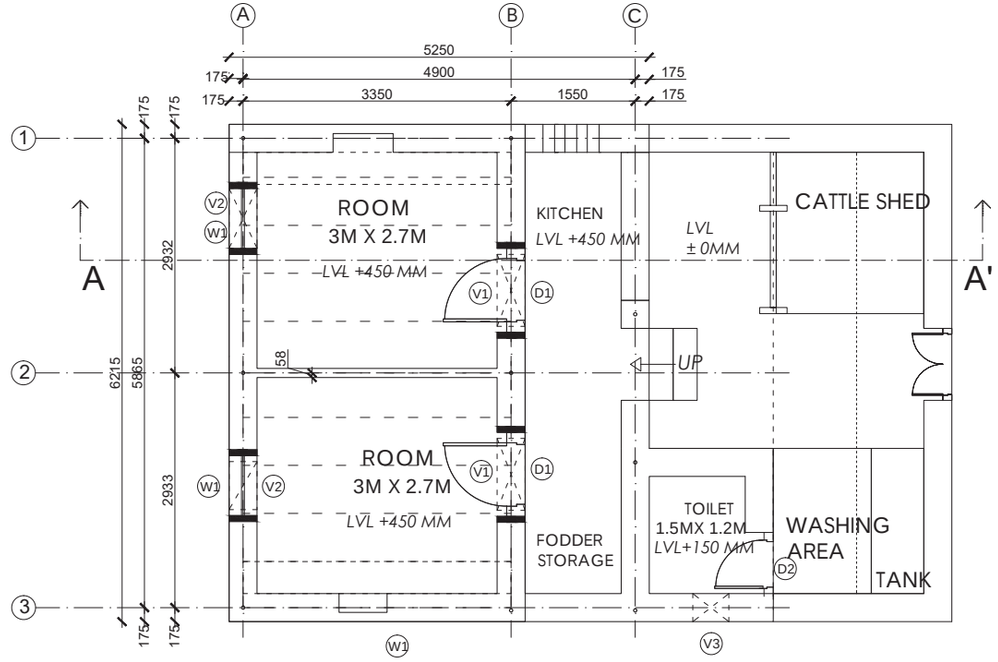


TYPICAL SECTION



TYPICAL PLAN

Cost Estimate for ZONE-C Design 02

S. NO.	COMPONENT	LABOR COST (₹)	TOTAL (LABOR +MATERIAL) (₹)
1	Foundation	8385	39836
2	RCC wall bands	1432	10727
	Plinth band		
	Lintel band		
	Roof band		
3	Walling	13073	57205
4	Roof structure	7936	23708
5	Roof finish	4503	10544
6	Doors and windows	546	9489
7	Chajja (Shading device)	328	954
8	Flooring	928	12835
9	Wall finishes	2450	6548
		39581	171844
	ESTIMATED COST OF CORE HOUSE		171844
	Toilet block (Toilet + Bath)	7505	36054

RJ-03B

Cost breakup

Item	Cost (INR)
Foundation	39836/-
Walls	74480/-
Roof	34252/-
Doors, Chajja and Windows	10443/-
Flooring	12835/-
Total	**171846/-**

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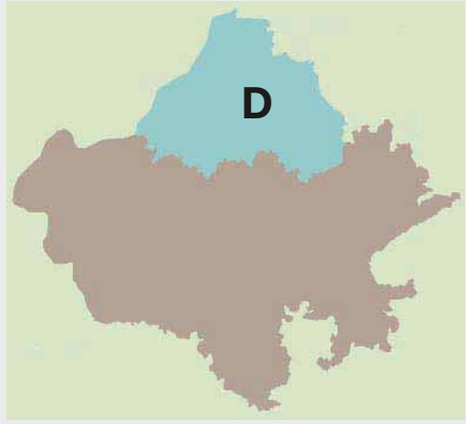
RJ-04A

Zone D includes 6 Districts :

1. Ganganagar district
2. Hanumangarh district
3. Bikaner district
4. Churu district
5. Jhunjhunun district
6. Sikar district

Zone D has two typologies
RJ-D-01
RJ-D-02



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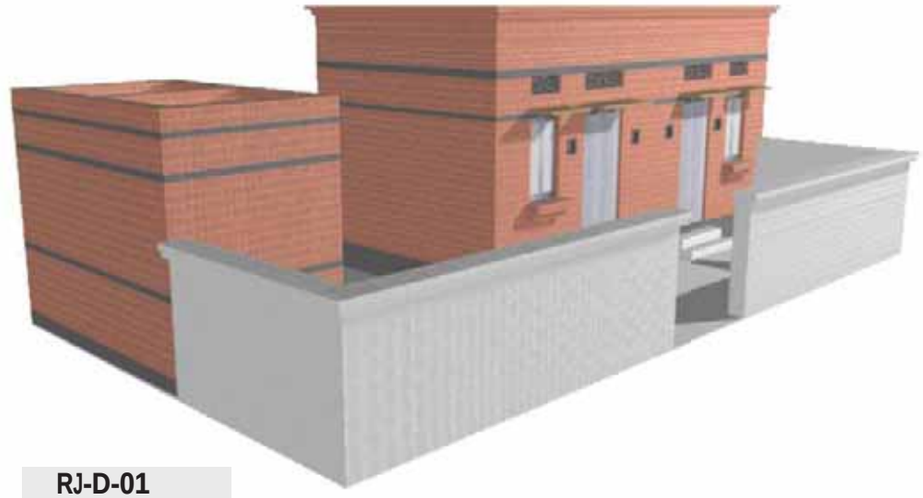
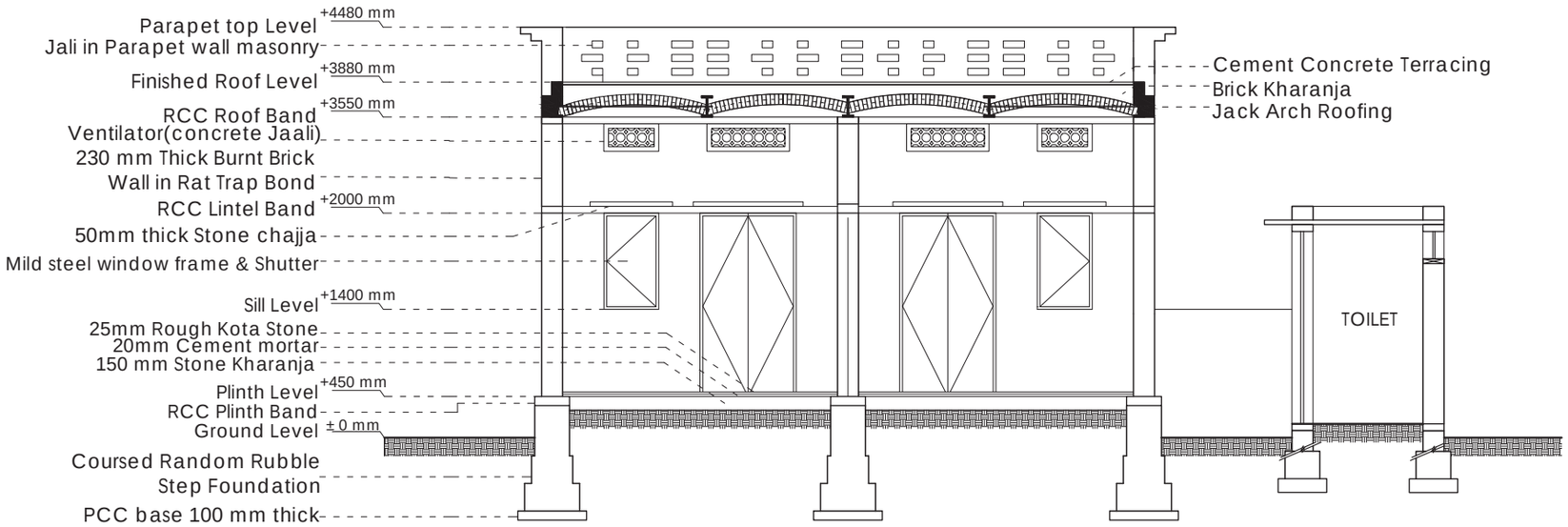


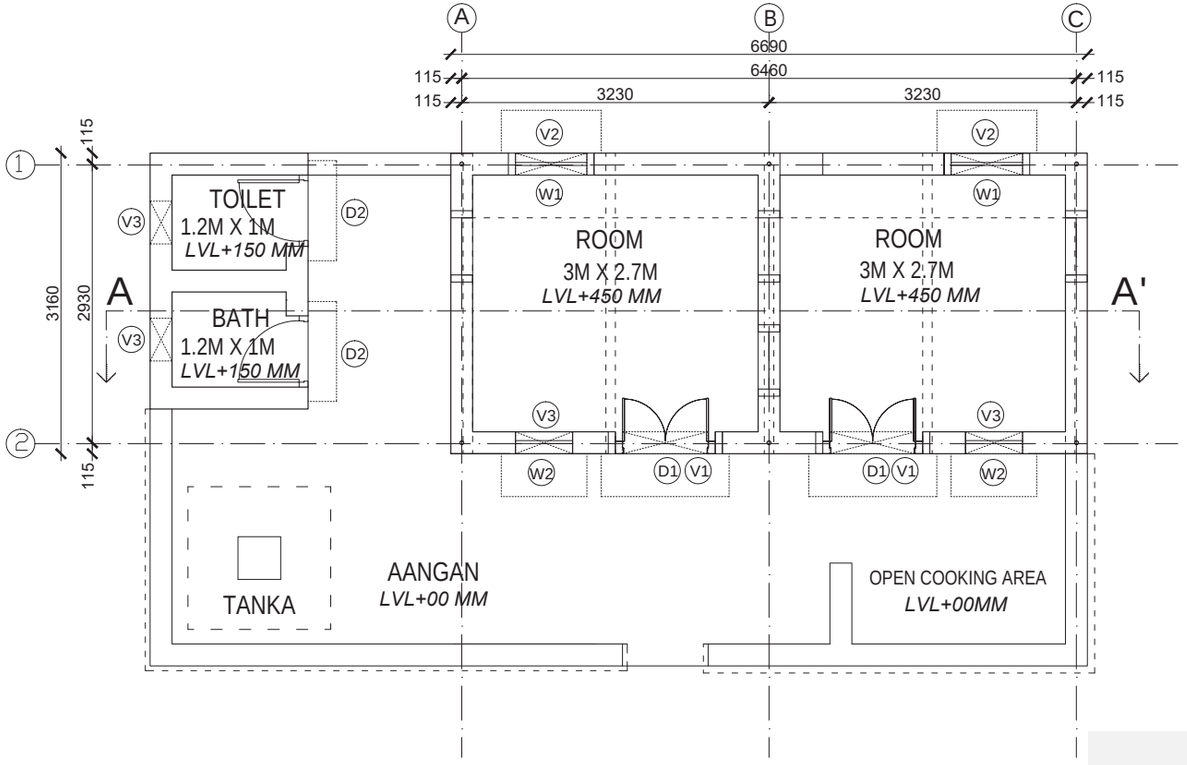
RJ-D-01

- The type design is developed by taking cue from the traditional housing typology where cooking space is kept outside in open with a low height wall enclosure. The core house is a simple rectangle in shape with two rooms having access from the open space (aangan) in front.
- Ventilators- jaali are provided above door and window openings for effective cross ventilation. Aala, The house is proposed to be provided with detached toilet in one corner of the plot. Water can be stored in underground water tank. Seismic bands are proposed at plinth, lintel and roof level.
- The cooking space in aangan is observed to have a low height wall enclosure. The cost of this wall is not included in the proposed type design for PMAY-G. The beneficiary can use any suitable local material available to build this enclosure.

Recommendations for construction systems		
Components	**Recommended Specifications**	**Specific Comments**
Foundations	• Continuous stepped brick foundation in cement-sand/cement-lime-sand mortar as per specification	
RCC Wall Bands	• **Plinth bands** 1. Plinth band 75 mm RCC Plinth band is provided at plinth level as per specifications • **Lintel Bands** 1. 75 mm RCC Plinth band is provided at lintel level as per specifications • **Roof Bands** 1. 75 mm RCC Plinth band is provided at roof level as per specifications	
Wall	• 9” thick Rat trap brick wall with cement-sand/ cement-lime-sand mortar as per specification	
Wall Finsih	• Cement pointing on external surfaces as per detail.	
Roof Structure	• Brick Jack Arch roof with Iron girders as primary structural members	
Roof Finish	• China mosaic laid on P.C.C/ lime terracing as per detailed specifications	
Floor	• Unpolished kota stone/ Karegi flooring as per detail.	
Door and Windows	• Mild Steel frame and shutter as per specifications.	
Tie Beams	• Tie-Beam is provided at the floor level as per detail.	



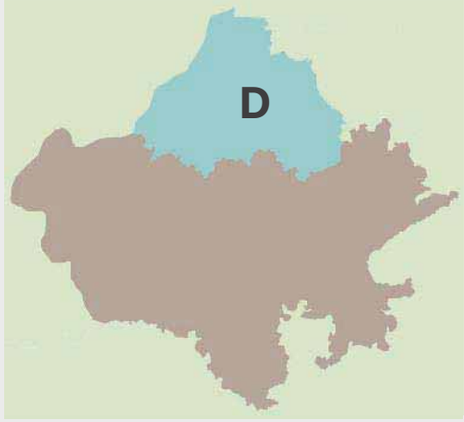
TYPICAL SECTION



TYPICAL PLAN

RJ-04A

Area statement:



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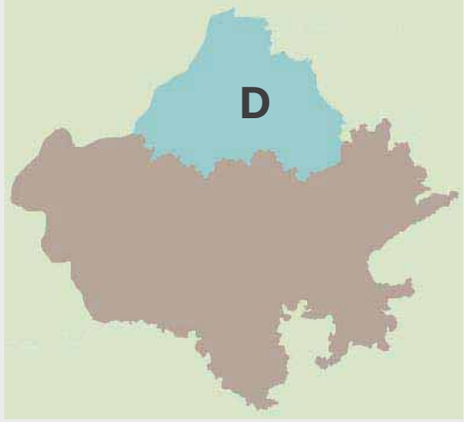
RJ-04A

Cost breakup

Item	Cost (INR)
Foundation	22169/-
Walls	49207/-
Roof	43056/-
Doors, Chajja and Windows	15285/-
Flooring	6487/-
Total	**136204/-**



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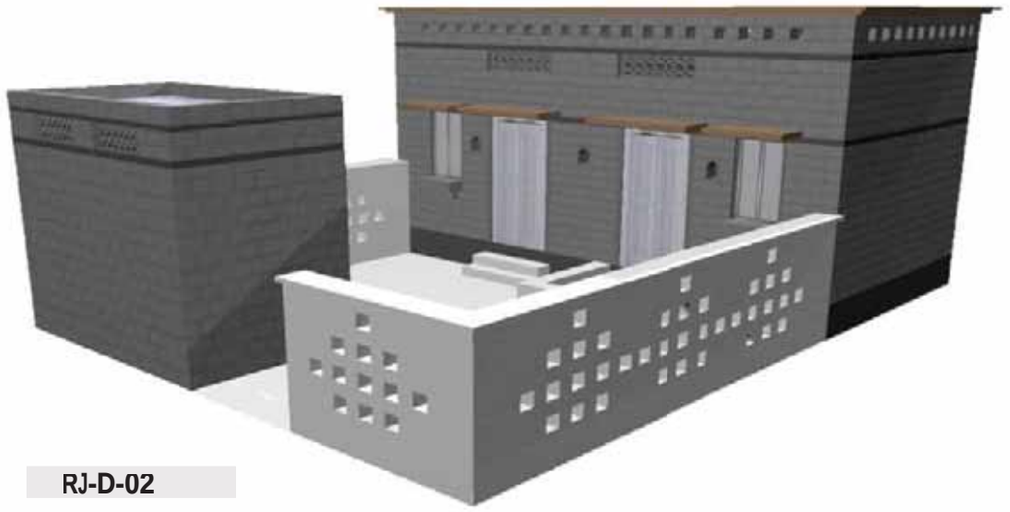
Cost Estimate for ZONE-D Design 01

S. NO.	COMPONENT	LABOR COST (₹)	TOTAL (LABOR +MATERIAL) (₹)
1	Foundation	10618	22169
2	RCC wall bands	1341	9978
	Plinth band		
	Lintel band		
	Roof band		
3	Walling	9325	33022
4	Roof structure	6350	31526
5	Roof finish	1246	11530
6	Doors and windows	698	11678
7	Chajja	1469	3607
8	Flooring	1700	6487
9	Wall finishes	5294	6207
		38041	136204
	ESTIMATED COST OF CORE HOUSE		136204
	Toilet block (Toilet + Bath)	14511	32771

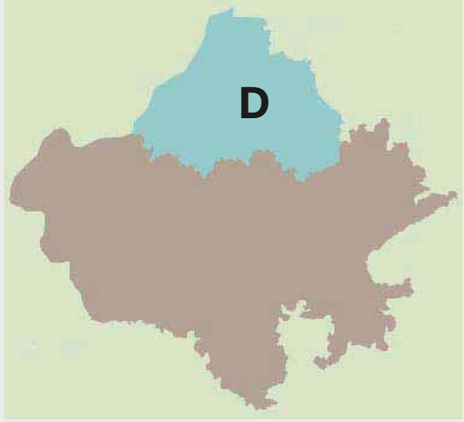
RJ-04B



RJ-D-02

- The type design is developed by taking cue from the traditional housing typology where cooking space is kept outside in open with low height wall enclosure. The core house is a simple rectangle in shape with two rooms having access from the open space (aangan) in front.
- Ventilator and jaali is provided above door and window openings for effective cross ventilation. Aala, a traditional feature observed as being widely used, is provided on both sides of the door. The house is proposed to be provided with detached toilet in one corner of the plot. Water can be stored in underground water tank. Seismic bands are proposed at plinth, lintel and roof level.
- The cooking space in aangan is observed to have a low height wall enclosure. The cost of this wall is not included in the proposed type design for LAY. The beneficiary can use any suitable local material available to build this enclosure.

Recommendations for construction systems		
Components	**Recommended Specifications**	**Specific Comments**
Foundations	• Continuous Coursed Rubble foundation in cement-sand/ cement-lime-sand mortar as per specifications	
RCC Wall Bands	• Plinth bands 1. Plinth band 75 mm RCC Plinth band is provided at plinth level as per specifications • Lintel Bands 1. 75 mm RCC Plinth band is provided at lintel level as per specifications • Roof Bands 1. 75 mm RCC Plinth band is provided at roof level as per specifications	
Wall	• Precast stone filler block wall in cement/cement-lime-sand mortar as per specifications	
Wall Finsih	• Cement pointing on external surfaces as per detail.	
Roof Structure	• Stone patti with cement-sand pointing	
Roof Finish	• China mosaic laid on P.C.C/ lime terracing as per detailed specifications	
Floor	• Unpolished kota stone/ Karegi flooring as per detail.	
Door and Windows	• Mild Steel frame and shutter as per specifications.	
Tie Beams	• Tie-Beam is provided at the floor level as per detail.	



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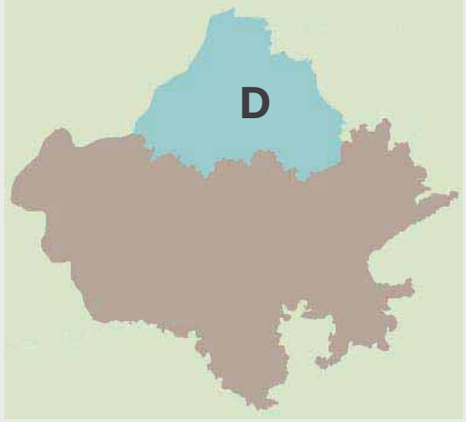
RJ-04B

Area statement:



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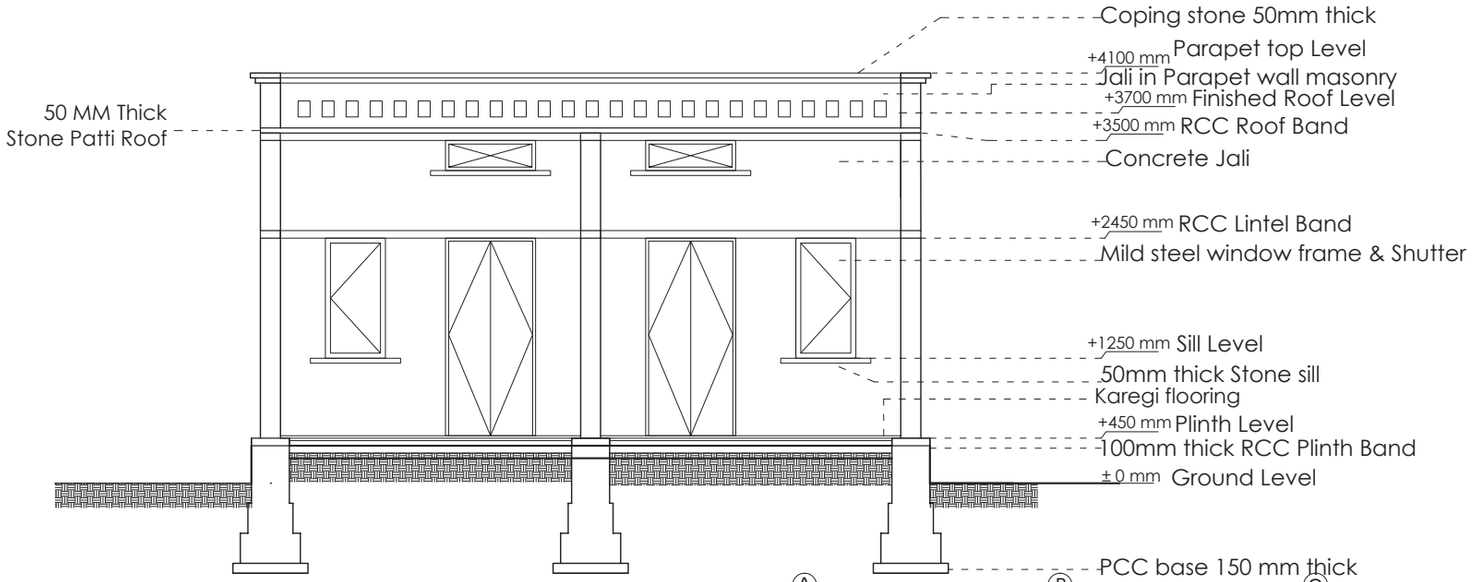
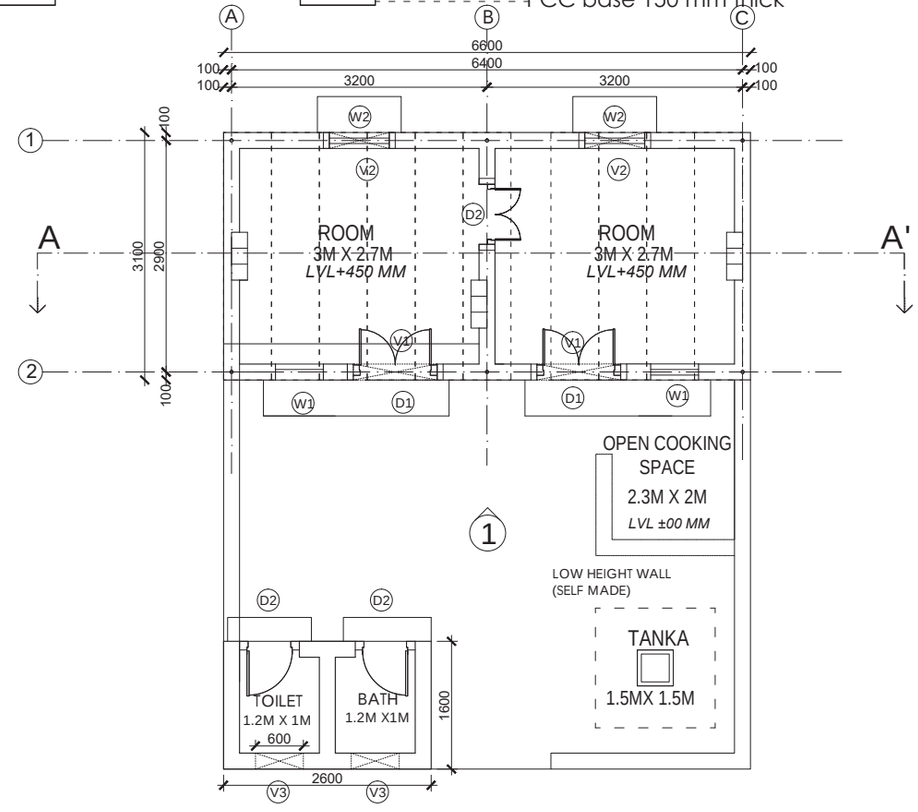


TYPICAL SECTION AA'



TYPICAL PLAN

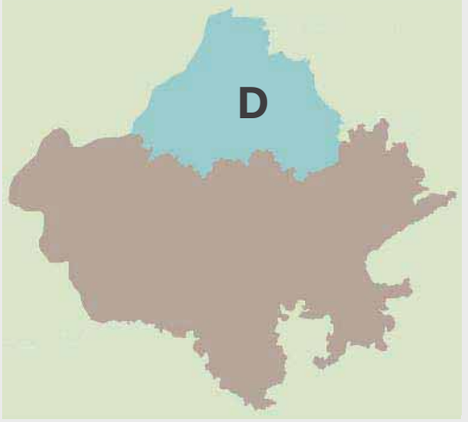
Cost Estimate for ZONE-D Design 02

S. NO.	COMPONENT	LABOR COST(₹)	TOTAL (LABOR +MATERIAL) (₹)
1.	Foundation	9184	44808
2.	RCC wall bands	1348	9553
	Plinth band		
	Lintel band		
	Roof band		
3.	Walling	8093	34779
4.	Roof structure	6955	24115
5.	Roof finish	1480	13107
6.	Doors and windows	3780	12939
7.	Chajja	1388	3084
8.	Flooring	2404	10519
9.	Wall finishes	10179	13305
		44811	166208
	ESTIMATED COST OF CORE HOUSE		166208
	Toilet block (Toilet + Bathing space)	8912	34482

RJ-04B

Cost breakup

Item	Cost (INR)
Foundation	44808/-
Walls	57637/-
Roof	37222/-
Doors, Chajja and Windows	16023/-
Flooring	10519/-
Total	**166209/-**



RAJASTHAN

pahal
Prakriti Hunar Lokvidya

Sikkim

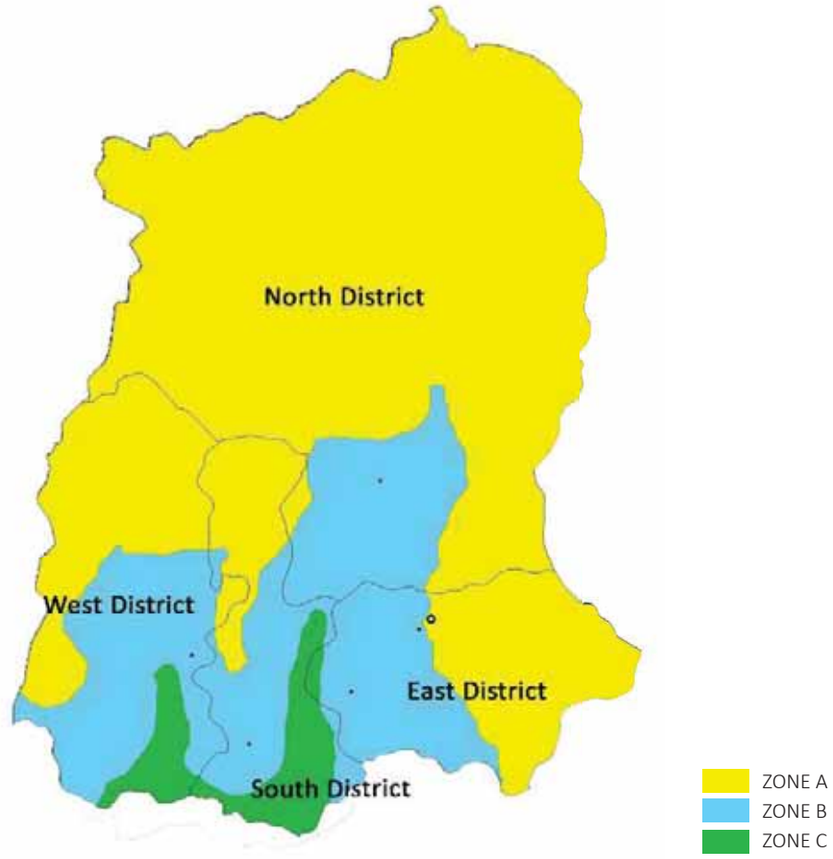
Sikkim is a hill state with rising altitude from South to North. The southern part has temperate climate with long monsoon and winters. Summers are pleasant with temperatures reaching around 28C. The northern part has tundra/ alpine climate.

The region is highly earthquake prone in seismic zone IV. Transportation to construction sites is difficult. Stones, gravel, sand is collected locally from small rivulets/ springs. Local timber and bamboo is extensively used in the construction of houses

Zone A
This zone is defined for the region which are upto 900 meter altitude. Tropical climate prevails in such a region which is a non-arid climate in which all twelve months have mean temperatures of at least 18 °C (64 °F). In such type of climate there are often only two seasons, a wet season and a dry season. This zonelies in seismic zone IV and experiences high rainfall.Wind speed is mostly high to an average of 50 m/s. The local available building construction materials are bamboo, timber and stone.

Zone B
The region defined in this zone is based on the altitude from 900 meters to 1800 meters. Temperate type of climate is found in this region, which is characterised by hot, usually humid summers and mild to cool winters. This zone also lies in seismic zone IV and experiences high rainfall. Wind speed is mostly high to an average of 50 m/s. The local available building construction materials are bamboo, timber and stone. The use of Ikra walls, CGI sheets and solid or hollow blocks can be done, as thin bamboo Ikra walls and CGI sheets are acceptable in temperate climate of the South Sikkim.

Zone C
Most of this zone is located at the altitude level 1800 meter to 3000 meter above mean sea level in the Northern most part of Sikkim. The climate type in this region is cold or Tundra which is characterized by cold and windy, also the rainfall is scant. This zone also lies in seismic zone IV. The local available building construction materials are bamboo, timber and stone. Materials which can be used in this zone for construction are Timber, stone, solid and hollow blocks as colder climate of the North requires a more insulated house.At higher altitudes good structural bamboo is not available and hence timber framing is popularly used.



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SIKKIM HOUSING TYPOLGIES AT A GLANCE

TYPOLOGY	APPLICABLE HOUSING ZONES	TOTAL AREA sq.m/sq.ft	
SK-01	Zone A & B	27.05 sq.m	291.16 sq.ft
SK-02	Zone A & B	22.84 sq.m	245.85 sq.ft
SK-03	Zone A & B	24.80 sq.m	266.95 sq.ft
SK-04	Zone C	24.80 sq.m	266.95 sq.ft
SK-05	Zone C	26.39 sq.m	284.06 sq.ft


SK-01


SK-02


SK-03


SK-04


SK-05

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SK-01

This typology is applicable to Zone A & B.
Highlights for Zone A:
This zone lies in seismic zone IV and experiences high rainfall.Wind speed is mostly high to an average of 50 m/s.

Highlights for Zone B: Temperate type of climate is found in this region, which is characterised by hot, usually humid summers and mild to cool winters. This zone also lies in seismic zone IV and experiences high rainfall. Wind speed is mostly high to an average of 50 m/s.

Zone A & B comprises of:

1. **North District**
2. **East District**
3. **West District.**
4. **Northern part of South District**

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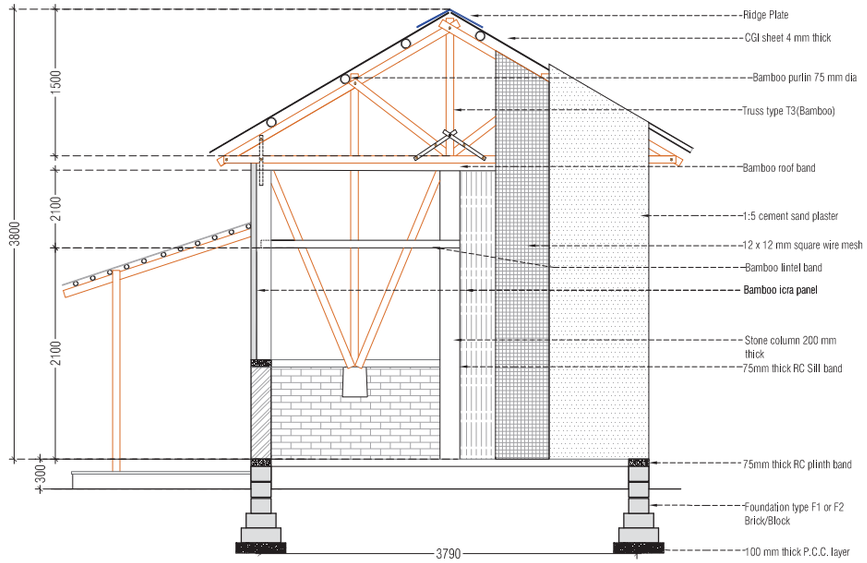
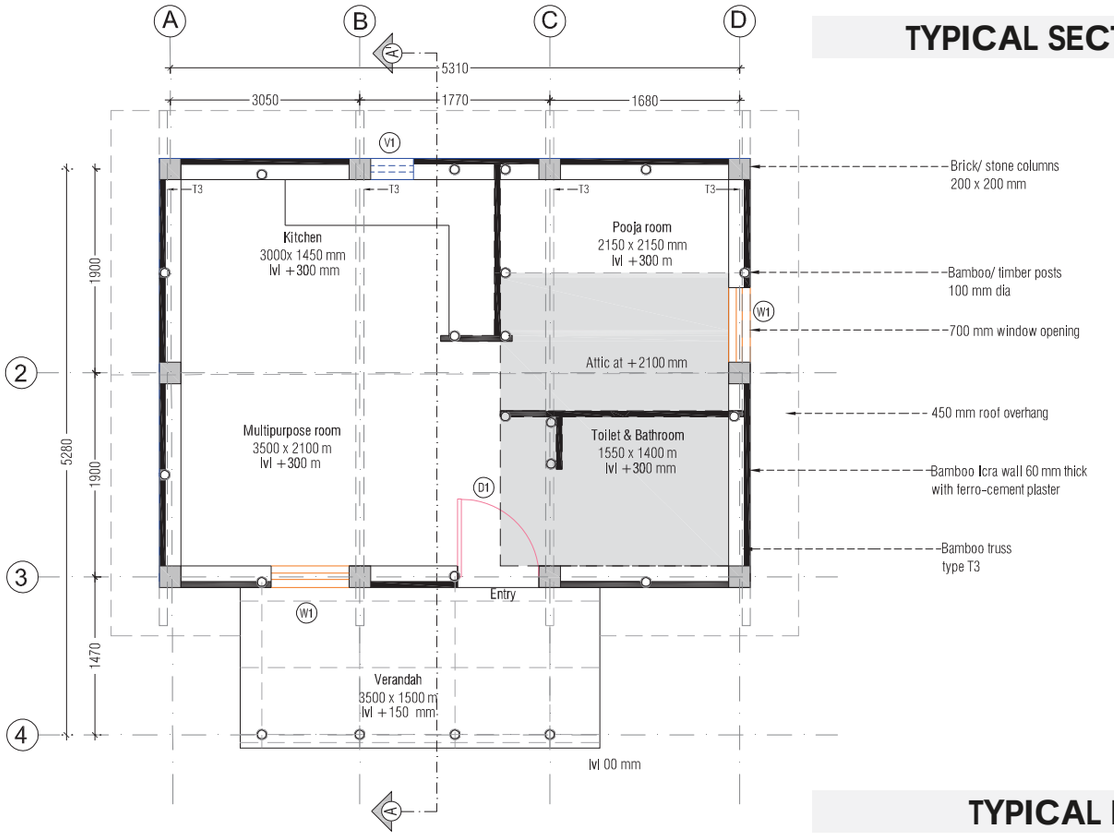
SK-01

Recommendations for Built Form		
Plan Layout	**Plinth/Floor**	**Roof Profile**
Layout designed to suit traditional needs- Multipurpose room withkitchen, A pooja room and toilet + bath	The house has an earthen plinth that is about 300 mm high.	A hipped roof with bamboo truss understructure or gable roof

Recommendations for construction systems		
Components	**Recommended Specifications**	**Specific Comments**
Foundations	• strip foundation with stone block masonry in 1:6 cement mortar	
Plinth	• Stone block Masonry plinth with earth back-filling.	
Wall	• 250 thk brick masonry upto sill level. • Ikra wall panelling with bamboo framing	• The vertical supports can be either grouted into the concrete pedestals provided in the plinth or, can be rested on the pedestals with a bent 8 mm rod anchoring it to the pedestals.
Wall Finish	• Ferrocement plaster	Optional: Cement based paint for external walls and lime rendering for internal walls.
Roof Structure	• Sloping roof with bamboo understructure(truss)	
Floor	• Plain cement flooring over RCC bed on a back filled plinth.	



TYPICAL SECTION AA'



TYPICAL PLAN

SK-01

Area statement:

Item	Area	
	Sq.m	Sq.ft
Multipur-pose Room	6.12	65.88
Kitchen	4.24	45.64
Pooja Room	4.59	49.41
Toilet & Bathroom	2.16	23.25
Attic	**5.83**	**62.75**
Verandah	**5.01**	**53.93**
Carpet Area	**24.11**	**259.52**
Built up Area	**27.05**	**291.16**

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SK-01
Cost estimate

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SR.NO.	Item of Work	Total (Rs)
1	Excavation	1593
2	Trench filling	301
3	Hand Packed Stone Soling	3108
4	1:3:6 Mix concerete for steps and column	1787
5	Plinth in coursed random rubble stone masonry	7510
6	RCC Tie beam	14057
7	Flooring in 10% cement stabilized mud with smooth surface finish	3272
8	Bamboo post (vertical) frame structure in walling	5000
9	Bamboo Beams (horizontal) frame structure in walling	2200
10	Reinforce Ekra wall Paneling	30377
11	Drill /auger mild steel bar and position mild steel bar	4960
12	Chicken wire mesh in Reinforced Ekra wall	6963
13	Door and window frames in local timber	2650
14	Door and window Shutters in local timber	14809
15	Provision of handles; sliding door bolt; tower bolt	1284
16	Roofing u/s in local available bamboo	4776
17	Roof cover in CGI Sheeting as / specs	29870
18	Roof Rridge finish complete	3451
19	CGI Sheet infill at eave ends	8432
20	Primer paint in timber frame	359
21	Enamel paint work in all type of timber frame	264
22	Provision for Electrification	2000
23	China water close (WC)	3322
24	Provision for internal water supply & sanitation	8800
25	Provision for Chulla & Chimney	2000
26	Sub Total	163145
A1	Contractor's Profit (7.5% deduction from total)	12236
A2	Total (Sr. No .26 - Sr. No. A1)	150909
B	Cost index :15% of items (Sr. no.13, Sr.no.15, Sr.no.16 & Sr. no.17)	6379
C	Loadind / unloading & carriage cost (L. S.)	5000
	ESTIMATE COST OF CORE HOUSE (A2 +B +C)	**162288**
	Plinth area (sqft)	272
	Cost per sqft	596.6470588

SK-02

SK-02

This typology is applicable to Zone A & B.

Highlights for Zone A:
This zone lies in seismic zone IV and experiences high rainfall.Wind speed is mostly high to an average of 50 m/s.

Highlights for Zone B: Temperate type of climate is found in this region, which is characterised by hot, usually humid summers and mild to cool winters. This zone also lies in seismic zone IV and experiences high rainfall. Wind speed is mostly high to an average of 50 m/s.

Zone A & B comprises of:

1. **North District**
2. **East District**
3. **West District.**
4. **Northern part of South District**

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Recommendations for Built Form		
Plan Layout	**Plinth/Floor**	**Roof Profile**
Layout designed to suit traditional needs- Verandah, Multipurpose room with kitchen and an attic	The house has an earthen plinth that is about 300 mm high.	A hipped roof with bamboo truss understructure

Recommendations for construction systems		
Components	**Recommended Specifications**	**Specific Comments**
Foundations	• Concrete stub foundation • Double Bamboo vertical posts grouted in CC stubs	
Plinth	• Stone block Masonry plinth with earth back-filling.	
Wall	• Ikra wall panelling with bamboo framing	• The vertical supports can be either grouted into the concrete pedestals provided in the plinth or, can be rested on the pedestals.
Wall Finish	• Ferrocement plaster	Optional: Cement based paint for external walls and lime rendering for internal walls.
Roof Structure	• Sloping roof with bamboo understructure(truss)	
Floor	• Plain cement flooring over RCC bed on a back filled plinth.	

SK-02

Area statement:

Item	Area	
	Sq.m	Sq.ft
Multipur-pose Room	12.76	137.35
Kitchen	4.80	51.67
Verandah	4.11	44.24
Attic	3.67	39.50
Carpet Area	**21.34**	**229.70**
Built up Area	**22.84**	**245.85**
Carpet Area	**24.11**	**259.52**
Built up Area	**27.05**	**291.16**

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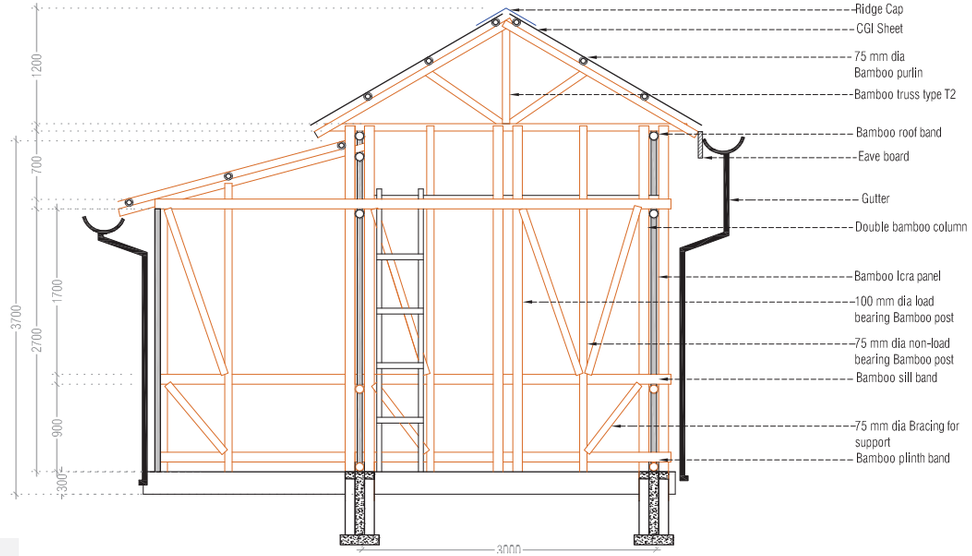
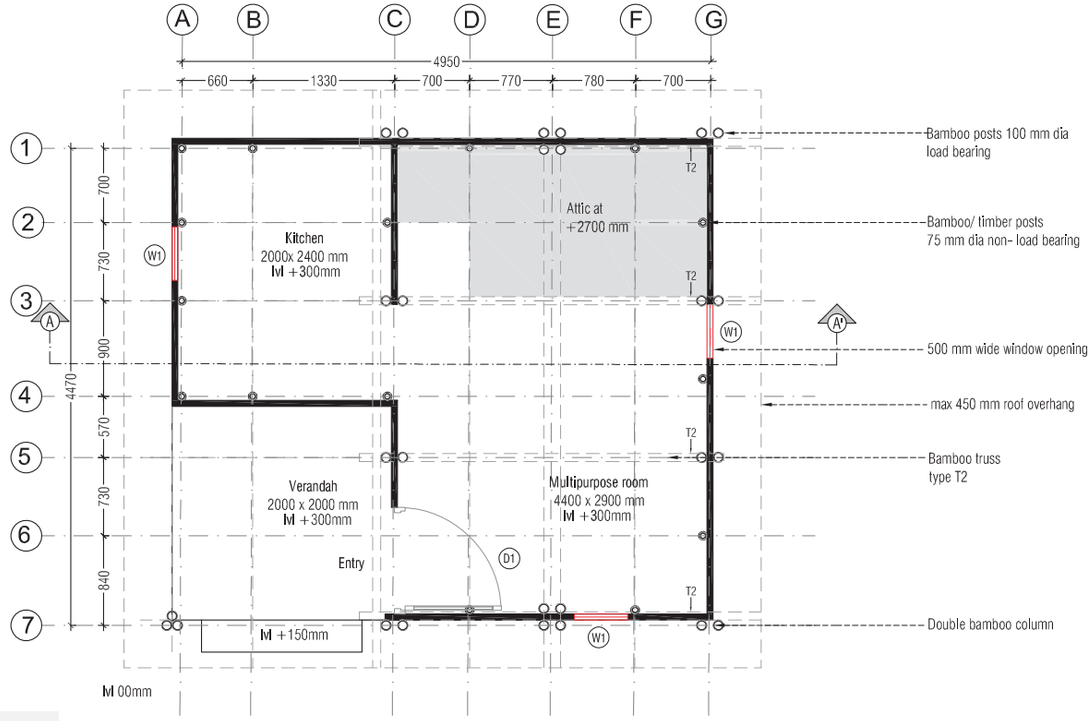


TYPICAL SECTION AA'



TYPICAL PLAN

SK-02
Cost estimate

SR.NO.	Item of Work	Total (Rs)
1	Excavation	1488
2	Trench filling	308
3	Hand Packed Stone Soling	3338
4	Plinth in Coursed random rubble stone masonry 1:4:8: mix	1750
5	Plinth in Coursed random rubble stone masonry	6867
6	RCC Tie beam	12679
7	Flooring in 1:2:4 mix with float clean neat cement to give smooth surface	5326
8	Bamboo post (vertical) frame structure in walling	4600
9	Bamboo Beams (horizontal) frame structure in walling	1000
10	Reinforce Ekra wall Paneling	23952
11	Drill /auger mild steel bar and position mild steel bar	3410
12	Chicken wire mesh in Reinforced Ekra wall	3939
13	1:4 mix cement plaster for steps	236
14	Door and window frames in local timber	1422
15	Door and window Shutters in local timber	9632
16	Provision of handles; sliding door bolt; tower bolt	838
17	Bamboo for attic	4361
18	Roofing under structure in locally available bamboo	5016
19	False ceiling in veranda	4326
20	Roof finish in CGI Sheeting	32499
21	Roof Ridge finish complete	2997
22	CGI Sheet infill at eave ends	8705
23	White washing (external)	909
24	Distempering (internal + external)	2544
25	Prime paint in timber frame	228
26	Enamel paint work in all type of timber frame	229
27	Provision for electrification	2000
28	Provision for Chulla & Chimney	2000
29	Sub Total	146599
A1	Contractor's Profit (7.5% deduction from total)	11000
A2	Total (Sr. No .28 - Sr. No. A1)	135661
B	Cost index :15% of items (Sr. no.5,6,7,8,11.16,17 & Sr. no.18)	7484
C	Loadind / unloading & carriage cost (L. S.)	5000
	ESTIMATE COST OF CORE HOUSE (A2 +B +C)	**148145**
	Plinth area (sqft)	279
	Cost per sqft	531.0

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SK-03

This typology is applicable to Zone A & B.
Highlights for Zone A:
This zone lies in seismic zone IV and experiences high rainfall.Wind speed is mostly high to an average of 50 m/s.

Highlights for Zone B: Temperate type of climate is found in this region, which is characterised by hot, usually humid summers and mild to cool winters. This zone also lies in seismic zone IV and experiences high rainfall. Wind speed is mostly high to an average of 50 m/s.

Zone A & B comprises of:

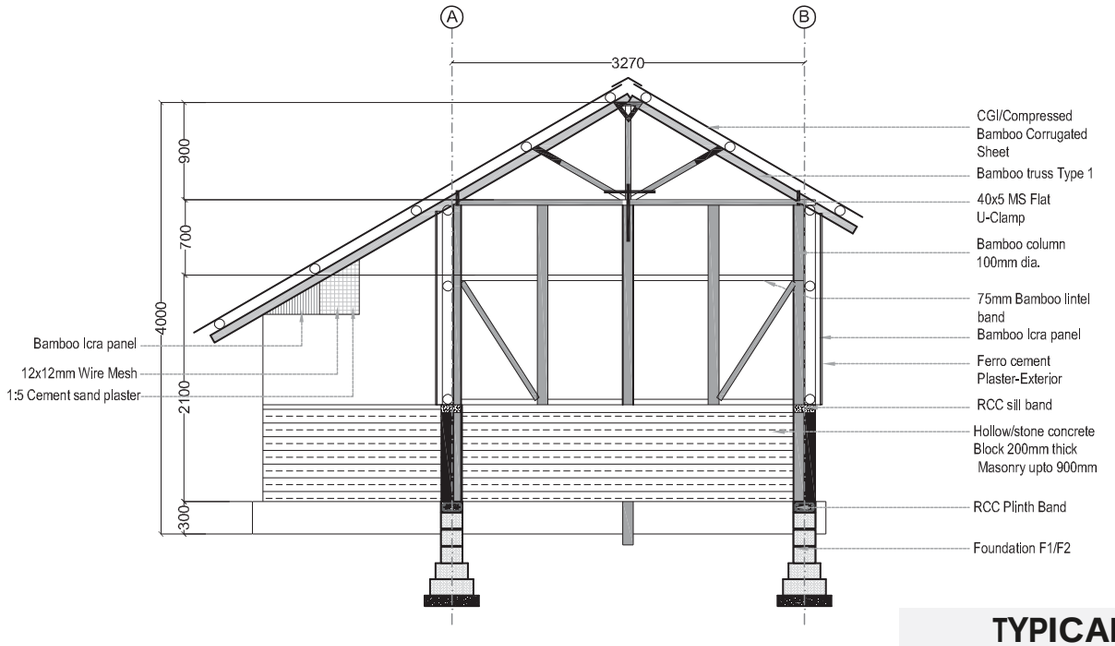
1. **North District**
2. **East District**
3. **West District.**
4. **Northern part of South District**

SIKKIM

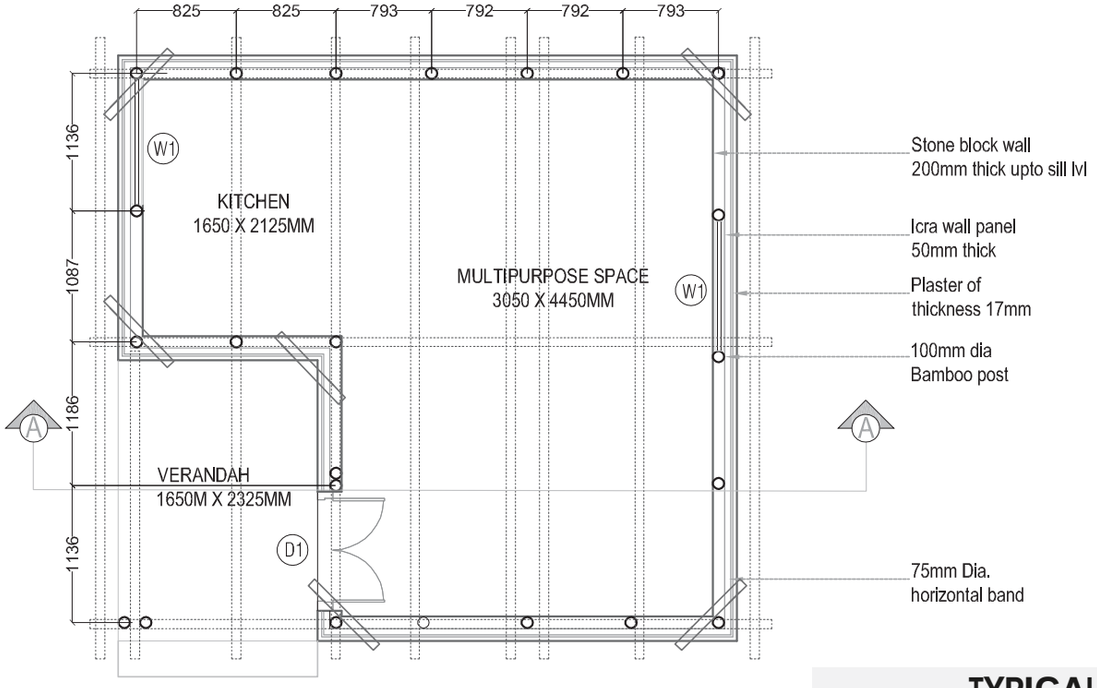
SK-03

Recommendations for Built Form		
Plan Layout	**Plinth/Floor**	**Roof Profile**
Layout designed to suit traditional needs- Multipurpose room withkitchen and toilet + bath	The house has an earthen plinth that is about 300 mm high.	A hipped roof

Recommendations for construction systems		
Components	**Recommended Specifications**	**Specific Comments**
Foundations	• Concrete stub foundation • Double Bamboo vertical posts grouted in CC stubs	
Plinth	• Stone block Masonry plinth with earth back-filling.	
Wall	• Hollow concrete block masonry upto sill level • Ikra wall panelling with bamboo framing above sill level • The walls are incorporated with RCC obands at the plinth/ sill level	• The vertical supports can be connected to the rcc lintel band at the sill level using MS bolts.
Wall Finish	• Ferrocement plaster	Optional: Cement based paint for external walls and lime rendering for internal walls.
Roof Structure	• Sloping roof with bamboo understructure(truss)	
Floor	• Plain cement flooring over RCC bed on a back filled plinth.	



TYPICAL SECTION AA'



TYPICAL PLAN

SK-03

Area statement:

Item	Area	
	Sq.m	Sq.ft
Multipur-pose Room	13.65	146.93
Kitchen	3.50	37.67
Verandah	3.83	41.23
Carpet Area	17.35	186.76
Built up Area	**24.80**	**266.95**

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SK-03
Cost estimate

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SR.NO.	Item of Work	Total (Rs)
1	Excavation	1265
2	Trench filling	283
3	Hand Packed Stone Soling	3192
4	CC (Cement Conceret) 1:3:6 mix	14423
5	Continuous HCB foundation 1:2:4 mix	852
6	Plinth beam 1:2:4 mix column, window still tie, window lintel, lintel,jams around doors and windows	15247
7	Form work for all RCC	2000
8	Door stepes on coursed random rubble stone mosonry with plaster	187
9	Flooring in 1 :2 :4 mix with floor clean neat cement to give smooth surface	6119
10	Walling in Hollow concrete block in 1:5 cement mortor till sill	1701
11	Cement Plaster 12mm thick 1 :4 mix	4926
12	Bamboo frame strucure for walling	2600
13	Reinforced Ekra wall Paneling in bamboo frame	4773
14	Drill /auger mild steel bar and position mild steel bar	2722
15	Chicken wire mesh in Reinforced Ekra wall	3919
16	Door and window frames	2725
17	Door and window shutters	9633
18	Provision of handles; sliding door bolt; tower bolt	750
19	Roofing under structure in locally available bamboo	5543
20	False ceiling in veranda	4326
21	Roof finish in CGI Sheeting	39359
22	Roof Ridge finish complete	3211
23	CGI Sheet infill at eave ends	9388
24	White washing on walling	809
25	Primer paint in timber frame	241
26	Enamel paint work in all type of timber frame	214
27	Provision for electrification (LS)	2000
28	Provision for Chulla & Chimney	2000
29	Sub total	139408
A1	Contractor's Profit (7.5% deduction from total)	10456
A2	Total (Sr. No.29 - Sr. No. A1)	128952
B	Cost index :15% of A2	19343
C	Loadind / unloading & carriage cost (L. S.)	50000
	ESTIMATE COST OF CORE HOUSE (A2 +B +C)	153295
	Plinth area (sqft)	274
	Cost per sqft	**559.4708029**

SK-04

SK-04

This typology is applicable to Zone C.

Zone C highlights: The climate type in this region is cold or Tundra which is characterized by cold and windy, also the rainfall is scant. This zone also lies in seismic zone IV.

Zone C comprises of:

1. Southern part of West District.
2. Northern part of South District

Local available construction materials comprises of Bamboo, Timber, stone, solid or hollow concrete blocks can be found in this zone.

Recommendations for Built Form		
Plan Layout	**Plinth/Floor**	**Roof Profile**
Layout designed to suit traditional needs- Multipurpose room with kitchen and a verandah	The house has an earthen plinth that is about 300 mm high.	A hipped roof with bamboo truss understructure

Recommendations for construction systems		
Components	**Recommended Specifications**	**Specific Comments**
Foundations	• Concrete stub foundation • Double Bamboo vertical posts grouted in CC stubs	
Plinth	• Stone block Masonry plinth with earth back-filling.	
Wall	• Hollow concrete block masonry • The walls are incorporated with RCC obands at the plinth/ sill level	
Wall Finish	• Ferrocement plaster	Optional: Cement based paint for external walls and lime rendering for internal walls.
Roof Structure	• Sloping roof with bamboo understructure(truss) incorporated with U clamps and J bolts etc..	
Floor	• Plain cement flooring over RCC bed on a back filled plinth.	

SIKKIM

SK-04

Area statement:

Item	Area	
	Sq.m	Sq.ft
Multipur-pose Room	13.65	146.93
Kitchen	3.50	37.67
Verandah	3.83	41.23
Carpet Area	17.35	186.76
Built up Area	**24.80**	**266.95**

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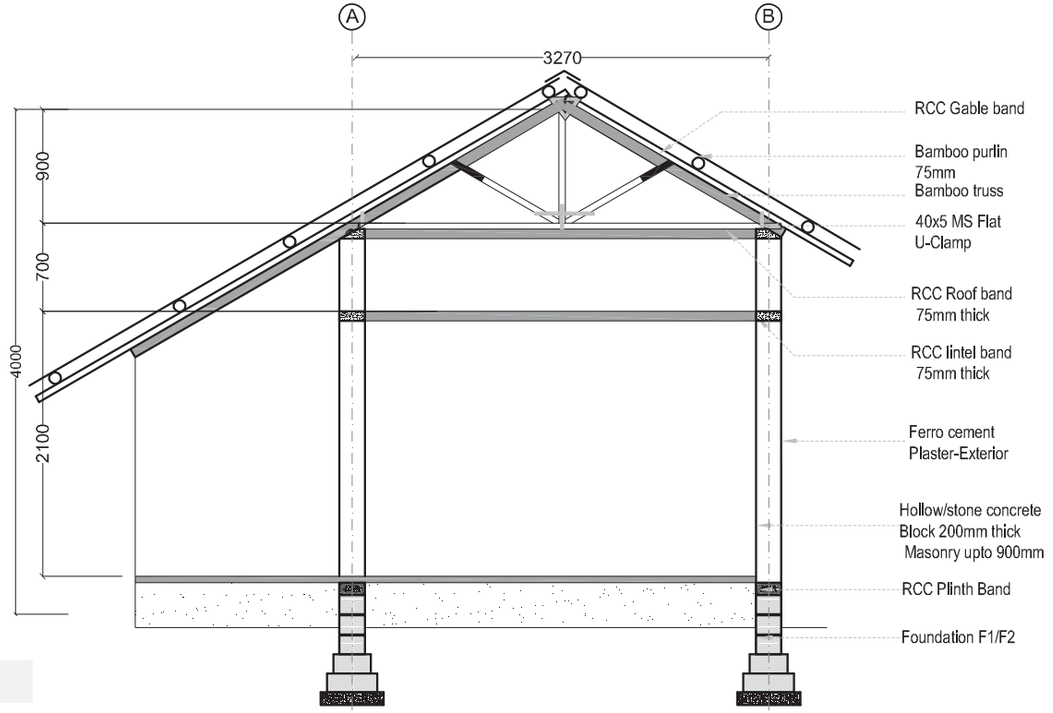
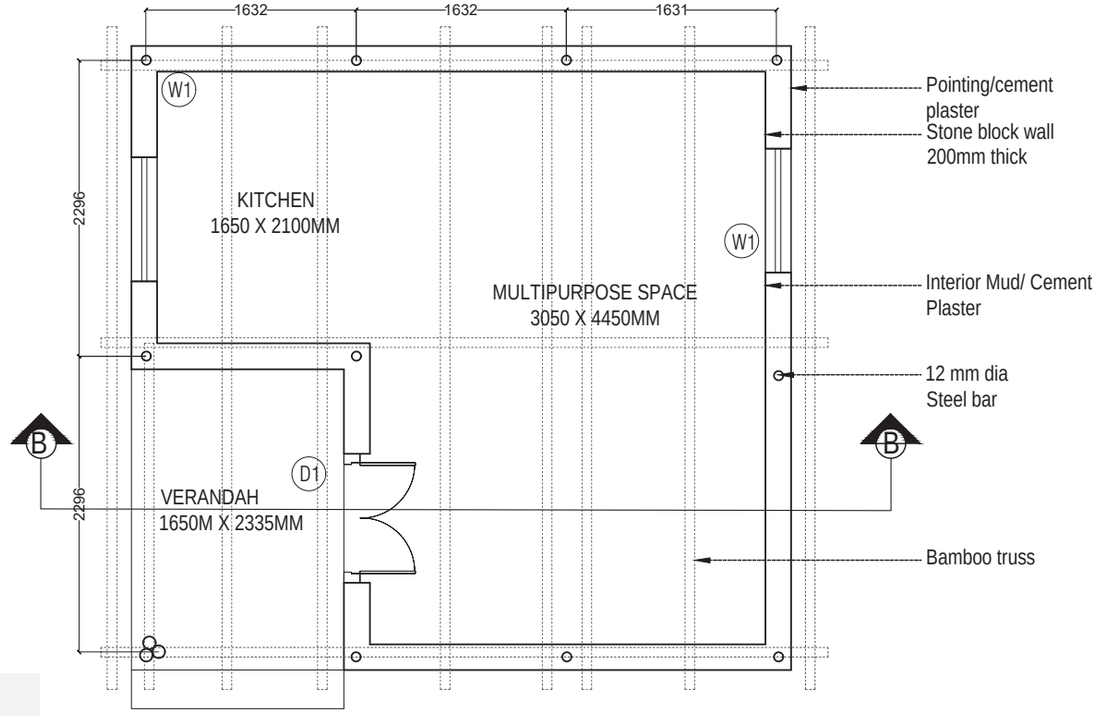


TYPICAL SECTION AA'



TYPICAL PLAN

SK-04
Cost estimate

Sl.No.	Item of Work	Total (Rs)
1	Excavation	1161
2	Trench filling and for continuous for HCB foundation	283
3	Hand Packed Stone Soling	3192
4	CC (cement concrete) 1:3:6 mix	14423
5	Continuous HCB foundation 1:2:4 mix Plinth beam 1:2:4 mix	699
6	Column, window still tie, window lintel, lintel,jambs around door,windows	20196
7	Form work for all RCC WORKS	2000
8	Door stepes on coursed random rubble stone mosonry with plaster	187
9	Flooring in 1 :2 :4 mix with floor clean neat cement to give smooth surface	6020
10	Walling in Hollow concrete block in 1:5 cement mortor till lintel lvl	5107
11	Cement Plaster 12mm thick 1 :4 mix	11532
12	12mm thick cement plaster for steps	52
13	Door and window frames	2423
14	Door and window Shutters	9213
15	Provision of handles; slinding door bolt ; tower bolt	838
16	Roofing under structure in locally available bamboo	5554
17	False ceiling in veranda	4326
18	Roof finish in CGI Sheeting	33796
19	Roof Ridge finish complete	3211
20	CGI Sheet infill at eave to roof lvl on either side of the truss system	9385
21	White washing on walling	380
22	Distempering	1064
23	Primer paint in timber frame	241
24	Enamel paint work in all type of timber frame	218
25	Provision for electrification (LS)	2000
26	Provision for Chulla & Chimney	2000
27	Sub Total	139501
A1	Contractor's Profit (7.5% deduction from total)	10463
A2	Total (Sr. No .27 - Sr. No. A1)	129038
B	Cost index :15% A2	19356
C	Loadind / unloading & carriage cost (L. S.)	5000
	ESTIMATE COST OF CORE HOUSE (A2 +B +C)	153394
	Plinth area (sqft)	274
	Cost per sqft	559.8321168

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SK-05

This typology is applicable to Zone C.

Zone C highlights: The climate type in this region is cold or Tundra which is characterized by cold and windy, also the rainfall is scant. This zone also lies in seismic zone IV.

Zone C comprises of:

1. Southern part of West District.
2. Northern part of South District

Local available construction materials comprises of Bamboo, Timber, stone, solid or hollow concrete blocks can be found in this zone.

SIKKIM

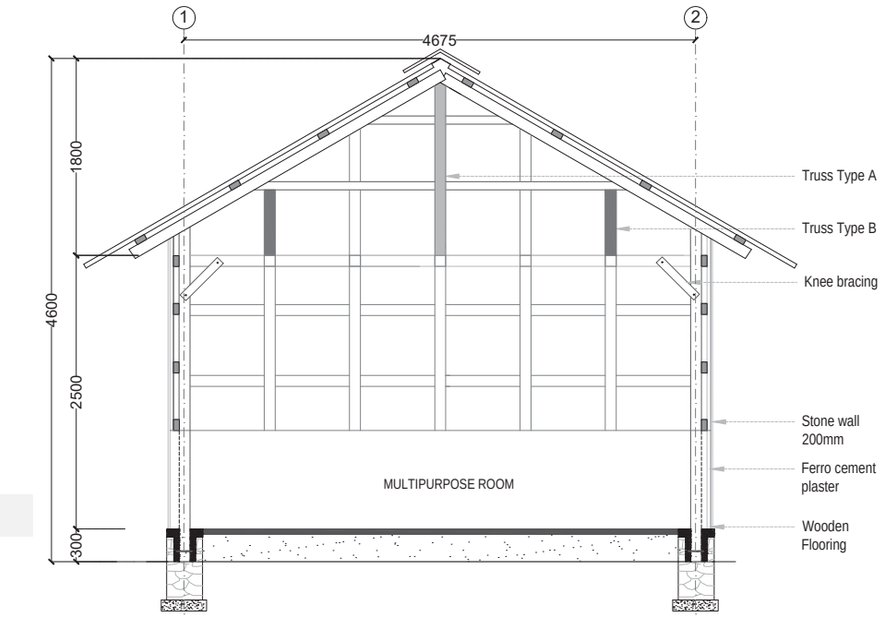
SK-05

Recommendations for Built Form		
Plan Layout	**Plinth/Floor**	**Roof Profile**
Layout designed to suit traditional needs- Multipurpose room with kitchen and a verandah	The house has an earthen plinth that is about 300 mm high.	A hipped roof with bamboo truss understructure

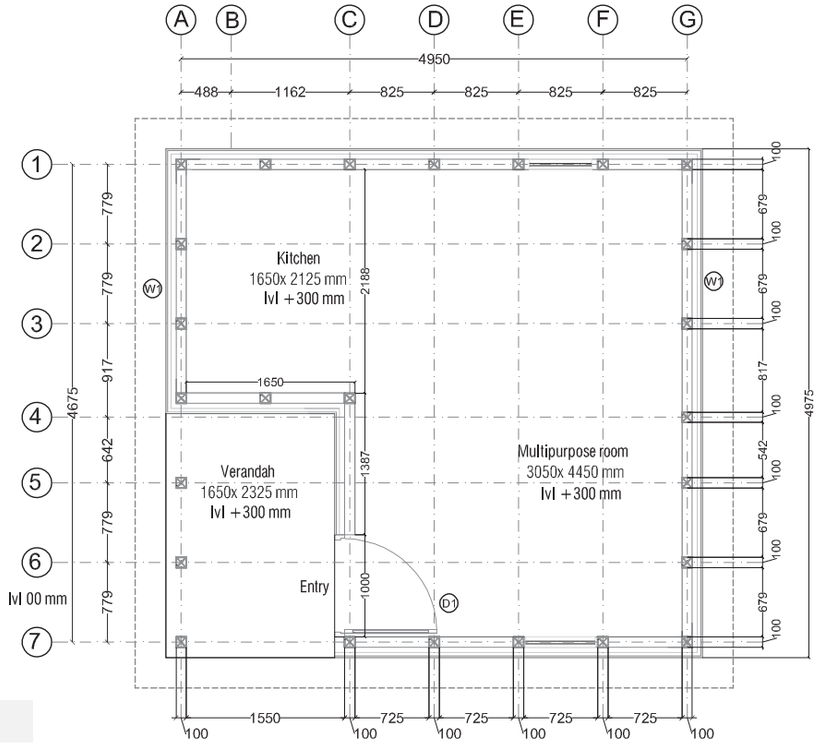
Recommendations for construction systems		
Components	**Recommended Specifications**	**Specific Comments**
Foundations	• Concrete stub foundation • Double Bamboo vertical posts grouted in CC stubs	
Plinth	• Stone block Masonry plinth with earth back-filling.	
Wall	• 200 mm thk stone block masonry upto sill level • Ikra wall panelling above sill level with timber framing • The walls are incorporated with RCC obands at the plinth/ sill level	
Wall Finish	• Ferrocement plaster	Optional: Cement based paint for external walls and lime rendering for internal walls.
Roof Structure	• Sloping roof with bamboo understructure(truss) incorporated with U clamps and J bolts etc..	
Floor	• Wooden flooring	

SK-05

TYPICAL SECTION AA'



TYPICAL PLAN



Area statement:

Item	Area	
	Sq.m	Sq.ft
Multipur-pose Room	14.64	157.58
Kitchen	3.61	38.86
Verandah	3.77	40.58
Carpet Area	18.45	198.60
Built up Area	**26.39**	**284.06**

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SK-05
Cost estimate

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SR.NO.	Item of Work	Total (Rs)
1	Excavation	834
2	Trench filling	363
3	Hand Packed Stone Soling	3605
4	CC (Cement concerete)1:3:6 Mix concrete for steps	1053
5	Plinth in coursed random rubble stone masonry 1:4:8 mix	9471
6	Door stepes on coursed random rubble stone mosonry with plaster	105
7	Flooring in 1 :2 :4 mix with floor clean neat cement to give smooth surface	5573
8	Timber post (vertical) for foundation	15052
9	Timber post (vertical) and beams (Horizontal) frame structure in walling	26574
10	Ekra wall peneling	21655
11	Door and window frames	2950
12	Door and window Shutters	11079
13	Provision of handles; slinding door bolt ; tower bolt	966
14	Roofing u/s in local available timber	15093
15	False Ceiling in varandha	4326
16	Roof finish in CGI Sheet	32055
17	Roof Rridge finish complete	6154
18	White washing at both G.F. & F.F.(External)	828
19	Distempeing at both G.F. & F.F. (External + Internal)	221
20	Primer paint in timber frame	297
21	Enamel paint work in all type of timber frame	1589
22	Provision for Electrification	2000
23	Provision for Chulla & Chimney	2000
24	Sub Total	163843
25	Contractor's Profit (7.5% deduction from total)	12288
26	Total (Sr. No .23 - Sr. No. A1)	151555
	Cost index :15% of item A2	22732
A1	Loadind / unloading & carriage cost (L. S.)	5000
A2	ESTIMATE COST OF CORE HOUSE (A2 +B +C)	**179287**
B	Plinth area (sqft)	287
C	Cost per sqft	624.6933798

pahal
Prakriti Hunar Lokvidya

Tripura

The traditional zoning of the Tripura is hilly and non-hilly areas. Barring a few places, the various tribal groups are found in all eight districts, sometimes living in the same village.

The entire state is in the highest seismic zone (Z-V) with high short time northwesters. Parts of the state are vulnerable to landslide and flood. Tripura has been divided into three 'housing zones' based on socio-cultural pattern of living, geo-climate, soil type, local materials, existing traditional construction practices (materials and skills), multi-hazards, etc.

ZONE A: Hilly Areas: Jampui Hills

Jampui hills has 10 small villages and most of the inhabitants belong to the Mizo community. The average altitude of this region is 3100 ft from the MSL. Zone I is bordering Mizoram. Excellent quality mud walls are found in this region. Brick is very expensive. The locality has potential for cement stabilised mud block.

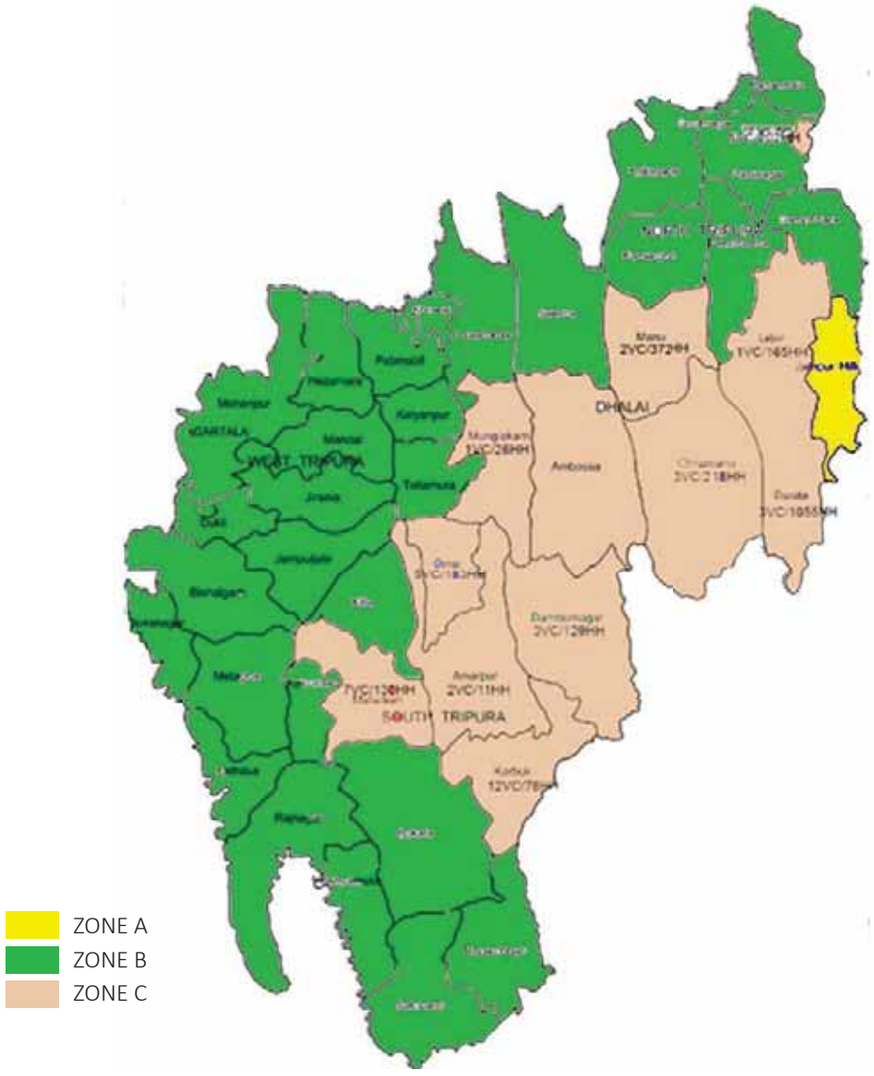
ZONE B : Non Hilly areas All tribes + Bengalis

Majority of the buildings have mud wall with CGI sheets on bamboo under structure. Each plot of land has space for pig, chicken, goats and cows. Local masons have developed their own way of utilising the local mud, reeds, etc., to make seismic and high wind safe buildings. The people in this zone prefer linear or L type plans that maximize ventilation. All the dwelling units have veranda on two or four sides depending upon affordability. Veranda is used for livelihood related activities. Every house has a stock of fire wood.

ZONE C

Tong Ghars have been observed in this zone. This is preferred by the Chakmas, Reangs and the Darlongs. Design type 'modified Tong Ghar' has been recommended for this zone with modifications (solid plinth).

One of the unique shelter types in Tripura is Tong Ghar (house on stilt). These are preferred by the Reangs, Chakmas and the Darlongs. Otherwise all the dwelling units in the non-hilly areas had linear and L type plans that maximize ventilation. Many preferred L-type. Other than Jampui hills, the rest of Tripura has undulating low rise landform. The traditional zoning of the state is hilly and non-hilly areas. While there are places where good numbers of specific tribes live, e.g., Chakmas in Laljuri, Debbarmas in Jampuijola, etc, others in the same places live as well. Therefore, among the surveyed settlements in the eight districts, a clear cut social zoning could not be done. Based on the desktop research, state level data and the resource mapping, the following zoning has been done for Tripura based on topography/ climate and social pattern.



TRIPURA

TRIPURA HOUSING TYPOLGIES AT A GLANCE

TYPOLOGY	APPLICABLE HOUSING ZONES	TOTAL AREA
TR-01	Zone B & C	596.11 Sq.ft
TR-02	Zone A,B & C	534.76 sq.ft
TR-03	Zone A, B & C	523.35 sq.ft
TR-04	Zone B & C	848.31 sq.ft
TR-05	Zone C	605.37 sq.ft


TR-01


TR-02


TR-05

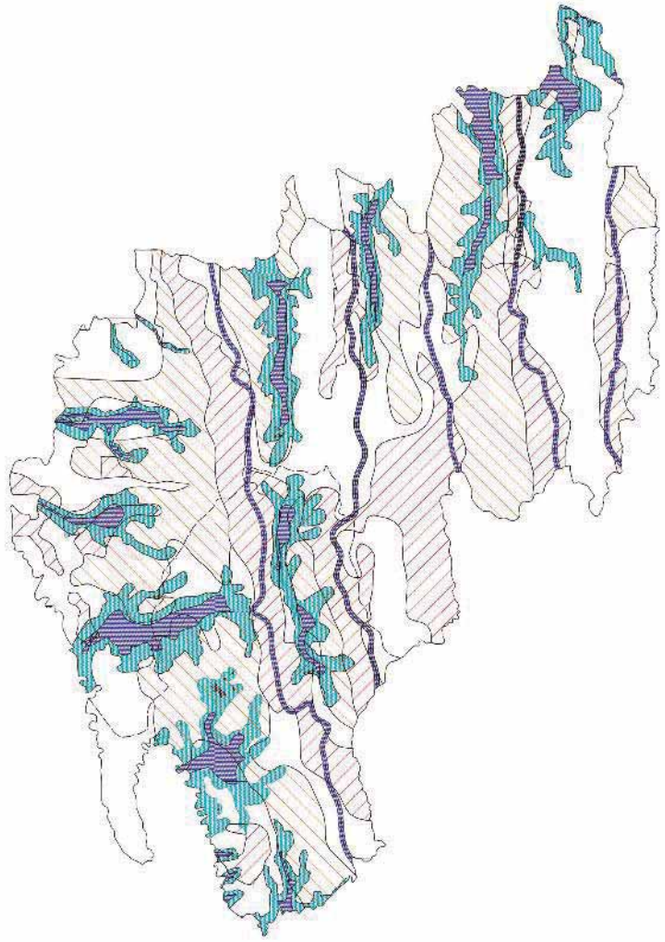

TR-04


TR-03

MULTI-HAZARD

The typologies proposed for the state of Tripura indeed are proposed with housing zones in mind but the designs have been proposed stressing on the multi-hazard point of view.

TRIPURA



The purpose of defining 'housing zones' in Tripura is to suggest suitable designs and technologies for the PMAY-G beneficiary houses, keeping in mind the multi-hazards, climate, available materials and construction skills etc. The extensive list of factors considered for zoning are as follows:

- Climate: Monsoon, summer, winter, sun path, humidity, temperature, air movement, etc.
- Geology/soil type
- Multi-Hazards/Earthquake, Wind, Flood, Landslide, etc
- Ethnic and living pattern
- Language
- Religion
- Locally available skills
- Construction material
- Existing traditional construction practices

However, this is different for multi-hazard safety of a building where all factors should be considered simultaneously. Therefore, for multi-hazard situation, a superimposed map has been used for zoning.

ZONE 1: earthquake + wind + severe landslides

ZONE 2: earthquake + wind +medium landslides

ZONE 3: earthquake + wind + flood once a year to once in ten years

ZONE 4: earthquake + wind + flood 3-4 times in a year

ZONE 5: earthquake + wind + severe landslides + flood 3-4 times in a year

ZONE 6: earthquake + wind + severe landslides + flood once a year to once in ten years

ZONE 7: earthquake + wind + medium landslides + flood 3-4 times in a year

ZONE 8: earthquake + wind + medium landslides + flood once a year to once in ten years

ZONE 9: earthquake + wind

BUILT FORM

Overall Recommendations for Built Form		
Components	**Types of Component**	**Description**
Ceiling and attic	Provide adequate roof projection on all sides to protect the upper part of wall from rains. Success lies in the design of bamboo member joints. Detail the joints so that any damaged member could be replaced without jeopardising the structural safety. Use bunch of bamboos with metal straps to create deep beam effect	
Openings	O1	Phenol bonded or equivalent CK shutter framed with split bamboo/ local timber.
	O2	GCI with timber frame
	O3	O1 or O2 with 25x25 MS angle frame
	O4	O1 or O2 with 65x90 precast RCC frame
		Genral Points : All CK items should be painted with fire retardant paint. Window overhang – Use the twuikaloi (Mondai) style
Floor	FL1	Plastic sheet as rising dampness stopper + 75mm sand bed + 300x300x16mm precast CC tiles (produced at local building centre or RDD store at block level)
	FL2	Cement floor on flat brick soling
	FL3	Bamboo floor in stilt house
Plinth and Steps	General Recommendations Seismic safety: Since the entire state falls in Seismic Zone 5, bands (at plinth, lintel and roof), corner reinforcement, windows and doors (location and size), shear walls must be carefully detailed make sure that the following points are complied with • Architectural/structural configuration to be symmetrical and not irregular in plan • Are there provisions for physically challenged-friendly access to the buildings and functional areas • Masonry Structure to have vertical reinforcements & horizontal bands in walls according to code. Unreinforced masonry has proven very vulnerable in strong shaking. To improve seismic performance of masonry buildings one needs to provide, reinforcements at all wall corners and RCC or bamboo reinforces bands at plinth, window sill and lintel level.	

Overall Recommendations for Built Form		
Components	**Types of Component**	**Description**
Foundations	F1	Wall footing in the soil with SBC 10tons /sqm.
	F2	Precast RC stub with metal plate with holding down bolts.
	F3	F2 type foundation with plinth on stilt in black cotton soil area or high flood area.
Wall	W1	250-300mm thick 5-10% cement stabilized rammed earth wall.
	W2	600mm high rammed earth wall as per above specifications + CK plastered in 10% stabilized mud mortar on both sides.
	W3	600mm high rammed earth wall as per above specifications + CK plastered in 1:5 cement mortar on both sides.
	W4	75mm thick brick wall upto 600mm high in 1:4 cement mortar + CK plastered in 10% stabilized mud mortar on both sides.
	W5	75mm thick brick wall upto 600mm high in 1:4 cement mortar + CK plastered in 1:5 cement mortar on both sides.
	W6	Same as W1 + small local pebbles on the outside wall
	W7	Split bamboo walls (CK) as in Tong house
	W8	Partition wall in CK
		General notes: All CK walls should be painted with fire retardant paint. Corrugated CK may also be used.
ROOF	R1	GCI with crimp curve with least number of treated bamboo understructure
	R2	GCI sheet (do-chala) with treated bamboo understructure
	R3	GCI roof (Samoa type) in very high wind area – local specific
	R4	Micro concrete tile roof with wind arresters
	R5	Thatch over GCI sheet for modified Tong house

TRIPURA

TR-01

Applicable to
Zone B : Non Hilly areas All tribes + Bengalis
Zone C: resided by Chakmas, Reangs and the Darlongs.

High seismic activity, severe landslides and high wind velocity

Resources
- Bamboo
- Mud
- Timber
- Stone

TRIPURA

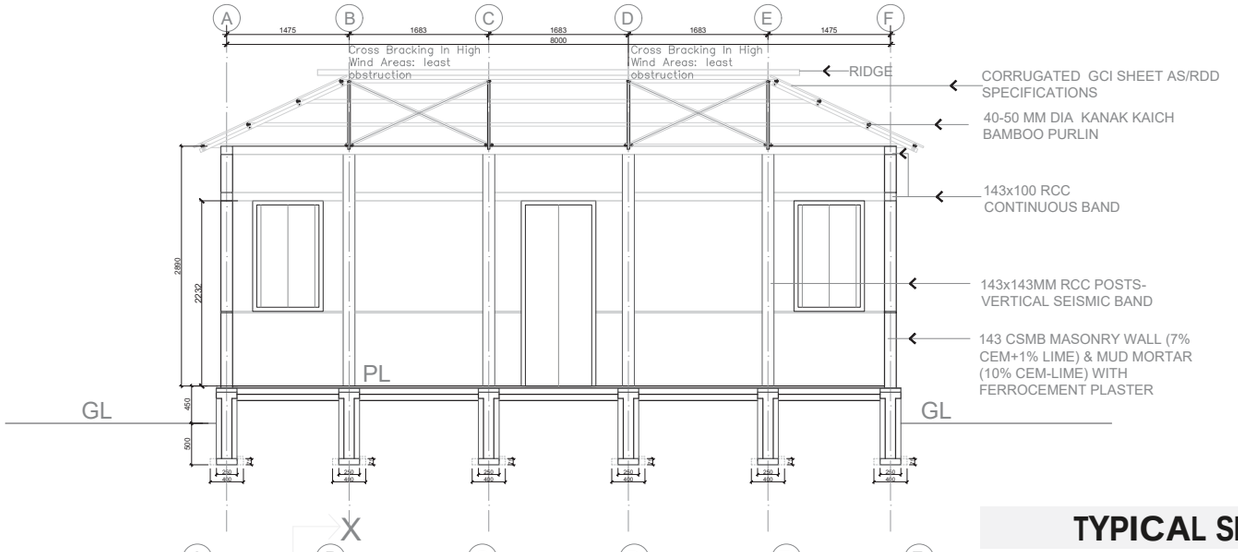
TR-01

- Open elongated plan shapes with a single row of rooms to allow cross ventilation-
- Use veranda for shading and rain protection
- use reflective roof with false ceiling

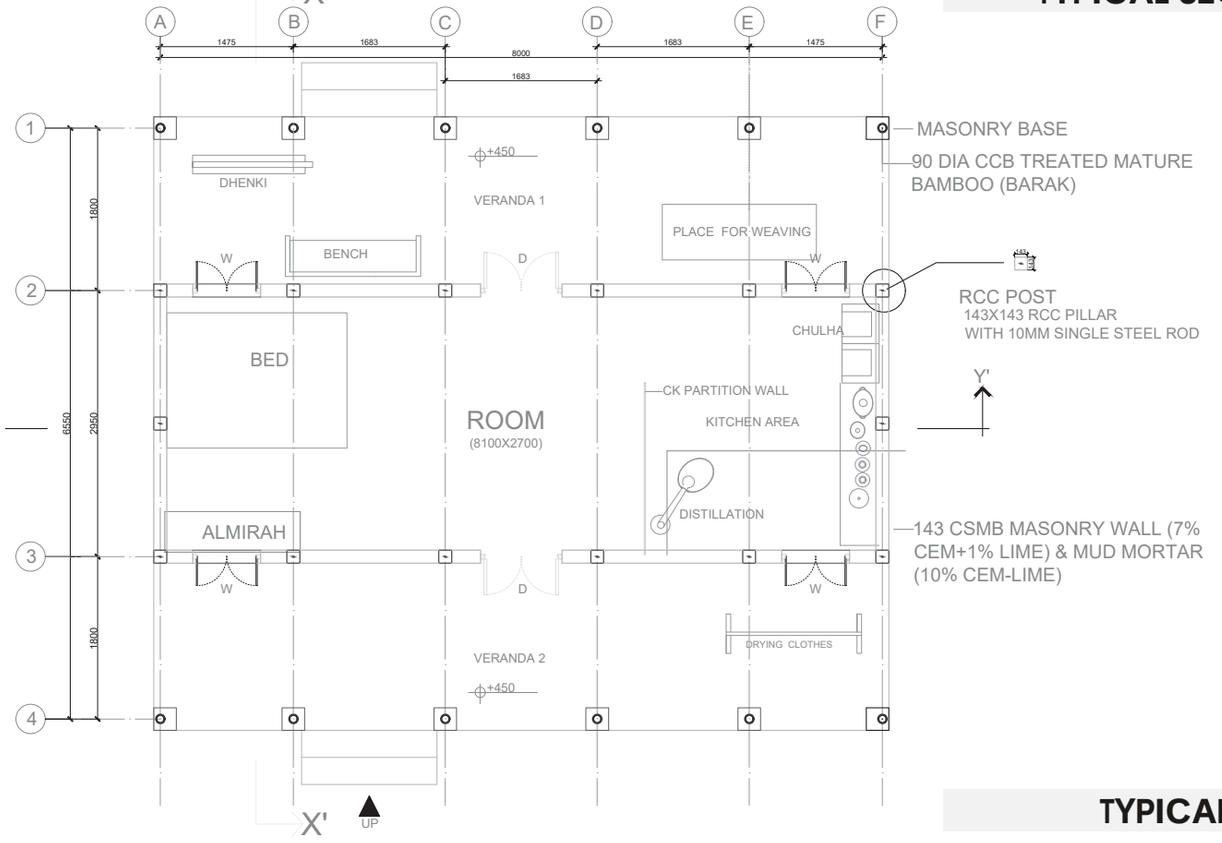
- Open elongated plan shapes with a single row of rooms to allow cross ventilation-
- Use veranda for shading and rain protection
- use reflective roof with false ceiling

Recommendations for construction systems		
Components	**Recommended Specifications**	**Specific Comments**
Foundations	• 250 x 250 Brick Stub 20 Nos in 1:5 CM on 75 CC (1:5:10) • R.C. Band at GL, lintel and wall top (50 x 250)as horizontal seismic bands.	
Wall	• Walls 30 mm thk. ck wall plastered on external face in 1:4 cement mortar. • 143 Thk .cement stabilized mud block masonry in 10% stabilized mud mortar with 14 nos rc posts as vertical seismic bands. • 190mm thick 7% cement stab. • Mud brick in stab mud mortar (10%) wall till 900mm + ck plastered in 10% stabilized mud on both sides.	• The brick specifications can differ as per site and house type falling under different multi hazard zones.
Roof	• GCI Sheet (Char-Chala) with treated bamboo under structure/ or micro concrete tile roofing	
Floor	• Plastic Sheet as rising dampness-stopper plus 75 mm sand bed plus 300 x 300 x 16 mm precast CC tiles or flat brick soling in 1:3 CM.	
Opening	• Phenol Bonded or equivalent ck shutter framed with split bamboo / local timber • Alternatively use GCI shuttering framed with split bamboo/local timber.	

TR-01



TYPICAL SECTION AA'



TYPICAL PLAN

Area Statement:

Item	Area	
	Sq.m	Sq.ft
Room	14.89	160.28
Kitchen	7.17	77.18
Verandah 1	15.09	162.43
Verandah 2	15.09	162.43
Carpet Area	**22.31**	**240.14**
Built up Area	**55.38**	**596.11**

TRIPURA

TR-01
Cost estimate

Total Cost ` 152,888/-

Item	Cost (INR)
Room	88,859
Front veranda	32,014
Rear veranda	32,014
Total covered area	152,888

TRIPURA

S.No.	DESCRIPTION	QUANTITY	UNIT	UNIT RATE	AMOUNT
1	Excavation in foundation	9.303	cu.m.	142.32	1323.98
	Backfill 1/3rd of excavation	3.101	cu.m.	52.00	161.25
	Plinth filling	17.020	cu.m.	52.00	885.03
2	Lean concrete (1:5:10) in Foundation	0.216	cu.m.	4101.58	885.94
	total volume of Lean Concrete in foundation	0.765	cu.m.	5032.00	3850.42
3	Brick Masonry in Foundation				
	250X250 Post in 1:6 CM from base conc to underside of brick flat course at PL	0.928	cu.m.	4101.58	3806.78
	75x250 MM Flat Brick	0.752	cum	5133.33	3859.63
4	Total volume of Brick Masonry in Foundation	4.266	cu.m.	5032.00	21464.63
5	Plastering on plinth wall in 1:4 CM	14.495	sqm	117.56	1704.11
6	RCC band at PL (50x250) M20 concrete in Foundation with 6mm dia@ 300 c/c steel bars				
	Over 250x250 MM Stubs	0.056	cu.m.	6847.05	385.15
	total volume of RCC Band (M 20 Conc.)	0.501	cu.m.	6847.05	3432.08
	Steel for the above @ 200kg/cum	111.500	kg	55.78	6219.47
7	100x100 MM RCC Posts	0.303	cu.m.	6876.83	2083.68
	Steel for the above @ 200kg/cum	60.600	kg	55.78	3380.27
8	Flooring	55.08	sqm	331.82	18276.65
9	Champa Kampa for Walls 12mm stabilized CM plaster	15.761	sq.m.	468.48	7383.64
10	Champa Kampa in Windows	0.578	sqm	468.48	270.78
11	1:3 Cement plaster on Wall	15.761	sq.m.	117.56	1852.87
12	75 MM Brick Wall with 1:3 CM	0.990	cu.m.	5133.33	5083.54
13	Brick Masonry (250x250 Post) in Veranda	0.045	cu.m.	4101.58	184.57
14	150x100 MM RCC Continuous Band	0.344	cu.m.	6847.05	2351.96
	Steel for the above @ 200kg/cum	68.700	kg	55.78	3832.086
15	100x100 MM RCC Piece Lintel over Opening	0.048	cu.m.	6847.05	328.6584
	Steel consumption	12.000	kg	55.78	669.36
16	Horizontal 100 mm Kanak Kaich Bamboo	18.6	m.	28.75	616.11
17	Vertical 100 mm Barak Bamboo in the Veranda	13.3	m.	28.75	440.66
18	Vertical 50 mm Barak Bamboo for Window and Door Frame	21.0	m.	28.75	694.31
19	30mm Bamboo for door & window	64.04	m	28.75	2117.32
20	50mm Bamboo for door	13.2	m	28.75	436.43
21	Vertical 50 mm Barak Bamboo near Columns	29.4	m.	28.75	972.04
22	Roofing GCI Sheet	77.3	sqm	495.00	44018.96

23	Truss (Kanak Kaich Bamboo)				
	Total length of 100mm for Rafter	20.1	m.	28.75	662.90
	Total length of 50mm for Tie Members	13.1	m.	28.75	432.50
	Total length of 50mm for Raking Members	34.230	m.	28.75	1131.73
	Total length of 50mm for Purlins	74.3	m.	28.75	2456.21
24	Lean To (Kanak Kaich Bamboo)				
	Total length of 50 mm for Lean To Members	17.6	m.	28.75	581.37
	Total length of 50mm for Lean To Purlins	80.8	m.	28.75	2669.80
	Add 15% of the bamboo works				1981.71
25	* All the bamboo lengths are increased by 15%.				**152,888.57**

TRIPURA

TR-02

Applicable to :
Zone A:Hilly Areas: Jampui Hills
Zone B : Non Hilly areas All tribes + Bengalis
Zone C: resided by Chakmas, Reangs and the Darlongs.

Seismic activity, ocassional floods, severe landslides and high wind velocity

Available resources

- Bamboo
- Mud
- Timber
- Stone

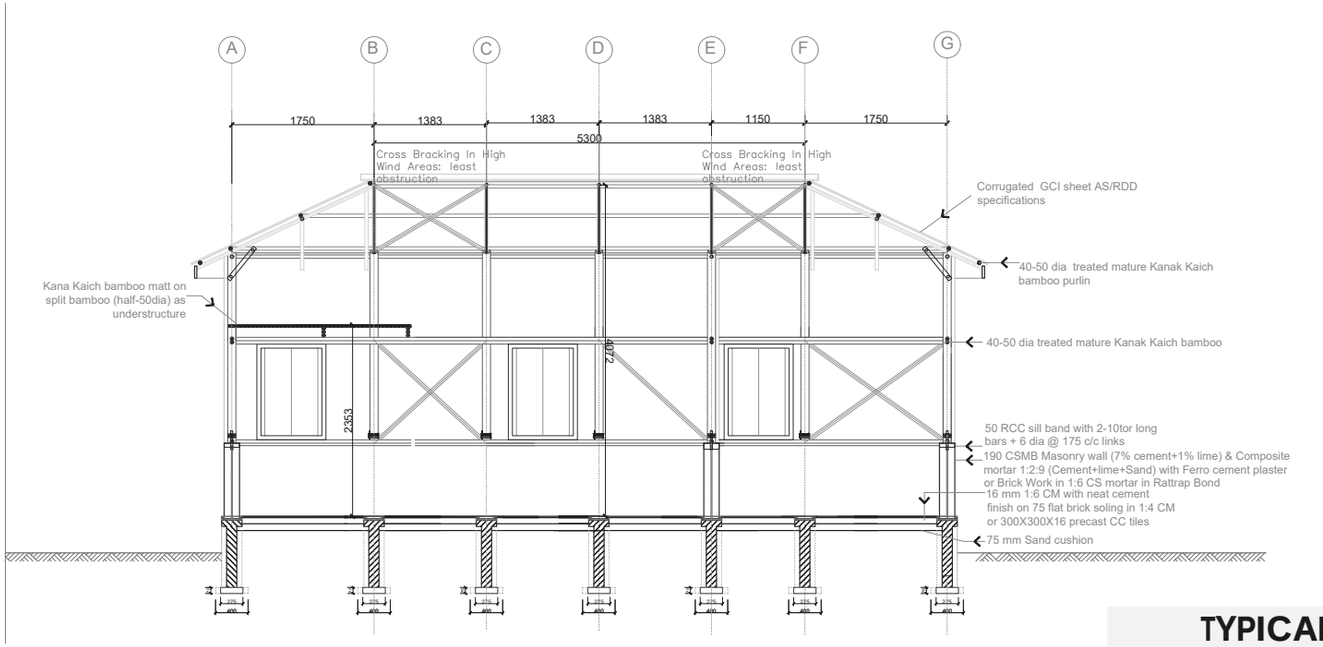
TRIPURA

TR-02

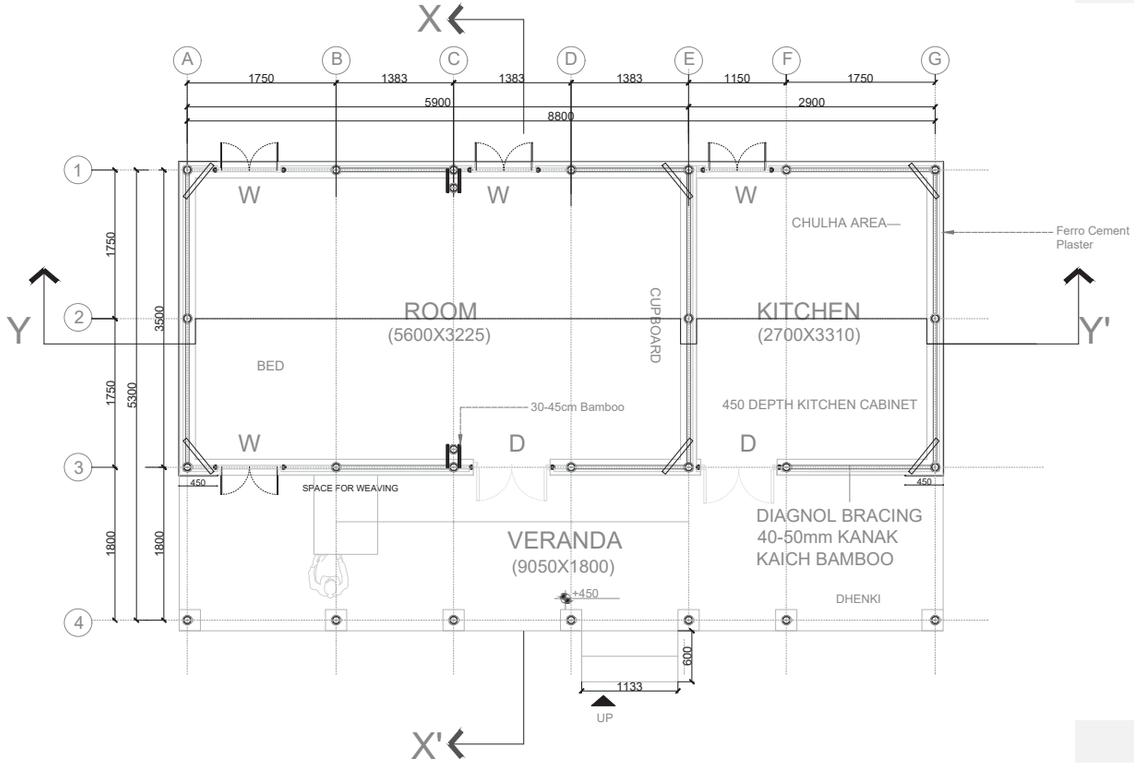
HIGHLIGHTS OF TR-A-01 AND TR-A-02

- 3 bays have been provided (1 bed space, 1 multipurpose space , kitchen) having minimum width of 2.7 m following the existing trend.
- Verandah space on either ends.
- Activities like hand loom, clothes drying area and dhenki as seen from the surveyed houses can be done here in these verandahs.
- One verandah can be done in incremental basis and the user will have an option to increase the length of one room up to the verandah in the future without much alteration in the design.

Recommendations for construction systems		
Components	**Recommended Specifications**	**Specific Comments**
Foundations	• 250 x 250 Brick Stub 20 Nos on 75 CC (1:5:10) • R.C. Band at GL and wall top (50x250)	
Wall	• Brick pillars 250 x 250 10 in No plus end walls 75 brick work in 1:3 cement mortar. • Veranda side is part 75 mm brick wall.	
Wall Finish	• Cement Stabilized mud	
Roof	• GCI Sheet (Do-Chala) with treated bamboo under structure/ or micro concrete tile roofing	
Floor	• Plastic Sheet as rising dampness plus 75 mm sand bed plus 300 x 300 x 16 mm precast concrete tiles or flat bricks soling in 1:3 cement mortar	
Opening	• Phenol Bonded or equivalent shutter framed with split bamboo / local timber • Alternatively use GCI shuttering framed with split bamboo/local timber.	



TYPICAL SECTION AA'

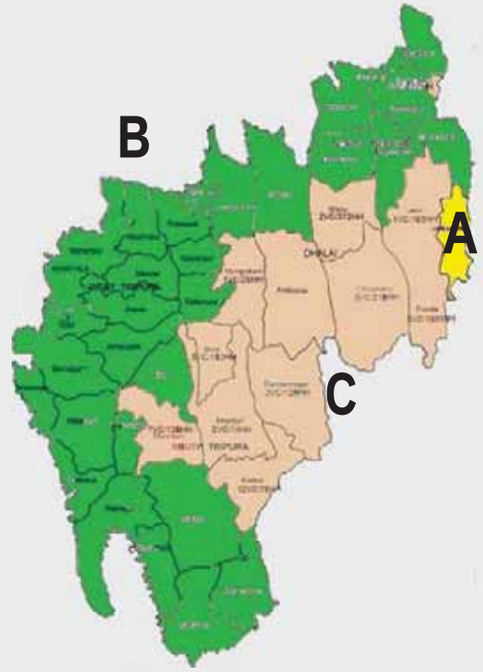


TYPICAL PLAN

TR-02

Area Statement:

Item	Area	
	Sq.m	Sq.ft
Room	18.90	203.44
Kitchen	8.97	96.55
Attic	6.75	72.66
Verandah	16.46	177.18
Carpet Area	**34.96**	**376.31**
Built up Area	**49.68**	**534.76**



TRIPURA

TR-02
Cost estimate

Cost breakup

Item	Cost (INR)
Foundation	50,744/-
Flooring	15,683/-
Walls/Floors/ Windows	40,808/-
Attic and Roof	60,048/-
Total	**1,67,619/-**

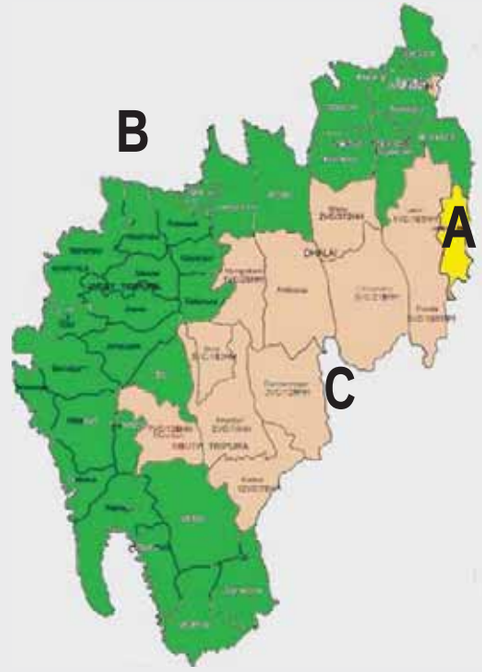
S.NO	DESCRIPTION	QUANTITY	UNIT		UNIT RATE (`)	AMOUNT
1	Excavation in foundation	8.333	cu.m.		142.32	1185.96
	Backfill 1/3rd of excavation	2.778	cu.m.		52.00	144.44
	Plinth filling	15.202	cu.m.		52.00	790.49
2	Lean concrete 1:5:10 in Foundation	0.893	cum		4761.51	4254.13
3	Brick masonry in Foundation	0.938	cum		4101.58	3845.23
4	125mm Wall in 1:4 CM	4.029	cum		4101.58	16526.42
5	RCC band at PL (50x250) M20 concrete in Foundation with 6mm dia@ 300 c/c steel bars	0.500	cum		6847.05	3422.24
	Reinforcement for the abve @200kg/cum	99.963	kg		55.78	5575.91
6	Anchor bar 10mm dia Steel Rod from plinth beam to top of toe wall	18.000	m		55.78	684.76
		12.276	kg			
7	Sand cushion under Flooring	3.300	cum		51.78	170.87
8	Flat brick soling in 1:4 CM in Flooring	3.456	cum		51.78	178.95
9	Neat Cement Finish with 1:6 CM in Flooring	44.146	sqm		331.82	14648.46
10	1:4 CM plastering on Plinth wall	4.937	sqm		117.56	580.37
11	7% cement+1% lime stabilized Rammed Earth	4.591	cum		3213.05	14751.79
12	250x50 Brick stubs in Wall	0.208	cum		4101.58	854.41
13	Brick Masonry in Veranda	0.070	cum		4101.58	287.11
14	Supporting 100mm Barak bamboo in walls	57.930	m		28.75	1665.49
15	100mm Kanak Kaich bamboo in walls (Horizontal supporting structure)	99.864	m		28.75	2871.09
16	75mm Diagonal Bracing in walls	20.118	m		28.75	578.39
17	50mm Bamboo for door & window frame in walls	15	m		28.75	431.25
18	30mm Bamboo for window & door	76.08	m		28.75	2187.30
19	50mm Bamboo for door	13.2	m		28.75	379.50
20	Champa Kampa in Windows	1.153	sqm		336.98	388.54
21	Champa Kampa in Wall	62.933	sqm		468.48	29482.82
22	1:4 CM plastering on plinth wall	14.321	sqm		117.562	1683.58
23	75 mm Kanak Kaich Bamboo for Attic frame	20.856	m		28.75	599.61

S.NO	DESCRIPTION	QUANTITY	UNIT		UNIT RATE	AMOUNT
24	Half Bamboo Understructure of 50mm dia in Attic Floor	151.3	m		28.75	4349.88
25	Bamboo matt in Attic floor	7.954	sqm		426.98	3396.36
26	GCI roof sheeting (0.43)	75.695	sqm		495.00	37468.78
	Fabrication				64.36	4871.94
27	Bamboo under structure in roof					
	100mm dia bamboo required	29.892	m		28.75	859.40
	50mm dia bamboo required	43.248	m		28.75	1243.38
	50mm dia bamboo required	13.332	m		28.75	383.30
	purlin required in roof understrcture	79	m		28.75	2271.25
	Bamboo under structure in roof LEAN to	13.446	m		28.75	386.57
	Purlin in roof understructure for Lean to	29.625	m		28.75	851.72
28	Add 15% for bamboo works					3368.17129
	Total					**167,619.84**

TR-02
Cost estimate

Cost breakup

Item	**Cost (INR)**
Foundation	50,744/-
Flooring	15,683/-
Walls/Floors/ Windows	40,808/-
Attic and Roof	60,048/-
Total	**1,67,619/-**



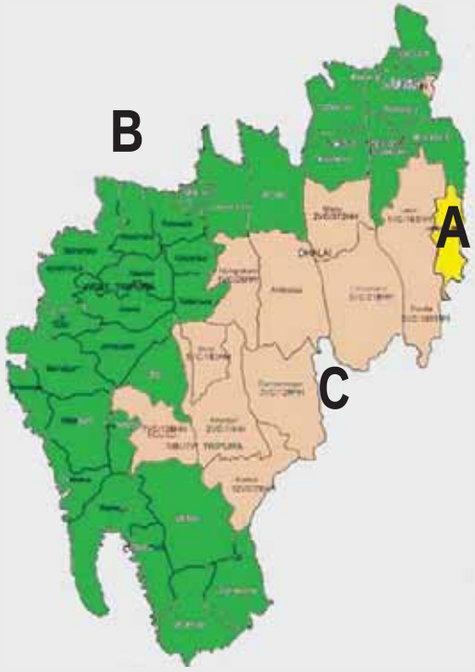
TR-03

Applicable to :
Zone A:Hilly Areas: Jampui Hills
Zone B : Non Hilly areas All tribes + Bengalis
Zone C: resided by Chakmas, Reangs and the Darlongs.

Seismic activity, Occasional floods and high wind velocity

Available resources

- Bamboo
- Mud
- Timber
- Stone



TRIPURA

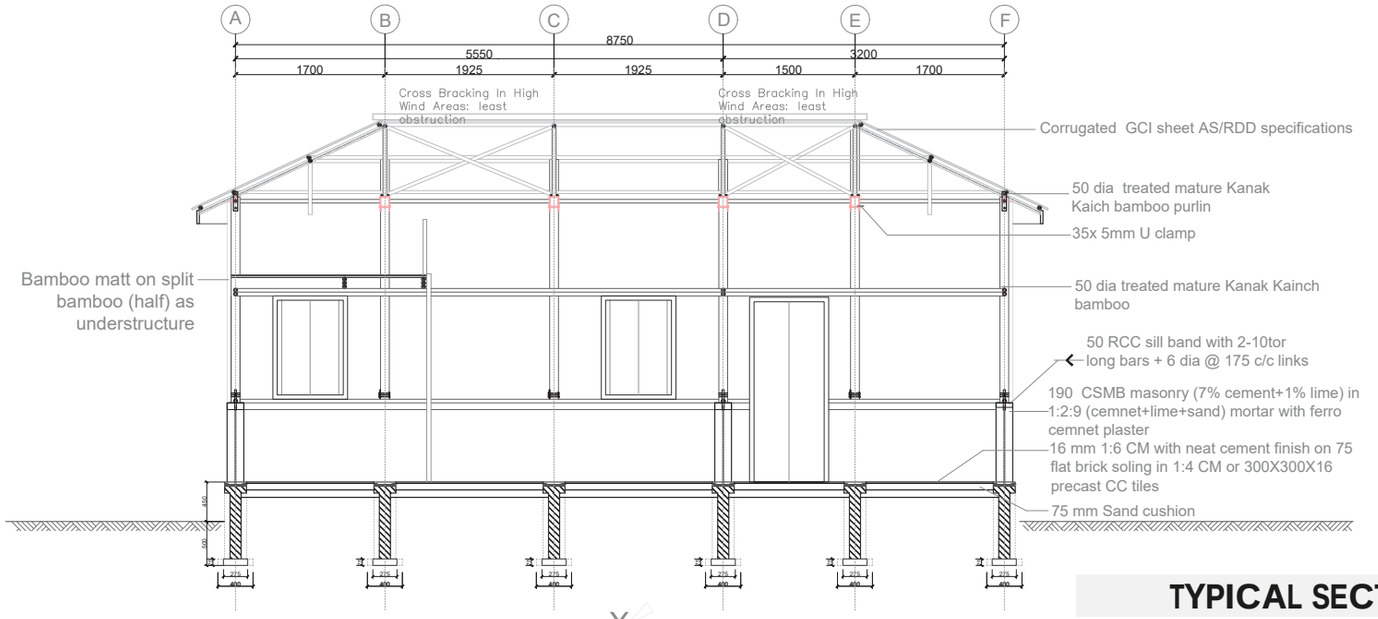
TR-03

HIGHLIGHTS OF TR-A-01 AND TR-A-02

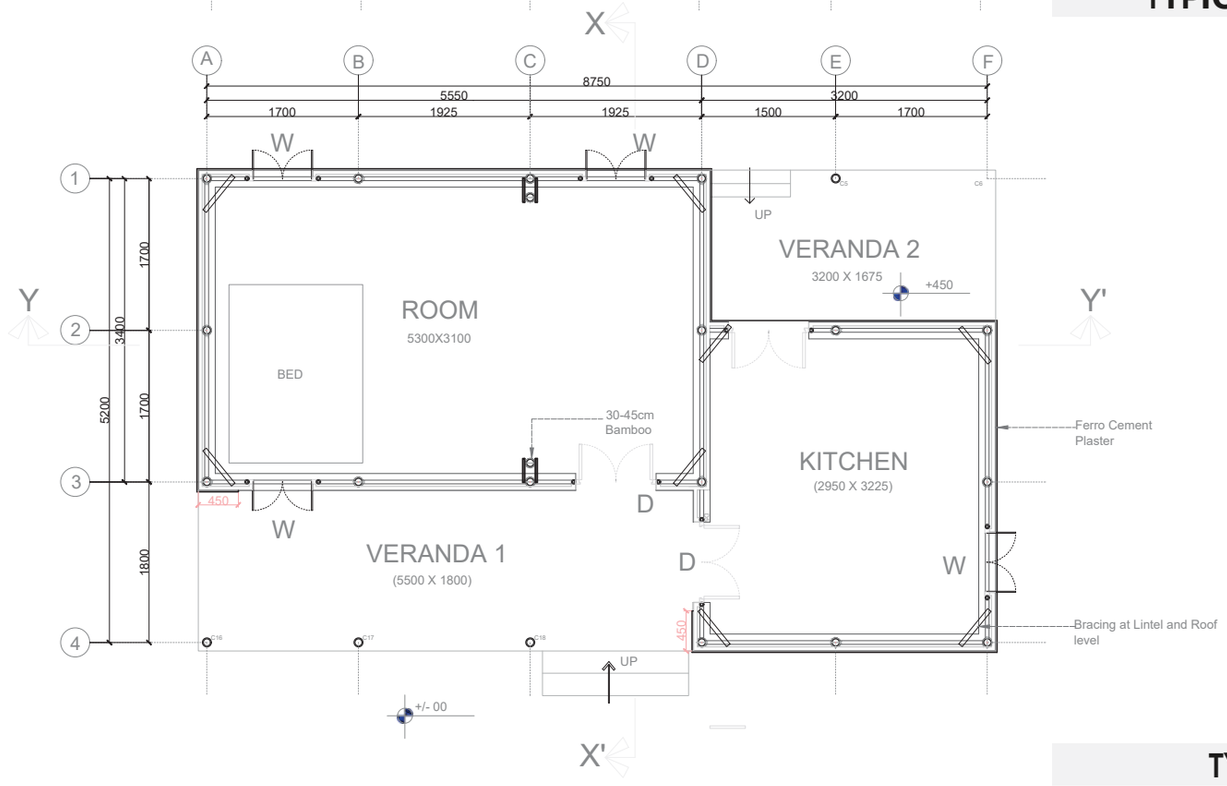
- 3 bays have been provided (1 bed space, 1 multipurpose space , kitchen) having minimum width of 2.7 m following the existing trend.
- Verandah space on either ends.
- Activities like hand loom, clothes drying area and dhenki as seen from the surveyed houses can be done here in these verandahs.
- One verandah can be done in incremental basis and the user will have an option to increase the length of one room up to the verandah in the future without much alteration in the design.

Recommendations for construction systems		
Components	**Recommended Specifications**	**Specific Comments**
Foundations	• 250 x 250 Brick Stub 20 Nos on 75 CC (1:5:10) • R.C. Band at GL and wall top (50x250)	
Wall	• Brick pillars 250 x 250 10 in No plus end walls 75 brick work in 1:3 cement mortar. • Veranda side is part 75 mm brick wall.	
Wall Finish	• Cement Stabilized mud	
Roof	• GCI Sheet (Do-Chala) with treated bamboo under structure/ or micro concrete tile roofing	
Floor	• Plastic Sheet as rising dampness plus 75 mm sand bed plus 300 x 300 x 16 mm precast concrete tiles or flat bricks soling in 1:3 cement mortar	
Opening	• Phenol Bonded or equivalent shutter framed with split bamboo / local timber • Alternatively use GCI shuttering framed with split bamboo/local timber.	

TR-03



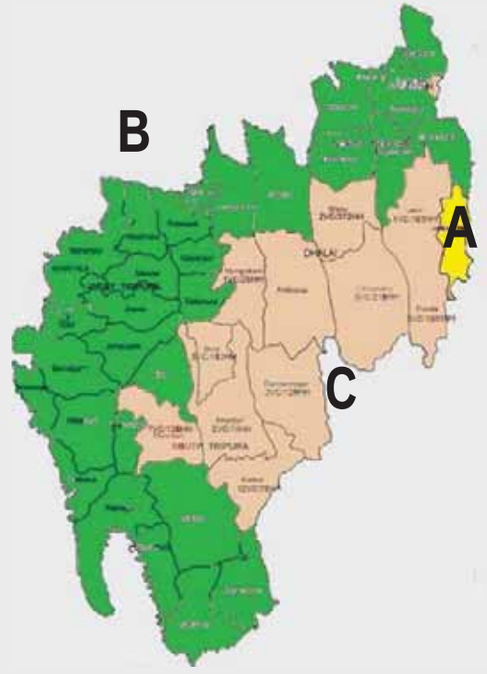
TYPICAL SECTION AA'



TYPICAL PLAN

Area Statement:

Item	Area	
	Sq.m	Sq.ft
Room	16.21	174.48
Kitchen	9.96	107.21
Attic	7.67	82.56
Verandah 1	10.10	108.72
Verandah 2	**5.44**	**58.56**
Carpet Area	**35.48**	**381.91**
Built up Area	**48.62**	**523.35**

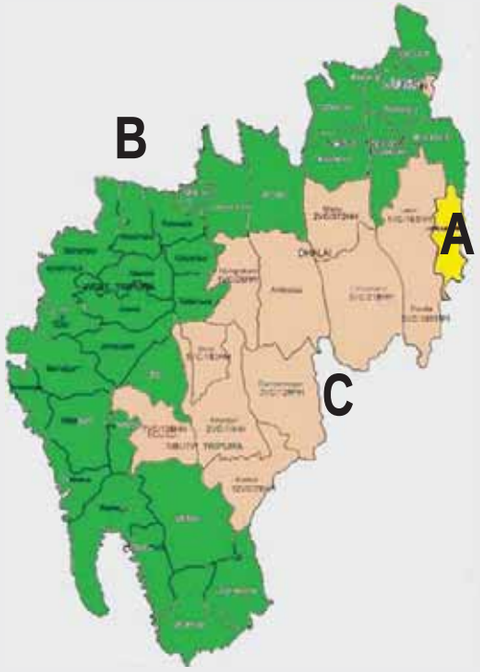


TRIPURA

TR-03
Cost estimate

Cost breakup

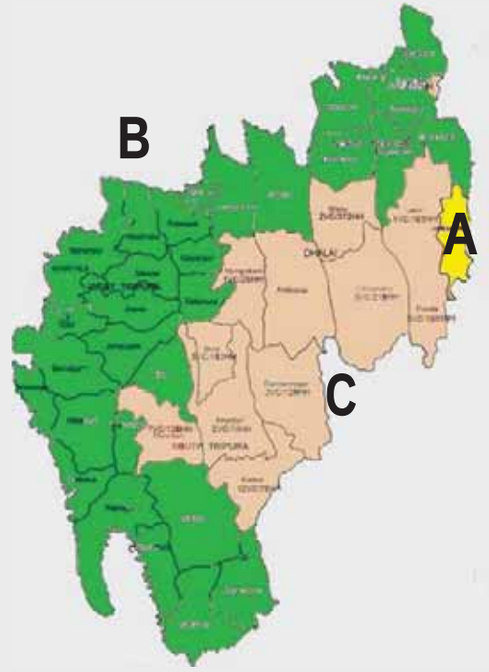
Item	Cost (INR)
Foundation	60,205/-
Flooring	14,398/-
Walls/Floors/ Windows	42,006/-
Attic and Roof	65,378/-
Total	**1,81,987/-**



TRIPURA

S.NO.	DESCRIPTION	QUANTITY	UNIT	UNIT RATE (INR)	AMOUNT (INR)
1	Excavation in foundation	11.802	cu.m.	142.32	1679.62523
	Backfill 1/3rd of excavation	3.934	cu.m.	52.00	204.568
	Plinth filling	14.578	cu.m.	52.00	758.03
2	Lean concrete (1:5:10) in Foundation	0.910	cu.m.	4761.51	4334.46
3	Brick Masonry in Foundation				
	250X250 Post in 1:5 CM from base conc to underside of brick flat course at PL	1.031	cu.m.	4101.58	4229.75
	Total volume of Brick Masonry in Foundation	3.988	cu.m.	5032.00	20068.245
4	RCC band at PL (50x250) M20 concrete in Foundation	0.512	cu.m.	6847.05	3504.83372
	Steel for the above @ 200kg/cum	102.375	kg	55.78	5710.4775
5	10mm Dia. Steel Rod in Foundation	18.000	m.		
		11.160	kg	55.78	622.5048
6	7% cement and 1% lime stabilized Rammed Earth Wall	5.943	cu.m.	3213.05	19093.6787
7	Flooring	43.390	sqm	331.82	14397.7594
8	Champa Kampa for Walls with both sides plastered in CM 12mm (with CWM)	63.807	sq.m.	468.48	29892.3961
9	1:4 CM on plinth wall	13.651	sq.m.	117.56	1604.80947
10	Brick Masonry (250x250 Post) in Veranda	0.070	cu.m.	4101.58	287.1106
11	Horizontal 100 mm Kanak Kaich Bamboo in the Wall	114.61	m.	28.75	3294.89375
12	Vertical 100 mm Barak Bamboo in the Wall	59.7	m.	28.75	1717.1225
13	Vertical 50 mm Barak Bamboo for Window and Door Frame	35.7	m.	28.75	1025.202
14	30mm Bamboo for window & door	102.48	m	28.75	2946.3
15	50mm Bamboo for door	19.8	m	28.75	569.25
16	Diagonal 75 mm Kanak Kaich Bamboo Members	23.27	m.	28.75	669.14
17	Roofing GCI Sheet	105.4	sq.m.	495.00	52185.05
18	Truss (Kanak Kaich Bamboo)	34.4	m.	28.75	988.30

S.NO.	DESCRIPTION	QUANTITY	UNIT	UNIT RATE (INR)	AMOUNT (INR)
	Total length of 50mm for Tie Members	16.7	m.	28.75	479.08
	Total length of 50mm for Raking Members	49.735	m.	28.75	1429.89
	Total length of 50mm for Purlins	112.1	m.	28.75	3223.59
	Lean To (Kanak Kaich Bamboo)	13.212	m.		
	Total length of 50mm for Lean To	15.2	m.	28.75	436.82
	Purlins	7.455	m.		
	Total length of 50mm for Lean To Purlins	8.6	m.	28.75	246.48
	Total length of 100mm Kanak Kaich Bamboo for Truss	34.4	m.	28.75	988.30
	Total length of 50mm Kanak Kaich Bamboo for Truss	202.3	m.		
19	Attic				
	Item no. 15.1 Half Bamboo length for Attic flooring	80.8	m.	28.75	2321.97938
	Area of Bamboo Mat for Attic Flooring	7.5	sq.m.	28.75	215.74
20	* All the bamboo lengths are increased by 15%.				2862.70736
	Total				**181,988.11**



TR-04

Applicable to
Zone B : Non Hilly areas All tribes + Bengalis
Zone C: resided by Chakmas, Reangs and the Darlongs.

seismic activity, occassional floods and high wind velocity

Resources
- Bamboo
- Mud
- Timber
- Stone

TRIPURA

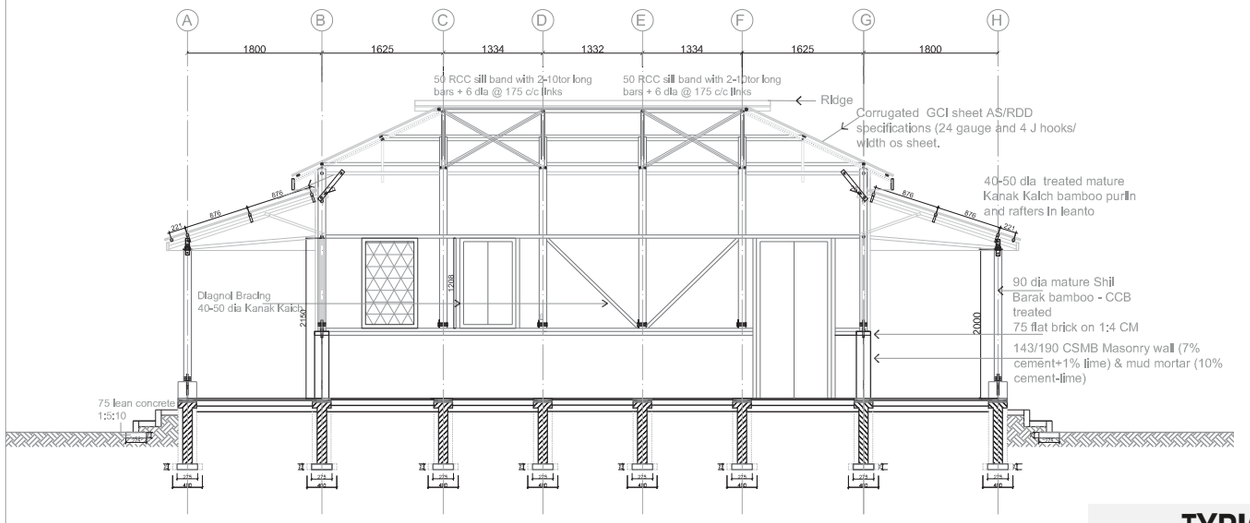
- Open elongated plan shapes with a single row of rooms to allow cross ventilation-
- Use veranda for shading and rain protection
- use reflective roof with false ceiling

Recommendations for construction systems		
Components	**Recommended Specifications**	**Specific Comments**
Foundations	• 250 x 250 Brick Stub 20 Nos in 1:5 CM on 75 CC (1:5:10) • R.C. Band at GL, lintel and wall top (50 x 250)as horizontal seismic bands.	
Wall	• Walls 30 mm thk. ck wall plastered on external face in 1:4 cement mortar. • 143 Thk .cement stabilized mud block masonry in 10% stabilized mud mortar with 14 nos rc posts as vertical seismic bands. • 190mm thick 7% cement stab. • Mud brick in stab mud mortar (10%) wall till 900mm + ck plastered in 10% stabilized mud on both sides.	• The brick specifications can differ as per site and house type falling under different multi hazard zones.
Roof	• GCI Sheet (Char-Chala) with treated bamboo under structure/ or micro concrete tile roofing	
Floor	• Plastic Sheet as rising dampness-stopper plus 75 mm sand bed plus 300 x 300 x 16 mm precast CC tiles or flat brick soling in 1:3 CM.	
Opening	• Phenol Bonded or equivalent ck shutter framed with split bamboo / local timber • Alternatively use GCI shuttering framed with split bamboo/local timber.	

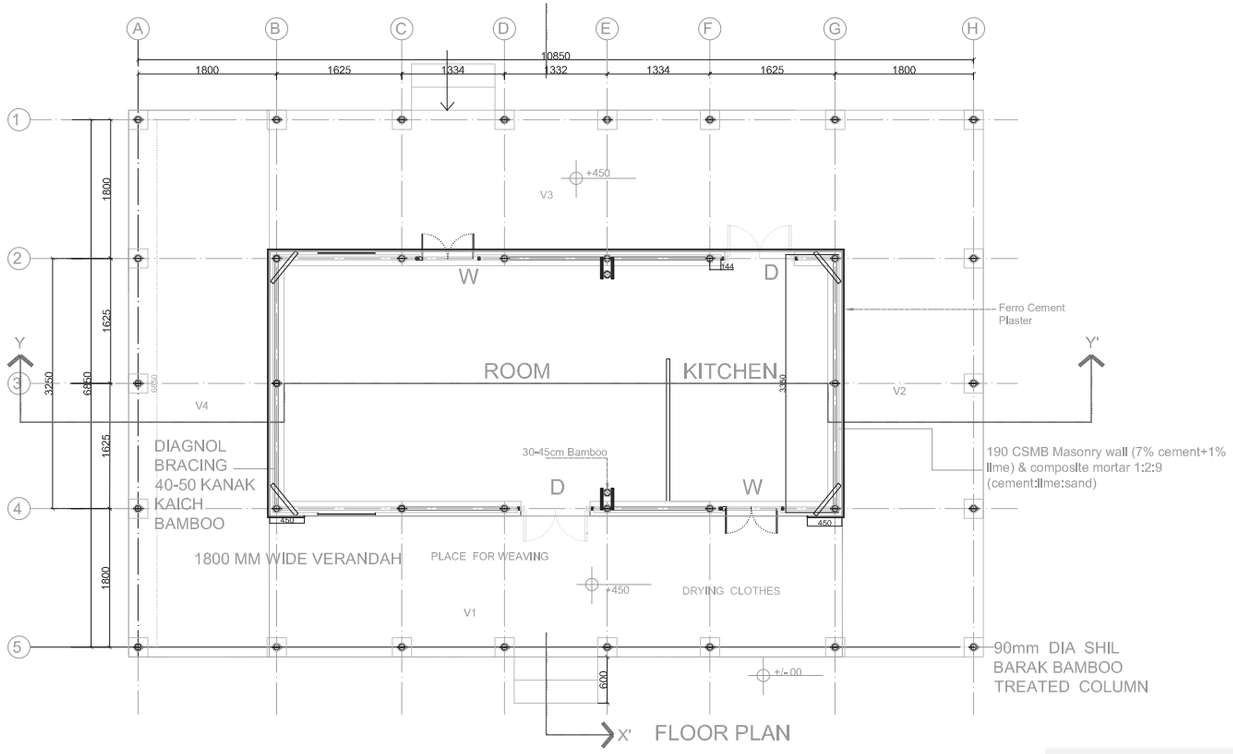
TR-04

Area Statement:

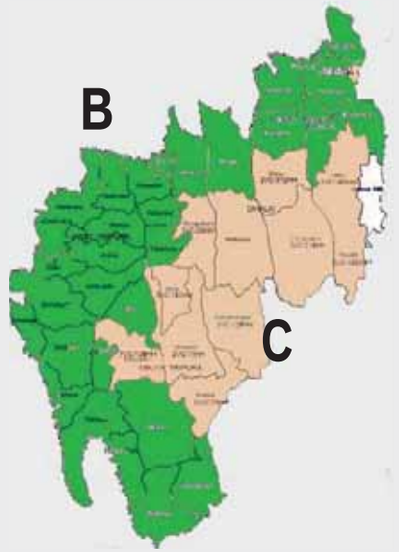
Item	Area	
	Sq.m	Sq.ft
Room	15.32	164.90
Kitchen	6.28	67.60
Verandah 1+2+3+4	52.78	568.12
Carpet Area	21.98	236.59
Built up Area	**78.81**	**848.31**



TYPICAL SECTION AA'



TYPICAL PLAN



TRIPURA

TR-04
Cost estimate

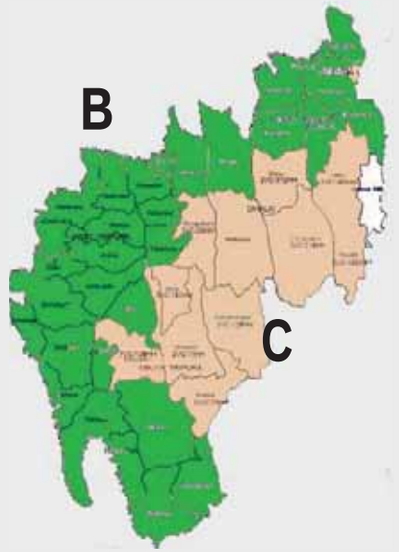
Cost breakup

Item	Cost (INR)
Foundation	60,597/-
Flooring	27,542/-
Walls/Doors/ Windows	40,231/-
Roof	63,141/-
Total	**1,91,512/-**

TRIPURA

S.NO.	DESCRIPTION	QUANTITY	UNIT	UNIT RATE	AMOUNT
1	Excavation in foundation	11.844	cu.m.	142.32	1685.66
	Backfill 1/3rd of excavation	3.948	cu.m.	52.00	205.30
		21.536	cu.m.	52.00	1119.85
2	Lean concrete 1:5:10 in Foundation	1.234	cum	4761.51	5873.73
3	Brick masonry in Foundation				
	250X250 Post in 1:5 CM from base conc to underside of brick flat course at PL	1.500	cum	4101.58	6152.37
4	125mm Wall in 1:4 CM	5.325	cum	5133.33	27333.08
5	RCC band at PL (50x250) M20 concrete in Foundation with 6mm dia@ 300 c/c steel bars	1.013	cum	6847.05	6932.64
	Reinforcement for the above item @200kg/cum	202.500	kg	55.78	11295.45
6	10mm dia Steel Rod as anchor to bamboo posts	19.200	m		
		11.904	kg	55.78	664.01
7	Neat Cement Finish with 1:6 CM in Flooring	74.699	sqm	331.82	24786.66
8	1:4 cement plastering on Plinth wall	17.785	sqm	117.56	2090.83
9	7% cement+ 1% lime stabilized Rammed Earth in Wall	4.418	cum	3213.05	14195.18
10	250x50 Brick stubs in Wall	0.200	cum	5133.33	1028.99
11	Brick Masonry in Veranda	0.281	cum	5133.3333	1442.47
12	Supporting 100mm Barak bamboo in walls	53.040	m	28.75	1524.90
13	100mm Kanak Kaich bamboo in walls (Horizontal supporting structure)	96.699	m	28.75	2780.10
14	75mm Diagnol Bracing in walls	12.41	m	28.75	356.79
15	50mm Bamboo for door & window frame in walls	10	m	28.75	287.50
16	30mm Bamboo for door & window frame	76.08	m	28.75	2187.30

S.NO.	DESCRIPTION	QUANTITY	UNIT	UNIT RATE	AMOUNT
17	50mm Bamboo for door	13.2	m	28.75	379.50
18	Champa Kampa in Windows	1.153	sqm	468.48	540.16
19	Champa Kampa in Wall	31.548	sqm	468.48	14779.84
20	40 mm Jaali in Wall	2.500	sqm	291.67	729.17
21	GCI roof sheeting (Gz 18)	98.702	sqm	495.00	48857.27
22	Bamboo under structure in roof				
	Normal Truss				
	100mm dia bamboo required	12.384	m	28.75	356.04
	Raking member of 50mm dia	4.56	m	28.75	131.10
23	Tie member of 50mm dia	22.608	m	28.75	649.98
24	Purlin in roof understructure for scissor truss	92.272	m	28.75	2652.82
25	Bamboo under structure in roof				
	Rafter of 100mm dia	10.52	m	28.75	302.45
	Raking member of 50mm dia	6.586	m	28.75	189.35
26	Tie Member of 50mm dia	3.112	m	28.75	89.47
27	Bamboo under structure in roof LEAN to	42.716	m	28.75	1228.09
28	Purlin in roof understructure for Lean to	151.728	m	28.75	4362.18
29	Add labour for bamboo work 25%				4322.05
					191512.25



TR-05

Zone C comprises areas of Chakma, Reang and Darlongs

Seismic activity, High wind velocity, severe landslides & flood

Resources

- Bamboo
- Mud
- Timber
- Stone

Besides this, the designs from other zones could be used here too. As the designs are based on multi-hazards.

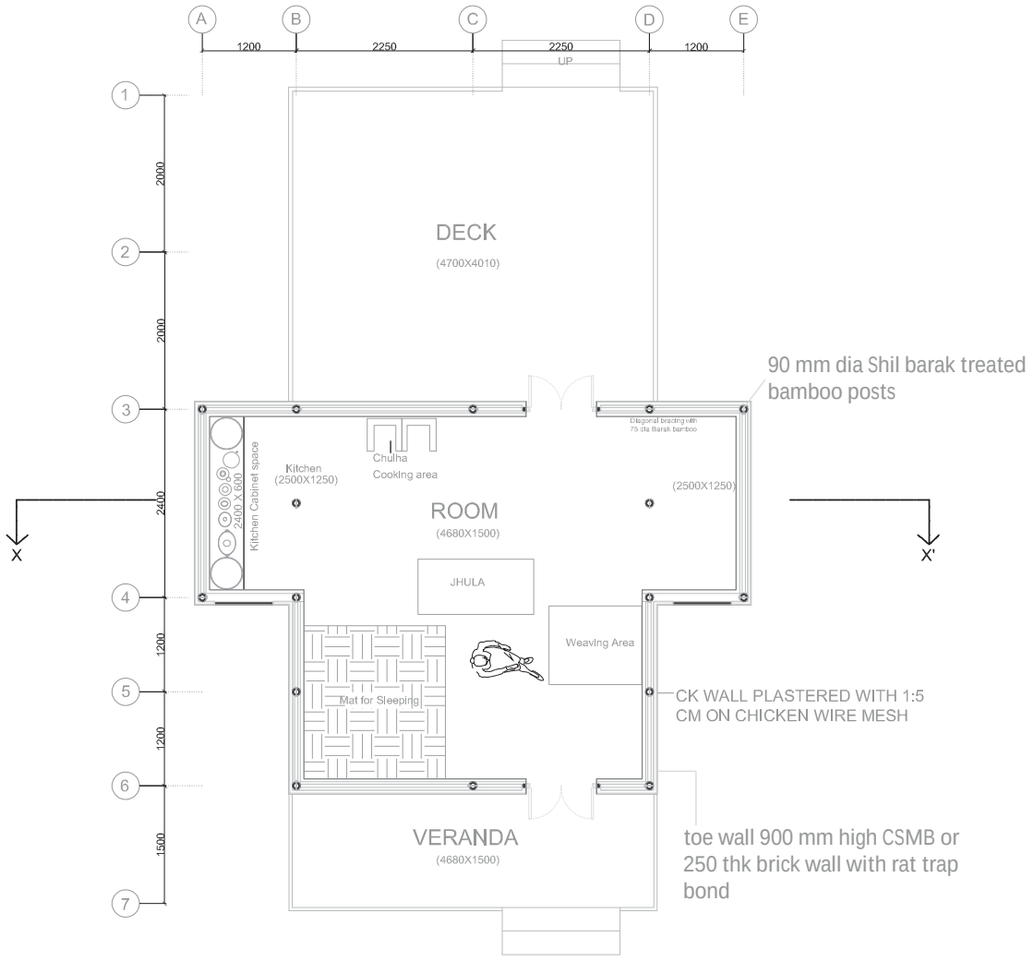
TRIPURA

TR-05

HIGHLIGHTS OF TR-C-01

- Revitalized vernacular form with CSMB wall and GCI hipped roof on bamboo
- Solid high plinth- spaces and hierarchy of spaces same as the traditional style

Recommendations for construction systems		
Components	**Recommended Specifications**	**Specific Comments**
Foundations	• 250 x 250 Brick Stub 20 Nos in 1:5 CM on 75 CC (1:5:10) • R.C. Band at GL, lintel and wall top (50 x 250)as horizontal seismic bands.	
Wall	• Walls 30 mm thk. ck wall plastered on external face in 1:4 cement mortar. • 143 Thk .cement stabilized mud block masonry in 10% stabilized mud mortar with 14 nos rc posts as vertical seismic bands. • 190mm thick 7% cement stab. • Mud brick in stab mud mortar (10%) wall till 900mm + ck plastered in 10% stabilized mud on both sides.	• The brick specifications can differ as per site and house type falling under different multi hazard zones.
Roof	• GCI Sheet (Char-Chala) with treated bamboo under structure/ or micro concrete tile roofing	
Floor	• Plastic Sheet as rising dampness-stopper plus 75 mm sand bed plus 300 x 300 x 16 mm precast CC tiles or flat brick soling in 1:3 CM.	
Opening	• Phenol Bonded or equivalent ck shutter framed with split bamboo / local timber • Alternatively use GCI shuttering framed with split bamboo/local timber.	



FLOOR PLAN DESIGN OPTION 5

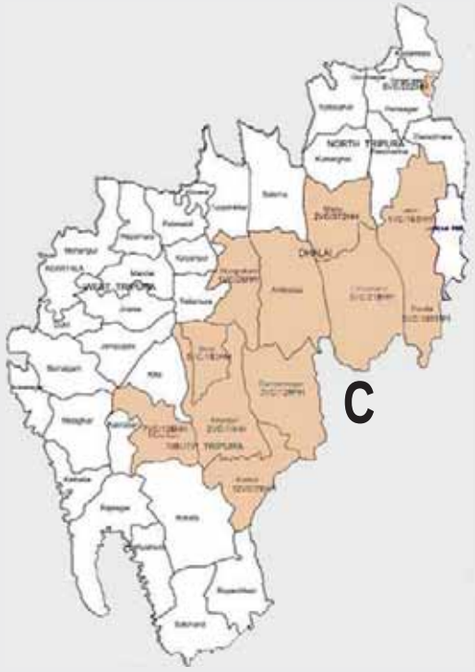
TR-05

Area Statement:

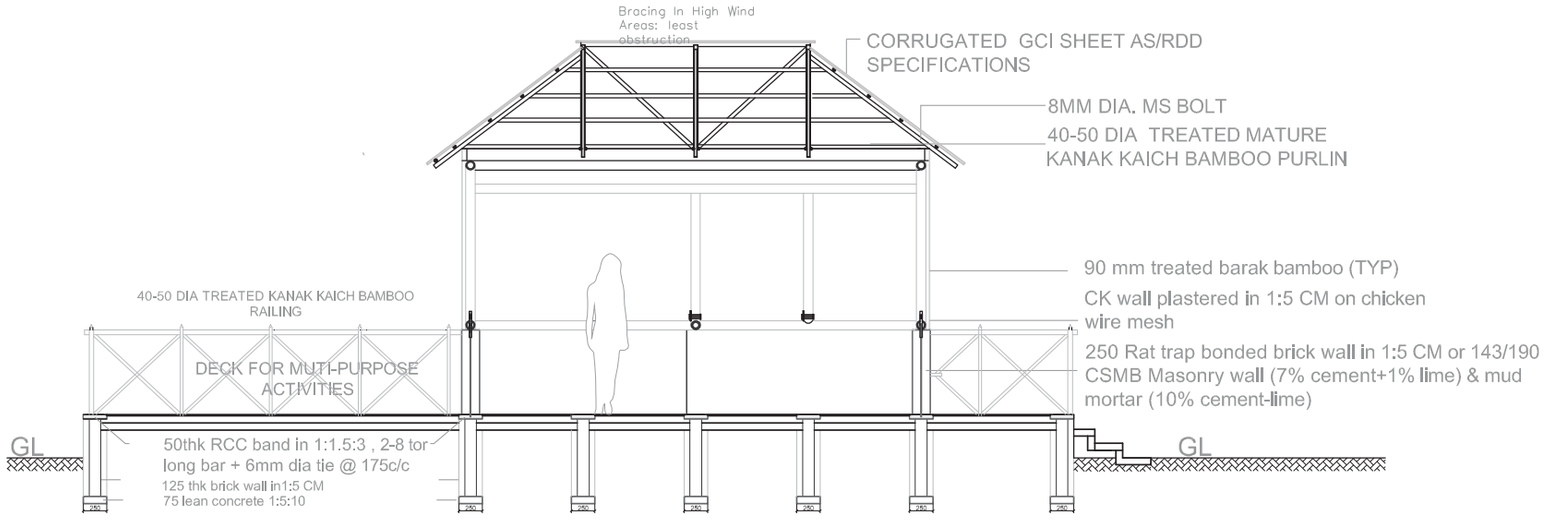
Item	Area	
	Sq.m	Sq.ft
Room	23.2	249.72
Kitchen	2.69	28.96
Verandah	7.83	84.28
Deck	19.08	205.38
Carpet Area	**25.89**	**278.68**
Built up Area	**56.24**	**605.37**

TRIPURA

TR-05



TRIPURA



SECTION YY'

S.NO.	DESCRIPTION	QUANTITY	UNIT	UNIT RATE INR	AMOUNT INR
1	Excavation in foundation	10.122	cu.m.	142.32	1,440.53
	Backfill 1/3rd of excavation	3.374	cu.m.	52.00	175.45
	Plinth filling	16.910	cu.m.	52.00	879.30
	Lean concrete (1:5:10) in Foundation	1.059	cu.m.	5548.5575	5,878.00
2	Brick Masonry in Foundation	1.134	cu.m.	4271.4713	4,845.45
3	125 MM Brick Wall in 1:4 CM	4.290	cu.m.	5032.00	21,587.28
4	RCC band at PL (50x250) M20 concrete in Foundation	0.329	cu.m.	6847.05	2,250.97
	Reinforcement for the above item @200 kg/cum	65.750	kg	55.78	3,667.54
5	10 MM Dia. Steel Rod in Foundation				
		10.912	kg	55.78	608.67
6	7% cement+1% lime stabilized Rammed Earth Wall	3.825	cu.m.	3213.05	12,290.79
7	Flooring				
	Flooring room- from ACAD dwg	25.361	sqm	331.82	8,415.29
	Deck + Front veranda	25.046	sqm	82.955	2,077.69
8	Champa Kampa for Walls				
	Item no. 7 total area of Champa Kampa	30.270	sq.m.	468.48	14,180.93
9	1:4 Cement stabilized mud wash on toe wall	137.976	sq.m.	10	1,379.76
10	Horizontal 100 mm Kanak Kaich Bamboo in the Wall	67.192	m.	28.75	1,931.78
11	Vertical 100 mm Barak Bamboo in the Wall	46.938	m.	28.75	1,349.48
12	Vertical 50 mm Barak Bamboo for Door Frame	9.7	m.	28.75	277.73
13	Diagonal 75 mm Kanak Kaich Bamboo Members	25.121	m.	28.75	722.22
14	30mm Bamboo for door	51.2	m.	28.75	1,472.00
15	50mm Bamboo for door	13.2	m.	28.75	379.50
16	40 mm Jaali in Wall	2.500	sqm	28.75	71.88
17	Roofing GCI Sheet	61.3	sq.m.	495.00	30,323.07

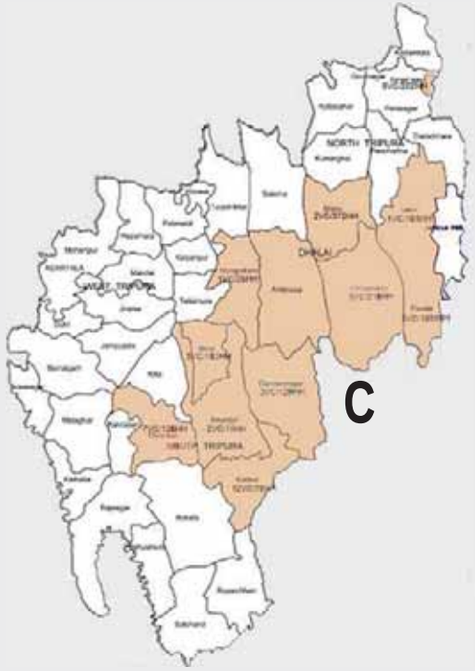
TR-05
Cost estimate

Cost breakup

Item	Cost (INR)
Foundation	41,335/-
Flooring	22,784/-
Walls/Floors/ Windows	21,764/-
Roof	38,091/-
Total	**1,23,972/-**

TRIPURA

TR-05
Cost estimate



TRIPURA

S.NO.	DESCRIPTION	QUANTITY	UNIT	UNIT RATE INR	AMOUNT INR
18	Truss (Kanak Kaich Bamboo)				
	Total length of 100mm for Rafter	29.6	m.	28.75	849.57
	Total length of 50mm for Tie Members	2.5	m.	28.75	72.08
	Total length of 50mm for Raking Members	14.803	m.	28.75	425.58
	Total length of 50mm for Purlins	55.9	m.	28.75	1,606.11
19	Lean To (Kanak Kaich Bamboo)				
	Total length of 50mm for Lean To	10.7	m.	28.75	307.48
	Total length of 50mm for Lean To Purlins	57.2	m.	28.75	1,643.21
20	Support Truss				
	Total length of 100mm for Rafter	15.4	m.	28.75	443.83
	Total length of 50mm for Raking Members	7.503	m.	28.75	215.70
	Total length of 50mm for Purlins	41.4	m.	28.75	1,190.78
	Total length of 100mm Kanak Kaich Bamboo for Truss	45.0	m.		
	Total length of 50mm Kanak Kaich Bamboo for Truss	189.9	m.		
21	add 15% for bamboo works				1013.15072
					123,972.78

DEMONSTRATION HOUSES IN TRIPURA

FOR PMAY BENEFICIARIES

THE COMPLETE HOUSES: TRIPURA

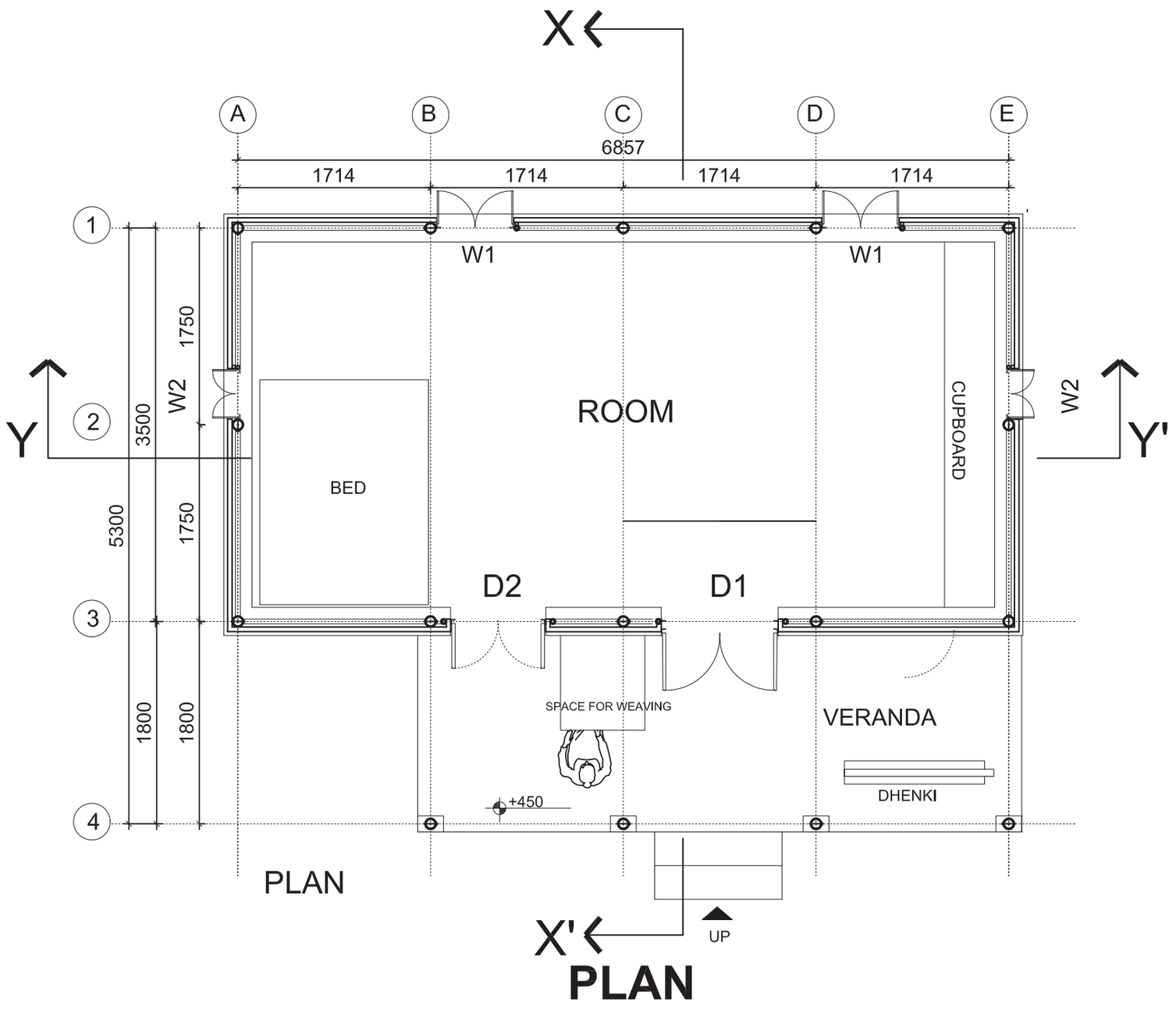
NALCHHAR BLOCK

MOHANBHOG BLOCK

JAMPUIJOLA BLOCK

NALCHHAR BLOCK

TRIPURA



TYPICAL PLAN

DEMONSTRATION HOUSE

BENEFICIARY-SUDHAN DEBBARMA

ZONE- B

JAMPUIJOLA BLOCK

Technologies
Foundation: Brick Stub
Wall: toe wall in rat trap brick wall; super structure in treated bamboo mat plastered with 1:5 CM
Roof CCB treated bamboo truss + CGI sheet

Area=36.33 sqm (391 sft)
Cost= Rs 1,22,863/-

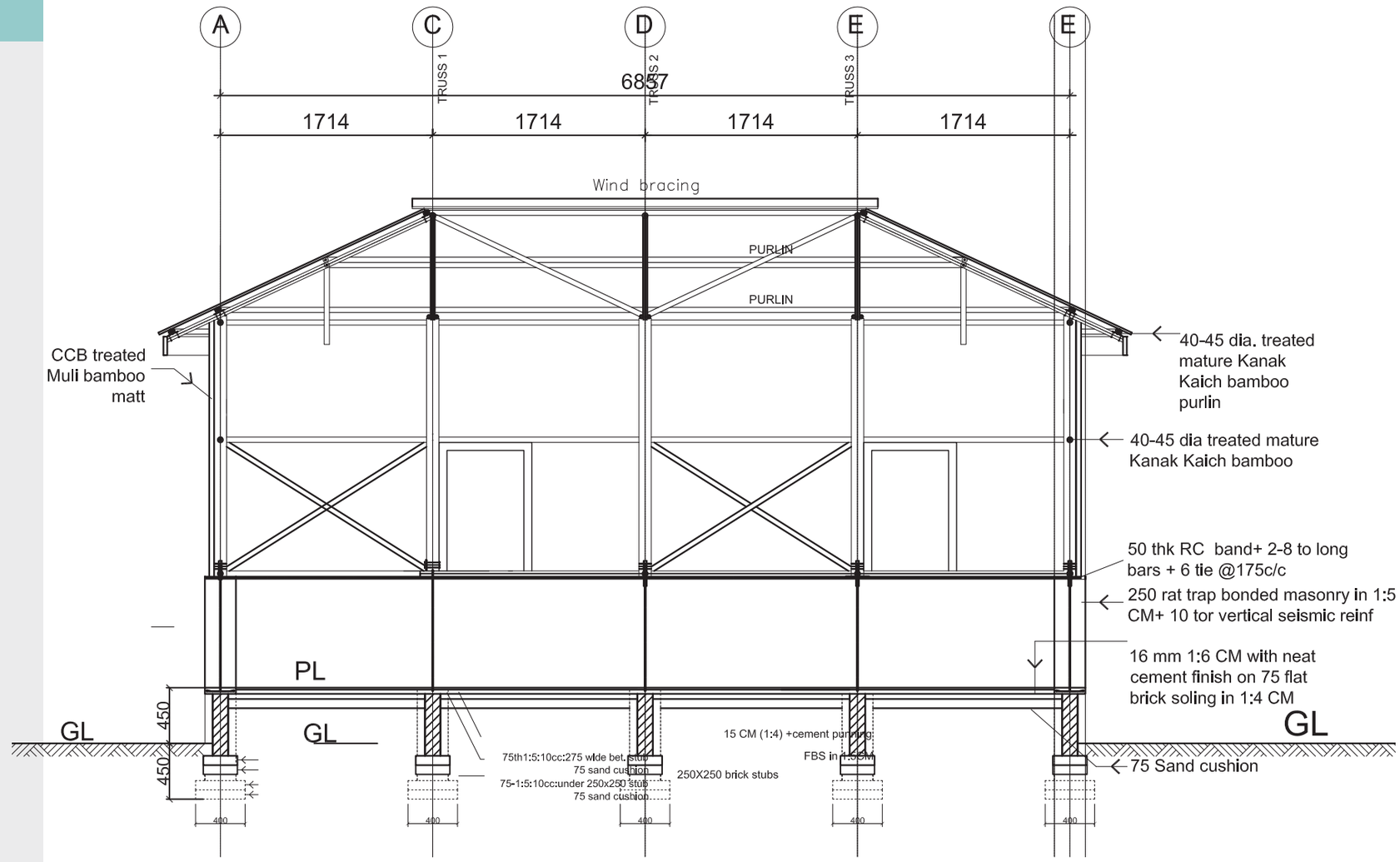
TRIPURA

DEMONSTRATION HOUSE
BENEFICIARY-SUDHAN DEBBARMA
ZONE- B
JAMPUIJOLA BLOCK

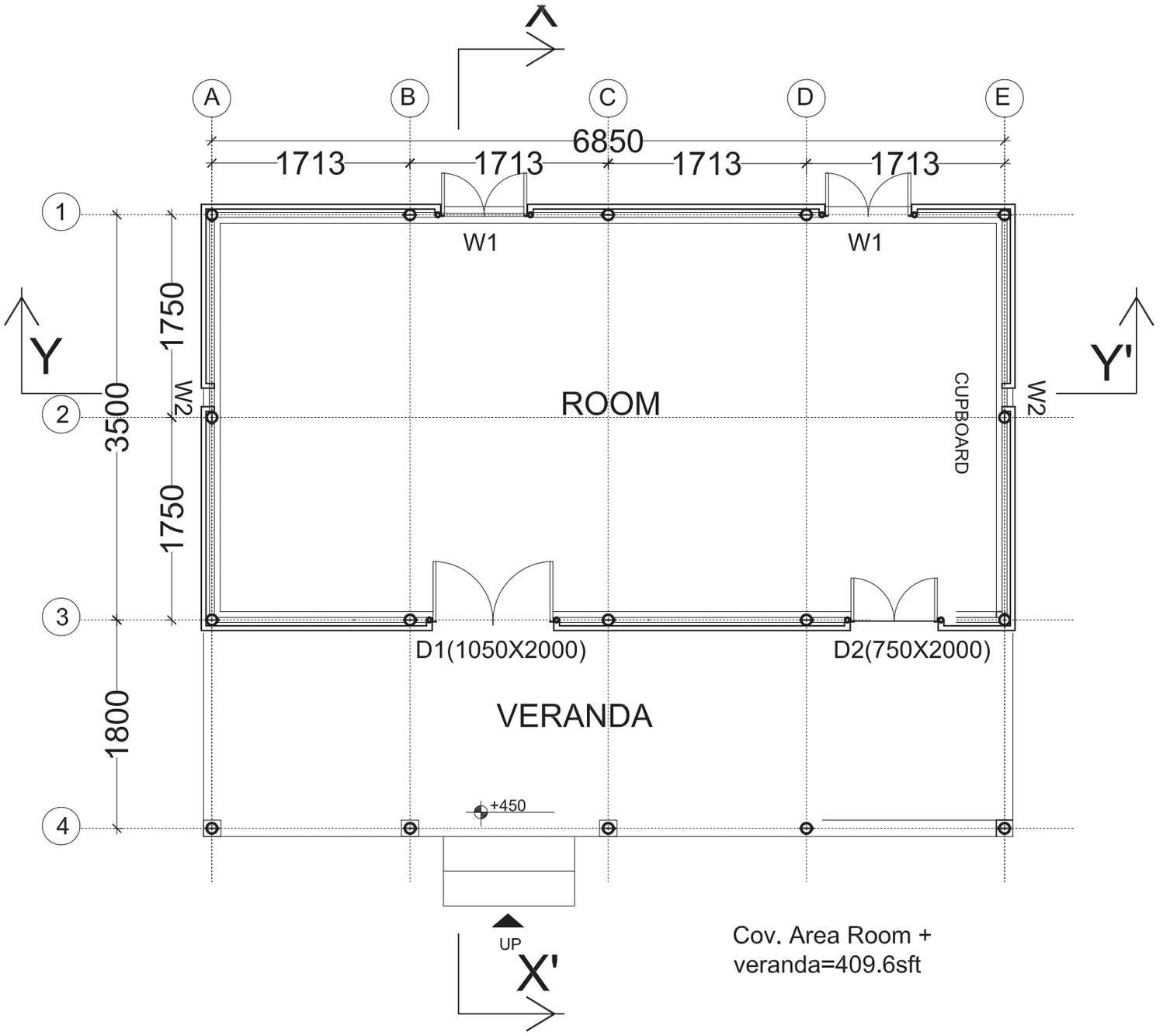
Technologies
Foundation: Brick Stub
Wall: toe wall in rat trap brick wall; super structure in treated bamboo mat plastered with 1:5 CM
Roof CCB treated bamboo truss + CGI sheet

Area=36.33 sqm (391 sft)
Cost= Rs 1,22,863/-

TRIPURA



SECTION XX'



Cov. Area Room + veranda=409.6sft

TYPICAL PLAN

DEMONSTRATION HOUSE
BENEFICIARY-KAJOL SUTRADHAR
ZONE- B
MOHANBOG BLOCK

Technologies
Foundation: Brick Stub
Wall: toe wall in cement stabilized mud block; super structure in treated bamboo mat plastered with 1:5 CM
Roof CCB treated bamboo truss + CGI sheet

Area=38.07 sqm (409 sft)
Cost= Rs 1,07,529/-

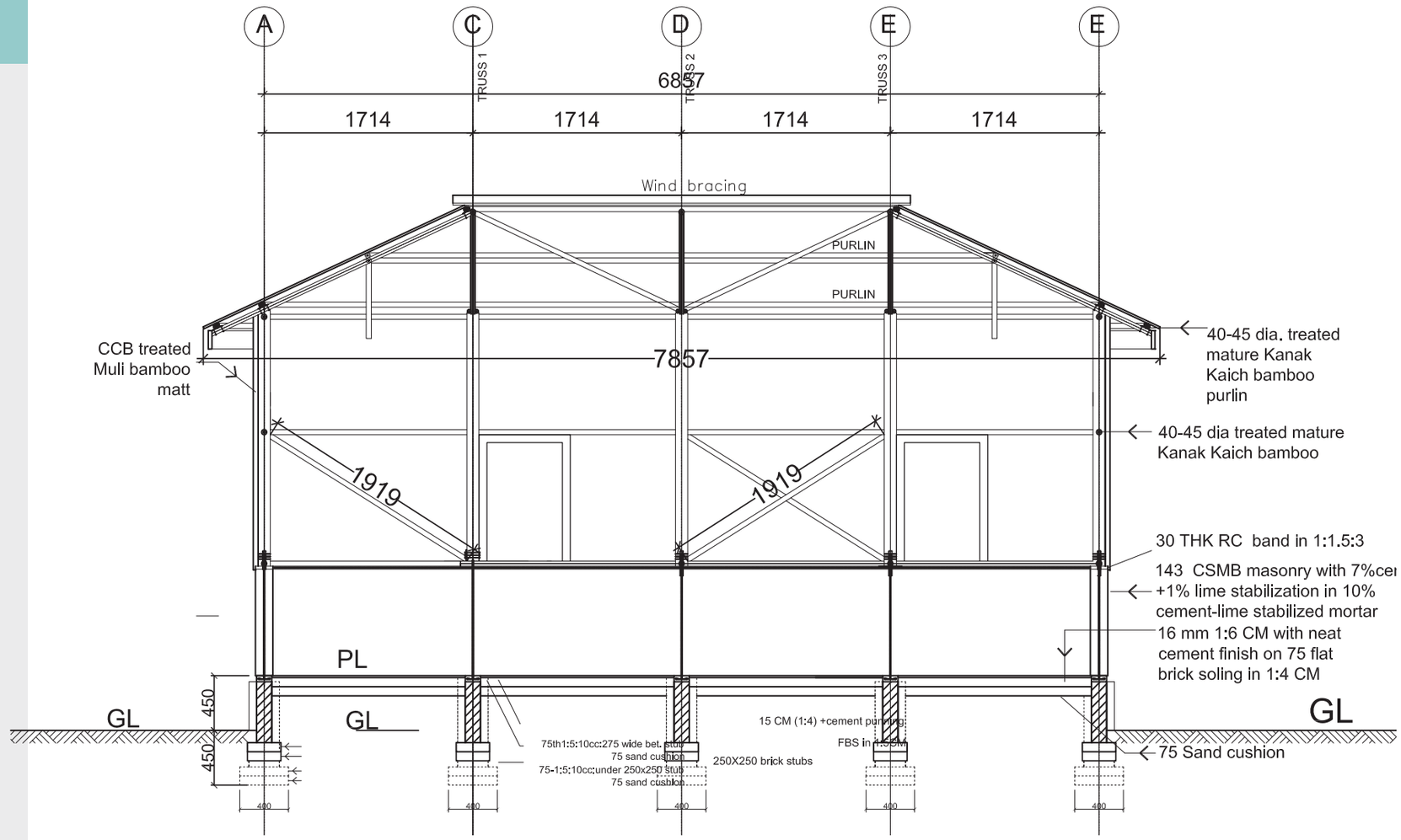
TRIPURA

DEMONSTRATION HOUSE
BENEFICIARY-KAJOL SUTRADHAR
ZONE- B
MOHANBOG BLOCK

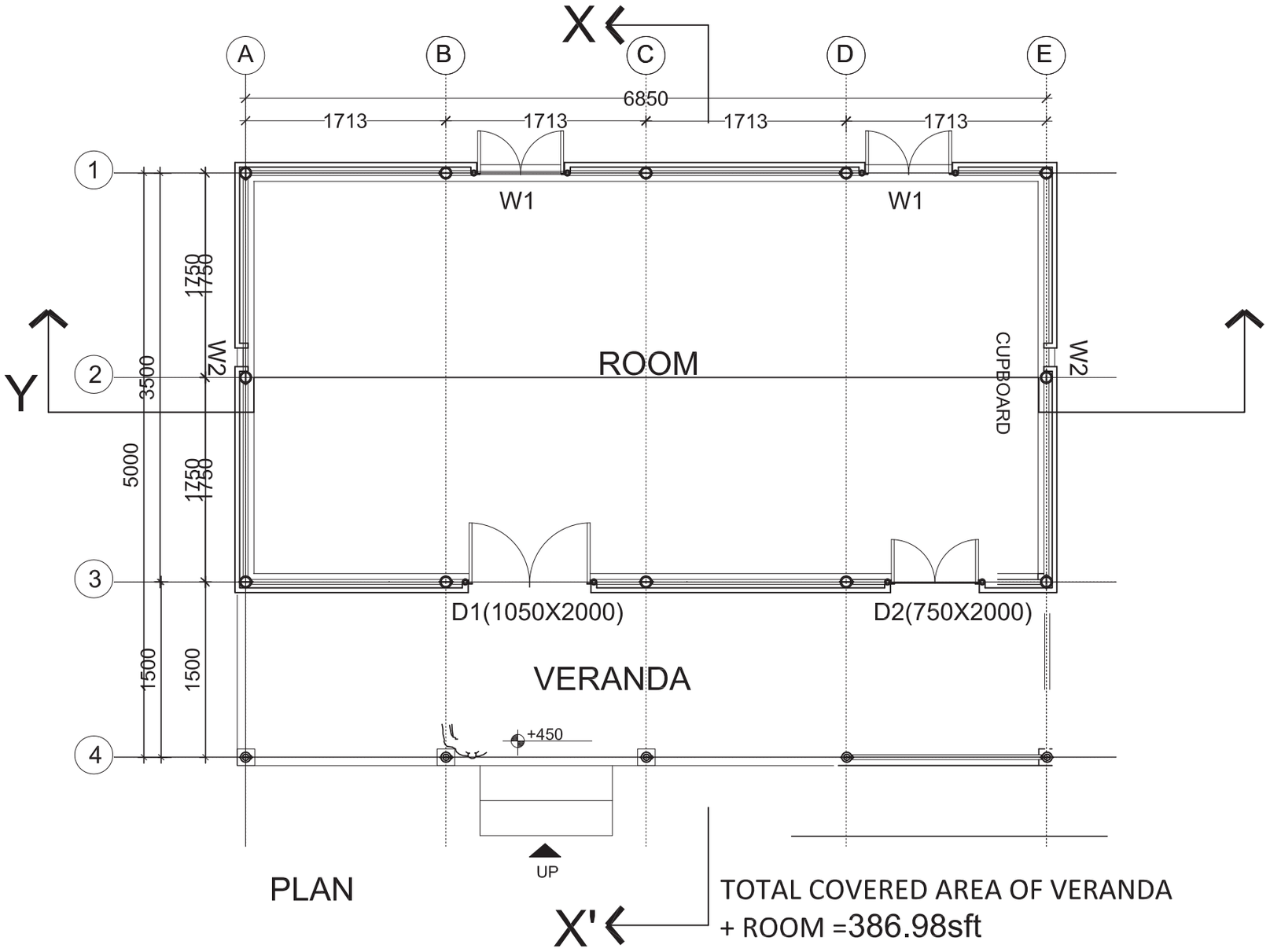
Technologies
Foundation: Brick Stub
Wall: toe wall in cement stabilized mud block; super structure in treated bamboo mat plastered with 1:5 CM
Roof CCB treated bamboo truss + CGI sheet

Area=38.07 sqm (409 sft)
Cost= Rs 1,07,529/-

TRIPURA



SECTION XX'



TYPICAL PLAN

DEMONSTRATION HOUSE

BENEFICIARY-CHINU GHOSH

ZONE- B

NALCHHAR BLOCK

Technologies
Foundation: Brick Stub
Wall: toe wall in cement stabilized mud block; super structure in treated bamboo mat plastered with 1:5 CM
Roof CCB treated bamboo truss + CGI sheet

Area=35.96 sqm (387sft)
Cost= Rs 1,26,319/-

TRIPURA

DEMONSTRATION HOUSE

BENEFICIARY-CHINU GHOSH

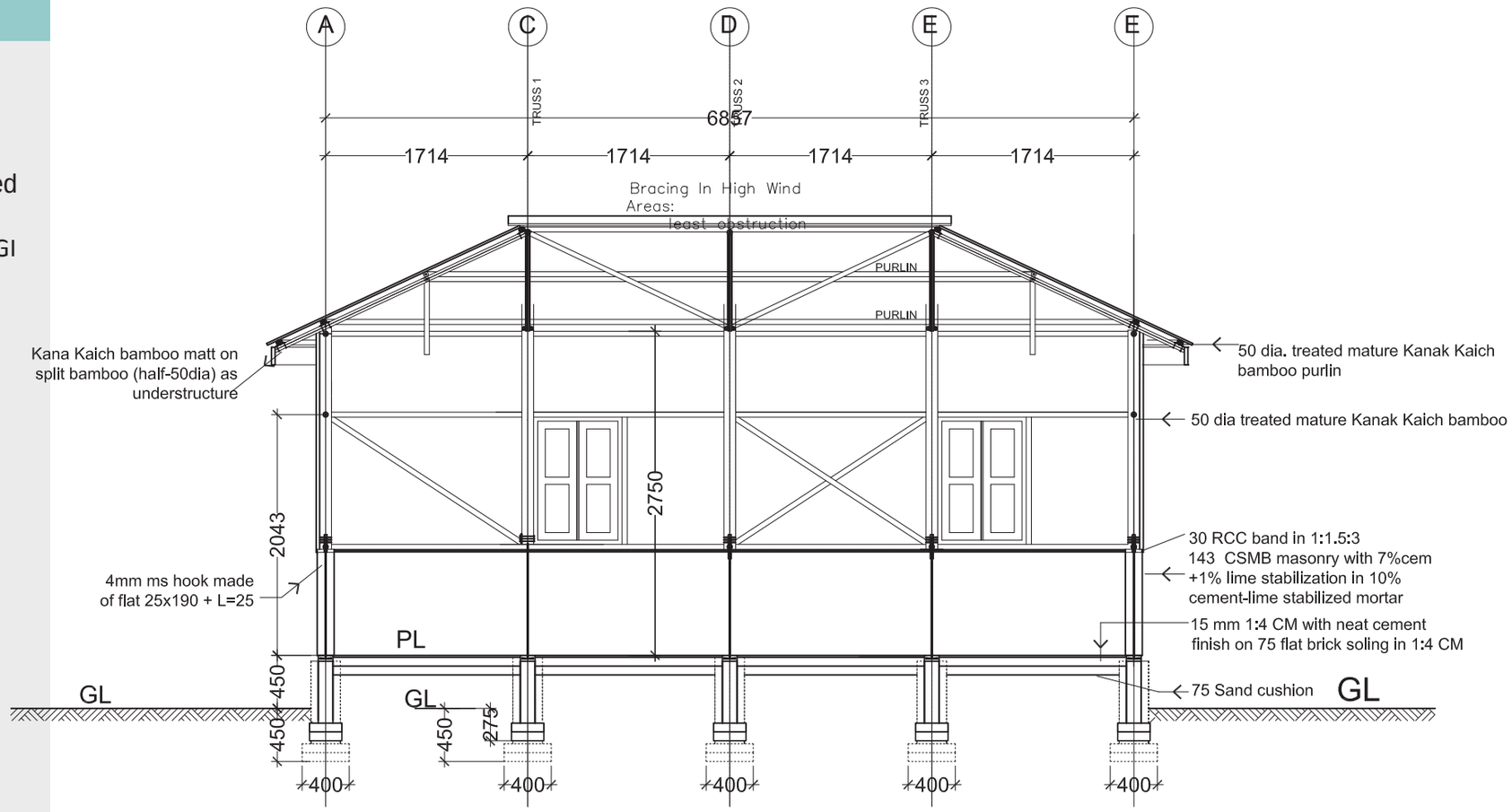
ZONE- B

NALCHHAR BLOCK

Technologies
Foundation: Brick Stub
Wall: toe wall in cement stabilized mud block; super structure in treated bamboo mat plastered with 1:5 CM
Roof CCB treated bamboo truss + CGI sheet

Area=35.96 sqm (387sft)
Cost= Rs 1,26,319/-

TRIPURA



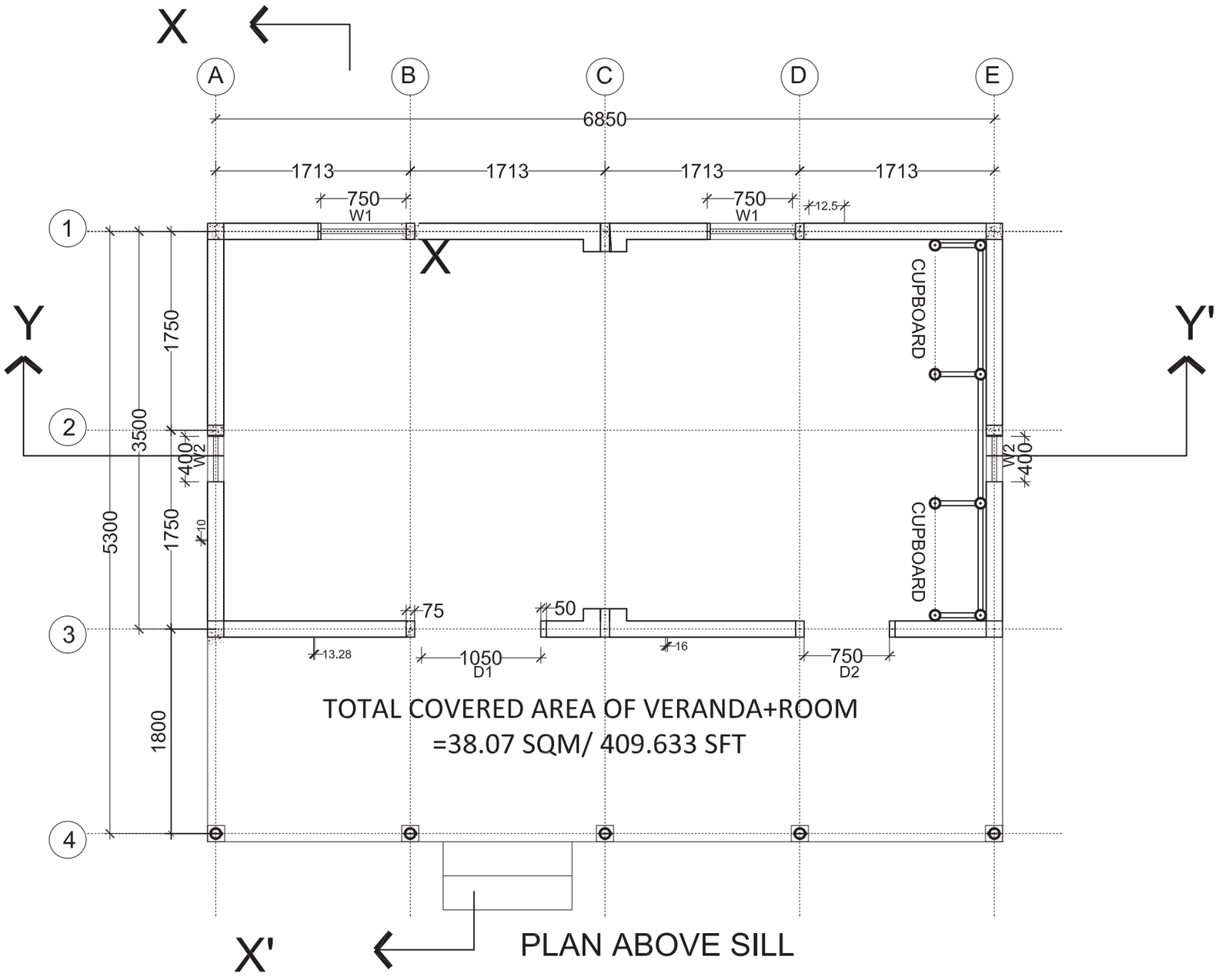
SECTION XX'

DEMONSTRATION HOUSE

BENEFICIARY-JHARNA DAS

ZONE- B

NALCHHAR BLOCK



TYPICAL PLAN

Technologies
Foundation: Brick Stub
Wall: Full wall in cement stabilized mud block with seismic bands and vertical reinforcements
Roof CCB treated bamboo truss + CGI sheet

Area=38.07 sqm (409 sft)
Cost= Rs 1,51,543

TRIPURA

DEMONSTRATION HOUSE

BENEFICIARY-JHARNA DAS

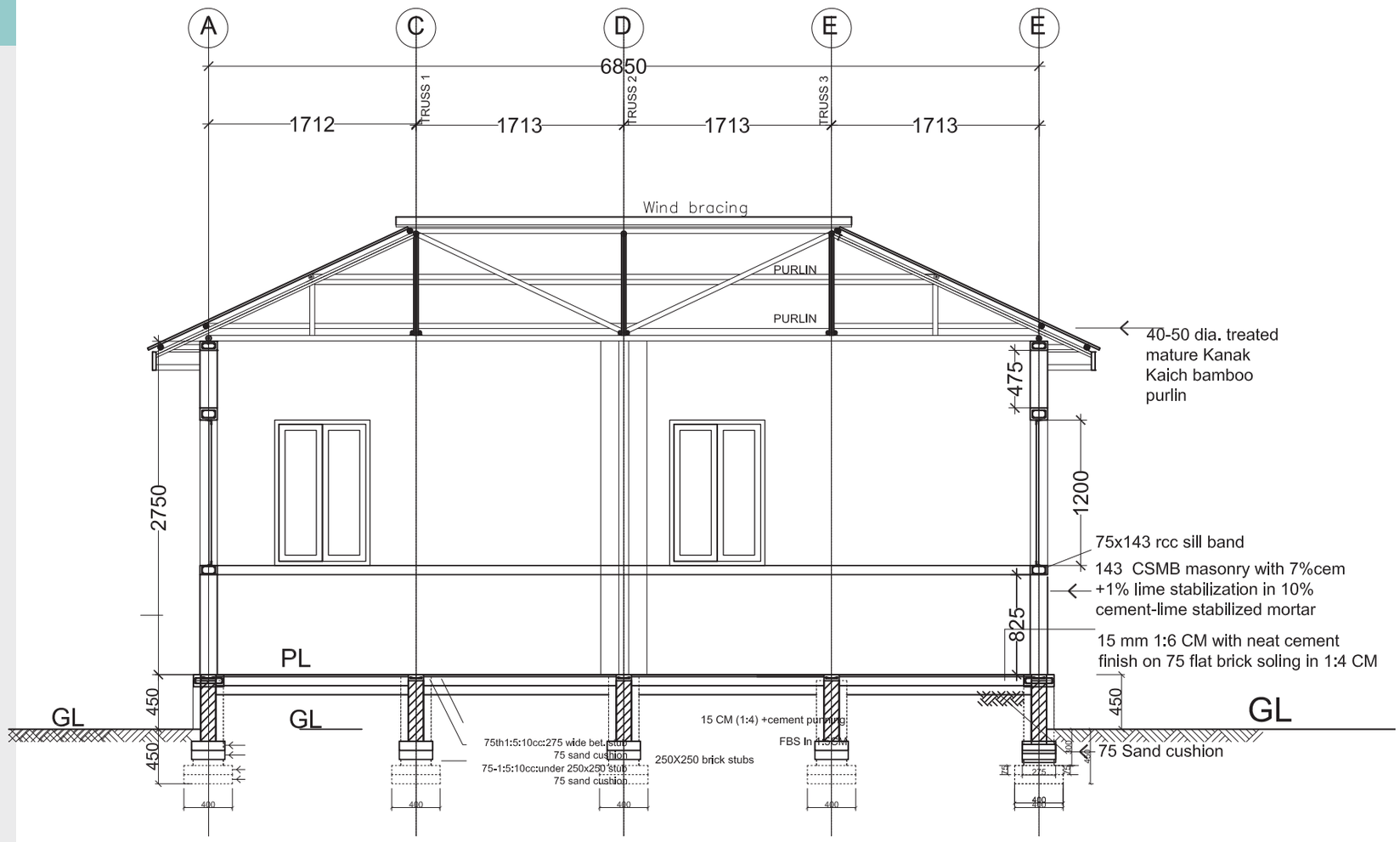
ZONE- B

NALCHHAR BLOCK

Technologies
Foundation: Brick Stub
Wall: Full wall in cement stabilized mud block with seismic bands and vertical reinforcements
Roof CCB treated bamboo truss + CGI sheet

Area=38.07 sqm (409 sft)
Cost= Rs 1,51,543

TRIPURA



SECTION XX'

DEMONSTRATION HOUSE
SUMMARY OF COSTS
ALL BENEFICIARIES

SUMMARY OF COSTING: FOUR MODEL HOUSES

	ROOM + VERANDA AREA	COST OF ROOM + VERANDA	UNIT COST	SPECIFICATIONS	PEOPLE WHO TOOK THE LEAD ROLE
CHINU GHOSH	35.964 SQM/ 386.98 SFT	RS. 1,03,326+ RS. 22,993= RS. 1,26,319	RS. 326.427/ SFT	CSMB toe wall + CCB treated bamboo super structure with bamboo mat plastered in 1:5 CM + bamboo truss+ GCI roof	BDO, B B DAS JE SUDHNGSHU BHOWMIK, TA NARAYAN CHANDRA DAS, MASON PARIMAL DAS
JHARNA DAS	38.07 SQM/ 409.633 SFT	RS 1,27,207 + RS 24,336= RS 1,51,543	RS 370/ SFT	CSMB full wall + 4 seismic bands at plinth, sill, lintel and roof level+ corner reinf. + CCB treated bamboo truss+ GCI roof	BDO, B B DAS JE SUDHNGSHU BHOWMIK, TA NARAYAN CHANDRA DAS, MASON PARIMAL DAS
SUDHAN BENBARMA	36.325 SQM/ 390.867 SFT	RS1,01,931+20,932 + RS = RS1,22863	RS 314.33/ SFT	Rat trap bonded toe wall + CCB treated bamboo super structure with bamboo mat plastered in 1:5 CM + bamboo truss+ GCI roof	BDO, MOLSOM JE PRANA DEBBARMA, MASON SANJIT DEBBARMA
KALOJ SUTRADHAR	38.07 SQM/ 409.633 SFT	RS1,07,529.29	RS. 262.5/ SFT	CSMB toe wall + CCB treated bamboo super structure with bamboo mat plastered in 1:5 CM + bamboo truss+ GCI roof	BDO, ARINDAM DAS GRAM PRADHAN TAPAN CHAKRABORTY MASON KANU DAS

All Costs Are As Per SoR 2015-16 And Some Items As Per Market Rate
All Estimates Have Been Prepared Directly With The Help Of The JEs
Chinu And Sudhan Took Active Part In Unskilled Works
Kajol Sutradhar's Contribution To The Project Was The Most Commendable- She Made The Highest Contribution. The Gram Pradhan Tapan Chakrabory Helped In Materials And Masons' Rates.
Dr Selim Reza And Team Treated The Bamboos

Special thanks to: The PS, RDD, JS, RDD, DM, Sepahijola and the ADM Sepahijola provided all the supports for the successful implementation of the project.

TRIPURA

pahal
Prakriti Hunar Lokvidya

Uttar Pradesh

UTTAR PRADESH

The state of Uttar Pradesh has distinct yet wholesome characteristics that make this state, one of the biggest in India, a unique state. Flanked by Himalayas in North, criss-crossed by rivers in the centre while the head of Bundelkhand plateau lies in its south, Uttar Pradesh has rich diversity throughout the state and it reflects in the buildings and communities construct.

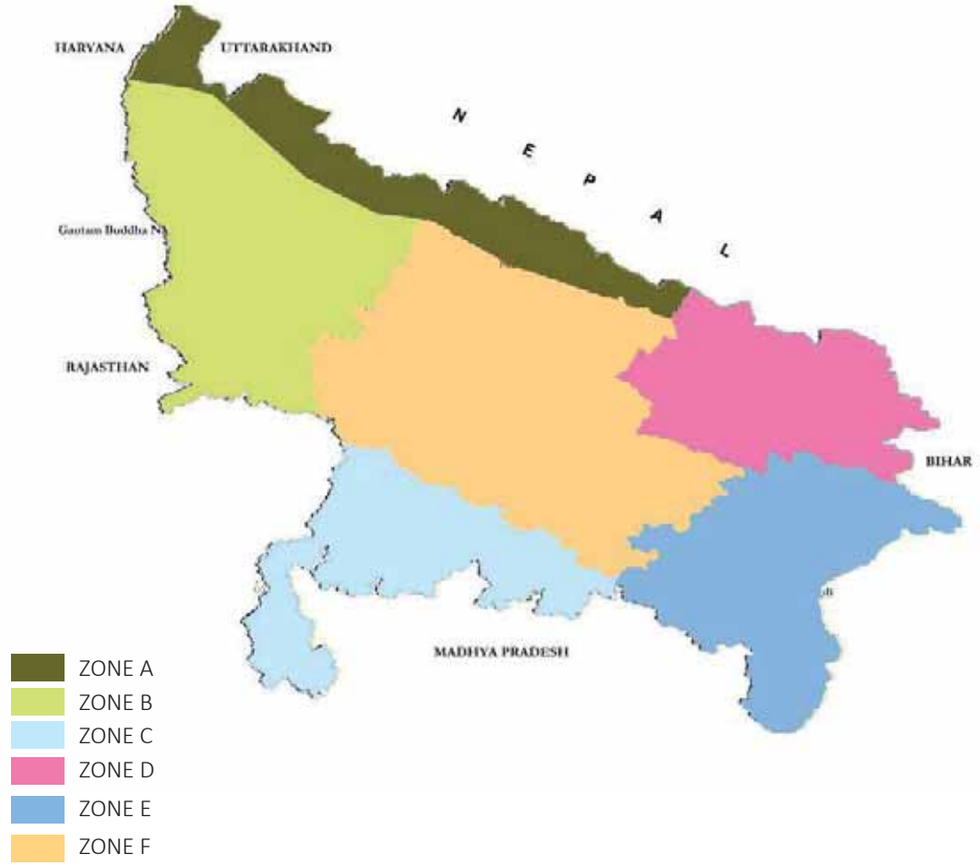
While the team started off with taking 7 historic zones as a base, there are 6 housing zones Uttar Pradesh can be classified into. There are characteristics that are distinct for some regions that do not necessarily fall into these historic zones. For example, the Tarai region, which lies in the foothills of Himalayas and has numerous tributaries flowing through the area has very distinct housing typologies, such as extensive use of bamboo, mud, grass and straw in various construction elements. On the other hand, the area under Lower Doab and Awadh has similar characteristics, and hence, can be treated as one region.

Zone A
Since Zone 1 falls under the highest category of seismic zone and high damage risk zone for wind/ cyclone, therefore lot of attention is given in incorporating the earthquake resistant features. Horizontal seismic bands and vertical reinforcement bands in the wall are provided as per Indian Standard Earthquake Resistant Design and Construction of BuildingsCode of Practice (IS 4326: 1993; Reaffirmed 2003; Edition 3.3).

Zone B
Since zone 2 lies in seismic zone III and most readily available material after mud is stone, therefore attention is given to judicious use stone and mud together in the construction technique for this zone.

Zone C
Bundelkhand lies in seismic zone II and does not have any flood hazard in the region. In most parts of the region, stone is dominant natural building material for construction.

Zone D
Since major areas of the region lies in flood prone zone, seismic zone V and high damage risk zone of cyclone, therefore, it becomes essential to incorporate all the safety features to prevent damage during any natural calamity. Most of the traditional houses of the region have sloping and light weight roofs, where the solution to tackle earthquake and cyclone risks lies.

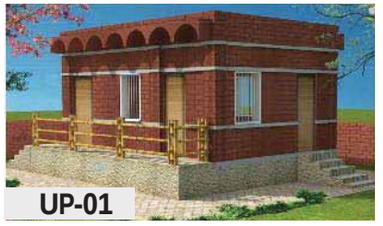


Zone E
The region lies in the flood hazard zone and also have seismic zone II and III. The region has many rivers flowing across and has very rich soil which are reflected in the vernacular houses, which are mainly built from mud. In some parts of the region, stone is also used as the major natural building material.

Zone F
Zone 6 lies in seismic zone III and II at the same time some regions are prone to flood hazards. Here, the attention is given in exploring the use of brick and benefiting from the soil condition of the flat plains of Awadh and Lower Doab.

UTTAR PRADESH HOUSING TYPOLGIES AT A GLANCE

TYPOLOGY	APPLICABLE HOUSING ZONES	TOTAL AREA Sq.ft/Sq.m	
UP-01	Zone A	344.5 Sq.ft	32.00 sq.m
UP-02	Zone B	322.92 sq.ft	30.00 sq.m
UP-03	Zone C	317.86 sq.ft	29.53 sq.m
UP-04	Zone D	317.86 sq.ft	29.53 sq.m
UP-05	Zone E	306.02 sq.ft	28.43 sq.m
UP-06	Zone F	355.21 sq.ft	33.00 sq.m


UP-01


UP-02


UP-03


UP-04


UP-05


UP-06

UTTAR PRADESH

UP-01

This typology is applicable to Zone A

Seismic zone V and high damage risk zone for wind/ cyclone,

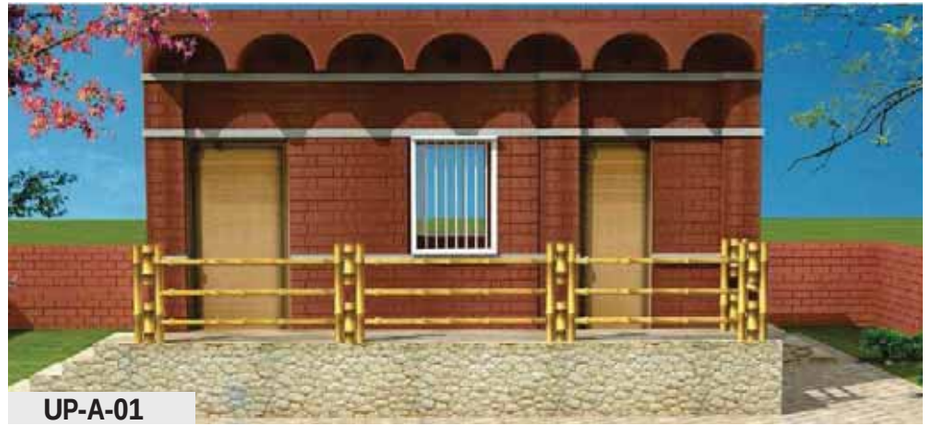
Zone A comprises of the following districts:

1. Saharanpur
2. Bijnor
3. Rampur
4. Bareilly
5. Pilibhit
6. Kheri
7. Bahraich
8. Shravasti

Resources Available

- Mud
- Due to large number of river flowing through this region, lot of pebbles and boulders are available in this region.

UTTAR PRADESH



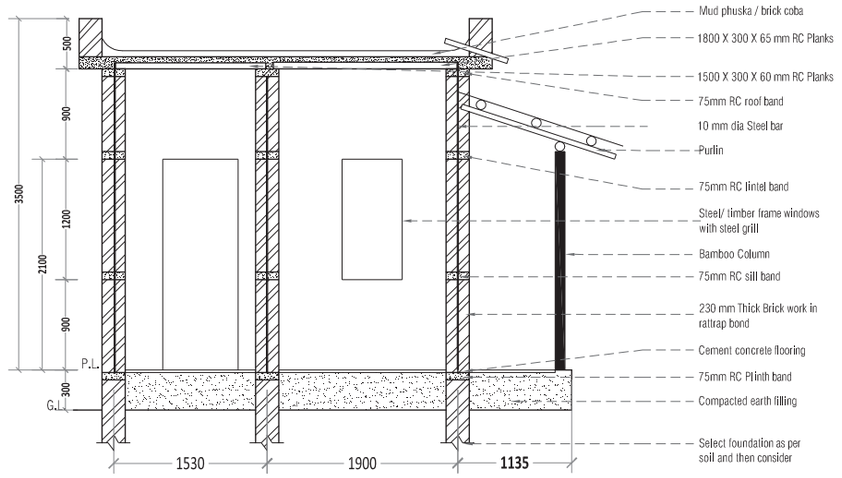
UP-A-01

- Column framed structure proposed without using RCC structure, thus minimizing the use of steel and concrete.
- Suggested construction technique for wall not only provide resistance to seismic disaster but at the same time saves up material consumption when compared with English bonded brick wall.
- Ferro Cement roofing channel provide about 60% reduction in dead weight as compared to RCC as its unit weight 50 kg per meter length.

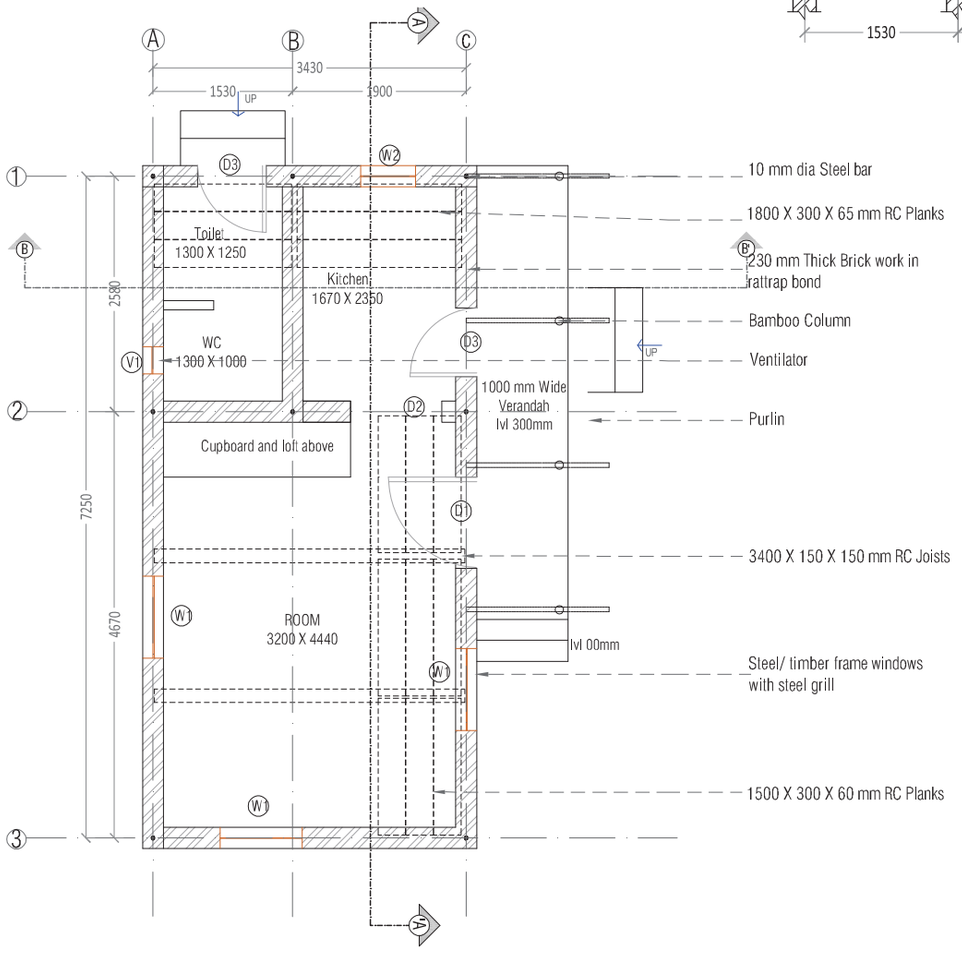
Recommendations for Built Form		
Plan Layout	**Plinth/Floor**	**Roof Profile**
Rectangular structure and liner in the arrangement of their interior spaces. Entry to the building is from longer side. Open to sky verandah is provided in one long side. Future expansion proposed vertically.	High Plinth level recommended	Light Weight Roof Recommended.

Recommendations for construction systems		
Components	**Recommended Specifications**	**Specific Comments**
Foundations	• Strip footing with large dressed stone with cement mortar till plinth level.	• Reducing the usage of concrete by recommending alternative to RCC framed structure.
Plinth	• Steel Reinforced RCC plinth beam at 750mm height from the ground.	
Wall	• 2 brick thick column with rat trap bonded brick wall. • Reinforcing bars embedded in brick masonry at the corners of all the rooms • Seismic bands provided at sill level, lintel level and ceiling level.	• Reinforcing bars recommended for openings larger than 0.6 m in width.
Wall Finish	• No wall finish required	
Roof Structure	• RC plank & joist roofing system	
Roof Cover	• Mud phuska/ brick coba	
Floor	• Plain Cement flooring	

UP-01



TYPICAL SECTION AA'



TYPICAL PLAN

Area Statement:

Item	Area	
	Sq.m	Sq.ft
Room	14.21	152.96
Kitchen	3.92	42.19
Toilet	3.05	32.83
Verandah	5.00	53.82
Carpet Area	**22.00**	**236.81**
Built up Area	**32.00**	**344.45**

UTTAR PRADESH

UP-01
Cost estimate

Cost breakup

Item	Cost (INR)
Foundation	29,335/-
Sub structure and Super Structure	95,453/-
Roof	37,769/-
Total	**162,557/-**

UTTAR PRADESH

S. No.	ITEM	UNIT	QUANTITY	RATES (INR)	AMOUNT
	FOUNDATION				
1	Site clearance and layout	LS	1.00	100.00	100.00
2	Earth work in excavation of foundation, levelling the bottom of the trench etc. complete (750mm wide and 750mm deep)	cum	15.13	228.38	3454.31
3	Providing and laying P.C.C. in foundation 100mm thick with 1:5:10 (12mm nominal size aggregates)	cum	2.18	2511.25	5465.74
4	Providing Random Rubble Masonry with cement mortar in foundation up to plinth level, including setting of block , mixing of mud with appropriate qty. of	cum	3.31	1240.37	4101.05
5	Providing 1.5 thick brick column with cement mortar in pedestal foundation	cum	2.40	4704.01	11289.62
6	Providing and laying D.P.C. 25mm thick with 1:2:4 cement concrete and WPC powder.	sqm	6.01	92.88	558.41
7	Providing and laying RCC plinth beam 150mm thick with 1:2:4 cement concrete	cum	0.69	3835.46	2646.47
8	Earth work in back filling of foundation	cum	15.06	114.19	1719.95
	TOTAL				**29335.56**
	SUB STRUCTURE				
9	Brick work in veranda in normal bond with 1:6 cement dust mortar	cum	0.83	4704.01	3904.45
10	Bamboo fencing in veranda (100mm dia)	rm	15.00	50.00	750.00
11	Bamboo fencing in veranda (50mm dia)	rm	16.25	26.00	422.50
12	Brick work in steps with 1:6 cement dust mortar	cum	1.20	4704.01	5644.81
13	Earthwork in excavation of soak pit and inspection chamber	cum	2.71	228.38	619.35
14	Honeycombed brick work in soak pit and plaster work in inspection chamber	cum	0.68	1001.12	676.95
15	Cement concrete floor with brick ballast	sqm	25.51	112.25	2863.52
	TOTAL				**14881.59**
	SUPER STRUCTURE				
16a	Brick masonry with Rat trap bond in super structure with cement mortar 1:4	cum	17.08	4227.77	72228.81
16b	Brick work in normal bond with 1:6 cement dust mortar	cum	1.73	4704.01	8114.42
	Deductions:				
16c	For door	cum	1.57	4227.77	6636.54
16d	For Windows	cum	0.94	4227.77	3969.67
	Window	cum	0.11	4227.77	459.45
16e	Ventilator	cum	0.11	4227.77	466.75
	Total Brickwork	cum	16.08		68810.81
17	Corner vertical 8mm MS reinforcement for seismic zone	kg	58.80	50.00	2940.00
18	Providing and fixing R.C.C. door/window frames complete				
a	White door frame	no.	3.00	950.00	2850.00
b	Grey window frame	no.	5.00	400.00	2000.00
19	Providing and laying RCC sill band 75mm thick with 1:2:4 cement concrete	cum	0.35	3835.46	1323.23
20	Providing and laying RCC lintel band 75mm thick with 1:2:4 cement concrete	cum	0.35	3835.46	1323.23
21	Providing and laying RCC tie band 75mm thick with 1:2:4 cement concrete	cum	0.35	3835.46	1323.23
	TOTAL				**80570.52**
	ROOF				
22	Providing ferrocement channel roof of 850mm span	sqm	31.62	1033.87	32690.83
23	Providing stone slab in sill and window breaker	sqm	1.09	40.00	43.61
24	Providing Stone slab for loft/ storage	sqm	4.50	40.00	180.00
25	Brick work in parapet in normal bond with 1:6 cement dust mortar	cum	0.81	4704.01	3786.73
26	Providing PCC Gola complete	rm	18.58	51.33	953.80
27	Coping Stone	sqm	2.30	50.00	115.00
	TOTAL				**37769.97**
	PLUMBING AND OTHER FIXTURE FOR TOILET				
28	Indian sanitary Pan and water seal	no.	1.00	500.00	500.00
29	PVC pipe 4"	rm	3.60	120.00	432.00
30	PVC treeway tee 3"	no.	1.00	80.00	80.00
31	Plastic water tap	no.	1.00	70.00	70.00
32	Wash basin	no.	1.00	400.00	400.00
	TOTAL				**1482.00**
	TOTAL COST OF HOUSE (INR)				**164039.63**
	AREA of HOUSE (SQM)				**26.10**
	COST PER SQM (INR)				**6285.04**

UP-B-01

- Judicious use of stone and mud together in the construction technique for this zone which lies in seismic zone II.
- Since in this region neither mud nor stone is suitable for walling material, therefore, hollow interlocking CSEB is suggested for this region. The hollow spaces allow the necessary reinforcemnt in every corner of the room at the same time saves material consumption in the manufacturing process of the blocks. The unique interlocking feature of the block ensures extra safety for the earthquake.

Recommendations for Built Form		
Plan Layout	**Plinth/Floor**	**Roof Profile**
Rectangular structure and linear in the arrangement of their interior spaces. Entry to the building is from longer side. Open to sky verandah is provided in one long side. Future expansion proposed vertically.	Low Plinth level recommended	Flat Roof with vernacular practice for roof

Recommendations for construction systems		
Components	**Recommended Specifications**	**Specific Comments**
Foundations	• Reinforced Stone masonry with cement mortar in a strip foundation.	• Optimum use of local material. Mud mortar is replaced by cement mortar for earthquake safety.
Plinth	• Reinforced RCC plinth beam at 450mm height from the ground	
Wall	• Hollow interlocking Compressed Stabilized Earth Block wall. • Reinforcing bars embedded in wall at the corners of all the rooms • Seismic bands provided at ceiling level	• Vertical MS reinforcing bars recommended for openings larger than 0.6 m in width.
Wall Finish	• No wall finish required	
Roof Structure	• Prefabricated reinforced concrete beam at roof level to support the load of the roof.	Bamboo reinforcements in the beam
Roof Cover	• Stone patti with mud phuska as insulation.	• Improving the existing practice.
Floor	• Plain Cement flooring finish over bricks.	

UP-02

This Typology is applicable to housing zone B.

Seismic zone II

Zone B comprises of the following districts:

1. Muzaffarnagar
2. Baghpat
3. Meerut
4. Ghaziabad
5. Gautam Budhha Nagar
6. Bulandshahar
7. Aligarh
8. Mathura
9. Agra
10. Hathras
11. Firozabad
12. Etah
13. Kanshiram Nagar
14. Badaun
15. Moradabad
16. Jyotiba Phule Nagar

Resources Available

- Cob/Adobe, Stone, Cob, Fired Clay Stone,
- Bamboo
- Thatch

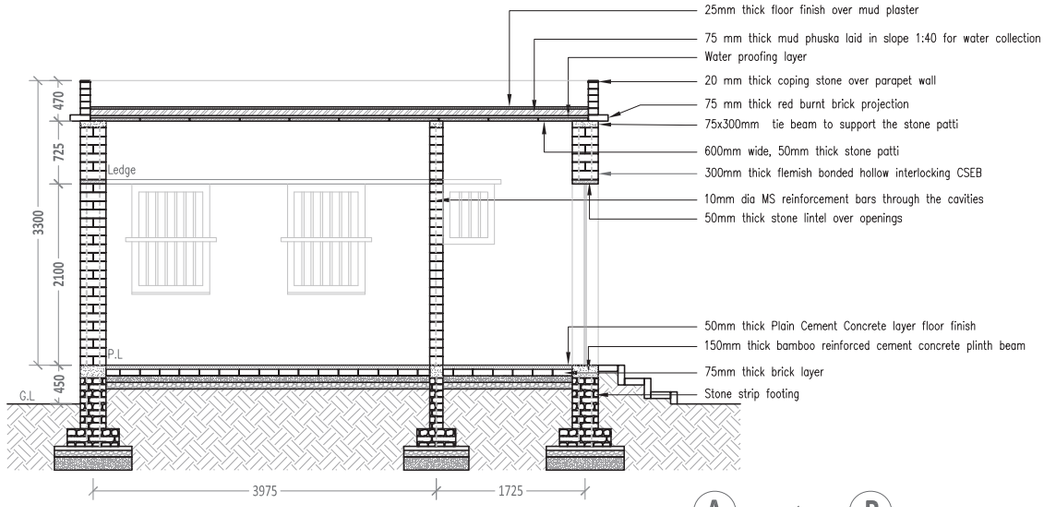
UTTAR PRADESH

UP-02A

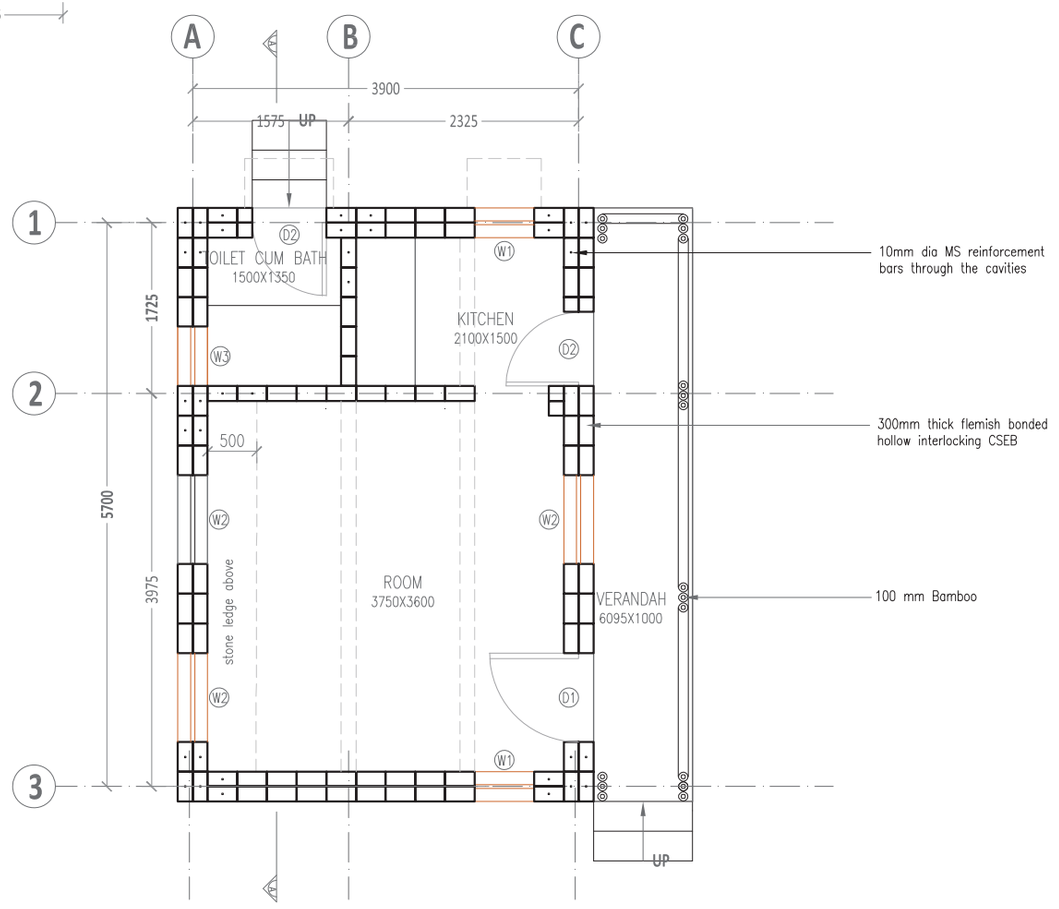
Area Statement:

Item	Area	
	Sq.m	Sq.ft
Room	14.01	150.80
Kitchen	3.50	37.67
Toilet	2.73	29.39
Verandah	4.00	43.06
Carpet Area	**21.00**	**226.04**
Built up Area	**30.00**	**322.92**

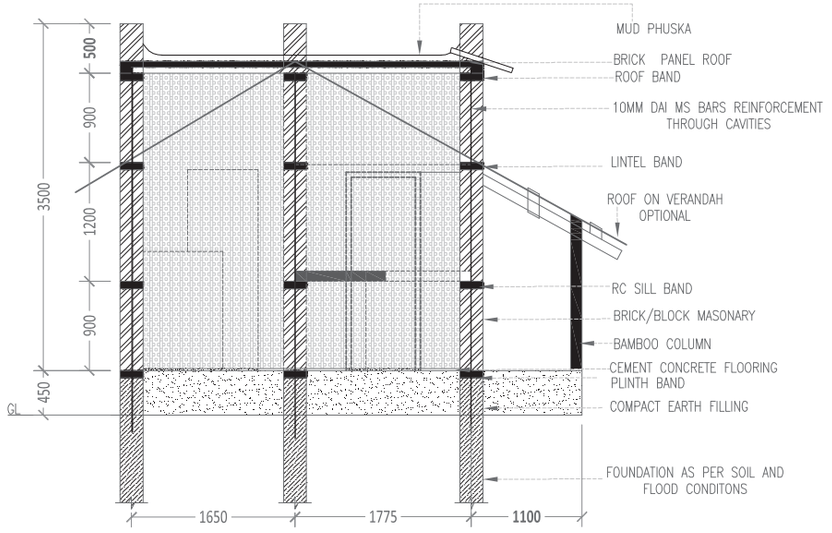
UTTAR PRADESH



TYPICAL SECTION AA'



TYPICAL PLAN



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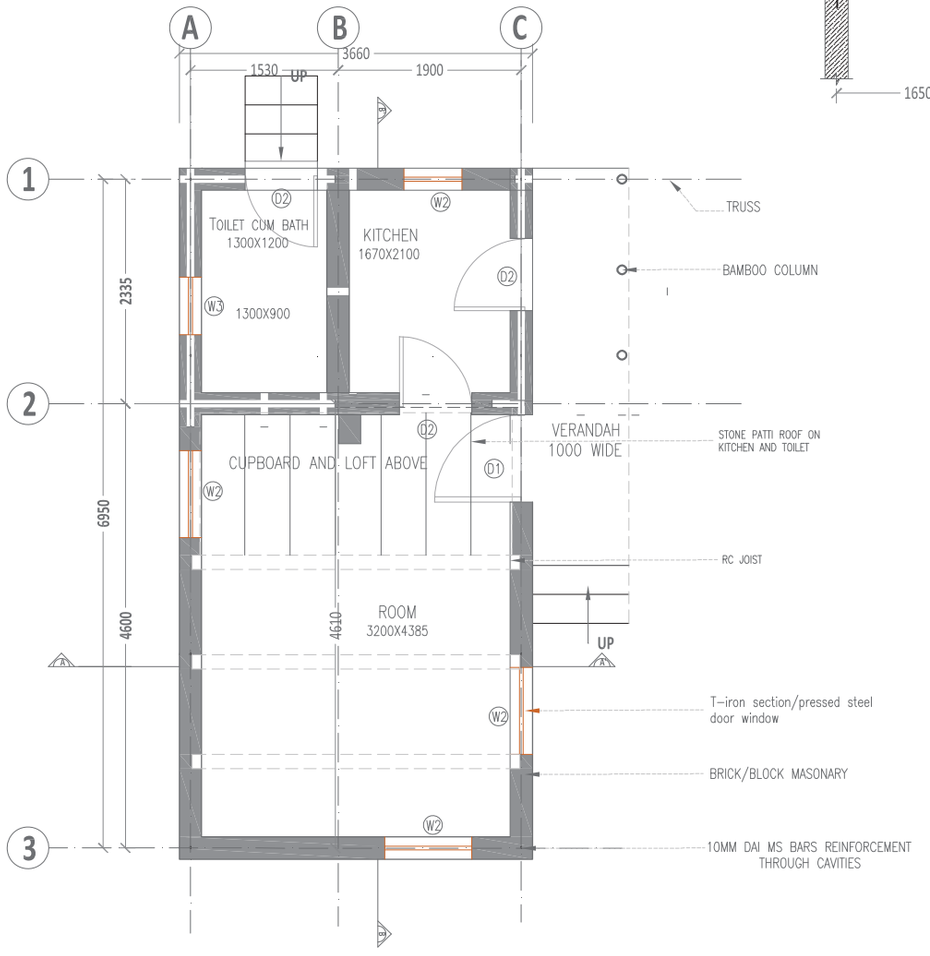


TYPICAL PLAN

UP-02B

Area Statement:

Item	Area	
	Sq.m	Sq.ft
Room	14.01	150.80
Kitchen	3.50	37.67
Toilet	2.73	29.39
Verandah	4.00	43.06
Carpet Area	**21.00**	**226.04**
Built up Area	**30.00**	**322.92**

UTTAR PRADESH

UP-02
Cost estimate

Cost breakup

Item	Cost (INR)
Foundation	21,473/-
Sub structure and Super Structure	75,781
Roof	41,963/-
Total	**139,217/-**

UTTAR PRADESH

S. No.	ITEM	UNIT	QUANTITY	RATE (INR)	AMOUNT
	FOUNDATION				
1	Site clearance and layout	LS	1.00	100.00	100.00
2	Earth work in excavation of foundation, levelling the bottom of the trench etc. complete (600mm wide and 600mm deep)	cum	14.60	228.38	3333.56
3	Providing and laying P.C.C. in foundation 100mm thick with 1:5:10 (12mm nominal size aggregates)	cum	2.11	2511.25	5288.69
4	Providing Random Rubble Masonry with cement mortar in foundation up to plinth level, including setting of block , mixing of mud with appropriate qty. of water etc.				
a	1st stepping	cum	4.42	1240.37	5484.00
b	2nd stepping	cum	1.85	1240.37	2291.56
5	Providing and laying D.P.C. 25mm thick with 1:2:4 cement concrete and WPC powder.	sqm	7.56	92.88	702.17
6	Providing and laying RCC plinth beam 150mm thick with 1:2:4 cement concrete	cum	0.86	3835.46	3313.84
7	Earth work in back filling of foundation	cum	8.40	114.19	959.35
	TOTAL				**21473.18**
	SUB STRUCTURE				
8	Brick work in veranda in normal bond with 1:6 cement dust mortar	cum	0.43	4704.01	2030.02
9	Bamboo fencing in veranda (100mm dia)	rm	15.00	50.00	750.00
10	Bamboo fencing in veranda (50mm dia)	rm	16.25	26.00	422.50
11	Brick work in steps with 1:6 cement dust mortar	cum	0.54	4704.01	2535.46
12	Earthwork in excavation of soak pit and inspection chamber	cum	2.71	228.38	619.35
13	Honeycombed brick work in soak pit and plaster work in inspection chamber	cum	0.68	1001.12	676.95
14	Cement conc floor with brick ballast	sqm	24.70	112.25	2772.60
	TOTAL				**9806.88**
	SUPER STRUCTURE				
15a	Brick work in super structure with hollow interlocking CSEB(300x150x100) in 1:10 cement mud mortar	cum	21.06	3274.53	
	Deductions:				
15b	For door	cum	1.51	3274.53	
15c	For Windows/Ventilators	cum	1.79	3274.53	
	Window	cum	0.11	3274.53	
	Total Brickwork	cum	17.65	3274.53	57783.52
16	Corner vertical 8mm MS reinforcement for seismic zone	kg	58.80	50.00	2940.00
17	Providing and fixing R.C.C. door/window frames complete				
a	White door frame	no.	3.00	950.00	2850.00
b	Grey window frame	no.	6.00	400.00	2400.00
	TOTAL				**65973.52**
	ROOF				
18	Providing stone patti roof over precast concrete beam	sqm	19.44	987.48	19196.57
19	Brick bats and mud phuska finishing over roof with cement dust mortar	sqm	19.44	623.11	12113.21
20	Providing stone slab in lintel over doors and windows	sqm	3.75	40.00	150.00
21	Providing stone slab in sill and window breaker		1.17	40.00	46.80
22	Providing Stone slab for loft/ storage	sqm	1.88	40.00	75.00
23	Brick work in parapet in normal bond with 1:6 cement dust mortar	cum	1.99	4704.01	9347.81
24	Providing PCC Gola complete	rm	18.00	51.33	924.03
25	Coping Stone	sqm	2.21	50.00	110.40
	TOTAL				**41963.81**
	PLUMBING AND OTHER FIXTURE FOR TOILET				
26	Indian sanitary Pan and water seal	no.	1.00	500.00	500.00
27	PVC pipe 4"	rm	3.60	120.00	432.00
28	PVC treeway tee 3"	no.	1.00	80.00	80.00
29	Plastic water tap	no.	1.00	70.00	70.00
30	Wash basin	no.	1.00	400.00	400.00
	TOTAL				**1482.00**
	TOTAL COST OF HOUSE (INR)				**140699.40**
	AREA of HOUSE (SQM)				**25.20**
	COST PER SQM (INR)				**5583.31**

UP-03


UP-C-01

- Use of locally available resources such as fly ash for bricks and stones for laying foundation and other key elements of the house.
- Use of rat trap bond for wall saves 25% of the material required for wall and also prevents the heat transfer through it.
- Plank and joist is the precast module for roofing system which requires less reinforcement as compared to conventional RCC slabs and also saves constrcution. Mud phuska on top prevents the heat transfer through it.

Recommendations for Built Form		
Plan Layout	**Plinth/Floor**	**Roof Profile**
Rectangular layout is planned considering the minimum footage of 6m. The house is built on one side of plot boundary and has welcoming entrance. Future expansion proposed towards the back side of the house	Average plinth height is recommended	Flat roof for closed spaces and sloping roof for semi open spaces.

Recommendations for construction systems		
Components	**Recommended Specifications**	**Specific Comments**
Foundations	• Random rubble stone masonry is proposed with cement mortar, bond stones and hooked links in regular intervals to hold the small stones together and prevent structural cracks in foundation.	• Reducing the usage of concrete by recommending alternative to RCC framed structure.
Plinth	• 500 mm high plinth level is recommended for the house.	
Wall	• Rat trap bond wall with fly ash bricks. • Stone lintels and brick arches above the openings. • Loft and roof projections supported on stone brackets resting on walls.	• Reinforcing bars recommended for openings larger than 0.6 m in width.
Wall Finish	• No wall finish required	
Roof Structure	• Prefabricated reinforced concrete beam at roof level to support the load of the roof. Bamboo framework for MCR tile roofing.	
Roof Cover	• Precast Ferro cement roofing channel.	
Floor	• Plain Cement flooring finish over bricks.	

This typology is applicable to Zone C

Bundelkhand lies in seismic zone II and does not have any flood hazard in the region

Zone C comprises of the following districts:

1. Lalitpur
2. Jhansi
3. Mahoba
4. Jalaun
5. Hamirpur
6. Banda
7. Chitrakoot

Resources Available

- Mud, Stone as the basic materials for construction.

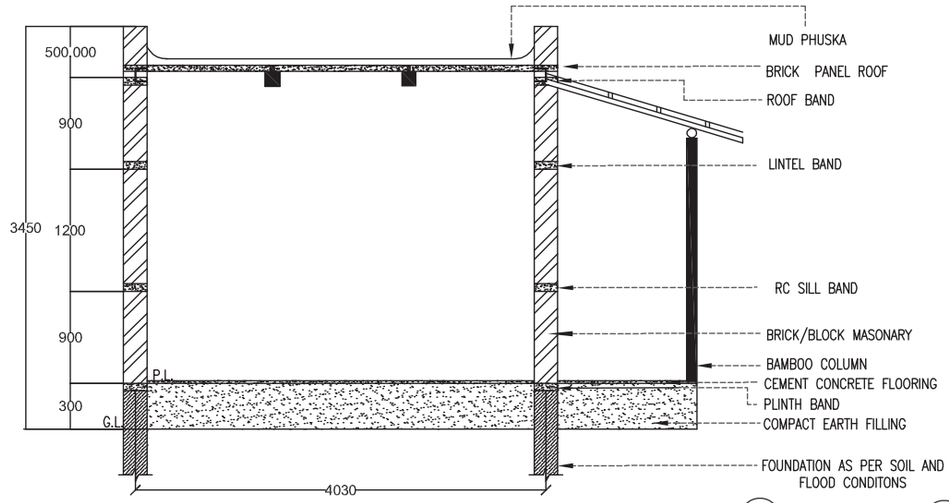
UTTAR PRADESH

UP-03

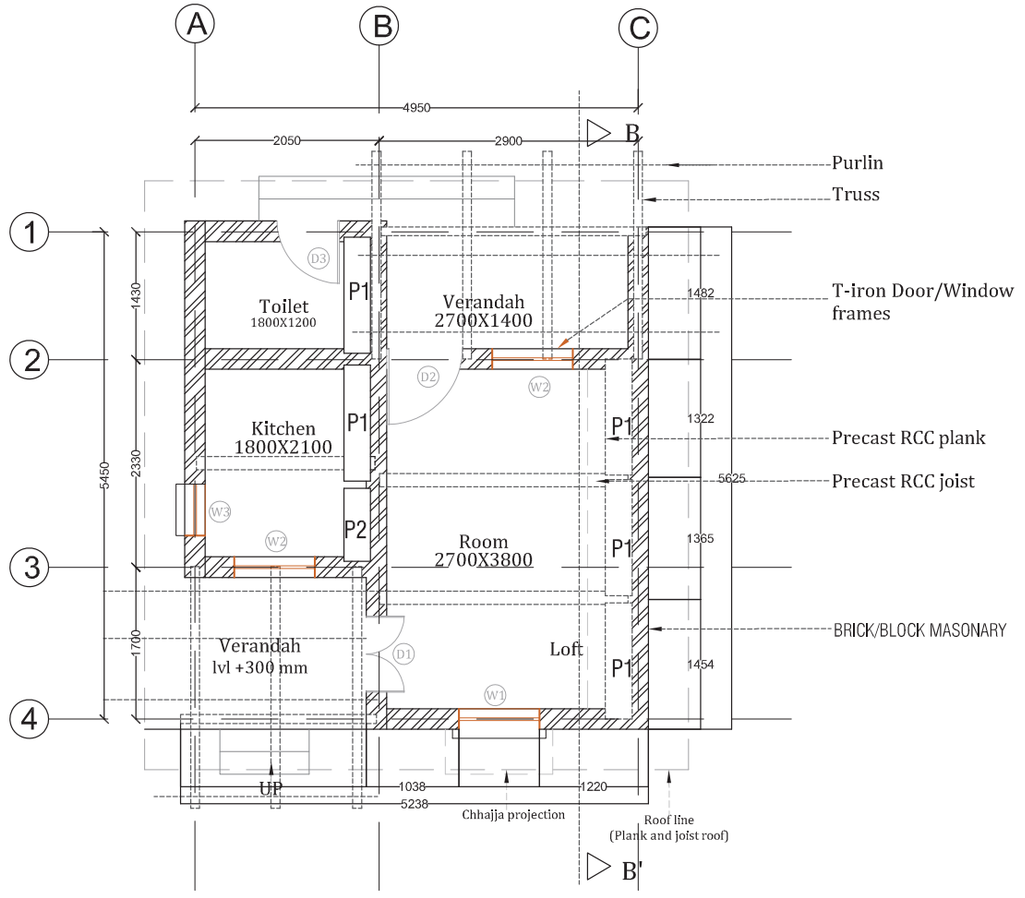
Area Statement:

Item	Area	
	Sq.m	Sq.ft
Room	10.45	112.48
Kitchen	3.88	41.76
Toilet	2.31	24.86
Verandah 1	3.45	37.14
Verandah 2	**3.86**	**41.55**
Carpet Area	**17.04**	**183.42**
Built up Area	**29.53**	**317.86**

UTTAR PRADESH



TYPICAL SECTION AA'



TYPICAL PLAN

S. No.	ITEM	UNIT	QUANTITY	RATE (INR)	AMOUNT
	FOUNDATION				
1	Site clearance and layout	LS	1.00	100.00	100.00
2	Earth work in excavation of foundation, levelling the bottom of the trench etc. complete (750mm wide and 750mm deep)	cum	15.45	223.30	3449.65
3	Providing and laying P.C.C. in foundation 100mm thick with 1:5:10 (12mm nominal size aggregates)	cum	1.84	2434.00	4480.51
4	Providing Random Rubble Masonry with cement mortar in foundation up to plinth level, including setting of block , mixing of mud with appropriate qty. of water etc.	cum	9.04	1235.22	11161.79
5	Providing 1.5 brick thick column with cement mortar in pedestal foundation	cum	1.80	4662.30	8392.13
6	Providing and laying D.P.C. 25mm thick with 1:2:4 cement concrete and WPC powder.	sqm	6.23	89.15	555.24
7	Earth work in back filling of foundation	cum	12.54	111.65	1400.09
	TOTAL				**29539.41**
	SUB STRUCTURE				
8	Brick work in veranda in normal bond with 1:6 cement dust mortar	cum	0.79	4662.30	3692.89
9	Brick work in steps with 1:6 cement dust mortar	cum	0.72	4662.30	3356.85
10	Earthwork in excavation of soak pit and inspection chamber	cum	2.71	223.30	605.59
11	Honeycombed brick work in soak pit and plaster work in inspection chamber	cum	0.68	1001.71	677.36
12	Cement concrete floor with brick ballast	sqm	24.90	113.77	2832.89
	TOTAL				**11165.58**
	SUPER STRUCTURE				
13a	Brick masonry with Rat trap bond in super structure with cement mortar 1:4	cum	14.21		
13b	Brick work in normal bond with 1:6 cement dust mortar	cum	0.11		
	Deductions:				
13c	For door	cum	1.67		
13d	For Windows	cum	0.43		
	Window	cum	0.28		
	Total Brickwork	cum	11.95	4217.98	50389.44
14	Providing and fixing R.C.C. door/window frames complete				
a	White door frame	no.	3.00	950.00	2850.00
b	Grey window frame	no.	3.00	400.00	1200.00
15	Providing and laying RCC lintel band 75mm thick with 1:2:4 cement concrete	cum	0.09	3854.83	333.81
16	Providing stone slab chhajja over windows	sqm	1.04	860.00	894.40
	TOTAL				**55667.65**
	ROOF				
17	Providing plank and joist roofing	sqm	19.75	927.89	18325.771
18	Brick bats and mud phuska finishing over roof with cement dust mortar	sqm	19.75	625.80	12359.503
19	Providing MCR tile roof with bamboo framework	sqm	19.24	876.68	16867.32
20	Providing Stone slab for loft/ storage	sqm	1.90	860.00	1634.00
21	Brick work in parapet in normal bond with 1:6 cement dust mortar	cum	1.43	4662.30	6669.34
22	Providing PCC Gola complete	rm	17.77	51.36	912.62
23	Coping Stone	sqm	2.04	53.20	108.72
	TOTAL				**56877.28**
	PLUMBING AND OTHER FIXTURE FOR TOILET				
24	Indian sanitary Pan and water seal	no.	1.00	500.00	500.00
25	PVC pipe 4"	rm	3.60	120.00	432.00
26	PVC treeway tee 3"	no.	1.00	80.00	80.00
27	Plastic water tap	no.	1.00	70.00	70.00
28	Wash basin	no.	1.00	400.00	400.00
	TOTAL				**1482.00**
	TOTAL COST OF HOUSE (INR)				**154731.92**
	AREA of HOUSE (SQM)				**28.20**
	COST PER SQM (INR)				**5486.95**

UP-03
Cost estimate

Cost breakup

Item	Cost (INR)
Foundation	29,539/-
Sub structure and Super Structure	66,833/-
Roof	56,877/-
Total	**154,249/-**

UTTAR PRADESH

UP-04

This typology is applicable to Zone D

flood prone zone, seismic zone V and high damage risk zone of cyclone

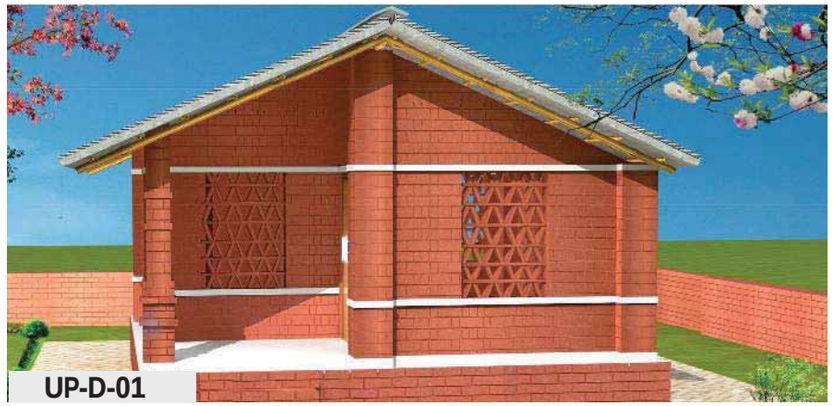
Zone D comprises of the following districts.

1. Gonda
2. Balrampur
3. Siddharth Nagar
4. Maharajganj
5. Kushinagar
6. Gorakhpur
7. Deoria
8. Sant Kabir Nagar
9. Basti
10. Faizabad
11. Ambedkar Nagar

Resources Available

- Mud and stone.
- Country tile

UTTAR PRADESH

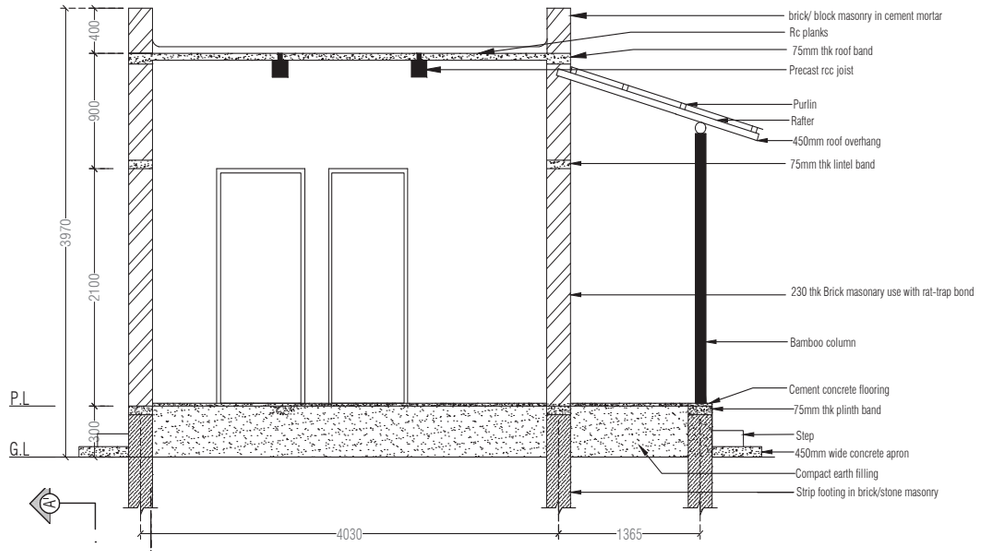


UP-D-01

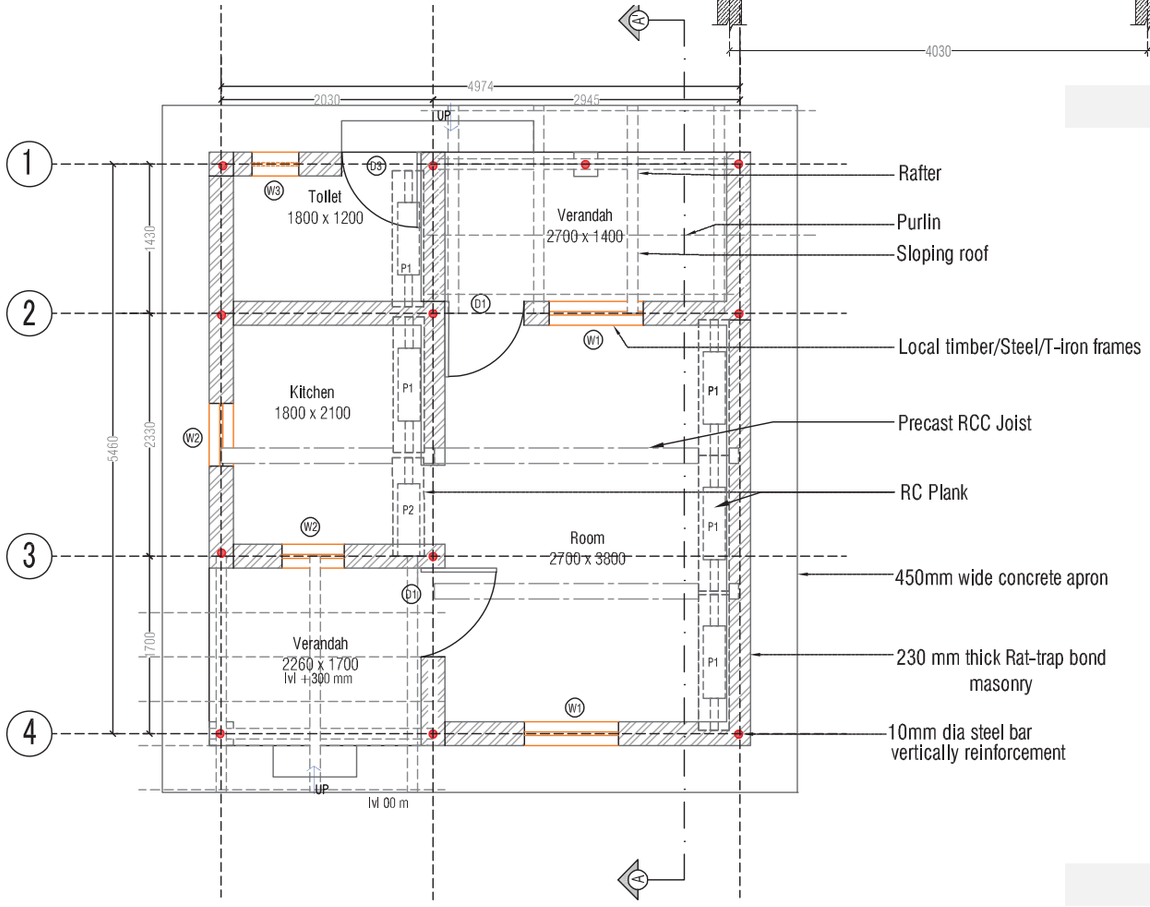
- Column framed structure proposed without using RCC structure, thus minimizing the use of steel and concrete.
- Suggested construction technique for wall not only provides resistance to seismic disaster but at the same time saves up material consumption when compared with English bonded brick wall. The horizontal seismic bands have bamboo splits as the reinforcement.
- Being light weight, pressed thatch panels provide a suitable roofing option for high seismic zones. GI corrugated increases the durability of roof.

Recommendations for Built Form		
Plan Layout	**Plinth/Floor**	**Roof Profile**
Rectangular layout planned considering the minimum footage of 6m. The house is built on one side of plot boundary and has welcoming entrance. Future expansion proposed towards the back side of the house	High plinth height is recommended	Light weight sloping roof is recommended.

Recommendations for construction systems		
Components	**Recommended Specifications**	**Specific Comments**
Foundations	• Strip footing with burnt clay bricks and cement mortar till plinth level.	• Reducing the usage of concrete by recommending alternative to RCC framed structure.
Plinth	• Plinth band provided	
Wall	• 2 brick thick column with rat trap bonded brick wall. • Reinforcing bars embedded in brick masonry at the corners of all the rooms • 75 mm thick seismic bands with bamboo reinforcement provided at sill level and lintel level.	• Reinforcing bars recommended for openings larger than 0.6 m in width.
Wall Finish	• No wall finish required	
Roof Structure	• Bamboo framework with 100 mm dia. Bamboos as purlins and 50 mm dia. Bamboos as batterns. or RC plank & joist system	
Roof Cover	• Pressed thatch panels with GIcorrugated sheet as roof cover • Mud phuska	
Floor	• Plain Cement flooring finish over bricks.	



TYPICAL SECTION AA'



TYPICAL PLAN

UP-04

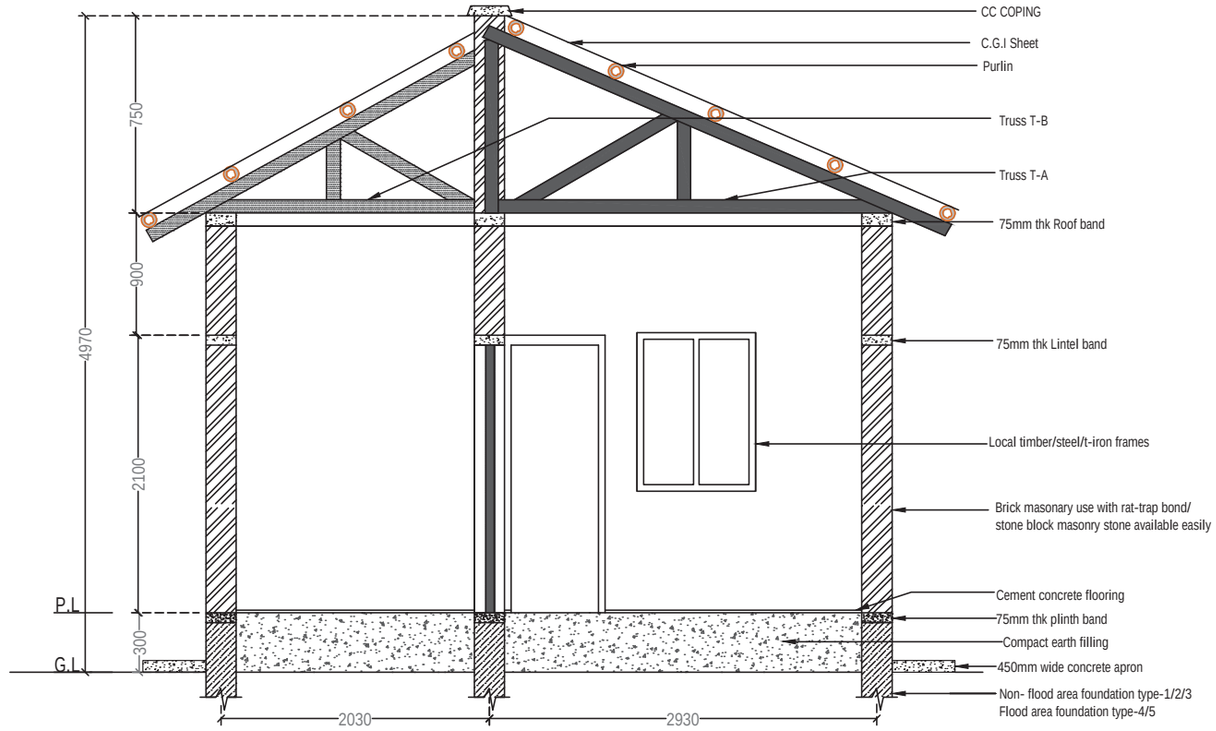
Area Statement:

Item	Area	
	Sq.m	Sq.ft
Room	10.26	110.44
Kitchen	3.78	40.69
Toilet	2.16	23.25
Verandah 1	3.45	37.14
Verandah 2	**3.86**	**41.55**
Carpet Area	**16.74**	**180.19**
Built up Area	**29.53**	**317.86**

UTTAR PRADESH

UP-04
Alternative roofing

UTTAR PRADESH



TYPICAL SECTION AA'- ALTERNATE ROOFING

S. No.	ITEM	UNIT	QUANTITY	RATE (INR)	AMOUNT
	FOUNDATION				
1	Site clearance and layout	LS	1.00	100.00	100.00
2	Earth work in excavation of foundation, levelling the bottom of the trench etc. complete (600mm wide and 600mm deep)	cum	10.31	228.38	2354.55
3	Providing and laying P.C.C. in foundation 100mm thick with 1:5:10 (12mm nominal size aggregates)	cum	1.57	2567.02	4030.22
4	Providing brick masonry pedestal foundation and footing with cement mortar up to plinth level, including mixing of mortar with appropriate qty. of water etc.	cum	6.94	4172.96	28960.36
5	Providing 400 mm thick brick column with cement mortar in pedestal foundation	cum	1.80	4172.96	7511.33
6	Providing and laying D.P.C. 25mm thick with 1:2:4 cement concrete and WPC powder.	sqm	6.23	102.77	640.08
7a	Providing and laying RCC plinth beam 150mm thick with 1:2:4 cement concrete	cum	0.77	4110.99	3144.91
7b	Bamboo split reinforcement in plinth beam	rm	108.32	10.00	1083.20
8	Earth work in back filling of foundation	cum	12.54	114.19	1431.91
	TOTAL				**49256.56**
	SUB STRUCTURE				
9	Brick work in veranda in normal bond with 1:6 cement dust mortar	cum	0.79	4365.55	3457.84
10	Brick work in steps with 1:6 cement dust mortar	cum	0.72	4365.55	3143.20
11	Earthwork in excavation of soak pit and inspection chamber	cum	2.71	228.38	619.35
12	Honeycombed brick work in soak pit and plaster work in inspection chamber	cum	0.68	1006.76	680.77
13	Cement conc floor with brick ballast	sqm	24.20	117.56	2844.98
	TOTAL				**10746.15**
	SUPER STRUCTURE				
14a	Brick masonry with Rat trap bond in super structure with cement mortar 1:4	cum	13.44	4172.96	56084.62
14b	Brick work in normal bond with 1:6 cement dust mortar	cum	3.27	4365.55	14275.36
	Deductions:				
14c	For door	cum	1.78	4172.96	7437.35
14d	For Windows	cum	0.80	4172.96	3350.98
	Total Brickwork	cum	14.12		59571.65
15	Corner vertical 8mm MS bar reinforcement for seismic zone	kg.	22.00	50.00	1099.80
16	Providing and fixing R.C.C. door/window frames complete				
a	White door frame	no.	3.00	950.00	2850.00
b	Grey window frame	no.	3.00	400.00	1200.00
17	Providing and laying RCC sill band 75mm thick with 1:2:4 cement concrete	cum	0.40	4110.99	1658.69
18	Providing and laying RCC lintel band 75mm thick with 1:2:4 cement concrete	cum	0.47	4110.99	1920.37
19	Bamboo split reinforcement in sill and lintel band	rm	201.88	10.00	2018.80
	TOTAL				**70319.30**
	ROOF				
20	Bamboo framework to support roof				
a	100 mm dia. bamboos as main structural members	rm	60	50.00	3000
b	50 mm dia. bamboos as battens to support pressed thatch and GI sheet	rm	130	26.00	3380
21	Durable and fire retardant pressed thatch panel roof	sqm	44.80	40.00	1792
22	GI corrugated sheet as roof cover	sqm	60.00	280.00	16800.00
23	Providing storage space above head room with bamboo	sqm	2.42	220.00	532.40
	TOTAL				**25504.40**
	PLUMBING AND OTHER FIXTURE FOR TOILET				
24	Indian sanitary Pan and water seal	no.	1.00	500.00	500.00
25	PVC pipe 4"	rm	3.60	120.00	432.00
26	PVC treeway tee 3"	no.	1.00	80.00	80.00
27	Plastic water tap	no.	1.00	70.00	70.00
28	Wash basin	no.	1.00	400.00	400.00
	TOTAL				**1482.00**
	TOTAL COST OF HOUSE (INR)				**157308.40**
	AREA of HOUSE (SQM)				**28.20**
	COST PER SQM (INR)				**5578.31**

UP-04
Cost estimate

Cost breakup

Item	Cost (INR)
Foundation	49,257/-
Sub Structure and Super Structure	81,065/-
Roof	25,504/-
Plumbing & other fixtures	1482/-
Total	**157,308/-**

UTTAR PRADESH

UP-05

This typology is applicable to Zone E

The region lies in the flood hazard zone and also have seismic zone II and III.

Zone E comprises of the following districts:

1. Sonbhadra
2. Chandauli
3. Ghazipur
4. Ballia
5. Mau
6. Azamgarh
7. Jaunpur
8. Varanasi
9. Allahabad
10. Bhadohi
11. Mirzapur districts.

Resources Available

- Burnt clay bricks and mud.

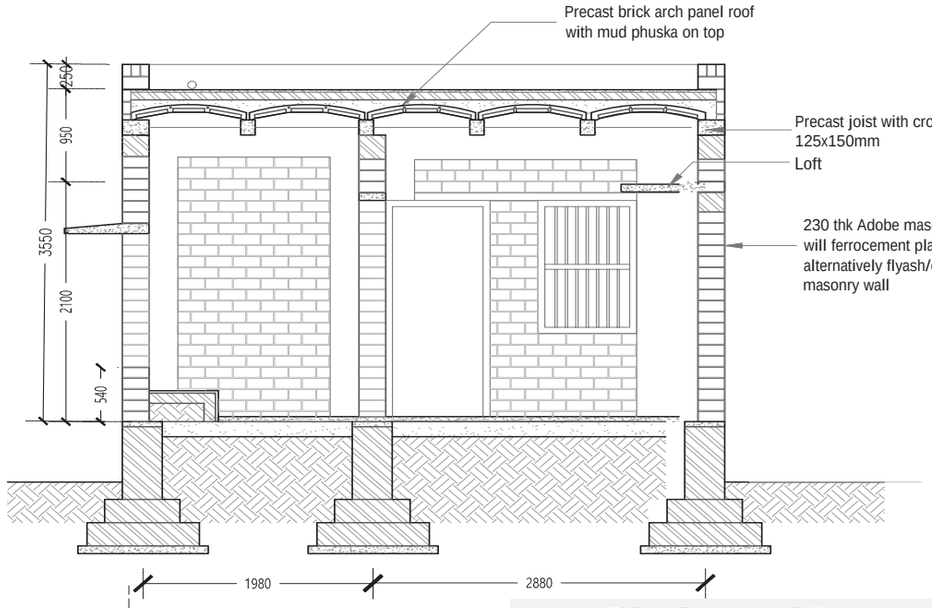
UTTAR PRADESH

UP-E-01

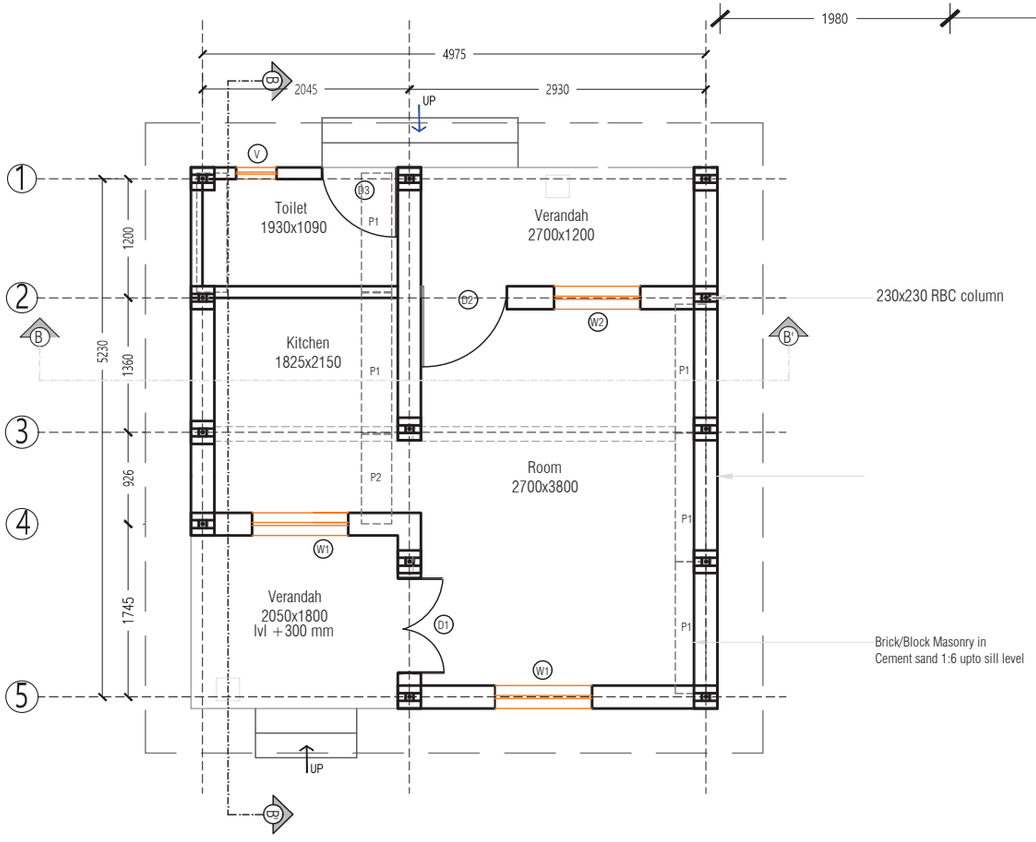
- Corner of the walls in fly ash bricks with cement mortar acts as the main structural framework and takes the load of roof.
- Terracotta tile face mud block using mud mortar as binding material and cement mortar for pointing the outer surface of wall. Terracotta tile being on the outer surface, protects wall from outside weathering effects.
- Brick tile arch panel, being the precast modular elements, major scaffolding is not required and it also takes very less time in laying the roof.

Recommendations for Built Form		
Plan Layout	**Plinth/Floor**	**Roof Profile**
Rectangular Structure and liner in the arrangement of their interior spaces. Entry to the building is from longer side. Open sky verandah is provided in one long side. Future expansion proposed vertically.	High plinth height is recommended	Combination of flat roof and sloping roof.

Recommendations for construction systems		
Components	**Recommended Specifications**	**Specific Comments**
Foundations	• Brick strip footing with cement mortar till plinth level.	• Reducing the usage of concrete by recommending alternative to RCC framed structure.
Plinth	• 650 mm high plinth level is recommended for the house.	
Wall	• The corners in fly ash bricks and cement mortar, which acts as the main structural framework and takes the load of roof. • Terracotta tile face mud block using mud mortar as binding material and cement mortar for pointing the outer surface.	
Wall Finish	• No wall finish required	
Roof Structure	• Precast Brick arch panels supported with precast beams	
Roof Cover	• Brick tile arch panel with mud phuska on top.	
Floor	• Plain Cement flooring finish over bricks.	



TYPICAL SECTION AA'



TYPICAL PLAN

UP-05
Cost estimate

Area Statement:

Item	Area	
	Sq.m	Sq.ft
Room	10.26	110.44
Kitchen	3.94	42.41
Toilet	2.09	22.50
Verandah 1	3.57	38.43
Verandah 2	**3.24**	**34.88**
Carpet Area	**16.88**	**181.70**
Built up Area	**28.43**	**306.02**

UTTAR PRADESH

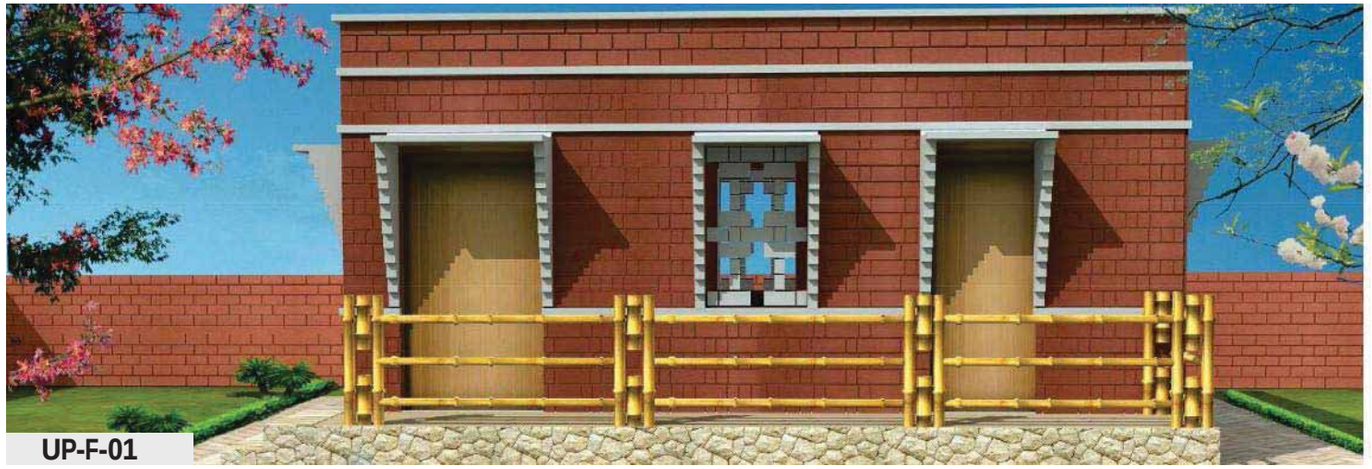
UP-05
Cost estimate

Cost breakup

Item	Cost (INR)
Foundation	28,165/-
Sub Structure and Super Structure	65,076/-
Roof	64,533/-
Total	**157,774/-**

UTTAR PRADESH

S. No.	ITEM	UNIT	QUANTITY	RATE (INR)	AMOUNT
	FOUNDATION				
1	Site clearance and layout	LS	1.00	100.00	100.00
2	Earth work in excavation of foundation, levelling the bottom of the trench etc. complete (750mm wide and 750mm deep)	cum	15.34	203.00	3113.21
3	Providing and laying P.C.C. in foundation 100mm thick with 1:5:10 (12mm nominal size aggregates)	cum	1.83	2343.00	4284.88
4	Providing Random Rubble Masonry with cement mortar in foundation up to plinth level, including setting of block , mixing of mud with appropriate qty. of water etc.	cum	15.05	1194.84	17982.35
5	Providing and laying D.P.C. 25mm thick with 1:2:4 cement concrete and WPC powder.	sqm	6.18	98.21	607.18
6	Earth work in back filling of foundation	cum	20.46	101.50	2076.69
	TOTAL				**28164.31**
	SUB STRUCTURE				
7	Brick work in veranda in normal bond with 1:6 cement dust mortar	cum	1.01	4615.12	4644.82
8	Brick work in steps with 1:6 cement dust mortar	cum	0.72	4615.12	3322.89
9	Earthwork in excavation of soak pit and inspection chamber	cum	2.71	203.00	550.54
10	Honeycombed brick work in soak pit and plaster work in inspection chamber	cum	0.68	969.99	655.91
11	Cement conc floor with brick ballast	sqm	24.90	108.04	2690.30
	TOTAL				**11864.44**
	SUPER STRUCTURE				
12a	Terracotta tile face mud block wall with cement mortar pointing in 1:3 and mud mortar as binding material	cum	9.01		
	Deductions:				
12b	For door	cum	0.95		
12c	For Windows	cum	0.70		
	Total Brickwork	cum	7.36	2087.86	15364.45
13	Brick work in normal bond with 1:6 cement dust mortar	cum	7.20	4615.12	33228.87
14	Providing and fixing R.C.C. door/window frames complete	cum			
a	White door frame	no.	3.00	950.00	2850.00
b	Grey window frame	no.	3.00	400.00	1200.00
15	Providing and laying RCC lintel band 75mm thick with 1:2:4 cement concrete	cum	0.21	2343.00	483.38
16	Providing 500 mm projected RCC chhajja over windows	sqm	0.10	860.00	86.00
	TOTAL				**53212.71**
	ROOF				
17	Brick tile arch panel roof	sqm	24.8	1292.56	32055.525
18	Brick bats and mud phuska finishing over roof with cement dust mortar	sqm	24.8	617.55	15315.133
19	Providing MCR tile roof with bamboo framework	sqm	9.10	874.50	7957.91
20	Providing RCC slab for loft/ storage	sqm	1.90	860.00	1634.00
21	Brick work in parapet in normal bond with 1:6 cement dust mortar	cum	1.43	4615.12	6601.86
22	Providing PCC Gola complete	rm	17.77	48.50	861.84
23	Coping Stone	sqm	2.04	52.00	106.26
	TOTAL				**64532.54**
	PLUMBING AND OTHER FIXTURE FOR TOILET				
24	Indian sanitary Pan and water seal	no.	1.00	500.00	500.00
25	PVC pipe 4"	rm	3.60	120.00	432.00
26	PVC treeway tee 3"	no.	1.00	80.00	80.00
27	Plastic water tap	no.	1.00	70.00	70.00
28	Wash basin	no.	1.00	400.00	400.00
	TOTAL				**1482.00**
	TOTAL COST OF HOUSE (INR)				**159256.00**
	AREA of HOUSE (SQM)				**28.20**
	COST PER SQM (INR)				**5647.38**



UP-F-01

- Geographical conditions and occupation of people is the primary focus from which prototype for Zone 6 is derived.
- Benefiting from extremely suitable for construction soil, wall and roof are suggested to built from this soil.
- 3. Filler slab roofing is not only aesthetical in appearance which gives the owner of house sense of pride, but also results in cheaper cost of material as compared to cement concrete slab.

Recommendations for Built Form		
Plan Layout	**Plinth/Floor**	**Roof Profile**
Rectangular Structure and linear in the arrangement of their interior spaces. Entry to the building is from longer side. Open sky verandah is provided in one long side.	High plinth height is recommended	Flat roof with use of local material for roof.

Recommendations for construction systems		
Components	**Recommended Specifications**	**Specific Comments**
Foundations	• Reinforced brick strip footing suggested.Non-erodible plaster finish of wall till plinth level of .60 m is suggested.	• Zone is under flood hazard prone area, therefore high plinth level recommended.
Plinth	• Seismic bands of cement concrete with bamboo reinforcement are suggested at plinth, sill and lintel level.	
Wall	• Rat trap bonded brick wall with corner reinforcements is suggested for the seismic zone III of awadh region.	• Premium quality of soil is available, thus good strength of bricks available.
Wall Finish	• No wall finish required	
Roof Structure	• RC plank & joist	Lot of pottery making is evident in many regions of this zone.
Roof Cover		
Floor	• Plain Cement flooring finish over bricks.	

UP-06

This typology is applicable to Zone F:

seismic zone III and II & flood hazards.

Zone F comprises of the following districts:

1. Shahjahanpur
2. Sitapur
3. Bahraich
4. Bara Banki
5. Rae Bareli
6. Sultanpur
7. Pratapgarh
8. Kaushambi
9. Fatehpur
10. Kanpur
11. Kanpur Dehat
12. Unnao
13. Lucknow
14. Hardoi
15. Kannauj
16. Farrukhabad
17. Mainpuri
18. Etawah
19. Auraiya

Resources Available

- Use of wood and mud for roofing.
- Mud

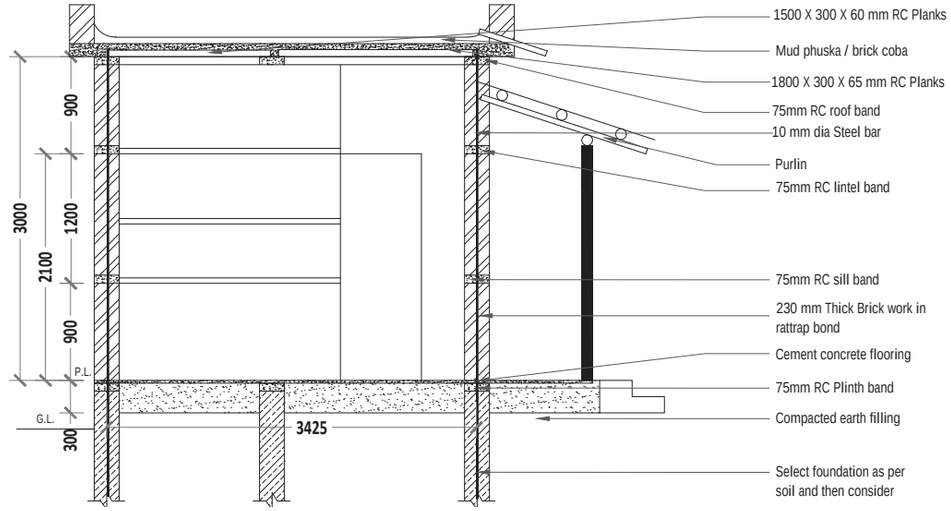
UTTAR PRADESH

UP-06

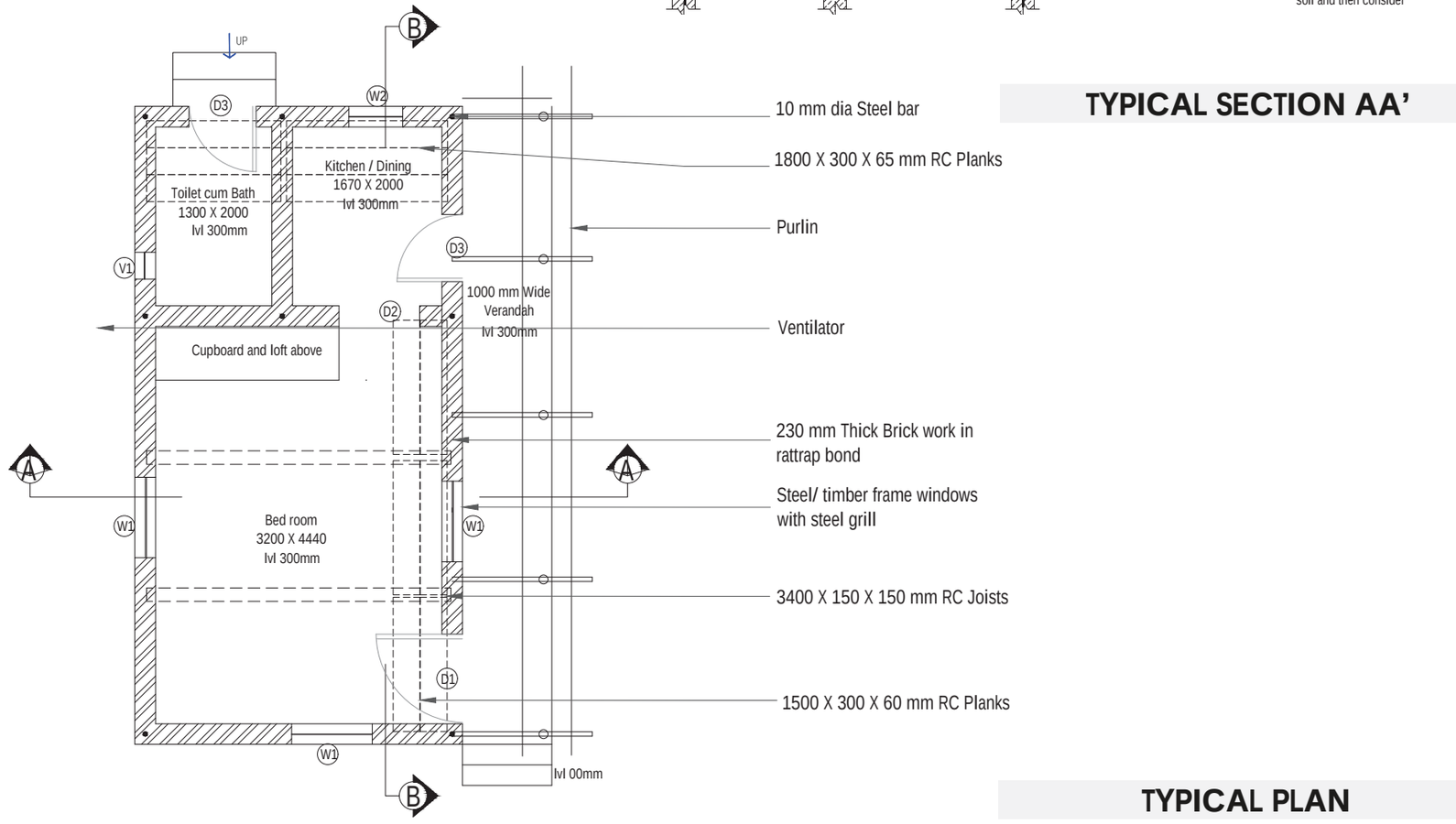
Area Statement:

Item	Area	
	Sq.m	Sq.ft
Bed Room	14.21	152.96
Kitchen / Dining	3.34	35.95
Toilet cum Bath	2.60	28.00
Verandah	7.00	75.35
Carpet Area	**21.00**	**226.04**
Built up Area	**33.00**	**355.21**
Built up Area	**28.43**	**306.02**

UTTAR PRADESH



TYPICAL SECTION AA'



TYPICAL PLAN

S. No.	ITEM	UNIT	QUANTITY	RATE (INR)	AMOUNT
	FOUNDATION				
1	Site clearance and layout	LS	1.00	100.00	100.00
2	Earth work in excavation of foundation, levelling the bottom of the trench etc. complete (600mm wide and 600mm deep)	cum	10.31	228.38	2354.55
3	Providing and laying P.C.C. in foundation 100mm thick with 1:5:10 (12mm nominal size aggregates)	cum	1.57	2687.00	4218.59
4	Providing brick masonry pedestal foundation and footing with cement mortar up to plinth level, including mixing of mortar with appropriate qty. of water etc	cum	6.94	4100.00	28454.00
5	Providing 1.5 thick brick column with cement mortar in pedestal foundatior	cum	1.68	4758.66	7994.54
6	Providing and laying D.P.C. 25mm thick with 1:2:4 cement concrete and WPC powder.	sqm	5.78	102.46	591.97
7a	Providing and laying RCC plinth beam 150mm thick with 1:2:4 cement concrete	cum	0.87	4110.99	3562.75
7b	Bamboo split reinforcement in plinth beam	rm	100.48	10.00	1004.80
8	Earth work in back filling of foundation	cum	15.64	114.19	1785.50
	TOTAL				**50066.70**
	SUB STRUCTURE				
9	Brick work in veranda in normal bond with 1:6 cement dust mortar	cum	0.83	5347.04	4438.18
10	Bamboo fencing in veranda (100mm dia)	Rm	15.00	50.00	750.00
11	Bamboo fencing in veranda (50mm dia)	Rm	16.25	26.00	422.50
12	Brick work in steps with 1:6 cement dust mortar	cum	0.54	5347.04	2887.40
13	Earthwork in excavation of soak pit and inspection chamber	cum	2.71	228.38	619.35
14	Honeycombed brick work in soak pit and plaster work in inspection chamber	cum	0.68	1000.99	676.87
15	Cement concrete floor with brick ballast	sqm	24.20	111.88	2707.39
	TOTAL				**12501.69**

UP-06
Cost estimate

Cost breakup

Item	Cost (INR)
Foundation	₹ 50,066.70
Substructure & Superstructure	₹ 87,156.85
Roof	₹ 43,293.80
Total	**₹ 180,517.35**

UTTAR PRADESH

UP-06
Cost estimate

	SUPER STRUCTURE				
16a	Brick masonry with Rat trap bond in super structure with cement mortar 1:4	cum	16.22		
	Deductions:				
16b	For door	cum	1.21		
16c	For Windows	cum	1.33		
		cum	0.21		
	Total Brickwork	cum	13.47	4758.66	64111.71
17	Corner vertical 8mm MS bar reinforcement for seismic zone	kg.	22.00	4.80	105.58
18	Providing and fixing R.C.C. door/window frames complete				
a	White door frame	no.	3.00	950.00	2850.00
b	Grey window frame	no.	5.00	400.00	2000.00
19	Providing and laying RCC sill band 75mm thick with 1:2:4 cement concrete	cum	0.43	4110.99	1786.34
20	Providing and laying RCC lintel band 75mm thick with 1:2:4 cement concrete	cum	0.43	4110.99	1786.34
21	Bamboo split reinforcement in sill and lintel band	rm	201.52	10.00	2015.20
	TOTAL				**74655.16**
	ROOF				
22	Providing plank and joist roofing	Sqm	20.63	927.89	19142.311
23	Brick bats and mud phuska finishing over roof with cement dust mortar	Sqm	24.8	625.00	15500
24	Providing stone slab in lintel over doors and windows	Sqm	4.66	40.00	186.494
25	Providing Stone slab for loft/ storage	Sqm	1.88	60.00	112.5
26	Brick work in parapet in normal bond with 1:6 cement dust mortar	cum	1.35	5347.04	7198.1304
27	Providing PCC Gola complete	Rm	18.59	52.43	974.8731
28	Coping stone	Sqm	4.49	40.00	179.492
	TOTAL				**43293.80**
	PLUMBING AND OTHER FIXTURE FOR TOILET				
29	Indian sanitary Pan and water seal	no.	1.00	500.00	500.00
30	PVC pipe 4"	rm	5.00	120.00	600.00
31	PVC treeway tee 3"	no.	1.00	80.00	80.00
32	Plastic water tap	no.	1.00	70.00	70.00
33	Wash basin	no.	1.00	400.00	400.00
	TOTAL				**1650.00**
	TOTAL COST OF HOUSE (INR)				**182167.35**
	AREA of HOUSE (SQM)				**28.20**
	COST PER SQM (INR)				**6459.84**
	AREA of HOUSE (SQFT)				**301.74**
	COST PER SQFT (INR)				**603.72**

UTTAR PRADESH

pahal
Prakriti Hunar Lokvidya

West Bengal

Dividing the state into housing typology Zones is a system of categorization that takes into account various parameters. Primarily, these include geo-climatic conditions, vulnerability to disasters, availability of natural resources, communities of the region, their lifestyles, occupations and skill sets. The variations observed in building typologies largely correspond to the above mentioned premises and are therefore grouped together forming blurred frontiers between any two given regions.

The state of Bengal is extremely diverse in terms of its geographic conditions that naturally influence all other factors that affect housing typologies. Preliminary studies indicated 5 Zones, namely; Coastal & Delta, East of Ganga, West of Ganga, Terai highlands and Hills.

This gave rise to four distinct housing typology Zones, where the regions lying East and West of Ganga were merged to form the inland central portion of the state. Following are the descriptions of each Zone along with images of the different landscapes and terrain found within the region

Zone A

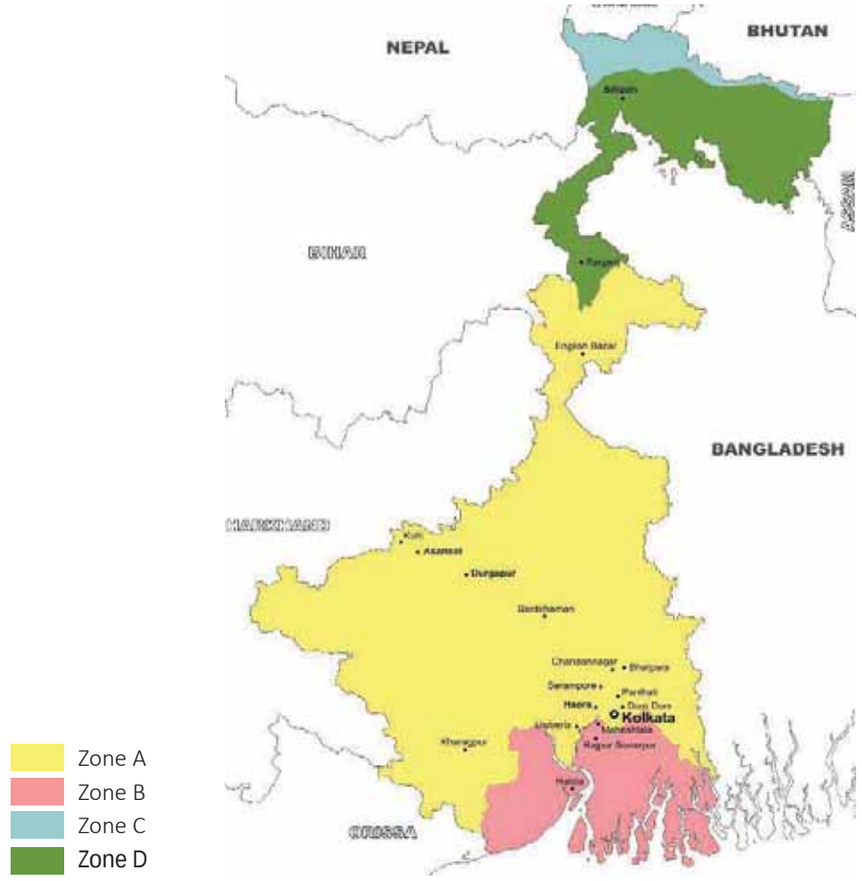
Building typology Zone A is characterized by its diverse climate, geography and vastness. The Zone lies predominantly in the Ganga flood plain with the far western region around Purulia district prone to drought. Most parts of the Zone fall under high temperature areas and regions with close proximity to the Ganga are prone to flooding. The Zone falls under seismic Zone 3.

Zone B

Zone B comprises of coastal and deltaic parts of West Bengal. This zone is highlighted by its extreme geographic conditions. The coast is exposed to high wind speeds, high humidity and sandy soils

Zone C

This Zone lies in close vicinity of Bhutan, Nepal & Tibet. The hills are the eastern extension of the Himalayas & the Dooars. The people native to this region are the Lepcahs, Bhutias, Rai etc. basic plan comprises of a verandahin the front & rooms within. It is a ground structure & most prevalent . The verandah is generally a simple indent within the rectangular footprint of the built form. This is usually done to prevent the addition of an additional roof overhang.



Zone D

The forest villages were often relocated by the forest depatement.

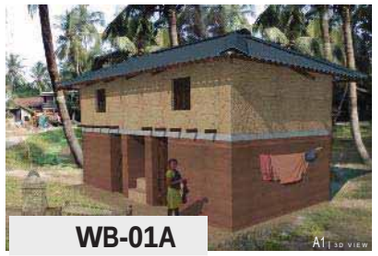
Protection against wildlife was extremely important. This caused the protection from wildlife creating stilt structures.

The sizes of houses varied with different configeration of verandahs, interior rooms & position of staircase. The Terai region is fairly tucked away in the dooars & are accesible through hill roads. although commuting with roads is maintained, it is still relatively remote. Rich in natural resources.

WEST BENGAL

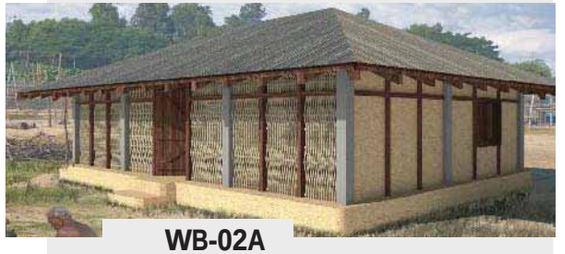
WEST BENGAL HOUSING TYPOLGIES AT A GLANCE

TYPOLOGY	APPLICABLE HOUSING ZoneS	TOTAL AREA Sq.m/Sq.ft	
WB-01A	Zone A	30.61 Sq.m	329.49 sq.ft
WB-01B	Zone A	51.03 sq.m	549.29 Sq.ft
WB-01C	Zone A	26.86 sq.m	289.12 sq.ft
WB-02A	Zone B	37.00 sq.m	398.27 sq.ft
WB-02B	Zone B	51.03 sq.m	549.29 sq.ft
WB-03A	Zone C	26.65 sq.m	286.86 sq.ft
WB-03B	Zone C	25 sq.m	267 sq.ft
WB-04A	Zone D	26.00 sq.m	279.86 sq.ft
WB-04B	Zone D	25.18 sq.m	271.04 sq.ft
WB-04C	Zone D	40.30 sq.m	433.79 sq.ft


WB-01A


WB-01A


WB-01C


WB-02A


WB-02B


WB-03A


WB-03B


WB-04A


WB-04B


WB-04C

WEST BENGAL

WB-01A

This typology is applicable to Zone A:

The Zone lies predominantly in the Ganga flood plain with the far western region around Purulia district prone to drought. Most parts of the Zone fall under high temperature areas and regions with close proximity to the Ganga are prone to flooding. The Zone falls under seismic Zone 3.

Zone A comprises of the following districts:

Inland & central Bengal.

1. Paschim Mednipur
2. Bankura, Purulia
3. Bardhaman
4. Birbhum
5. Maldah
6. Dakshin Dinajpur
7. Murshidabad
8. Nadi
9. North 24 Parganas.

Resources Available

- Locally available Mud
- Stone
- Thach Roof

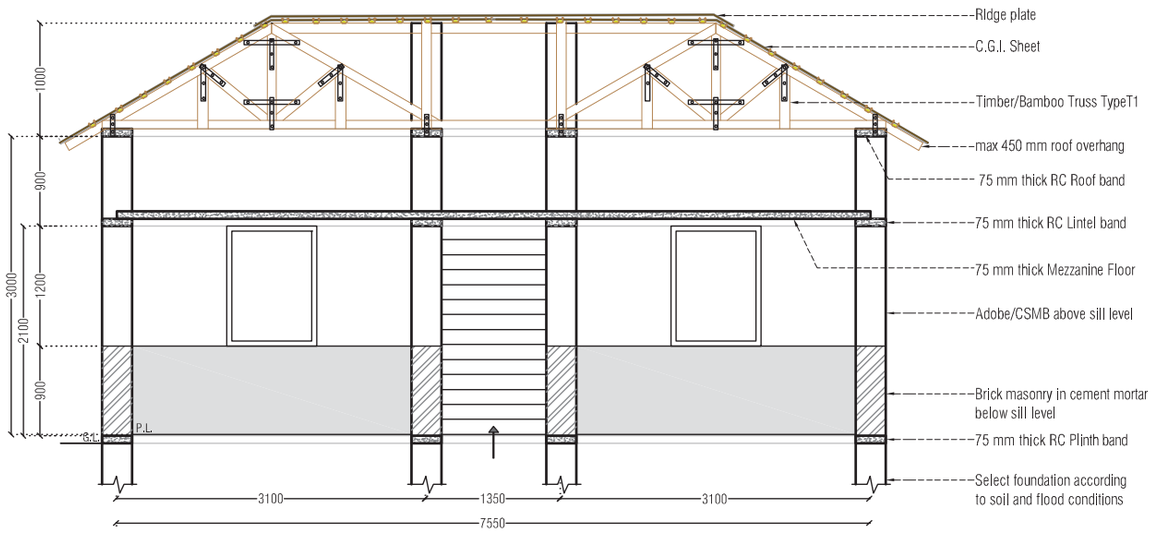
WEST BENGAL

- Intervention in structure & material solutions.
- R.C.C plinth, timber lintel & roof level ties provided to protect against seismic activities.
- Combination of GI sheet & thatch roof. Thatch acts as insulation & is protected by the GI sheet.
- Stabilized mud plaster for the exterior is an option.
- Mezzanine joints of bamboo extends to the outside to support addition of verandah roofs in incremental growth.

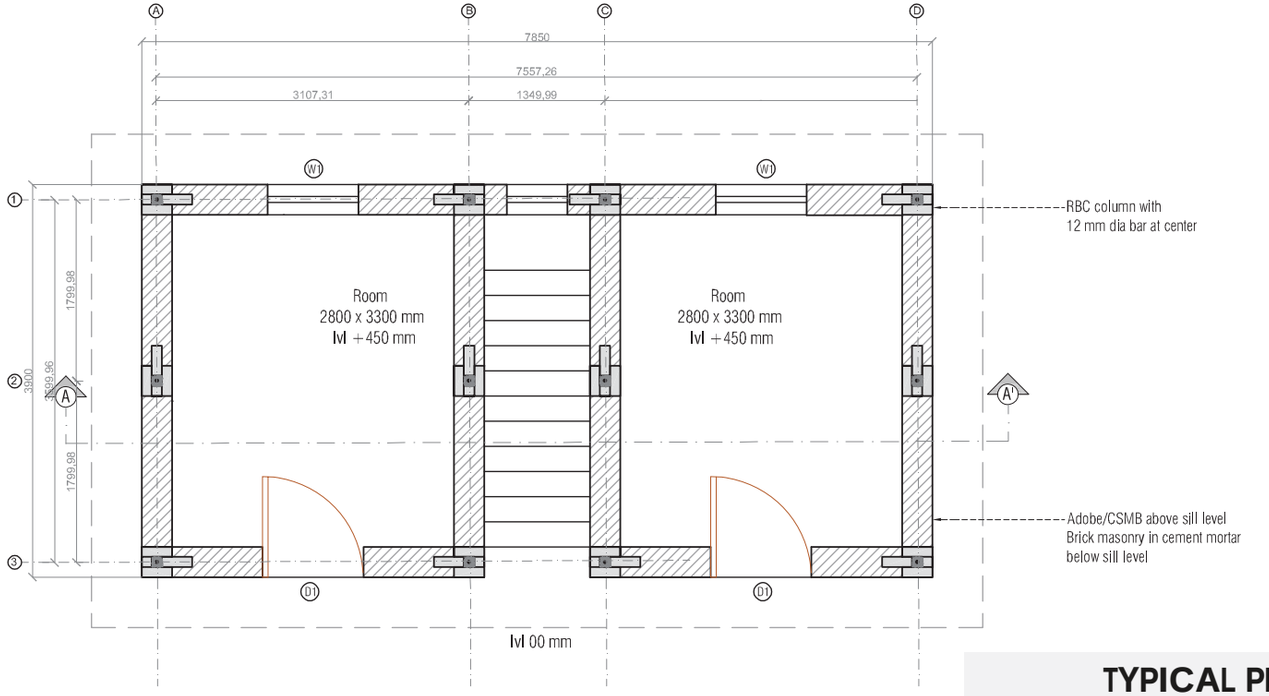
Recommendations for Built Form		
Plan Layout	**Plinth/Floor**	**Roof Profile**
This plan type includes a single room with a two way pitch roof extended over the open verandah in the front	Normal plinth design.	Sloped roof.

Recommendations for construction systems		
Components	**Recommended Specifications**	**Specific Comments**
Foundations	• Brick foundation	
Plinth	• Minimum 30 cm and 30 cm projected from the walls to protect the foundation and provide stability to the structure.	
Wall	• Brick Wall with Chicken Mesh Reinforced Stabilized Mud Plaster	• Wall plates should take loads of rafters and beams to further distribute the load on the cob walls.
Wall Finish	• Stabilised Mud Plaster	
Roof Structure	• Roof slope angle – min 25 & max 33. • Covered with sheet & has treated bamboo understructure	• Rigid connections between all roof members to increase stability.
Roof Cover	• Country Tiles with Timber Understructure.	• Woven reed mats can be used below the tiles as false ceiling for thermal insulation.
Floor	• cement flooring	

WB-01A



TYPICAL SECTION AA'



TYPICAL PLAN

Area Statement:

Item	Area	
	Sq.m	Sq.ft
Room 1	9.24	99.46
Room 2	9.24	99.46
Attic	18.48	198.92
Carpet Area	**38.16**	**410.75**
Built up Area	**30.61**	**329.49**

WEST BENGAL

WB-01A

Cost breakup

Item	Cost (INR)
Foundation	28880.00
Wall	95220.00
Mezzanine & Roof	79688.00
Total	**203788.00**

WEST BENGAL

SR. NO.	ITEM OF WORK	Quantity	Unit	Rate per unit (Rs)	Cost
1	**FOUNDATION**				
	Rammed earth	7.20	per brick	2500.00	18000.00
	RCC plinth beam	0.84	per cum	7000.00	5880.00
	Labor				5000.00
W	**TOTAL**				**28880.00**
2	**WALLS**				
	RBC columns with rebar	12.00	per unit	750.00	9000.00
	Rammed Earth wall (excluding window band)	16.00	per cum	2500.00	40000.00
	Adobe walls (excluding window)	6.90	per cum	800.00	5520.00
	Adobe walls (window band)	4.00	per cum	800.00	3200.00
	Doors	5.00	per pc	900.00	4500.00
	Windows	6.00	per pc	500.00	3000.00
	Labor				30000.00
X	**TOTAL**				**95220.00**
3	**MEZZANINE FLOOR**				
	Cob staircase	6.19	per cum	200.00	1238.00
	RCC lintel Beam	0.85	per cum	8000.00	6800.00
	75mm thk RCC floor	2.25	per cum	8000.00	18000.00
					10000.00
Y	**TOTAL**				**36038.00**
4	**ROOF**				
	RCC roof beam	0.50	per cum	8000.00	4000.00
	Bamboo members 10' long	50.00	pieces	320.00	16000.00
	CGI sheet	325.00	per sqft	42.00	13650.00
	Labor				10000.00
Z	**TOTAL**				**43650.00**
A	**TOTAL (W+X+Y+Z)**	**203788.00**			
B	**TOILET COST**	**15000.00**			
	GRAND TOTAL (A+B)	**218788.00**			
	AREA (sqm)	**47.00**			
	RATE OF CONSTRUCTION (per sqm)	**4655.06**			
	AREA (sqft)	**502.90**			
	RATE OF CONSTRUCTION (per sqft)	**435.05**			

WB-01B

- Intervention in structure & material solutions.
- R.C.C plinth, timber lintel & roof level ties provided to protect against seismic activities.
- Combination of GI sheet & thatch roof. Thatch acts as insulation & is protected by the GI sheet.
- Stabilized mud plaster for the exterior is an option.
- Mezzanine joints of bamboo extends to the outside to support addition of verandah roofs in incremental growth.

Recommendations for Built Form		
Plan Layout	**Plinth/Floor**	**Roof Profile**
This plan type includes a single room with a two way pitch roof extended over the open verandah in the front	Normal plinth design.	Sloped roof.

Recommendations for construction systems		
Components	**Recommended Specifications**	**Specific Comments**
Foundations	• Brick foundation • In case of black cotton soil should go to 60 cm, else minimum 45 cm.	
Plinth	• Minimum 30 cm and 30 cm projected from the walls to protect the foundation and provide stability to the structure.	
Wall	• Brick Wall with Chicken Mesh Reinforced Stabilized Mud Plaster	• Wall plates should take loads of rafters and beams to further distribute the load on the cob walls.
Wall Finish	• ferrocement plaster	
Roof Structure	• Roof slope angle – min 25 & max 33. • Covered with sheet & has treated bamboo understructure	• Rigid connections between all roof members to increase stability.
Roof Cover	• Country Tiles with Timber Understructure.	• Woven reed mats can be used below the tiles as false ceiling for thermal insulation.
Floor	• Cement flooring	

WB-01B

This typology is applicable to Zone A:

The Zone lies predominantly in the Ganga flood plain with the far western region around Purulia district prone to drought. Most parts of the Zone fall under high temperature areas and regions with close proximity to the Ganga are prone to flooding. The Zone falls under seismic Zone 3.

Zone A comprises of the following districts:

Inland & central Bengal.

1. Paschim Mednipur
2. Bankura, Purulia
3. Bardhaman
4. Birbhum
5. Maldah
6. Dakshin Dinajpur
7. Murshidabad
8. Nadi
9. North 24 Parganas.

Resources Available

- Locally available Mud
- Stone
- Thach Roof

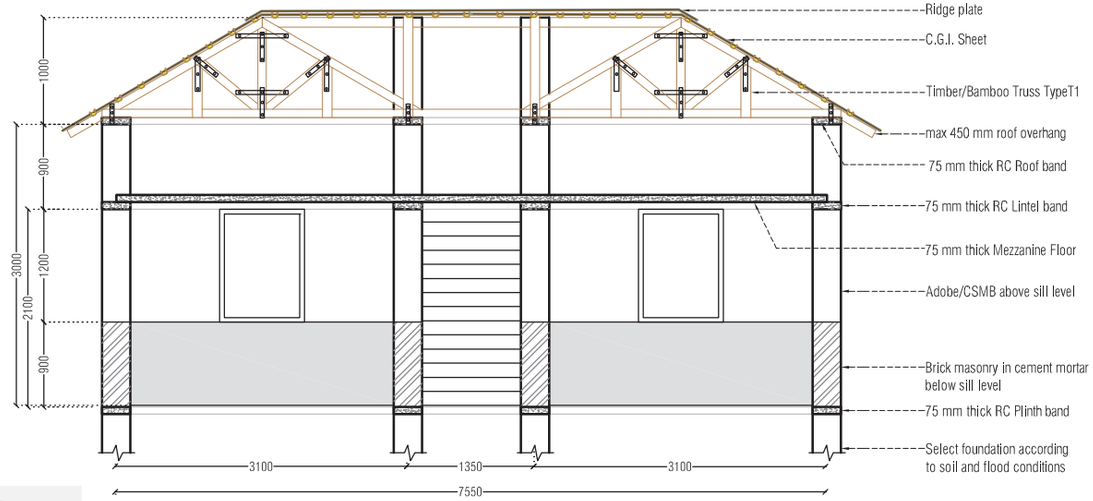
WEST BENGAL

WB-01B

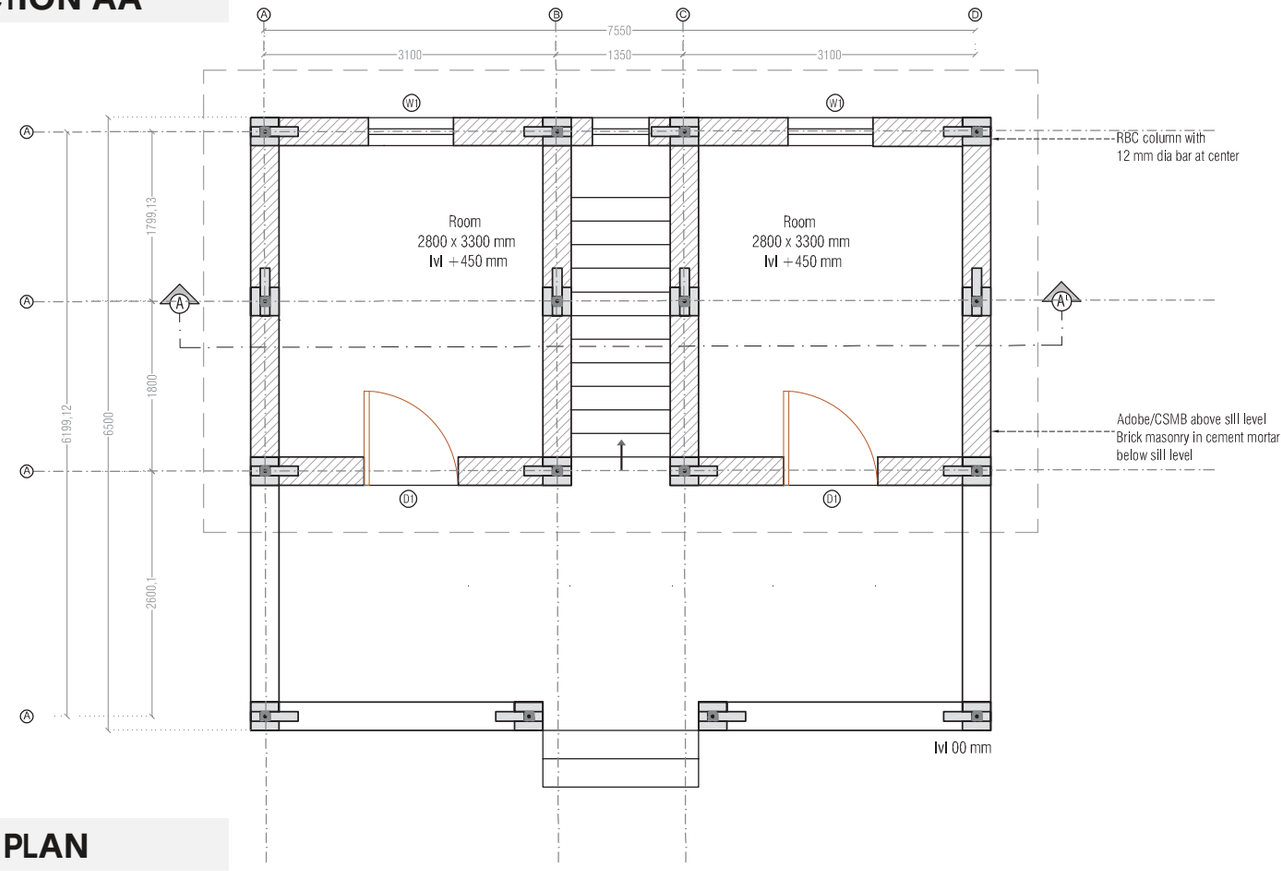
Area Statement:

Item	Area	
	Sq.m	Sq.ft
Room 1	9.24	99.46
Room 2	9.24	99.46
Attic	18.48	198.92
Verandah	**16.67**	**179.44**
Carpet Area	**38.16**	**410.75**
Built up Area	**51.03**	**549.29**

WEST BENGAL



TYPICAL SECTION AA'



TYPICAL PLAN

SR. NO.	ITEM OF WORK	Quantity	Unit	Rate per unit (Rs)	Cost
1	**FOUNDATION**				
	DPC	0.96	per cum	8000.00	1000.00
	Brick	9980.00	per brick	7.00	69860.00
	RCC plinth beam	0.11	per cum	8000.00	880.00
	Labor				5000.00
W	**TOTAL**				**76740.00**
2	**WALLS**				
	RBC columns with rebar	16.00	per unit	750.00	12000.00
	Cob wall verandah	15.65	per cum	200.00	3130.00
	cob wall above cill level	25.50	per cum	200.00	5100.00
	Brick masonry below cill level	20.00	per cum	200.00	4000.00
	Doors	4.00	per pc	900.00	3600.00
	Windows	5.00	per pc	500.00	2500.00
	Labor				10000.00
X	**TOTAL**				**40330.00**
3	**MEZZANINE FLOOR**				
	Staircase	6.19	per cum	200.00	1238.00
	RCC lintel Beam	0.11	per cum	8000.00	880.00
	75mm thk RCC floor	2.25	per cum	8000.00	18000.00
Y	**TOTAL**				**20118.00**
4	**ROOF**				
	RCC roof beam	0.11	per cum	8000.00	880.00
	Bamboo members 10' long	50.00	pieces	320.00	16000.00
	CGI sheet	585.30	per sqft	42.00	24582.60
	Labor				10000.00
Z	**TOTAL**				**51462.60**
	GRAND TOTAL (W+X+Y+Z)	**188650.60**			
	AREA (sqm)	**57.00**			
	RATE OF CONSTRUCTION (per sqm)	**3309.66**			
	AREA (sqft)	**609.90**			
	RATE OF CONSTRUCTION (per sqft)	**309.31**			

WB-01B

Cost breakup

Item	Cost (INR)
Foundation	76740.00
Wall	40330.00
Mezzanine & Roof	71580.60
Total	**188650.60**

WEST BENGAL

WB-01C

This typology is applicable to Zone A:

The Zone lies predominantly in the Ganga flood plain with the far western region around Purulia district prone to drought. Most parts of the Zone fall under high temperature areas and regions with close proximity to the Ganga are prone to flooding. The Zone falls under seismic Zone 3.

Zone A comprises of the following districts:

Inland & central Bengal.

1. Paschim Mednipur
2. Bankura, Purulia
3. Bardhaman
4. Birbhum
5. Maldah
6. Dakshin Dinajpur
7. Murshidabad
8. Nadi
9. North 24 Parganas.

Resources Available

- Locally available Mud
- Stone
- Thach Roof

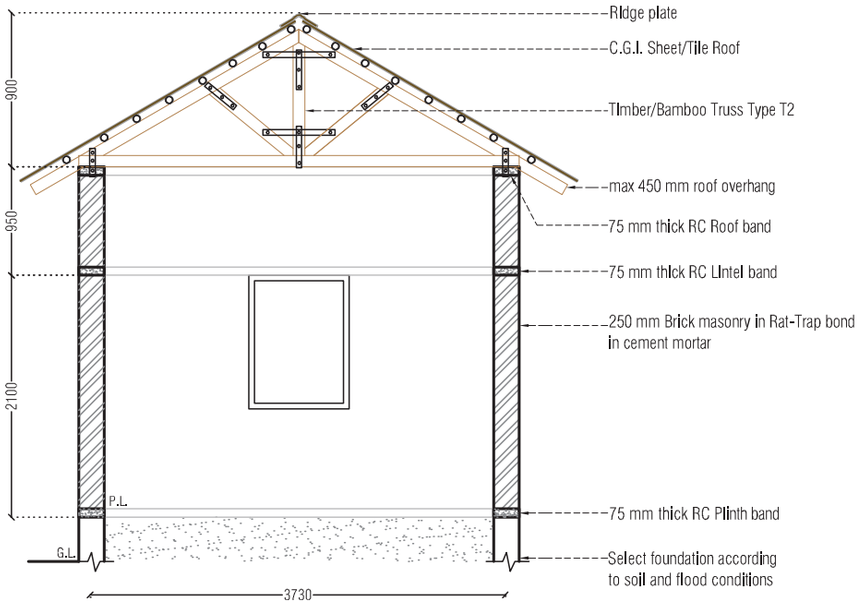
WEST BENGAL

- Intervention in structure & material solutions.
- R.C.C plinth, timber lintel & roof level ties provided to protect against seismic activities.
- Combination of GI sheet & thatch roof. Thatch acts as insulation & is protected by the GI sheet.
- Stabilized mud plaster for the exterior is an option.
- Mezzanine joints of bamboo extends to the outside to support addition of verandah roofs in incremental growth.

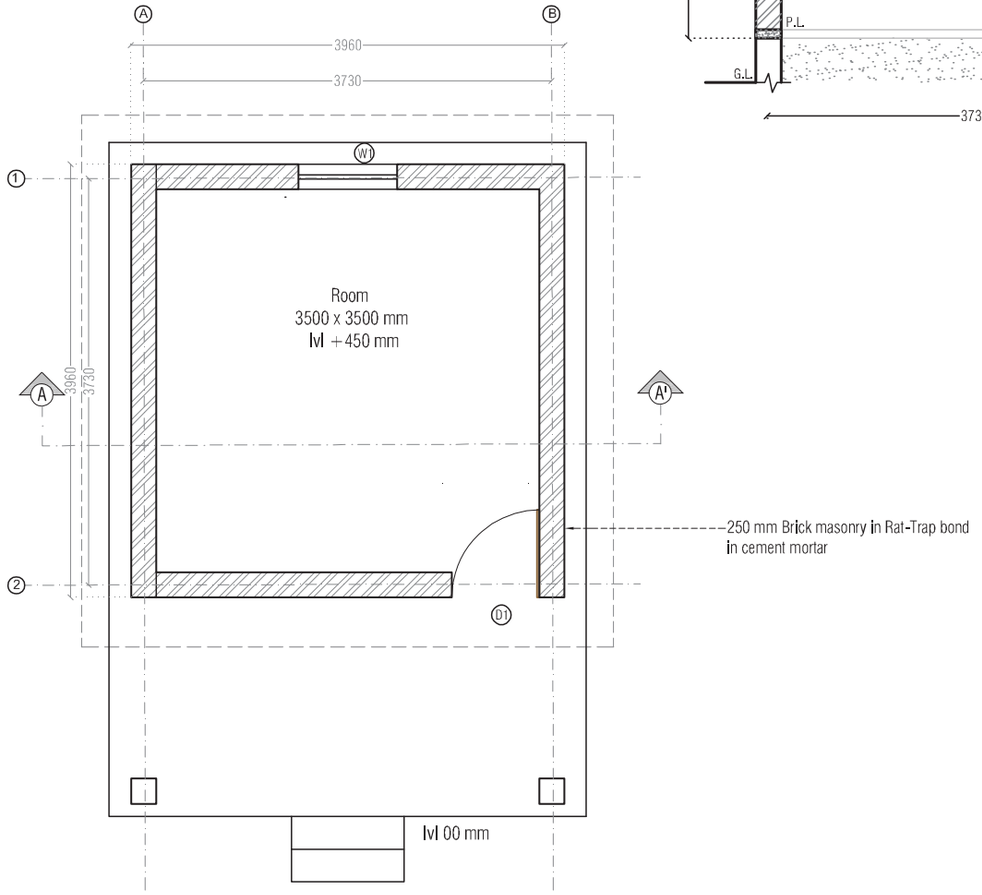
Recommendations for Built Form		
Plan Layout	**Plinth/Floor**	**Roof Profile**
This plan type includes a single room with a two way pitch roof extended over the open verandah in the front	Normal plinth design.	Sloped roof.

Recommendations for construction systems		
Components	**Recommended Specifications**	**Specific Comments**
Foundations	• Brick foundation • In case of black cotton soil should go to 60 cm, else minimum 45 cm.	
Plinth	• Minimum 30 cm and 30 cm projected from the walls to protect the foundation and provide stability to the structure.	
Wall	• Brick Wall with Chicken Mesh Reinforced Stabilized Mud Plaster	• Wall plates should take loads of rafters and beams to further distribute the load on the cob walls.
Wall Finish	• Ferrocement plaster	
Roof Structure	• Roof slope angle – min 25 & max 33. • Covered with sheet & has treated bamboo understructure	• Rigid connections between all roof members to increase stability.
Roof Cover	• Country Tiles with Timber Understructure.	• Woven reed mats can be used below the tiles as false ceiling for thermal insulation.
Floor	• cement flooring	

WB-01C



TYPICAL SECTION AA'



TYPICAL PLAN

Area Statement:

Item	Area	
	Sq.m	Sq.ft
Room	12.25	131.86
Verandah	8.72	93.86
Carpet Area	12.25	131.86
Built up Area	**26.86**	**289.12**

WEST BENGAL

WB-01C

Cost breakup

Item	Cost (INR)
Foundation	38250.00
Wall	74130.00
Roof	37636.00
Total	**150016.00**

WEST BENGAL

SR. NO.	ITEM OF WORK	Quantity	Unit	Rate per unit (Rs)	Cost
1	**FOUNDATION**				
	Brick	5930.00	per brick	5.00	29650.00
	RCC plinth beam	0.45	per cum	8000.00	3600.00
	Labor				5000.00
X	**TOTAL**				**38250.00**
2	**WALLS**				
	Brick wall	9470.00	per brick	5.00	47350.00
	RCC cill & lintel beam	0.56	per cum	8000.00	4480.00
	Doors	2.00	per pc	900.00	1800.00
	Windows	1.00	per pc	500.00	500.00
	Labor				20000.00
Y	**TOTAL**				**74130.00**
4	**ROOF**				
	RCC roof beam	0.45	per cum	8000.00	3600.00
	Bamboo members 10' long	10.00	pieces	320.00	3200.00
	CGI sheet	258.00	per sqft	42.00	10836.00
	Labor				20000.00
Z	**TOTAL**				**37636.00**
A	**TOTAL (X+Y+Z)**	**150016.00**			
B	**TOILET COST**	**15000.00**			
	GRAND TOTAL (A+B)	**165016.00**			
	AREA (sqm)	**32.00**			
	RATE OF CONSTRUCTION (per sqm)	**5156.75**			
	AREA (sqft)	**342.40**			
	RATE OF CONSTRUCTION (per sqft)	**481.94**			

WB-02A

- Intervention in structure & material solutions.
- R.C.C plinth, timber lintel & roof level ties provided to protect against seismic activities.
- Combination of GI sheet & thatch roof. Thatch acts as insulation & is protected by the GI sheet.
- Stabilized mud plaster for the exterior is an option.
- Brink walls built to protect the raised mud plinth during water logging.

Recommendations for Built Form		
Plan Layout	**Plinth/Floor**	**Roof Profile**
Sundarbans style or single room on ground with a staircase on one side & verandah wrapped around on all sides.	Raised plinths. (4 ft. in heavy flood regions)	Pitched roof.

Recommendations for construction systems		
Components	**Recommended Specifications**	**Specific Comments**
Foundations	• 60 to 90 cm deep foundation. • Fired brick with mud/cement mortar. • rubble foundation	• Cob/earth foundation, compressed earth blocks, adobe blocks.
Plinth	• Raised plinths. • RCC plinths & lintel bands.	
Wall	• Fired brick & stone – mud/cement mortar • Adobe blocks, compressed earth blocks, rammed earth, cob with mud mortar.	• Addition of plinth & lintel band.
Wall Finish	• ferrocement plaster	• Limewater over exposed masonry • Natural varnish & resin coating over wooden areas.
Roof Structure	• Timber, Bamboo, RCC, GI pipes- understructure. • Roof has an overhang for wall protection of 45-60cm.	• Roof insulation. • Corrugated bamboo & GI sheets. • Roof anchorage to its under structure & wall.
Roof Cover	• Thatch, terra-cotta flat & country tiles, corrugated GI sheets.	
Floor	• cemnt flooring	

This typology is applicable to Zone B:

Zone B comprises of coastal and deltaic parts of West Bengal. This zone is highlighted by its extreme geographic conditions. The coast is exposed to high wind speeds, high humidity and sandy soils

Zone B comprises of the following districts:

Coastal & Deltaic parts.

1. Purab Mednipur
2. South 24 Parganas.

Resources Available

- Local available Mud
- Terra-cotta Tiles
- Stone

WEST BENGAL

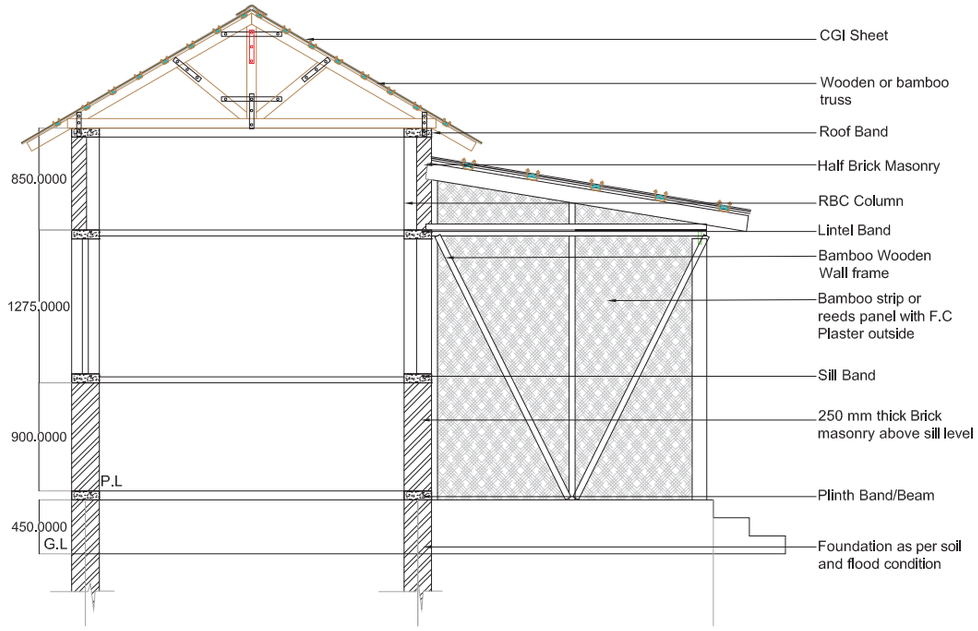
WB-02A

Area Statement:

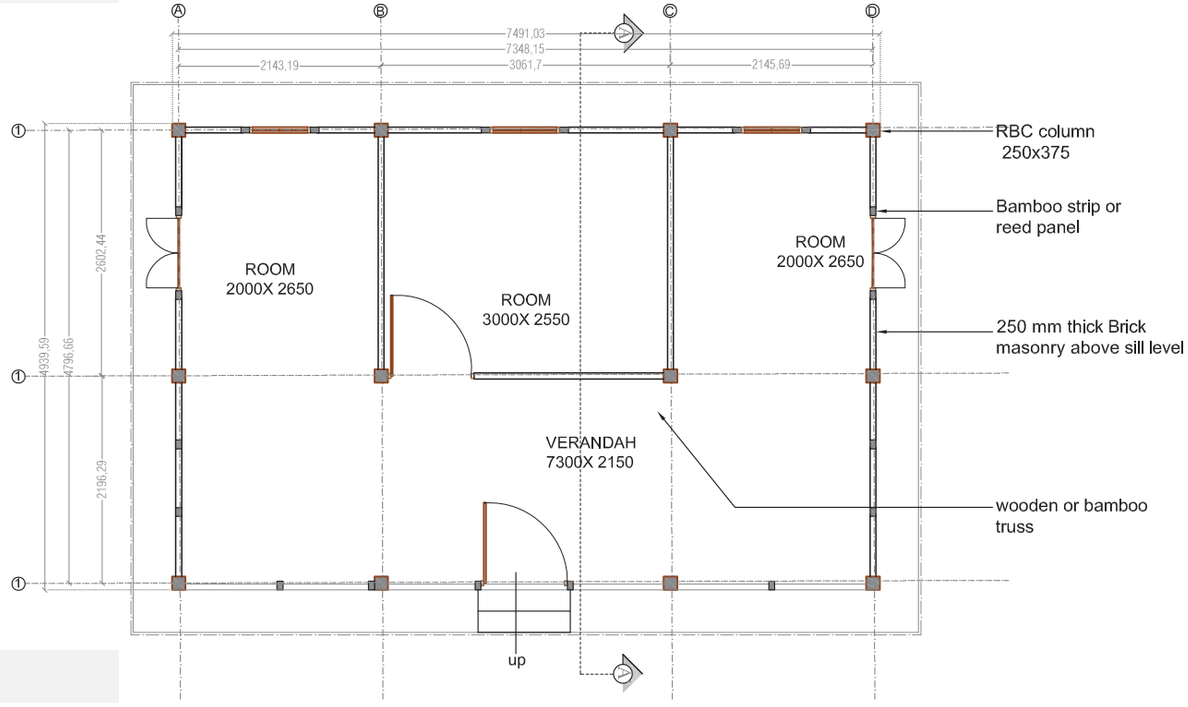
Item	Area	
	Sq.m	Sq.ft
Room 1	7.62	82.02
Room 2	5.29	56.94
Room 3	5.29	56.94
Verandah	**16.25**	**174.92**
Carpet Area	**18.24**	**196.34**
Built up Area	**37.00**	**398.27**

WEST BENGAL

TYPICAL SECTION AA'



TYPICAL PLAN



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WB-02A

SR. NO.	ITEM OF WORK	Quantity	Unit	Rate per unit (Rs)	Cost
1	**FOUNDATION**				
	Brick	7260.00	per brick	5.00	36300.00
	RCC plinth beam	0.56	per cum	8000.00	4480.00
	Labor				5000.00
W	**TOTAL**				**45780.00**
1	**STRUCTURE**				
	RCC columns	0.40	per cum	8000.00	3200.00
	RCC lintel Beam	0.40	per cum	8000.00	3200.00
X	**TOTAL**				**6400.00**
2	**WALLS**				
	Brickwork	8500.00	per brick	5.00	42500.00
	Wattle pannels	260.00	per sqft	15.00	3900.00
	Mud plaster for daub	260.00	per sqft	15.00	3900.00
	Stabilised mud plaster for exterior	570.00	per sqft	20.00	11400.00
	Doors	2.00	per pc	1000.00	1800.00
	Windows	5.00	per pc	700.00	2500.00
	Labor				20000.00
Y	**TOTAL**				**86000.00**
4	**ROOF**				
	RCC roof beam	0.56	per cum	8000.00	4480.00
	Bamboo members 10' long	55.00	pieces	320.00	17600.00
	CGI sheet	515.00	per sqft	42.00	21630.00
	Labor				20000.00
Z	**TOTAL**				**63710.00**
	GRAND TOTAL (W+X+Y+Z)	**195490.00**			
	AREA (sqm)	**40.00**			
	RATE OF CONSTRUCTION (per sqm)	**4887.25**			
	AREA (sqft)	**428.00**			
	RATE OF CONSTRUCTION (per sqft)	**456.75**			

Cost breakup

Item	Cost (INR)
Foundation	45780.00
Framed structure & walls	92400.00
Roof	63710.00
Total	**201890.00**

WEST BENGAL

WB-02B

This typology is applicable to Zone B:

Zone B comprises of coastal and deltaic parts of West Bengal. This zone is highlighted by its extreme geographic conditions. The coast is exposed to high wind speeds, high humidity and sandy soils

Zone B comprises of the following districts:

Coastal & Deltaic parts.

1. Purab Mednipur
2. South 24 Parganas.

Resources Available

- Local available Mud
- Terra-cotta Tiles
- Stone

WEST BENGAL

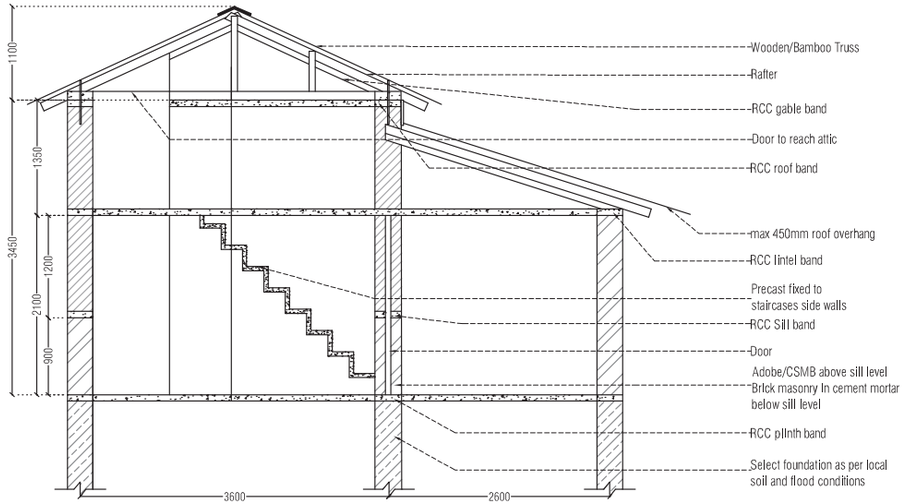

WB-B-02

- Intervention in structure & material solutions.
- R.C.C plinth, timber lintel & roof level ties provided to protect against seismic activities.
- Combination of GI sheet & thatch roof. Thatch acts as insulation & is protected by the GI sheet.
- Stabilized mud plaster for the exterior is an option.
- Mezzanine joints of bamboo extends to the outside to support addition of verandah roofs in incremental growth.

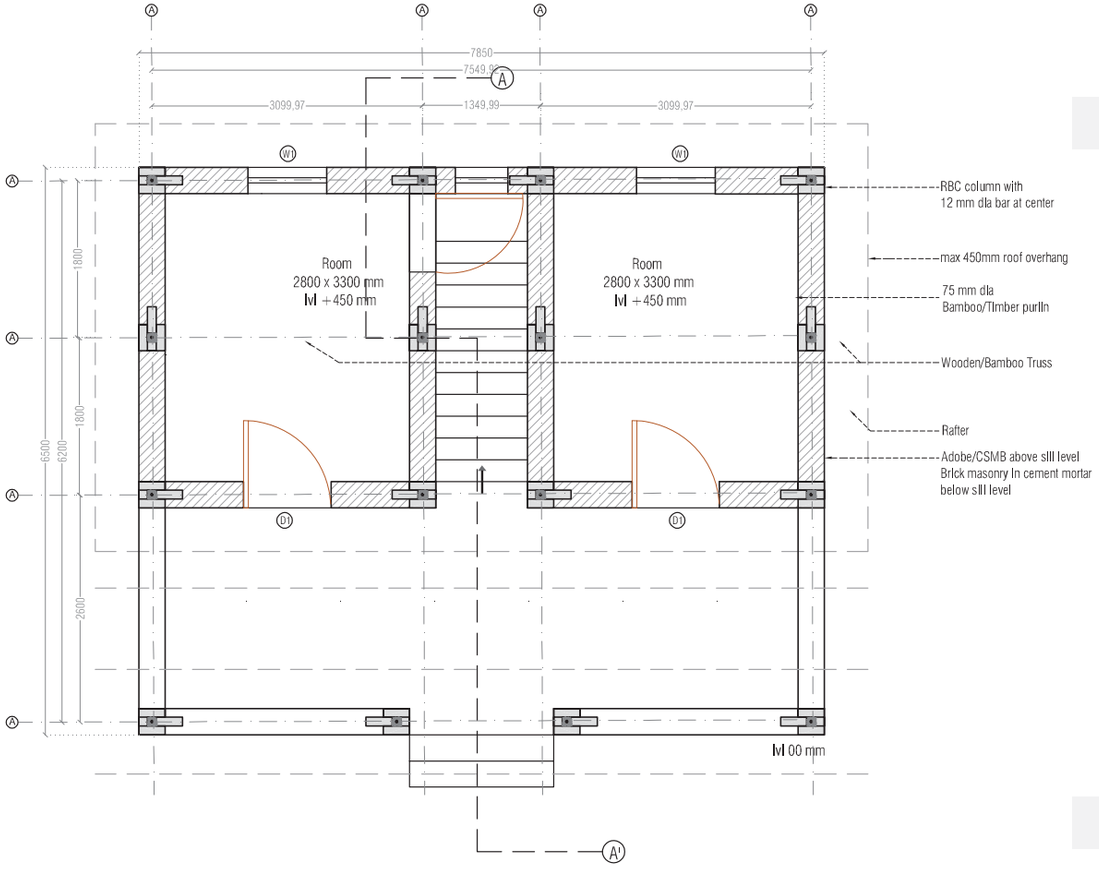
Recommendations for Built Form		
Plan Layout	**Plinth/Floor**	**Roof Profile**
Sundarbans style or single room on ground with a staircase on one side & verandah wrapped around on all sides.	Raised plinths. (4 ft. in heavy flood regions)	Pitched roof.

Recommendations for construction systems		
Components	**Recommended Specifications**	**Specific Comments**
Foundations	• 60 to 90 cm deep foundation. • Fired brick with mud/cement mortar. • Sand packed dry stone foundation	• Cob/earth foundation, compressed earth blocks, adobe blocks.
Plinth	• Raised plinths. • RCC plinths & lintel bands.	
Wall	• Fired brick & stone – mud/cement mortar • Adobe blocks, compressed earth blocks, rammed earth, cob with mud mortar.	• Addition of plinth & lintel band.
Wall Finish	• Mud plaster with cow dung or lime/cement. • Coating of a bituminous mix of silt & burnt rubber with local adhesive.	• Limewater over exposed masonry • Natural varnish & resin coating over wooden areas.
Roof Structure	• Timber, Bamboo, RCC, GI pipes- understructure. • Roof has an overhang for wall protection of 45-60cm.	• Roof insulation. • Corrugated bamboo & GI sheets. • Roof anchorage to its under structure & wall.
Roof Cover	• Thatch, terra-cotta flat & country tiles, corrugated GI sheets.	
Floor	• cement flooring	• Soorkhi • Lime crete

405



TYPICAL SECTION AA'

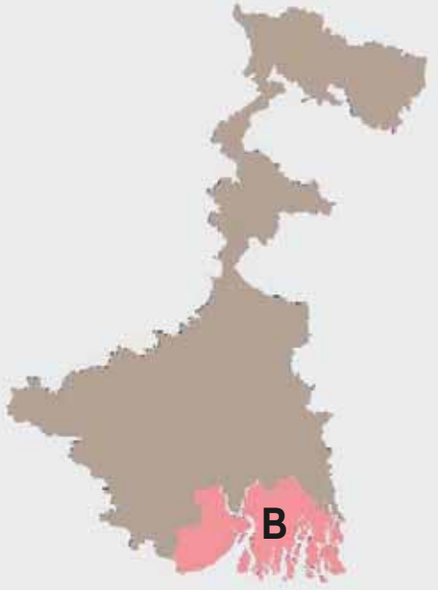


TYPICAL PLAN

WB-02B

Area Statement:

Item	Area	
	Sq.m	Sq.ft
Room 1	9.24	99.46
Room 2	9.24	99.46
Attic	18.48	198.92
Verandah	**16.67**	**179.44**
Carpet Area	**22.86**	**246.07**
Built up Area	**51.03**	**549.29**



WEST BENGAL

WB-02B

Cumulative cost breakup

Item	Cost (INR)
Foundation	16570.00
Walls & Mezzanine	103300.00
Roof	70200.00
Total	**190070.00**

WEST BENGAL

SR. NO.	ITEM OF WORK	Quantity	Unit	Rate per unit (Rs)	Cost
1	**FOUNDATION**				
	Adobework	15.70	per cum	300.00	4710.00
	RCC plinth beam	0.92	per cum	8000.00	7360.00
	Labor				4500.00
W	**TOTAL**				**16570.00**
2	**WALLS**				
	RBC columns with rebar	16.00	per unit	750.00	12000.00
	Brick masonry below cill level	5000.00	per brick	5.00	25000.00
	Adobe wall house	46.00	per cum	300.00	13800.00
	RCC cill beam	1.50	per cum	200.00	300.00
	Doors	4.00	per pc	1000.00	3600.00
	Windows	6.00	per pc	700.00	3000.00
	Labor				9000.00
X	**TOTAL**				**66700.00**
3	**MEZZANINE FLOOR**				
	RCC Staircase	0.20	per cum	8000.00	1600.00
	RCC lintel band	3.75	per cum	8000.00	30000.00
	Labor				5000.00
Y	**TOTAL**				**36600.00**
4	**ROOF**				
	RCC roof band	2.25	per cum	8000.00	18000.00
	Bamboo members 10' long	40.00	pieces	320.00	12800.00
	CGI sheet	700.00	per sqft	42.00	29400.00
	Labor				10000.00
Z	**TOTAL**				**70200.00**
A	**TOTAL (W+X+Y+Z)**	**190070.00**			
B	**TOILET COST**	**15000.00**			
	GRAND TOTAL (A+B)	**205070.00**			
	AREA (sqm)	**52.00**			
	RATE OF CONSTRUCTION (per sqm)	**3943.65**			
	AREA (sqft)	**556.40**			
	RATE OF CONSTRUCTION (per sqft)	**368.57**			

WB-03A

- It is a prevalent plan type which has been intervened with structural & material solutions
- It is framed structure with R.C.C posts & ferrocement in fill. The roof is a R.C.C understructurewith corrugated bamboo sheet on top.
- The verandah provided is a key design feature & works as a buffer space.
- The traditional plan type has been resolved within a grid for the frame structure to distribute equal load.
- Ties are provided at plinth, mezzanine & roof levels.

Recommendations for Built Form		
Plan Layout	**Plinth/Floor**	**Roof Profile**
2 basic types – Bhutias & Lepchas.	Stilt structure or raised plinths.	Slopped roof. Roof anchoring.

Recommendations for construction systems		
Components	**Recommended Specifications**	**Specific Comments**
Foundations	• Fired brick with mud/cement mortar. • Sand packed dry stone foundation. • RCC (for plinth beam)	• 60 to 90 cm deep foundation • Stone with mud/cement mortar. • Plum concrete with river boulders/stone.
Plinth	• Raised plinths. • Stilt structure. • Plum concrete.	
Wall	• Fired brick & stone – mud/cement mortar • Timber, Bamboo precast RCC frame.	• Addition of plinth & lintel band.
Wall Finish	• Mud plaster with cow dung or lime/cement. • Natural varnish & resin coating over wooden areas.	• Lime wash over exposed masonry
Roof Structure	• Pitched roof/ • Timber, Bamboo, RCC, GI pipes- understructure. • Roof insulation. • Corrugated bamboo & GI sheets.	• Roof has an overhang for wall protection of 45-60 cm. • Roof anchorage to it's under structure & wall.
Roof Cover	• Corrugated GI sheets with thatch/bamboo weave insulation , corrugated bamboo sheets or slate/stone shingles.	
Floor	• cement flooring • Timber or Bamboo (for first floor)	

This typology is applicable to Zone C

Seismic zone iv & v, heavy rainfal. forest fires and frequent landslides

Zone C comprises of the following Districts:

1. Uttar Dinajpur
2. Cooch Behar
3. The plains of Jalpaiguri & Alipurduar

Resources Available

- Stone
- Bamboo
- Timber
- Naturally available Mud

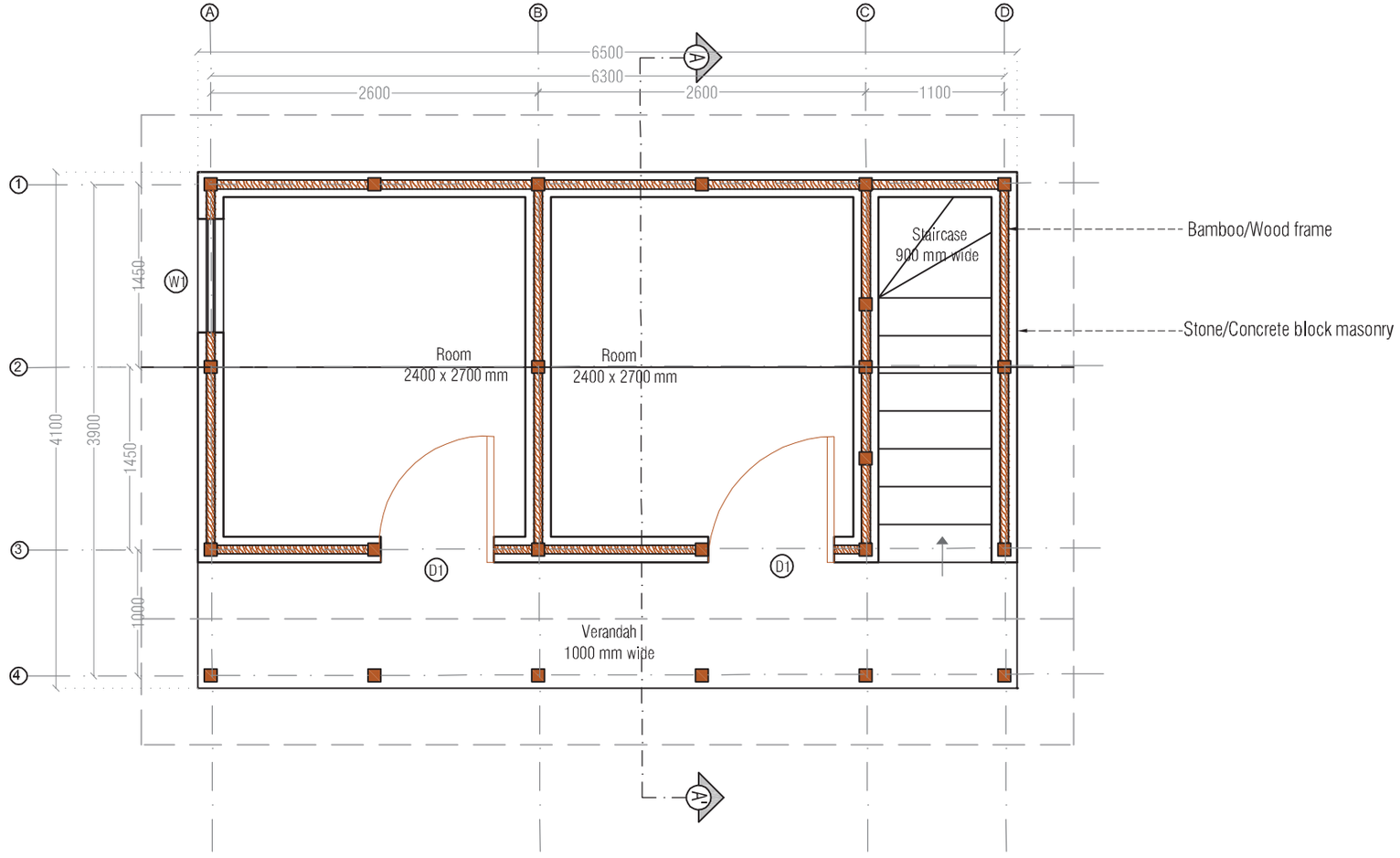
WEST BENGAL

WB-03A

Area statement

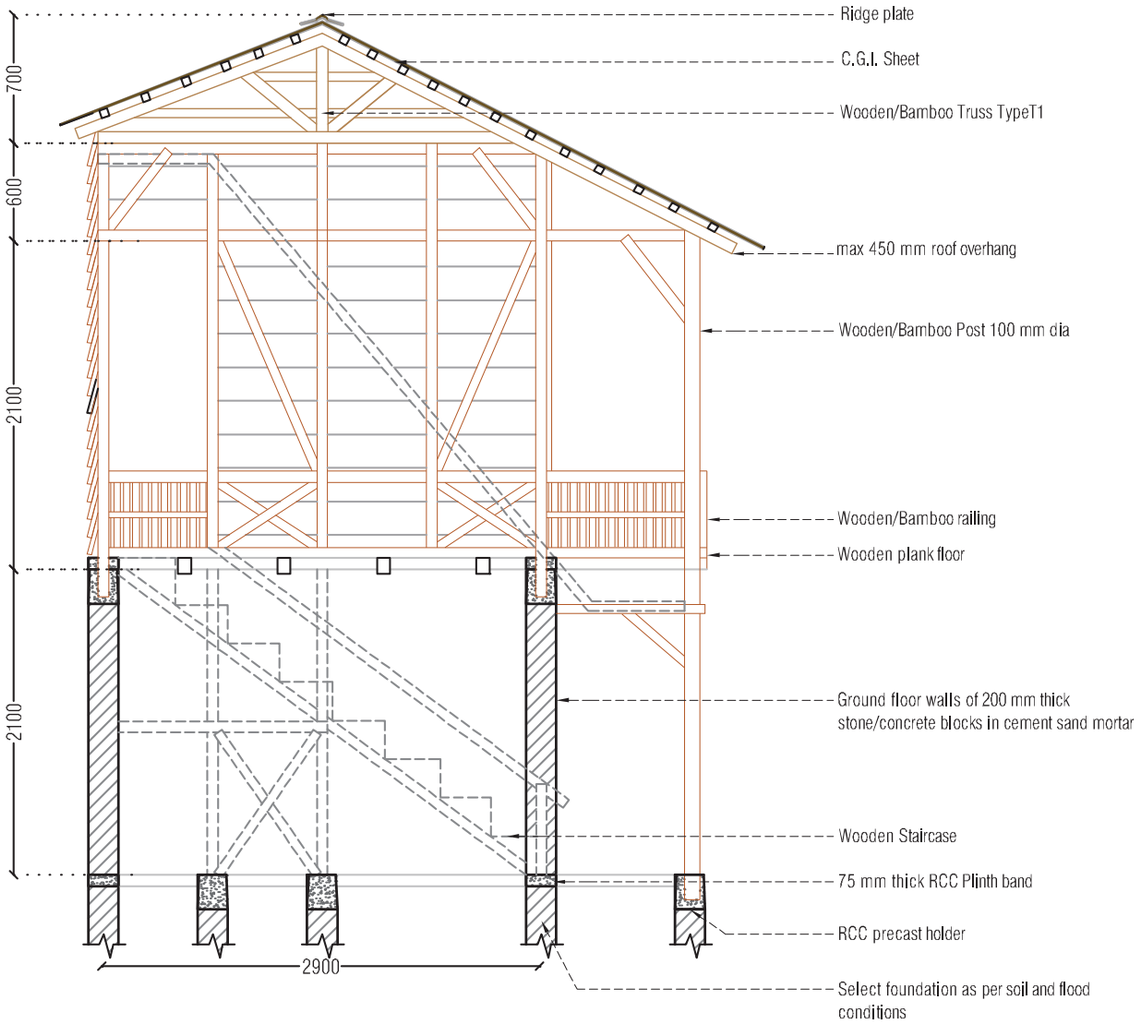
Item	Area	
	Sq.m	Sq.ft
Room 1	6.48	69.75
Room 2	6.48	69.75
Verandah	6.50	69.97
Carpet Area	**13.32**	**143.38**
Built up	**26.65**	**286.86**

WEST BENGAL



TYPICAL PLAN

WB-03A



TYPICAL SECTION AA'

WEST BENGAL

WB-03A

Cost breakup

Item	Cost (INR)
Foundation	41880.00
Stilt Structure & walls	49000.00
First floor Structure, staircase & walls	97925.00
Roof	**43200.00**
Total	**232005.00**

WEST BENGAL

SR. NO.	ITEM OF WORK	Quantity	Unit	Rate per unit (Rs)	Cost
1	**FOUNDATION**				
	Stonework	11.30	per cum	2000.00	22600.00
	RCC plinth beam	0.96	per cum	8000.00	7680.00
	Labor				11600.00
A	**TOTAL**				**41880.00**
2	**STILT LEVEL STRUCTURE & WALLS**				
	Wood for stilt band	46.00	per cum	300.00	13800.00
	Stoneblock wall	7.60	per cum	2000.00	15200.00
	Labor				20000.00
B	**TOTAL**				**49000.00**
2	**FIRST FLOOR STAIRCASE**				
	Timber beams	3.50	per cuft	500.00	1750.00
	Timber planks	12.50	per cuft	500.00	6250.00
	Labor				8000.00
C	**TOTAL**				**16000.00**
2	**FIRST FLOOR STRUCTURE**				
	Timber frame columns(big)	5.30	per cuft	500.00	2650.00
	Timber columns (small)	7.30	per cuft	500.00	3650.00
	Wood for lintel band	10.00	per cuft	500.00	5000.00
	Labor				13500.00
D	**TOTAL**				**56800.00**
3	**FIRST FLOOR WALLS**				
	Wattle	275.00	per sqft	15.00	4125.00
	Daub	275.00	per sqft	15.00	
	Doors	1.00	per pc	1000.00	1000.00
	Windows	3.00	per pc	700.00	5000.00
	Labor				15000.00
E	**TOTAL**				**25125.00**
4	**ROOF**				
	Bamboo members 10' long	20.00	pieces	320.00	6400.00
	CGI sheet	400.00	per sqft	42.00	16800.00
	Labor				20000.00
F	**TOTAL**				**43200.00**
	GRAND TOTAL (A+B+C+D+E+F)	**232005.00**			
	AREA (sqm)	**40.00**			
	RATE OF CONSTRUCTION (per sqm)	**5800.13**			
	AREA (sqft)	**428.00**			
	RATE OF CONSTRUCTION (per sqft)	**542.07**			

WB-03B

This typology is applicable to Zone C

Seismic zone iv & v, heavy rainfal. forest fires and frequent landslides

Zone C comprises of the following Districts:

1. Uttar Dinajpur
2. Cooch Behar
3. The plains of Jalpaiguri & Alipurduar

Resources Available

- Stone
- Bamboo
- Timber
- Naturally available Mud

WB-C-01

- It is a prevalent plan type which has been intervened with structural & material solutions
- It is framed structure with R.C.C posts & ferrocement in fill. The roof is a R.C.C understructurewith corrugated bamboo sheet on top.
- The verandah provided is a key design feature & works as a buffer space.
- The traditional plan type has been resolved within a grid for the frame structure to distribute equal load.
- Ties are provided at plinth, mezzanine & roof levels.

Recommendations for Built Form		
Plan Layout	**Plinth/Floor**	**Roof Profile**
2 basic types – Bhutias & Lepchas.	Stilt structure or raised plinths.	Slopped roof. Roof anchoring.

Recommendations for construction systems		
Components	**Recommended Specifications**	**Specific Comments**
Foundations	• Fired brick with mud/cement mortar. • Sand packed dry stone foundation. • RCC (for plinth beam)	• 60 to 90 cm deep foundation • Stone with mud/cement mortar. • Plum concrete with river boulders/stone.
Plinth	• Raised plinths. • Stilt structure. • Plum concrete.	
Wall	• Fired brick & stone – mud/cement mortar • Timber, Bamboo precast RCC frame.	• Addition of plinth & lintel band.
Wall Finish	• Mud plaster with cow dung or lime/cement. • Natural varnish & resin coating over wooden areas.	• Lime wash over exposed masonry
Roof Structure	• Pitched roof/ • Timber, Bamboo, RCC, GI pipes- understructure. • Roof insulation. • Corrugated bamboo & GI sheets.	• Roof has an overhang for wall protection of 45-60 cm. • Roof anchorage to it's under structure & wall.
Roof Cover	• Corrugated GI sheets with thatch/bamboo weave insulation , corrugated bamboo sheets or slate/stone shingles.	
Floor	• Cement flooring • Timber or Bamboo (for first floor)	

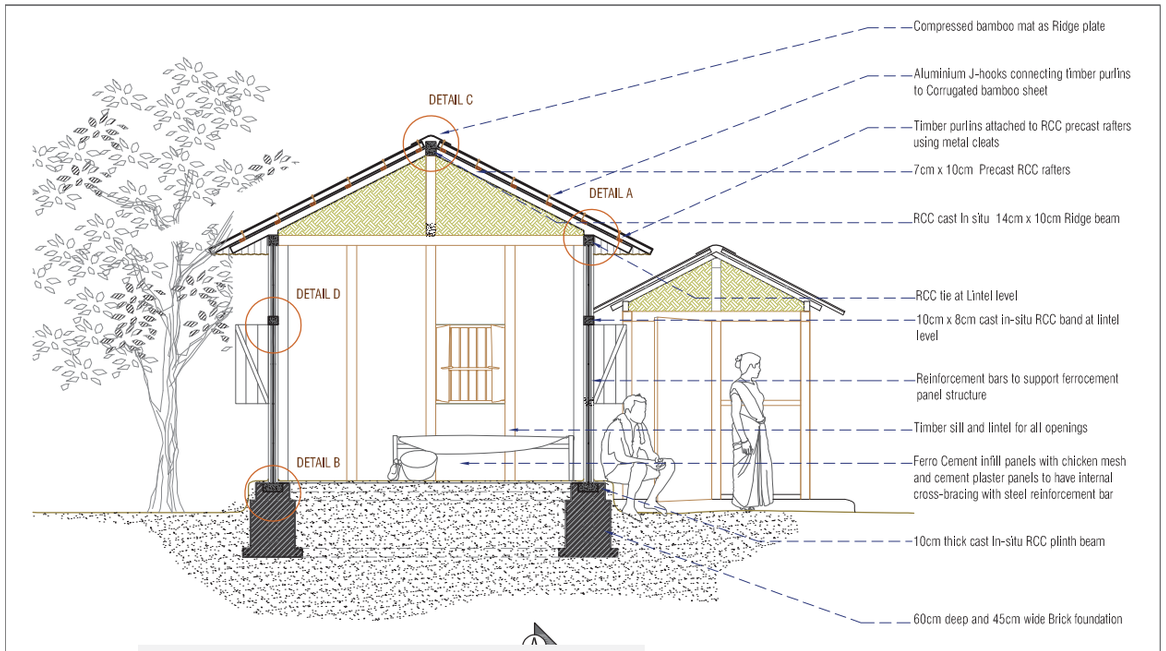
WEST BENGAL

WB-03B

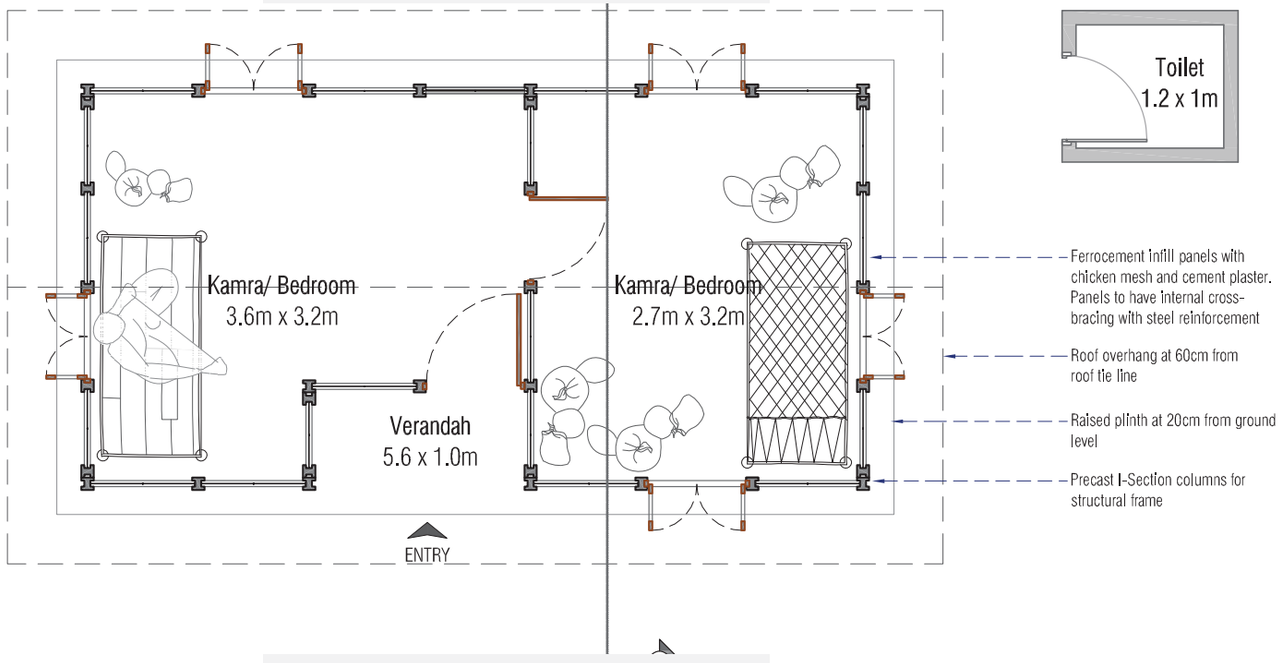
Area Statement:

Item	Area	
	Sq.m	Sq.ft
Room 1	9.76	105.06
Room 2	8.64	93.00
Verandah	1.80	19.38
Carpet Area	**18.60**	**200.21**
Built up Area	**24.48**	**263.50**

WEST BENGAL



TYPICAL SECTION AA'



TYPICAL PLAN

SR. NO.	ITEM OF WORK	Quantity	Unit	Rate per unit (Rs)	Cost
1	**FOUNDATION**				
	Brick	4095.00	per brick	7.00	28665.00
	RCC plinth beam	0.30	per cum	8000.00	2400.00
	Labor				6000.00
W	**TOTAL**				**37065.00**
1	**FRAMED STRUCTURE & WALLS**				
	RCC lintel Beam	0.15	per cum	8000.00	1200.00
	Concrete block masonry	12.00	per cum	3000.00	36000.00
	Doors	2.00	per pc	1000.00	1800.00
	Windows	5.00	per pc	700.00	2500.00
	Labor				14000.00
Y	**TOTAL**				**54300.00**
4	**ROOF**				
	RCC roof beam	0.30	per cum	8000.00	2400.00
	Bamboo members 10' long	25.00	pieces	320.00	8000.00
	CGI sheet	270.00	per sqft	42.00	11340.00
	Labor				6000.00
Z	**TOTAL**				**27740.00**
A	**TOTAL (W+X+Y+Z)**	**119105.00**			
B	**TOILET COST**	**15000.00**			
	GRAND TOTAL (A+B)	**134105.00**			
	AREA (sqm)	**25.00**			
	RATE OF CONSTRUCTION (per sqm)	**5364.20**			
	AREA (sqft)	**267.50**			
	RATE OF CONSTRUCTION (per sqft)	**501.33**			

WB-03B

Cost breakup

Item	Cost (INR)
Foundation	37065.00
Framed structure & walls	54300.00
Roof	27740.00
Total	**119105.00**

WEST BENGAL

WB-04A

This typology is applicable to Zone D

Seismic zone IV and some parts in seismic zone V, heavy rainfall, flooding, water logging

Zone D comprises of the following districts

1. Uttar Dinajpur & Cooch Behar
2. The plains of Jalpaiguri & Alipurduar
3. Zone D has two typologies

Resources Available

- Timber
- Bamboo
- Jute

WEST BENGAL

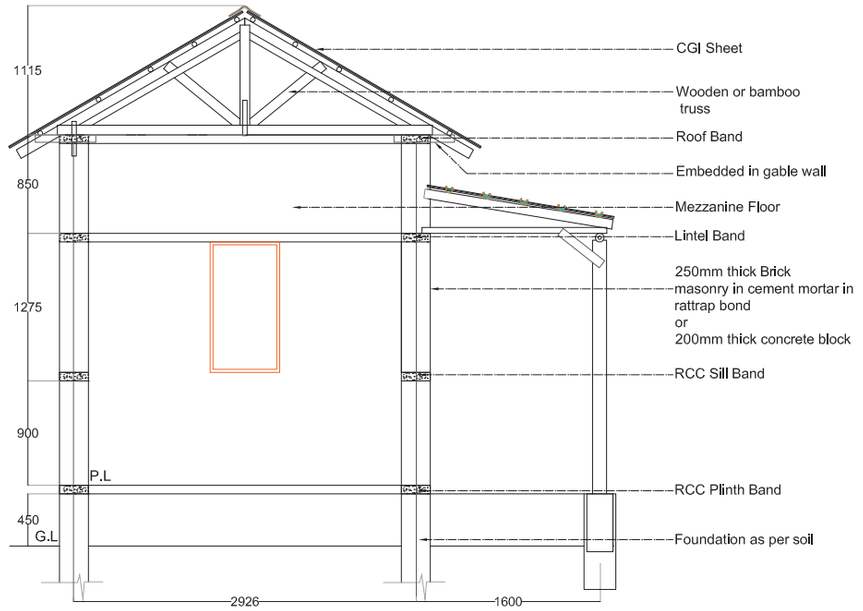

WB-04A

- It is a light framed structure in timber with ties at plinth, sill linttel & roof level for protection against seismeic activity .
- Efficient use of material is acheived by using upstanding brickwork as in fill wall till sill.
- Raised plinth protected with brickwork on its periphery against water logging.
- Space for toilets, wash areas, common courtyard & entrance enclosure has beem provided for.
- In fill walls are light.

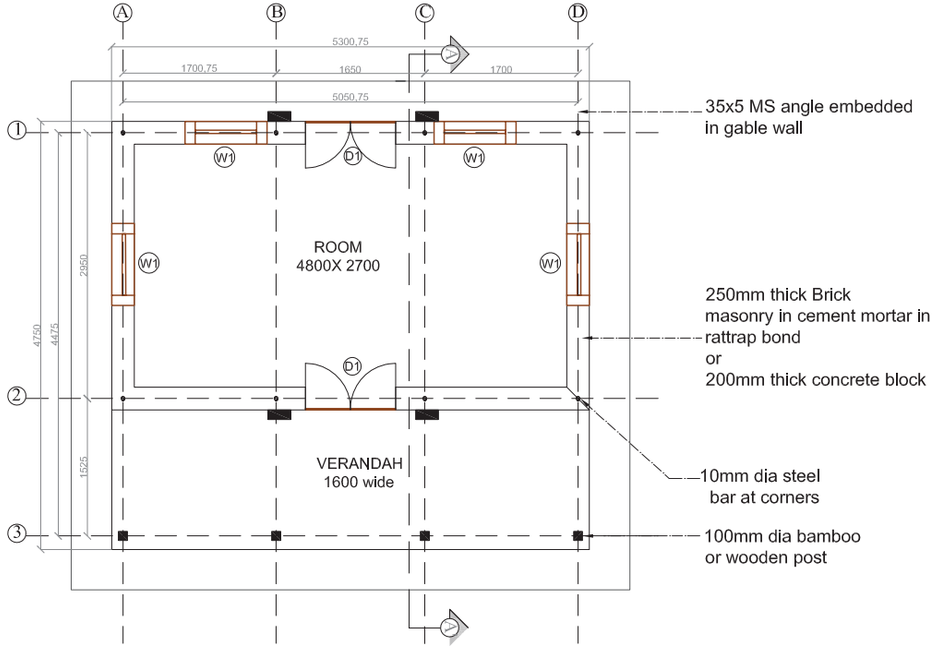
Recommendations for Built Form		
Plan Layout	**Plinth/Floor**	**Roof Profile**
Rectangular linear plan flanked by a covered verandah or raised building structure to protect from wildlife.	Stilt structure or raised plinths.	Slopped roof pitched roof.

Recommendations for construction systems		
Components	**Recommended Specifications**	**Specific Comments**
Foundations	• 60 to 90 cm deep foundation. • Fired brick with mud/cement mortar. • Sand packed dry stone foundation. • Stone with mud/cement mortar.	• Cob/earth foundation, compressed earth blocks, adobe blocks.
Plinth	• Raised plinths. • Stilt structure.	• Plum concrete.
Wall	• Fired brick & stone – mud/cement mortar • Timber, Bamboo precast RCC frame.	• Addition of plinth & lintel band.
Wall Finish	• Mud plaster with cow dung or lime/cement. • Coating of a bituminous mix of silt & burnt rubber with local adhesive.	• Limewater over exposed masonry • Natural varnish & resin coating over wooden areas.
Roof Structure	• Timber, Bamboo, RCC, GI pipes- understructure. • Roof has an overhang for wall protection of 45-60cm.	• Roof insulation. • Corrugated bamboo & GI sheets. • Roof anchorage to its under structure & wall.
Roof Cover	• Thatch, terra-cotta flat & country tiles, corrugated GI sheets.	
Floor	• cement flooring • Timber or Bamboo (for first floor)	

WB-04A



TYPICAL SECTION



TYPICAL PLAN

Area Statement:

Item	Area	
	Sq.m	Sq.ft
Room	12.5	134.55
Kitchen	2.87	30.89
Verandah	5.70	61.35
Carpet Area	**15.77**	**169.75**
Built up Area	**26.00**	**279.86**

WEST BENGAL

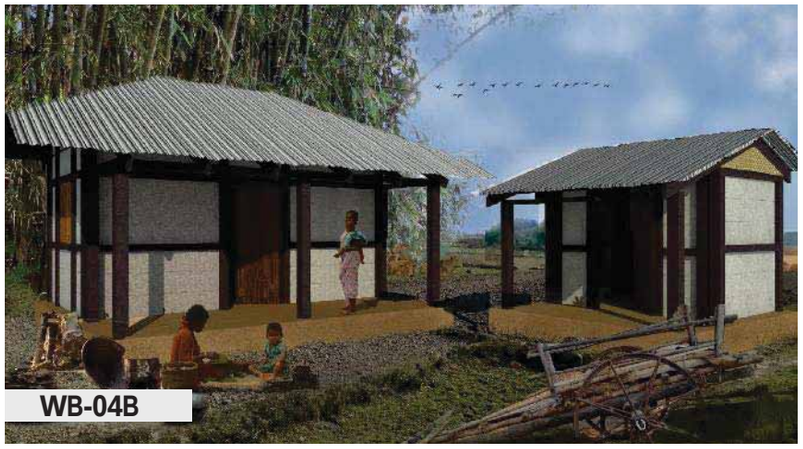
WB-04A

Cost breakup

Item	Cost (INR)
Foundation	46609.00
Framed structure & walls	56735.00
Roof	44380.00
Total	**147724.00**

WEST BENGAL

SR. NO.	ITEM OF WORK	Quantity	Unit	Rate per unit (Rs)	Cost
1	**FOUNDATION**				
	Brickwork	4407.00	per brick	7.00	30849.00
	Mudwork	10.00	per cum	200.00	2000.00
	RCC plinth beam	0.47	per cum	8000.00	3760.00
	Labor				10000.00
W	**TOTAL**				**46609.00**
2	**FRAMED STRUCTURE**				
	Wood for main columns	11.40	per cuft	500.00	5700.00
	Wood for verandah columns	3.80	per cuft	500.00	1900.00
	Wood for sill band	2.30	per cuft	500.00	2070.00
	Wood for lintel band	0.70	per cuft	500.00	350.00
	Wood for roof band	5.95	per cuft	500.00	2975.00
	Labor				15000.00
X	**TOTAL**				**22295.00**
3	**WALLS**				
	Upstanding brick till sill	3000.00	per pc	7.00	21000.00
	Bamboo weave mats full	0.76	per 280sqft	1500.00	1140.00
	Bamboo weave mats above lintel	0.30	per 280sqft	1500.00	
	Doors	2.00	per pc	1000.00	1800.00
	Windows	5.00	per pc	700.00	2500.00
	Labor				8000.00
Y	**TOTAL**				**34440.00**
4	**ROOF**				
	Bamboo members 10' long	25.00	pieces	320.00	8000.00
	CGI sheet	390.00	per sqft	42.00	16380.00
	Labor				20000.00
Z	**TOTAL**				**44380.00**
	TOTAL (W+X+Y+Z)	**147724.00**			
	AREA (sqm)	**24.00**			
	RATE OF CONSTRUCTION (per sqm)	**6155.17**			
	AREA (sqft)	**256.80**			
	RATE OF CONSTRUCTION (per sqft)	**575.25**			



- It is a light framed structure in timber with ties at plinth, sill linttel & roof level for protection against seismeic activity .
- Efficient use of material is acheived by using upstanding brickwork as in fill wall till sill.
- Raised plinth protected with brickwork on its periphery against water logging.
- Space for toilets, wash areas, common courtyard & entrance enclosure has beem provided for.
- In fill walls are light.

Recommendations for Built Form		
Plan Layout	**Plinth/Floor**	**Roof Profile**
Rectangular linear plan flanked by a covered verandah or raised building structure to protect from wildlife.	Stilt structure or raised plinths.	Slopped roof pitched roof.

Recommendations for construction systems		
Components	**Recommended Specifications**	**Specific Comments**
Foundations	• 60 to 90 cm deep foundation. • Fired brick with mud/cement mortar. • Sand packed dry stone foundation. • Stone with mud/cement mortar.	• Cob/earth foundation, compressed earth blocks, adobe blocks.
Plinth	• Raised plinths. • Stilt structure.	• Plum concrete.
Wall	• Fired brick & stone – mud/cement mortar • Timber, Bamboo precast RCC frame.	• Addition of plinth & lintel band.
Wall Finish	• Mud plaster with cow dung or lime/cement. • Coating of a bituminous mix of silt & burnt rubber with local adhesive.	• Limewater over exposed masonry • Natural varnish & resin coating over wooden areas.
Roof Structure	• Timber, Bamboo, RCC, GI pipes- understructure. • Roof has an overhang for wall protection of 45-60cm.	• Roof insulation. • Corrugated bamboo & GI sheets. • Roof anchorage to its under structure & wall.
Roof Cover	• Thatch, terra-cotta flat & country tiles, corrugated GI sheets.	
Floor	• cement flooring • Timber or Bamboo (for first floor)	

WB-04B

This typology is applicable to Zone D

Seismic zone IV and some parts in seismic zone V, heavy rainfall, flooding, water logging

Zone D comprises of the following districts

1. Uttar Dinajpur & Cooch Behar
2. The plains of Jalpaiguri & Alipurduar
3. Zone D has two typologies

Resources Available

- Timber
- Bamboo
- Jute

WEST BENGAL

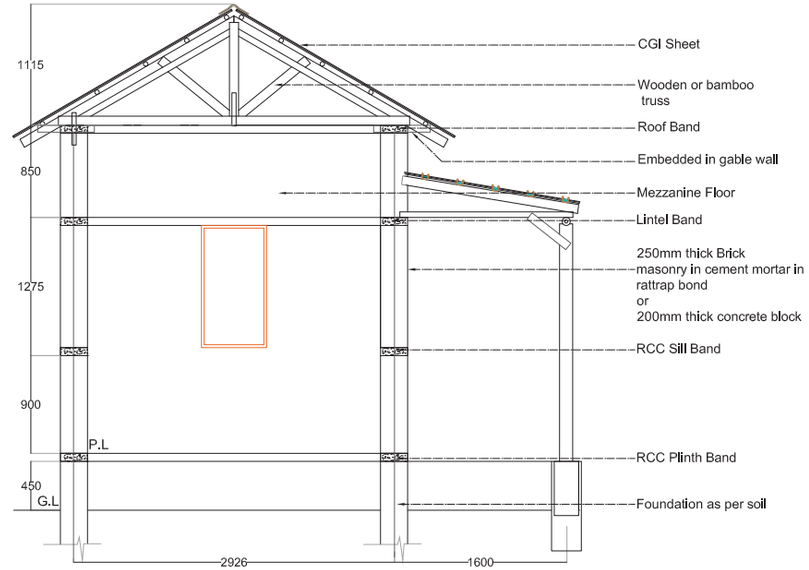
WB-04B

Area Statement:

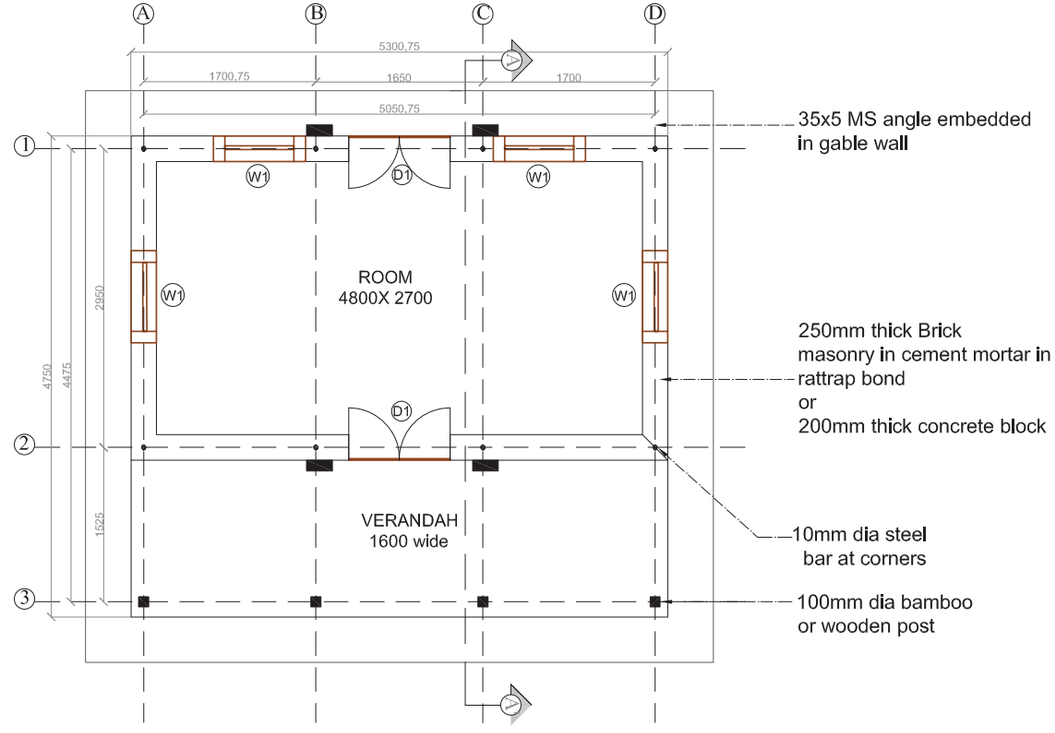
Item	Area	
	Sq.m	Sq.ft
Room	12.96	139.50
Verandah	8.22	88.48
Carpet Area	12.96	139.50
Built up Area	**25.18**	**271.04**
Built up Area	**26.00**	**279.86**

WEST BENGAL

TYPICAL SECTION



TYPICAL PLAN



SR. NO.	ITEM OF WORK	Quantity	Unit	Rate per unit (Rs)	Cost
1	**FOUNDATION**				
	Brickwork	775.00	per brick	7.00	5425.00
	Mudwork	11.40	per cum	200.00	2280.00
	RCC plinth beam	0.54	per cum	8000.00	4320.00
	Labor				8000.00
W	**TOTAL**				**20025.00**
2	**FRAMED STRUCTURE**				
	Wood for verandah columns	3.80	per cuft	500.00	1900.00
	RCC for sill band	0.26	per cuft	500.00	229.50
	RCCfor lintel band	0.26	per cuft	500.00	127.50
	RCC for roof band	0.26	per cuft	500.00	127.50
	Labor				15000.00
X	**TOTAL**				**17384.50**
3	**WALLS**				
	Brick masonry	20.00	per cu.m.	200.00	4000.00
	Doors	2.00	per pc	1000.00	1800.00
	Windows	4.00	per pc	700.00	2000.00
	Labor				8000.00
Y	**TOTAL**				**15800.00**
4	**ROOF**				
	Bamboo members 10' long	12.00	pieces	320.00	3840.00
	CGI sheet	350.00	per sqft	42.00	14700.00
	Labor				20000.00
Z	**TOTAL**				**38540.00**
A	**GRAND TOTAL (W+X+Y+Z)**	**91749.50**			
B	**TOILET COST**	**15000.00**			
	GRAND TOTAL (A+B)	**106749.50**			
	AREA (sqm)	**34.50**			
	RATE OF CONSTRUCTION (per sqm)	**3094.19**			
	AREA (sqft)	**369.15**			
	RATE OF CONSTRUCTION (per sqft)	**289.18**			

WB-04B

Cost breakup

Item	Cost (INR)
Foundation	20025.00
Framed structure & walls	33184.50
Roof	38540.00
Total	**91749.50**

WEST BENGAL

WB-04C

This typology is applicable to Zone D

Seismic zone IV and some parts in seismic zone V, heavy rainfall, flooding, water logging

Zone D comprises of the following districts

1. Uttar Dinajpur & Cooch Behar
2. The plains of Jalpaiguri & Alipurduar
3. Zone D has two typologies

Resources Available

- Timber
- Bamboo
- Jute

WEST BENGAL

- Stilted level is made out of bricks piers with a reinforcement bar at its center. It is tied at the plinth and top level and anchored into the ground acting like a frame structure.
- In fill walls are light like bamboo sheets or timber.
- Space for toilets, wash area, common courtyard and entrance enclosure has been provided for efficient material use for in fill walls by using upstanding brickwork.
- Raised plinth protected with brickwork which goes up to sill protecting the house during waterlogging.

Recommendations for Built Form		
Plan Layout	**Plinth/Floor**	**Roof Profile**
Rectangular linear plan flanked by a covered verandah or raised building structure to protect from wildlife.	Stilt structure or raised plinths.	Slopped roof pitched roof.

Recommendations for construction systems		
Components	**Recommended Specifications**	**Specific Comments**
Foundations	• 60 to 90 cm deep foundation. • Fired brick with mud/cement mortar. • Sand packed dry stone foundation. • Stone with mud/cement mortar.	• Cob/earth foundation, compressed earth blocks, adobe blocks.
Plinth	• Raised plinths. • Stilt structure.	• Plum concrete.
Wall	• Fired brick & stone – mud/cement mortar • Timber, Bamboo precast RCC frame.	• Addition of plinth & lintel band.
Wall Finish	• Mud plaster with cow dung or lime/cement. • Coating of a bituminous mix of silt & burnt rubber with local adhesive.	• Limewater over exposed masonry • Natural varnish & resin coating over wooden areas.
Roof Structure	• Timber, Bamboo, RCC, GI pipes- understructure. • Roof has an overhang for wall protection of 45-60cm.	• Roof insulation. • Corrugated bamboo & GI sheets. • Roof anchorage to its under structure & wall.
Roof Cover	• Thatch, terra-cotta flat & country tiles, corrugated GI sheets.	
Floor	• cement flooring • Timber or Bamboo (for first floor)	

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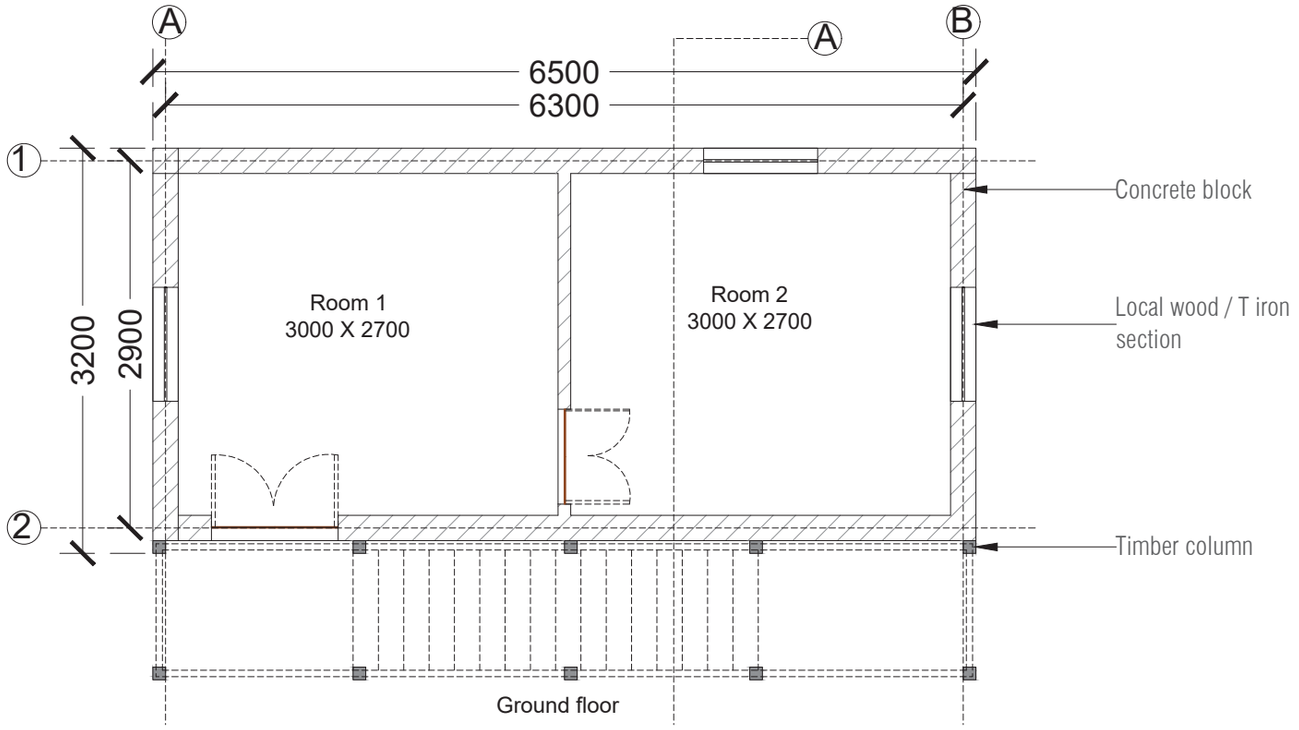

TYPICAL PLAN

WB-04C

Area Statement:

Item	Area	
	Sq.m	Sq.ft
Room 1 (Ground Floor)	8.10	87.19
Room 2 (Ground Floor)	8.10	87.19
Room 1 (First Floor)	8.10	87.19
Room 2 (First Floor)	**8.10**	**87.19**
Carpet Area	**32.94**	**354.57**
Built up Area	**40.30**	**433.79**

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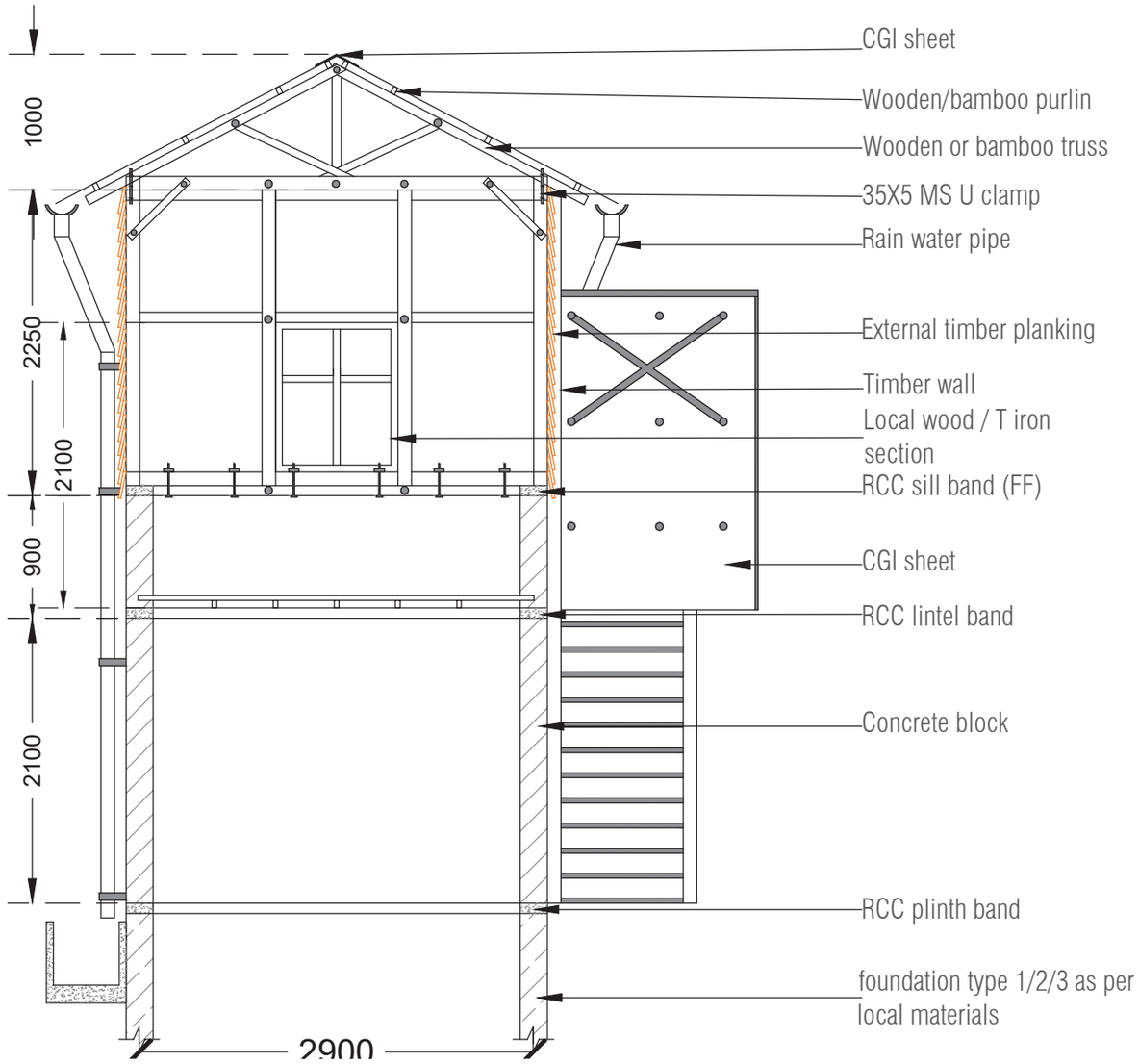
WB-04C

WEST BENGAL



TYPICAL SECTION

SR. NO.	ITEM OF WORK	Quantity	Unit	Rate per unit (Rs)	Cost
1	**FOUNDATION**				
	Brickwork	3900.00	per pc	7.00	27300.00
	Mudwork	12.30	per cum	200.00	2460.00
	RCC plinth beam	0.30	per cum	8000.00	2400.00
	Labor				3600.00
A	**TOTAL**				**35760.00**
2	**STILT LEVEL STRUCTURE & WALLS**				
	Concrete block wall	9.00	per cum	3000.00	27000.00
	RCC sill band	0.30	per cum	8000.00	2400.00
	RCC lintel band	0.30	per cum	8000.00	2400.00
	Labor				10000.00
B	**TOTAL**				**41800.00**
3	**FIRST FLOOR STAIRCASE**				
	Timber beams	34.00	per cuft	500.00	17000.00
	Timber planks	15.00	per cuft	500.00	7500.00
	Labor				8000.00
C	**TOTAL**				**32500.00**
4	**FIRST FLOOR STRUCTURE**				
	Timber frame columns (small)	21.20	per cuft	500.00	10600.00
	Timber frame columns (big)	15.00	per cuft	500.00	7500.00
	Wood for sill band	3.60	per cuft	500.00	1800.00
	Wood for lintel band	3.60	per cuft	500.00	1800.00
	Roof beam	8.00	per cuft	500.00	4000.00
	Labor				4150.00
D	**TOTAL**				**29850.00**
5	**FIRST FLOOR WALLS**				
	Timber plank walls	44.60	per sqft	500.00	22300.00
	Doors	1.00	per pc	1000.00	1000.00
	Windows	4.00	per pc	700.00	5000.00
	Labor				7500.00
E	**TOTAL**				**35800.00**
6	**ROOF**				
	Bamboo members 10' long	25.00	pieces	320.00	8000.00
	CGI sheet	215.00	per sqft	42.00	9030.00
	Labor				20000.00
F	**TOTAL**				**37030.00**
	GRAND TOTAL (A+B+C+D+E+F)	**212740.00**			
	AREA (sqm)	**30.00**			
	RATE OF CONSTRUCTION (per sqm)	**7091.33**			
	AREA (sqft)	**321.00**			
	RATE OF CONSTRUCTION (per sqft)	**662.74**			

WB-04C

Cost breakup

Item	Cost (INR)
Foundation	35760.00
Stilt Structure & walls	41800.00
First floor Structure, staircase & walls	98150.00
Roof	**37030.00**
Total	**212740.00**

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