A Compendium of Rural Housing Typologies

Volume II

Prakriti Hunar Lokvidya

Pradhan Mantri Awaas Yojana – Gramin
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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MESSAGE

Prime Minister Narendra Modi has launched Pradhan Mantri Awas Yojana (PMAY-G), a program aimed at fulfilling the dream of a house for every Indian. This program is a part of the Swachh Bharat Abhiyan, and it seeks to construct houses for the poor and vulnerable sections of society across India. The scheme is designed to provide a sustainable living environment for the poor, ensuring both quality and affordability.

The PMAY-G is implemented as a rural housing scheme, focusing on creating a sustainable living environment. The program aims to construct houses for the poor and vulnerable sections of society, ensuring both quality and affordability. The scheme is designed to provide a sustainable living environment for the poor, ensuring both quality and affordability.

As an important step towards achieving these objectives, the Ministry of Rural Development, along with the Ministry of Housing and Urban Affairs, has launched the Pradhan Mantri Awas Yojana (PMAY-G). This program is designed to construct houses for the poor and vulnerable sections of society, ensuring both quality and affordability.

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The Pradhan Mantri Awas 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 2.37 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, the Ministry of Rural Development has conducted studies in different parts 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 these 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 "PARDHI" 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 covered house designs which have been structurally validated in 10 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.

PARDHI – 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 regions 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 houses that are secure and that they are proud of.
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Foreword

Pradhan Mantri Awaas Yojana – Gramin, (PMAY-G), a flagship programme of the Ministry of Rural Development aims to fulfill 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 is committed 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 available skill-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
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 Hon’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**

- **Typology Number**
- **State Initial in this case - Uttar Pradesh**

This represents the housing typology in a particular state

The code to the housing typology proposed

**UP - 01**

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

State name

STATE
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.

**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 Typologies at a Glance

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

AS-01

AS-02

AS-03

AS-04

AS-05

AS-06
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.

• 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.

<table>
<thead>
<tr>
<th>Components</th>
<th>Recommended Specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Foundations</td>
<td>• Strip foundation where flood level is not more than 300 mm and stilted foundations where flood levels are more than 450 mm.</td>
</tr>
</tbody>
</table>
| 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 |
**Typical Plan**

- **Bamboo lira panel with ferrocement plaster (above s.l level)**
- **75 mm thick RCC lintel band**
- **75 mm thick RCC roof band**
- **Half brick wall till s.l level (900 mm)**
- **150 mm thick flush band**
- **Brick/Block masonry strip foundation**

---

**Area Statement:**

<table>
<thead>
<tr>
<th>Item</th>
<th>Area (sq.m)</th>
<th>Area (sq.ft)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Room 1+2</td>
<td>26.84</td>
<td>288.91</td>
</tr>
<tr>
<td>Kitchen</td>
<td>8.76</td>
<td>94.29</td>
</tr>
<tr>
<td>Verandah</td>
<td>13.7</td>
<td>147.7</td>
</tr>
<tr>
<td>Carpet Area</td>
<td>35.6</td>
<td>383.2</td>
</tr>
<tr>
<td>Built up Area</td>
<td>52.05</td>
<td>560.27</td>
</tr>
</tbody>
</table>

---

**Typical Section-AA’**

- **Bamboo lira panel with ferrocement plaster (above s.l level)**
- **150 mm dia. Bamboo posts**
- **RBC corner column**
- **RBC intermediate column**
- **Bamboo posts in precast RCC stubs**

---

**Zone - A**

**ASSAM**
### Cost Breakup

<table>
<thead>
<tr>
<th>Item</th>
<th>Cost (INR)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Room</td>
<td>₹ 127,172.16</td>
</tr>
<tr>
<td>Kitchen</td>
<td>₹ 17,991.10</td>
</tr>
<tr>
<td>Verandah</td>
<td>₹ 22,105.02</td>
</tr>
<tr>
<td>Total</td>
<td>₹ 167,268.28</td>
</tr>
</tbody>
</table>

### Cost Estimate

<table>
<thead>
<tr>
<th>SR. NO.</th>
<th>ITEM OF WORK</th>
<th>Room</th>
<th>Kitchen</th>
<th>Verandah</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Excavation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Wall</td>
<td>262.50 cft</td>
<td>3.08</td>
<td>808.50</td>
</tr>
<tr>
<td>2</td>
<td>RCC post, 6 No.</td>
<td>72.00 cft</td>
<td>3.08</td>
<td>221.76</td>
</tr>
<tr>
<td>3</td>
<td>Brick Soling</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Wall</td>
<td>87.50 cft</td>
<td>35.00</td>
<td>3062.50</td>
</tr>
<tr>
<td>4</td>
<td>RCC post, 6 No.</td>
<td>9.00 cft</td>
<td>35.00</td>
<td>315.00</td>
</tr>
<tr>
<td>5</td>
<td>PCC 1:4-8</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Wall</td>
<td>55.10 cft 110.17</td>
<td>110.17</td>
<td>5465.80</td>
</tr>
<tr>
<td>6</td>
<td>Brickwork foundation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>half brick wall</td>
<td>272.20 cft 170.68</td>
<td>170.68</td>
<td>2926.50</td>
</tr>
<tr>
<td>7</td>
<td>Plinth beam</td>
<td>30.60 cft 171.70</td>
<td>171.70</td>
<td>4732.50</td>
</tr>
<tr>
<td>8</td>
<td>Reinforcement steel</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Plinth beam</td>
<td>117.00 kg 60.27</td>
<td>60.27</td>
<td>6646.43</td>
</tr>
<tr>
<td>9</td>
<td>Bamboo Truss</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Bamboo members 16&quot; long</td>
<td>25.00 pieces</td>
<td>8000.00</td>
<td>8.00 pieces</td>
</tr>
<tr>
<td></td>
<td>Tools, Hardware</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Labour</td>
<td>2500</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Door (With 2nd class treated timber)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>wooden frame, section 4' x3'</td>
<td>2.80 cft 70.00</td>
<td>70.00</td>
<td>1963.50</td>
</tr>
<tr>
<td></td>
<td>wooden frame, section 4' x3'</td>
<td>6.00 cft 70.00</td>
<td>70.00</td>
<td>5606.00</td>
</tr>
<tr>
<td>11</td>
<td>Cement-sand plaster 1:6 (15 mm thick)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>internal wall</td>
<td>648.00 cft 165.00</td>
<td>165.00</td>
<td>10532.00</td>
</tr>
<tr>
<td></td>
<td>minus openings</td>
<td>564.00 cft 11.88</td>
<td>11.88</td>
<td>6051.67</td>
</tr>
</tbody>
</table>

**Total**: 127172.16  
**Total**: 17991.10  
**Total**: 22105.02
## AS-02

**Applicable to Zone A**

Zone A comprises 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

<table>
<thead>
<tr>
<th>Plan Layout</th>
<th>Plinth/Floor</th>
<th>Roof Profile</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Stilt Floor Design</td>
<td>Sloped roof</td>
</tr>
</tbody>
</table>

This design responds to the custom of stilted houses in parts of Assam.

### Recommendations for construction systems

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

Typical Plan

Typical Section-AA'

Area Statement:

<table>
<thead>
<tr>
<th>Item</th>
<th>Area Sq.m</th>
<th>Area Sq.ft</th>
</tr>
</thead>
<tbody>
<tr>
<td>Room + Kitchen</td>
<td>35.85</td>
<td>385.89</td>
</tr>
<tr>
<td>Uncovered platform</td>
<td>5.86</td>
<td>63.08</td>
</tr>
<tr>
<td>Verandah</td>
<td>10.44</td>
<td>122.38</td>
</tr>
<tr>
<td>Carpet Area</td>
<td>35.85</td>
<td>385.89</td>
</tr>
<tr>
<td>Built up Area</td>
<td>53.74</td>
<td>578.46</td>
</tr>
</tbody>
</table>
**Cost estimate**

<table>
<thead>
<tr>
<th>Item</th>
<th>Cost (INR)</th>
</tr>
</thead>
<tbody>
<tr>
<td>House</td>
<td>₹ 150,343.31</td>
</tr>
<tr>
<td>Open platform</td>
<td>₹ 5,464.70</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>₹ 155,808.01</td>
</tr>
</tbody>
</table>

**Cost breakup**

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
<th>Quantity</th>
<th>Rate per unit (Rs)</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Excavation</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RCC stub</td>
<td></td>
<td>42</td>
<td>3.08</td>
<td>129.36</td>
</tr>
<tr>
<td>RCC post</td>
<td></td>
<td>168</td>
<td>3.08</td>
<td>517.44</td>
</tr>
<tr>
<td><strong>Brick Soling</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RCC stub</td>
<td></td>
<td>0</td>
<td>35</td>
<td>0</td>
</tr>
<tr>
<td>RCC post</td>
<td></td>
<td>56</td>
<td>35</td>
<td>1960</td>
</tr>
<tr>
<td><strong>PCC 1:4:8</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RCC stub</td>
<td></td>
<td>10</td>
<td>110.17</td>
<td>991.53</td>
</tr>
<tr>
<td>RCC post</td>
<td></td>
<td>19.8</td>
<td>110.17</td>
<td>2196.77</td>
</tr>
<tr>
<td><strong>Brickwork above plinth (1:4)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>half brick wall</td>
<td></td>
<td></td>
<td>107.1</td>
<td></td>
</tr>
<tr>
<td>deduction for openings</td>
<td></td>
<td></td>
<td>6.9</td>
<td></td>
</tr>
<tr>
<td>total brickwork</td>
<td></td>
<td></td>
<td>100.2</td>
<td></td>
</tr>
<tr>
<td><strong>Wooden frame</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Horizontal member 3”x4”</td>
<td></td>
<td>21</td>
<td>750</td>
<td>15778.12</td>
</tr>
<tr>
<td>Vertical member 2”x4”</td>
<td></td>
<td>15.8</td>
<td>750</td>
<td>11480</td>
</tr>
<tr>
<td><strong>Bamboo split wall 3” thick with cement plaster</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1:4</td>
<td>467.5</td>
<td>30.76</td>
<td>11248.35</td>
<td></td>
</tr>
<tr>
<td>deduction for openings</td>
<td></td>
<td>61.2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>total wall</td>
<td></td>
<td>406.3</td>
<td>30.76</td>
<td>11248.35</td>
</tr>
<tr>
<td><strong>Concrete 1:1.5:3</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Plinth beam long,1 bracket</td>
<td></td>
<td>28.6</td>
<td>171.7</td>
<td>4413.4</td>
</tr>
<tr>
<td>Plinth beam long,2 brackets</td>
<td></td>
<td>19.6</td>
<td>171.7</td>
<td>3034.2</td>
</tr>
<tr>
<td>Plinth beam, transverse</td>
<td></td>
<td>10.5</td>
<td>171.7</td>
<td>1622.6</td>
</tr>
<tr>
<td>Full Post below plinth</td>
<td></td>
<td>34.3</td>
<td>171.7</td>
<td>5300.4</td>
</tr>
<tr>
<td>Full Post above plinth</td>
<td></td>
<td>17.5</td>
<td>171.7</td>
<td>2704.3</td>
</tr>
<tr>
<td>Post till plinth</td>
<td></td>
<td>13.7</td>
<td>171.7</td>
<td>2120.2</td>
</tr>
<tr>
<td>Stub</td>
<td></td>
<td>10</td>
<td>171.7</td>
<td>1543.3</td>
</tr>
<tr>
<td><strong>Reinforcement steel</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Plinth beam with 1 bracket</td>
<td></td>
<td>120</td>
<td>60.27</td>
<td>6509.16</td>
</tr>
<tr>
<td>Plinth beam with 2 brackets</td>
<td></td>
<td>72</td>
<td>60.27</td>
<td>3905.5</td>
</tr>
<tr>
<td>Plinth beam without bracket</td>
<td></td>
<td>16</td>
<td>60.27</td>
<td>968</td>
</tr>
<tr>
<td>Full Post</td>
<td></td>
<td>194</td>
<td>60.27</td>
<td>10523.35</td>
</tr>
<tr>
<td>Post till plinth</td>
<td></td>
<td>24</td>
<td>60.27</td>
<td>1301.8</td>
</tr>
<tr>
<td><strong>Bamboo Truss</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bamboo members 10” long</td>
<td></td>
<td>60</td>
<td>320</td>
<td>4900</td>
</tr>
<tr>
<td>Tools, hardware</td>
<td></td>
<td></td>
<td>1000</td>
<td></td>
</tr>
<tr>
<td>labor</td>
<td></td>
<td></td>
<td>2500</td>
<td></td>
</tr>
<tr>
<td><strong>GQ sheet (0.45 mm thick)</strong></td>
<td>with fitting complete</td>
<td>650</td>
<td>41.85</td>
<td>24482.25</td>
</tr>
<tr>
<td><strong>Door (With 2nd class treated timber)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>wooden frame, section 4”x3”</td>
<td></td>
<td>2.5</td>
<td>700</td>
<td>1732.5</td>
</tr>
<tr>
<td><strong>Window (With 2nd class treated timber)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>wooden frame, section 4”x3”</td>
<td></td>
<td>5.7</td>
<td>700</td>
<td>3984.75</td>
</tr>
<tr>
<td><strong>Bamboo for floor</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4” primary bamboo</td>
<td></td>
<td>195</td>
<td>12</td>
<td>2340</td>
</tr>
<tr>
<td>3” secondary bamboo</td>
<td></td>
<td>312</td>
<td>8</td>
<td>2496</td>
</tr>
<tr>
<td>Flooring bamboo</td>
<td></td>
<td>400</td>
<td>8</td>
<td>3200</td>
</tr>
<tr>
<td><strong>TOTAL AMOUNT</strong></td>
<td></td>
<td></td>
<td></td>
<td>150343.31</td>
</tr>
</tbody>
</table>

**ASSAM**
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.

AS-03

Recommendations for Built Form

<table>
<thead>
<tr>
<th>Plan Layout</th>
<th>Plinth/Floor</th>
<th>Roof Profile</th>
</tr>
</thead>
<tbody>
<tr>
<td>This plan type includes a larger area with three rooms and a front verandah and kitchen at the rear.</td>
<td>Sloped roof</td>
<td></td>
</tr>
</tbody>
</table>

Recommendations for construction systems

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

<table>
<thead>
<tr>
<th>Item</th>
<th>Area Sq.m</th>
<th>Area Sq.ft</th>
</tr>
</thead>
<tbody>
<tr>
<td>Room</td>
<td>39.10</td>
<td>420.87</td>
</tr>
<tr>
<td>Kitchen</td>
<td>11.79</td>
<td>126.91</td>
</tr>
<tr>
<td>Verandah</td>
<td>21.24</td>
<td>228.63</td>
</tr>
<tr>
<td>Carpet Area</td>
<td>50.89</td>
<td>547.78</td>
</tr>
<tr>
<td>Built up Area</td>
<td>79.53</td>
<td>856.06</td>
</tr>
</tbody>
</table>

**Typical Plan**

**Typical Section-AA’**
# Cost estimate

## Item breakup

<table>
<thead>
<tr>
<th>Item</th>
<th>Cost (INR)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Room</td>
<td>₹ 118,973.30</td>
</tr>
<tr>
<td>Kitchen</td>
<td>₹ 25,098.60</td>
</tr>
<tr>
<td>Verandah</td>
<td>₹ 32,877.50</td>
</tr>
<tr>
<td>Total</td>
<td>₹ 176,949.40</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>S NO.</th>
<th>ITEM OF WORK</th>
<th>Room</th>
<th>Kitchen+store</th>
<th>Verandah+ additional room</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Quantity</td>
<td>Unit</td>
<td>Rate per unit (Rs)</td>
</tr>
<tr>
<td>1</td>
<td>Excavation</td>
<td>231</td>
<td>cft</td>
<td>3.1</td>
</tr>
<tr>
<td>2</td>
<td>Brick Soling</td>
<td>Wall</td>
<td>77</td>
<td>sq ft</td>
</tr>
<tr>
<td>3</td>
<td>RCC 1:4:8</td>
<td>Wall</td>
<td>28.9</td>
<td>cft</td>
</tr>
<tr>
<td>4</td>
<td>Brickwork foundation (1:4)</td>
<td>half brick wall</td>
<td>25.9</td>
<td>cft</td>
</tr>
<tr>
<td>5</td>
<td>Brickwork above plinth</td>
<td>half brick wall</td>
<td>9.7</td>
<td>cft</td>
</tr>
<tr>
<td>6</td>
<td>Wooden frame</td>
<td>Horizontal member 3”x4”</td>
<td>16.5</td>
<td>cft</td>
</tr>
<tr>
<td>7</td>
<td>Bamboo split wall 3” thick with cement plaster 1:4</td>
<td>Deduction for openings</td>
<td>86.5</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Concrete 1:1:5:3</td>
<td>Plinth beam</td>
<td>19.3</td>
<td>cft</td>
</tr>
<tr>
<td>9</td>
<td>Reinforcement steel</td>
<td>Plinth beam</td>
<td>96.7</td>
<td>kg</td>
</tr>
<tr>
<td>10</td>
<td>Bamboo Truss</td>
<td>Post</td>
<td>146.9</td>
<td>kg</td>
</tr>
<tr>
<td>11</td>
<td>GCI sheet (0.45 mm thick)</td>
<td>Bamboo members 10” long</td>
<td>32</td>
<td>pieces</td>
</tr>
<tr>
<td>12</td>
<td>Door (With 2nd class treated timber)</td>
<td>GCI sheet</td>
<td>500</td>
<td>sq ft</td>
</tr>
<tr>
<td>13</td>
<td>Window (With 2nd class treated timber)</td>
<td>wooden frame, section 4”x3”</td>
<td>2.8</td>
<td>cft</td>
</tr>
</tbody>
</table>

Total cost: ₹ 176,949.40
Recommendations for Built Form

<table>
<thead>
<tr>
<th>Plan Layout</th>
<th>Plinth/Floor</th>
<th>Roof Profile</th>
</tr>
</thead>
<tbody>
<tr>
<td>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.</td>
<td>High Plinth Design</td>
<td>Sloped roof.</td>
</tr>
</tbody>
</table>

Recommendations for construction systems

<table>
<thead>
<tr>
<th>Components</th>
<th>Recommended Specifications</th>
<th>Specific Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Foundations</td>
<td>• 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</td>
<td></td>
</tr>
<tr>
<td>Plinth</td>
<td>• Plinth at 300 mm from the ground level</td>
<td></td>
</tr>
</tbody>
</table>
| Wall             | • A core space constructed using a combination of half brick masonry and wooden frame construction – this has high resistance to earthquake forces.  
|                 | • Auxiliary 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
Area Statement:

<table>
<thead>
<tr>
<th>Item</th>
<th>Area Sq.m</th>
<th>Area Sq.ft</th>
</tr>
</thead>
<tbody>
<tr>
<td>Room 1</td>
<td>28.45</td>
<td>306.24</td>
</tr>
<tr>
<td>Room 2</td>
<td>6.13</td>
<td>65.98</td>
</tr>
<tr>
<td>Kitchen</td>
<td>10.12</td>
<td>108.93</td>
</tr>
<tr>
<td>Verandah 1</td>
<td>13.42</td>
<td>144.45</td>
</tr>
<tr>
<td>Verandah 2</td>
<td>9.03</td>
<td>97.20</td>
</tr>
<tr>
<td>Carpet Area</td>
<td>45.02</td>
<td>484.60</td>
</tr>
<tr>
<td>Built up Area</td>
<td>72.26</td>
<td>777.80</td>
</tr>
</tbody>
</table>

TYPICAL PLAN

**Assam**
## AS-04

### Cost estimate

#### Cost breakup

<table>
<thead>
<tr>
<th>Item</th>
<th>Cost (INR)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Room</td>
<td>₹ 122,490.36</td>
</tr>
<tr>
<td>Kitchen</td>
<td>₹ 28,874.26</td>
</tr>
<tr>
<td>Verandah</td>
<td>₹ 35,039.99</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>₹ 186,404.61</strong></td>
</tr>
</tbody>
</table>

### Kitchenstore

<table>
<thead>
<tr>
<th>SR. NO.</th>
<th>ITEM OF WORK</th>
<th>Quantity</th>
<th>Unit</th>
<th>Rate per unit (Rs.)</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Excavation</td>
<td>376</td>
<td>cft</td>
<td>3.08</td>
<td>1158.08</td>
</tr>
<tr>
<td>2</td>
<td>BrickSoling</td>
<td>96</td>
<td>cft</td>
<td>3.08</td>
<td>295.68</td>
</tr>
<tr>
<td>4</td>
<td>Brickwork foundation (1:4)</td>
<td>136.3</td>
<td>cft</td>
<td>165.96</td>
<td>20358.31</td>
</tr>
<tr>
<td>5</td>
<td>Brickwork above plinth (1:4)</td>
<td>118.44</td>
<td>cft</td>
<td>165.96</td>
<td>843.13</td>
</tr>
<tr>
<td>6</td>
<td>Bamboo split wall in bamboo frame with mud plaster</td>
<td>517</td>
<td>Sft</td>
<td>12</td>
<td>1728</td>
</tr>
<tr>
<td>7</td>
<td>Concrete 1:1.5:3</td>
<td>160</td>
<td>RT</td>
<td>12</td>
<td>1728</td>
</tr>
<tr>
<td>8</td>
<td>Reinforcement steel</td>
<td>108.68</td>
<td>kg</td>
<td>60.27</td>
<td>5895.13</td>
</tr>
<tr>
<td>9</td>
<td>Treated bamboo truss</td>
<td>133.12</td>
<td>kg</td>
<td>60.27</td>
<td>7220.83</td>
</tr>
<tr>
<td>10</td>
<td>GI sheet (0.45 mm thick)</td>
<td>685</td>
<td>sq ft</td>
<td>41.85</td>
<td>23600.53</td>
</tr>
<tr>
<td>11</td>
<td>Door (With 2nd class treated timber)</td>
<td>4.95</td>
<td>cft</td>
<td>700</td>
<td>3463</td>
</tr>
<tr>
<td>12</td>
<td>Window (With 2nd class treated timber)</td>
<td>6.9</td>
<td>cft</td>
<td>700</td>
<td>4620</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>122490.36</strong></td>
<td></td>
<td></td>
<td></td>
<td>28874.26</td>
</tr>
</tbody>
</table>

### Verandah additional room

<table>
<thead>
<tr>
<th>Item</th>
<th>Quantity</th>
<th>Unit</th>
<th>Rate per unit (Rs.)</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>RCC post</td>
<td>32</td>
<td>cft</td>
<td>33</td>
</tr>
<tr>
<td>3</td>
<td>RCC 1:4:8</td>
<td>59.2</td>
<td>cft</td>
<td>110.17</td>
</tr>
<tr>
<td>4</td>
<td>Half brick wall</td>
<td>136.3</td>
<td>cft</td>
<td>165.96</td>
</tr>
<tr>
<td>5</td>
<td>Half brick wall</td>
<td>118.44</td>
<td>cft</td>
<td>165.96</td>
</tr>
<tr>
<td>6</td>
<td>Bamboo split wall in bamboo frame with mud plaster</td>
<td>517</td>
<td>Sft</td>
<td>12</td>
</tr>
<tr>
<td>7</td>
<td>Concrete 1:1.5:3</td>
<td>160</td>
<td>RT</td>
<td>12</td>
</tr>
<tr>
<td>8</td>
<td>Reinforcement steel</td>
<td>108.68</td>
<td>kg</td>
<td>60.27</td>
</tr>
<tr>
<td>9</td>
<td>Treated bamboo truss</td>
<td>133.12</td>
<td>kg</td>
<td>60.27</td>
</tr>
<tr>
<td>10</td>
<td>GI sheet (0.45 mm thick)</td>
<td>685</td>
<td>sq ft</td>
<td>41.85</td>
</tr>
<tr>
<td>11</td>
<td>Door (With 2nd class treated timber)</td>
<td>4.95</td>
<td>cft</td>
<td>700</td>
</tr>
<tr>
<td>12</td>
<td>Window (With 2nd class treated timber)</td>
<td>6.9</td>
<td>cft</td>
<td>700</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>122490.36</strong></td>
<td></td>
<td></td>
<td>28874.26</td>
</tr>
</tbody>
</table>
**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

---

<table>
<thead>
<tr>
<th>Recommendations for Built Form</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Plan Layout</strong></td>
</tr>
<tr>
<td>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.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Recommendations for construction systems</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Components</strong></td>
</tr>
<tr>
<td>Foundations</td>
</tr>
<tr>
<td>Plinth</td>
</tr>
</tbody>
</table>
| 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 |
**ASSAM**

**TYPICAL PLAN**

**TYPICAL SECTION - AA’**

---

**Area Statement:**

<table>
<thead>
<tr>
<th>Item</th>
<th>Sq.m</th>
<th>Sq.ft</th>
</tr>
</thead>
<tbody>
<tr>
<td>Room 1</td>
<td>7.69</td>
<td>82.78</td>
</tr>
<tr>
<td>Room 2</td>
<td>39.21</td>
<td>422.05</td>
</tr>
<tr>
<td>Kitchen 1</td>
<td>7.66</td>
<td>82.45</td>
</tr>
<tr>
<td>Kitchen 2</td>
<td>11.40</td>
<td>122.70</td>
</tr>
<tr>
<td>Verandah 1</td>
<td>7.87</td>
<td>84.71</td>
</tr>
<tr>
<td>Verandah 2</td>
<td>14.95</td>
<td>160.92</td>
</tr>
<tr>
<td>Carpet Area</td>
<td>65.96</td>
<td>709.99</td>
</tr>
<tr>
<td>Built up Area</td>
<td>94.35</td>
<td>1015.58</td>
</tr>
</tbody>
</table>
# Cost Estimate

## Cost Breakup

<table>
<thead>
<tr>
<th>Item</th>
<th>Cost (INR)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Room</td>
<td>₹ 136,246.52</td>
</tr>
<tr>
<td>Kitchen</td>
<td>₹ 30,617.28</td>
</tr>
<tr>
<td>Verandah + 2 additional rooms</td>
<td>₹ 30,383.52</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>₹ 197,247.32</strong></td>
</tr>
</tbody>
</table>

### Item of Work

<table>
<thead>
<tr>
<th>SR. NO.</th>
<th>ITEM OF WORK</th>
<th>Room</th>
<th>Kitchen</th>
<th>Verandah + 2 additional rooms</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Excavation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Wall</td>
<td>376</td>
<td>3.08</td>
<td>1158.08</td>
</tr>
<tr>
<td></td>
<td>RCC post</td>
<td>96</td>
<td>3.08</td>
<td>295.68</td>
</tr>
<tr>
<td>2</td>
<td>Bricklaying</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Wall</td>
<td>32</td>
<td>35</td>
<td>1120</td>
</tr>
<tr>
<td>3</td>
<td>RCC 1:4:8</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Wall</td>
<td>59.22</td>
<td>110.17</td>
<td>5871.84</td>
</tr>
<tr>
<td></td>
<td>RCC post</td>
<td>15.12</td>
<td>110.17</td>
<td>1499.19</td>
</tr>
<tr>
<td>4</td>
<td>Concrete block masonry in foundation (1:6)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>6&quot; thick wall</td>
<td>136.3</td>
<td>155</td>
<td>19071.44</td>
</tr>
<tr>
<td></td>
<td>Concrete block blocks</td>
<td>7</td>
<td>135</td>
<td>1085</td>
</tr>
<tr>
<td>5</td>
<td>Concrete block masonry in superstructure 1:6 mortar</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>6&quot; thick wall</td>
<td>141</td>
<td></td>
<td>2444</td>
</tr>
<tr>
<td></td>
<td>Deduction for openings</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total wall</td>
<td>132</td>
<td>165</td>
<td>19630</td>
</tr>
<tr>
<td>6</td>
<td>Bamboo mat wall in bamboo frame</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Deduction for opening</td>
<td>60.25</td>
<td>8</td>
<td>492</td>
</tr>
<tr>
<td></td>
<td>Bamboo mat</td>
<td>457</td>
<td>25</td>
<td>10276</td>
</tr>
<tr>
<td></td>
<td>Bamboo frame</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>4&quot; bamboo</td>
<td>174</td>
<td>22</td>
<td>1892</td>
</tr>
<tr>
<td></td>
<td>3&quot; bamboo</td>
<td>270</td>
<td>8</td>
<td>1994</td>
</tr>
<tr>
<td></td>
<td>Labour</td>
<td></td>
<td></td>
<td>1500</td>
</tr>
<tr>
<td>7</td>
<td>Concrete 1:1.5:3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Plinth beam</td>
<td>23.5</td>
<td>171.7</td>
<td>3631.40</td>
</tr>
<tr>
<td></td>
<td>Post</td>
<td>0</td>
<td>171.7</td>
<td>0</td>
</tr>
<tr>
<td>8</td>
<td>Reinforcement steel</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Plinth beam</td>
<td>108.68</td>
<td>60.27</td>
<td>5895.13</td>
</tr>
<tr>
<td></td>
<td>Post</td>
<td>133.12</td>
<td>60.27</td>
<td>7220.83</td>
</tr>
<tr>
<td>9</td>
<td>Treated bamboo truss</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Bamboo members 6&quot; long</td>
<td>40</td>
<td>pieces</td>
<td>12800</td>
</tr>
<tr>
<td></td>
<td>Tools, hardware</td>
<td>1000</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Labour</td>
<td>2500</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>GI sheet (0.45 mm thick)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>with fitting complete</td>
<td>685</td>
<td>sq ft</td>
<td>25800.53</td>
</tr>
<tr>
<td>11</td>
<td>Door (With 2nd class treated timber)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Wooden frame, section 4&quot;x3&quot;</td>
<td>4.95</td>
<td>700</td>
<td>3465</td>
</tr>
<tr>
<td></td>
<td>Bamboo door, 3&quot; dia</td>
<td>4.95</td>
<td>700</td>
<td>3465</td>
</tr>
<tr>
<td></td>
<td>Door frame, section 4&quot;x3&quot;</td>
<td>4.95</td>
<td>700</td>
<td>3465</td>
</tr>
<tr>
<td>12</td>
<td>Window (With 2nd class treated timber)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Wooden frame, section 4&quot;x3&quot;</td>
<td>6.6</td>
<td>700</td>
<td>4620</td>
</tr>
<tr>
<td></td>
<td>Window frame, section 4&quot;x3&quot;</td>
<td>6.6</td>
<td>700</td>
<td>4620</td>
</tr>
<tr>
<td></td>
<td>Window frame, section 4&quot;x3&quot;</td>
<td>6.6</td>
<td>700</td>
<td>4620</td>
</tr>
<tr>
<td></td>
<td>Window frame, section 4&quot;x3&quot;</td>
<td>6.6</td>
<td>700</td>
<td>4620</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>136246.52</td>
<td></td>
<td>30617.28</td>
</tr>
</tbody>
</table>
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.

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**

Recommendations for Built Form

<table>
<thead>
<tr>
<th>Plan Layout</th>
<th>Plinth/Floor</th>
<th>Roof Profile</th>
</tr>
</thead>
<tbody>
<tr>
<td>The layout of this proposed typology responds to the traditional ways of planning practised by the Karbi tribe in Assam</td>
<td>raised platform design</td>
<td>Sloped roof</td>
</tr>
</tbody>
</table>

Recommendations for construction systems

<table>
<thead>
<tr>
<th>Components</th>
<th>Recommended Specifications</th>
<th>Specific Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Foundations</td>
<td>14” x 14” Concrete Stub foundation to support improvised bamboo columns encased in the concrete stub.</td>
<td></td>
</tr>
<tr>
<td>Plinth</td>
<td>Raised platform, raised on concrete stubs and bamboo columns</td>
<td></td>
</tr>
<tr>
<td>Wall</td>
<td>interwoven bamboo mat/likra in bamboo/timber framing</td>
<td>Treatment of bamboo is proposed for durable construction</td>
</tr>
<tr>
<td></td>
<td>ferrocement plaster</td>
<td>The practice of tying large spans of bamboo mat to the structure makes the wall weak and decreases the durability of the enclosure.</td>
</tr>
<tr>
<td>Wall Finish</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Roof Structure</td>
<td>sloping roof with bamboo trusses</td>
<td></td>
</tr>
<tr>
<td>Roof Cover</td>
<td>CGI sheet</td>
<td></td>
</tr>
<tr>
<td>Floor</td>
<td>flattened bamboo/ split bamboo flooring</td>
<td></td>
</tr>
</tbody>
</table>
Area Statement:

<table>
<thead>
<tr>
<th>Item</th>
<th>Area Sq.m</th>
<th>Area Sq.ft</th>
</tr>
</thead>
<tbody>
<tr>
<td>Room 1</td>
<td>2.14</td>
<td>23.03</td>
</tr>
<tr>
<td>Room 2 + Sitting area</td>
<td>10.84</td>
<td>116.68</td>
</tr>
<tr>
<td>Kitchen + Sitting area</td>
<td>8.57</td>
<td>92.24</td>
</tr>
<tr>
<td>Verandah (bamboo platform)</td>
<td>6.46</td>
<td>69.53</td>
</tr>
<tr>
<td>Carpet Area</td>
<td>21.55</td>
<td>23.96</td>
</tr>
<tr>
<td>Built up Area</td>
<td>29.32</td>
<td>315.60</td>
</tr>
<tr>
<td>S.no</td>
<td>Item of work</td>
<td>quantity</td>
</tr>
<tr>
<td>------</td>
<td>--------------------------------------</td>
<td>----------</td>
</tr>
<tr>
<td>1</td>
<td>Excavation</td>
<td></td>
</tr>
<tr>
<td></td>
<td>14”x14” concrete stub</td>
<td>256</td>
</tr>
<tr>
<td></td>
<td>10”x10” concrete stub</td>
<td>234</td>
</tr>
<tr>
<td>2</td>
<td>PCC 1:4:8</td>
<td></td>
</tr>
<tr>
<td></td>
<td>14”x14” concrete stub</td>
<td>16</td>
</tr>
<tr>
<td></td>
<td>10”x10” concrete stub</td>
<td>14.63</td>
</tr>
<tr>
<td>3</td>
<td>Concrete 1:1:5:3 mix</td>
<td></td>
</tr>
<tr>
<td></td>
<td>14”x14” concrete stub</td>
<td>54</td>
</tr>
<tr>
<td></td>
<td>10”x10” concrete stub</td>
<td>31.59</td>
</tr>
<tr>
<td>4</td>
<td>Bamboo</td>
<td></td>
</tr>
<tr>
<td>4a</td>
<td>Vertical Posts - above plinth</td>
<td></td>
</tr>
<tr>
<td></td>
<td>4” dia bamboo</td>
<td>415</td>
</tr>
<tr>
<td></td>
<td>3” dia bamboo</td>
<td>54</td>
</tr>
<tr>
<td>4b</td>
<td>Vertical Posts - below plinth</td>
<td></td>
</tr>
<tr>
<td></td>
<td>4” bamboo</td>
<td>60</td>
</tr>
<tr>
<td>4c</td>
<td>Wall frame</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3” dia bamboo - vertical</td>
<td>160</td>
</tr>
<tr>
<td></td>
<td>3” dia bamboo horizontal</td>
<td>300</td>
</tr>
<tr>
<td>4d</td>
<td>Floor understructure</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Primary bundled beam of 2 bamboo - 3” dia</td>
<td>150</td>
</tr>
<tr>
<td></td>
<td>Secondary bamboo 3” dia</td>
<td>225</td>
</tr>
<tr>
<td></td>
<td>Tertiary 2”-3” bamboo</td>
<td>400</td>
</tr>
<tr>
<td></td>
<td>Flattened bamboo floor - 3” dia bamboo</td>
<td>520</td>
</tr>
<tr>
<td>4f</td>
<td>Truss</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Upper chord 4” dia</td>
<td>120</td>
</tr>
<tr>
<td></td>
<td>3” dia twin collars for each truss</td>
<td>150</td>
</tr>
<tr>
<td></td>
<td>Diagonal strut on each side of main bamboo columns</td>
<td>80</td>
</tr>
<tr>
<td></td>
<td>Parlin 2” dia</td>
<td>250</td>
</tr>
<tr>
<td></td>
<td>Tools, hardware</td>
<td></td>
</tr>
<tr>
<td>4g</td>
<td>Manpower for bamboo structure</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Manpower- carpenter</td>
<td>35</td>
</tr>
<tr>
<td></td>
<td>Unskilled labour</td>
<td>70</td>
</tr>
<tr>
<td>4h</td>
<td>Bamboo mat wall(incl. labour)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3” dia bamboo</td>
<td>450</td>
</tr>
<tr>
<td>5</td>
<td>GI sheet</td>
<td></td>
</tr>
<tr>
<td></td>
<td>with fitting complete</td>
<td>650</td>
</tr>
<tr>
<td>6</td>
<td>Door (With 2nd class treated timber)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>wooden frame, section 4”x3”</td>
<td>5.78</td>
</tr>
<tr>
<td></td>
<td>Window (With 2nd class treated timber)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>wooden frame, section 4”x3”</td>
<td>4.95</td>
</tr>
<tr>
<td></td>
<td>TOTAL AMOUNT</td>
<td></td>
</tr>
</tbody>
</table>

Cost breakup

<table>
<thead>
<tr>
<th>Item</th>
<th>Cost (INR)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Room</td>
<td>₹ 128,714.00</td>
</tr>
<tr>
<td>Total</td>
<td>₹ 128,714.00</td>
</tr>
</tbody>
</table>
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 HOUSING TYPOLOGIES AT A GLANCE

| TYPOLOGY | APPLICABLE HOUSING ZONES | TOTAL AREA  
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>BR-01</td>
<td>Zone A</td>
<td>33.18 Sq.m</td>
</tr>
<tr>
<td>BR-02</td>
<td>Zone A</td>
<td>33.18 Sq.m</td>
</tr>
<tr>
<td>BR-03</td>
<td>Zone B</td>
<td>30.4 Sq.m</td>
</tr>
<tr>
<td>BR-04</td>
<td>Zone B</td>
<td>33.18 Sq.m</td>
</tr>
<tr>
<td>BR-05</td>
<td>Zone G</td>
<td>33.18 Sq.m</td>
</tr>
<tr>
<td>BR-06</td>
<td>Zone C</td>
<td>33.18 Sq.m</td>
</tr>
</tbody>
</table>
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, Muzaffarpur, Saran, Hajipur, Samastipur, Darbhanga, Madhubani, Sitamarhi

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

Resources Available
- Timber And Bamboo
- Fired Bricks
- Thatch

• 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

<table>
<thead>
<tr>
<th>Recommendations for Built Form</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Plan Layout</strong></td>
</tr>
<tr>
<td>This plan type includes two room with a two way pitch roof extended over the open verandah in the front</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Recommendations for construction systems</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Components</strong></td>
</tr>
<tr>
<td>Foundations</td>
</tr>
<tr>
<td>Plinth</td>
</tr>
<tr>
<td>Wall</td>
</tr>
<tr>
<td>Upper walls are finished with Ikra walling systems with horizontal bracings</td>
</tr>
<tr>
<td>Wall Finish</td>
</tr>
<tr>
<td>Roof Structure</td>
</tr>
<tr>
<td>Covered with sheet &amp; has treated bamboo or timber under structure</td>
</tr>
<tr>
<td>Roof Cover</td>
</tr>
<tr>
<td>Floor</td>
</tr>
</tbody>
</table>
BR-01

Area Statement:

<table>
<thead>
<tr>
<th>Item</th>
<th>Area Sq.m</th>
<th>Area Sq.ft</th>
</tr>
</thead>
<tbody>
<tr>
<td>Room 1</td>
<td>9.17</td>
<td>98.70</td>
</tr>
<tr>
<td>Room 2</td>
<td>9.35</td>
<td>100.64</td>
</tr>
<tr>
<td>Verandah</td>
<td>10.03</td>
<td>107.96</td>
</tr>
<tr>
<td>Carpet Area</td>
<td>18.52</td>
<td>199.34</td>
</tr>
<tr>
<td>Built up Area</td>
<td>33.18</td>
<td>357.14</td>
</tr>
</tbody>
</table>
### Cost estimate

**BR-01**

<table>
<thead>
<tr>
<th>Item</th>
<th>Cost (INR)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Building material cost</td>
<td>₹ 96,043.00</td>
</tr>
<tr>
<td>Labour cost</td>
<td>₹ 44,500.00</td>
</tr>
<tr>
<td>Total</td>
<td>₹ 140,543.00</td>
</tr>
</tbody>
</table>

#### BUILDING MATERIAL COST

<table>
<thead>
<tr>
<th>SR. NO.</th>
<th>ITEM OF WORK</th>
<th>Quantity</th>
<th>Unit</th>
<th>Rate per unit (Rs)</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Brick</td>
<td>7033</td>
<td>pieces</td>
<td>₹ 7.00</td>
<td>₹ 49,231.00</td>
</tr>
<tr>
<td>2</td>
<td>Silver sand for filling</td>
<td>10</td>
<td>cu.m</td>
<td>₹ 70.00</td>
<td>₹ 700.00</td>
</tr>
<tr>
<td>3</td>
<td>Sand</td>
<td>6</td>
<td>cu.m</td>
<td>₹ 70.00</td>
<td>₹ 420.00</td>
</tr>
<tr>
<td>4</td>
<td>Cement</td>
<td>30</td>
<td>bags</td>
<td>₹ 400.00</td>
<td>₹ 12,000.00</td>
</tr>
<tr>
<td>5</td>
<td>Chips - 12mm</td>
<td>0.6</td>
<td>cu.m</td>
<td>₹ 86.00</td>
<td>₹ 51.60</td>
</tr>
<tr>
<td>6</td>
<td>Chips - 40mm metal</td>
<td>0.6</td>
<td>cu.m</td>
<td>₹ 86.00</td>
<td>₹ 51.60</td>
</tr>
<tr>
<td>7</td>
<td>stee 10mm dia</td>
<td>0.3</td>
<td>quintals</td>
<td>₹ 4,510.00</td>
<td>₹ 1,353.00</td>
</tr>
<tr>
<td>8</td>
<td>steel 6mm dia</td>
<td>0.08</td>
<td>quintals</td>
<td>₹ 4,510.00</td>
<td>₹ 360.80</td>
</tr>
<tr>
<td>9</td>
<td>Rod binding wire</td>
<td>5</td>
<td>kg</td>
<td>₹ 75.00</td>
<td>₹ 375.00</td>
</tr>
<tr>
<td>10</td>
<td>shuttering material</td>
<td></td>
<td>lumpsum</td>
<td></td>
<td>₹ 3,000.00</td>
</tr>
<tr>
<td>11</td>
<td>whitewash</td>
<td></td>
<td>lumpsum</td>
<td></td>
<td>₹ 3,000.00</td>
</tr>
<tr>
<td>12</td>
<td>Hardware-binding wire, nails, lashes, ropes</td>
<td></td>
<td>lumpsum</td>
<td></td>
<td>₹ 4,000.00</td>
</tr>
<tr>
<td>13</td>
<td>Doors and windows with steel frame and Ply ventilator (1' x 2')</td>
<td></td>
<td>lumpsum</td>
<td></td>
<td>₹ 8,000.000</td>
</tr>
<tr>
<td>14</td>
<td>Bamboo 3” dia and 20’ long for truss,wall and attic</td>
<td>30</td>
<td>pieces</td>
<td>₹ 200.00</td>
<td>₹ 6,000.00</td>
</tr>
<tr>
<td>15</td>
<td>Thatch roofing</td>
<td></td>
<td>lumpsum</td>
<td></td>
<td>₹ 7,500.00</td>
</tr>
<tr>
<td>X</td>
<td>TOTAL</td>
<td></td>
<td></td>
<td></td>
<td>₹ 96,043.00</td>
</tr>
</tbody>
</table>

#### LABOUR COST

<table>
<thead>
<tr>
<th>SR. NO.</th>
<th>ITEM OF WORK</th>
<th>Quantity</th>
<th>Unit</th>
<th>Rate per unit (Rs)</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Skilled spl. Mason</td>
<td>5</td>
<td>no.s</td>
<td>₹ 500.00</td>
<td>₹ 2,500.00</td>
</tr>
<tr>
<td>2</td>
<td>Skilled mason</td>
<td>40</td>
<td>no.s</td>
<td>₹ 450.00</td>
<td>₹ 18,000.00</td>
</tr>
<tr>
<td>3</td>
<td>Unskilled mason</td>
<td>60</td>
<td>no.s</td>
<td>₹ 400.00</td>
<td>₹ 24,000.00</td>
</tr>
<tr>
<td>Y</td>
<td>TOTAL</td>
<td></td>
<td></td>
<td></td>
<td>₹ 44,500.00</td>
</tr>
<tr>
<td>X + Y</td>
<td>TOTAL</td>
<td></td>
<td></td>
<td></td>
<td>₹ 140,543.00</td>
</tr>
</tbody>
</table>

#### GRAND TOTAL

| AREA (sqm) | ₹ 140,543.00 |
| RATE OF CONSTRUCTION (per sqm) | ₹ 6,388.32 |
| AREA (sqft) | 235.4 |
| RATE OF CONSTRUCTION (per sqft) | ₹ 597.04 |
- 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

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<td>Floor</td>
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<td>Verandah</td>
<td>10.03</td>
</tr>
<tr>
<td>Carpet Area</td>
<td>18.52</td>
</tr>
<tr>
<td>Built up Area</td>
<td>33.18</td>
</tr>
</tbody>
</table>

TYPICAL SECTION AA'

- 18/12 mm dia. Vertical corner Stake
- Gable wall
- Brick masonry in Full-Brick bond or Concrete block masonry

TYPICAL PLAN

- Room 3000 x 3000 mm
  - L + 450 mm
- Room 3000 x 3000 mm
  - L + 450 mm
- Verandah
  - 1500 mm wide
  - L + 450 mm

BIHAR
Alternative roofing

TYPICAL SECTION

TYPICAL PLAN

BIHAR
<table>
<thead>
<tr>
<th>SR. NO.</th>
<th>ITEM OF WORK</th>
<th>Quantity</th>
<th>Unit</th>
<th>Rate per unit (Rs)</th>
</tr>
</thead>
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<tr>
<td></td>
<td><strong>BUILDING MATERIAL COST</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Brick</td>
<td>12787</td>
<td>pieces</td>
<td>₹ 7.00</td>
</tr>
<tr>
<td>2</td>
<td>Silver sand for filling</td>
<td>10</td>
<td>cu.m</td>
<td>₹ 70.00</td>
</tr>
<tr>
<td>3</td>
<td>Sand</td>
<td>6</td>
<td>cu.m</td>
<td>₹ 70.00</td>
</tr>
<tr>
<td>4</td>
<td>Cement</td>
<td>40</td>
<td>bags</td>
<td>₹ 400.00</td>
</tr>
<tr>
<td>5</td>
<td>Chips - 12mm</td>
<td>0.6</td>
<td>cu.m</td>
<td>₹ 86.00</td>
</tr>
<tr>
<td>6</td>
<td>Chips - 40mm metal</td>
<td>0.2</td>
<td>cu.m</td>
<td>₹ 86.00</td>
</tr>
<tr>
<td>7</td>
<td>stee 10mm dia</td>
<td>0.3</td>
<td>quintals</td>
<td>₹ 4,510.00</td>
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<td>0.08</td>
<td>quintals</td>
<td>₹ 4,510.00</td>
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<tr>
<td>9</td>
<td>Rod binding wire</td>
<td>5</td>
<td>kg</td>
<td>₹ 75.00</td>
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<tr>
<td>10</td>
<td>shuttering material</td>
<td></td>
<td>lumpsum</td>
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<td>11</td>
<td>whitewash</td>
<td></td>
<td>lumpsum</td>
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<td>30</td>
<td>pieces</td>
<td>₹ 200.00</td>
</tr>
<tr>
<td>15</td>
<td>CGI Roofing (12' X 4’)</td>
<td>25</td>
<td>no.s</td>
<td>₹ 700.00</td>
</tr>
<tr>
<td><strong>X</strong></td>
<td><strong>TOTAL</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>LABOUR COST</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Skilled spl. Mason</td>
<td>5</td>
<td>no.s</td>
<td>₹ 500.00</td>
</tr>
<tr>
<td>2</td>
<td>Skilled mason</td>
<td>50</td>
<td>no.s</td>
<td>₹ 450.00</td>
</tr>
<tr>
<td>3</td>
<td>Unskilled mason</td>
<td>70</td>
<td>no.s</td>
<td>₹ 400.00</td>
</tr>
<tr>
<td><strong>Y</strong></td>
<td><strong>TOTAL</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>X + Y</strong></td>
<td><strong>TOTAL</strong></td>
<td></td>
<td></td>
<td>₹ 203,286.60</td>
</tr>
</tbody>
</table>

**GRAND TOTAL**

| AREA (sqm) | ₹ 22 |
| RATE OF CONSTRUCTION (per sqm) | ₹ 9,240.30 |
| AREA (sqft) | 235.4 |
| RATE OF CONSTRUCTION (per sqft) | ₹ 863.58 |
• 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

<table>
<thead>
<tr>
<th>Plan Layout</th>
<th>Plinth/Floor</th>
<th>Roof Profile</th>
</tr>
</thead>
<tbody>
<tr>
<td>This plan type includes two staggered rooms. With a sloping roof</td>
<td>Normal plinth design.</td>
<td>Sloped roof.</td>
</tr>
</tbody>
</table>

### Recommendations for construction systems

<table>
<thead>
<tr>
<th>Components</th>
<th>Recommended Specifications</th>
<th>Specific Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Foundations</td>
<td>• Foundations as per local conditions.</td>
<td></td>
</tr>
<tr>
<td>Plinth</td>
<td>• Minimum 30 cm high plinth level</td>
<td></td>
</tr>
<tr>
<td>Wall</td>
<td>• Brick/block masonry till sill level with Ikra walling.</td>
<td>• Thick adobe wall acts as thermal barrier</td>
</tr>
<tr>
<td></td>
<td>• precast post and MS sections</td>
<td></td>
</tr>
<tr>
<td>Wall Finish</td>
<td>• Stabilized Mud Plaster</td>
<td></td>
</tr>
<tr>
<td>Roof Structure</td>
<td>• Roof slope angle – Min 25 &amp; Max 33.</td>
<td>• Rigid connections between all roof members to increase stability.</td>
</tr>
<tr>
<td></td>
<td>• timber/bamboo understructure sloping roof</td>
<td></td>
</tr>
<tr>
<td>Roof Cover</td>
<td>• GI sheets</td>
<td></td>
</tr>
<tr>
<td>Floor</td>
<td>• PCC flooring</td>
<td></td>
</tr>
</tbody>
</table>
BIHAR BR-03
Alternative roofing

**TYPICAL PLAN**

**TYPICAL SECTION AA’**

- Med-planks
- Precast / RCC / RBC Roof
- RCC roof band
- RCC lintel band
- Brick / block masonry
- Vertical corner steel
- RCC sill band (ZONE Y)
- Local wood / T-iron section
- RCC plinth band

Select foundation as per local soil and flood conditions.
# BIHAR BR-03 Cost estimate

<table>
<thead>
<tr>
<th>Item</th>
<th>Cost (INR)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Building material cost</td>
<td>₹ 99,527.60</td>
</tr>
<tr>
<td>Labour cost</td>
<td>₹ 55,000.00</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>₹ 154,527.60</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SR. NO.</th>
<th>ITEM OF WORK</th>
<th>Quantity</th>
<th>Unit</th>
<th>Rate per unit (Rs)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>BUILDING MATERIAL COST</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Brick</td>
<td>5250</td>
<td>pieces</td>
<td>₹ 7.00</td>
</tr>
<tr>
<td>2</td>
<td>Silver sand for filling</td>
<td>10</td>
<td>cu.m</td>
<td>₹ 70.00</td>
</tr>
<tr>
<td>3</td>
<td>Sand</td>
<td>6</td>
<td>cu.m</td>
<td>₹ 70.00</td>
</tr>
<tr>
<td>4</td>
<td>Cement</td>
<td>45</td>
<td>bags</td>
<td>₹ 400.00</td>
</tr>
<tr>
<td>5</td>
<td>Chips - 12mm</td>
<td>0.6</td>
<td>cu.m</td>
<td>₹ 86.00</td>
</tr>
<tr>
<td>6</td>
<td>Chips - 40mm metal</td>
<td>0.2</td>
<td>cu.m</td>
<td>₹ 86.00</td>
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</tr>
<tr>
<td><strong>LABOUR COST</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Skilled spl. Mason</td>
<td>5</td>
<td>no.s</td>
<td>₹ 500.00</td>
</tr>
<tr>
<td>2</td>
<td>Skilled mason</td>
<td>50</td>
<td>no.s</td>
<td>₹ 450.00</td>
</tr>
<tr>
<td>3</td>
<td>Unskilled mason</td>
<td>75</td>
<td>no.s</td>
<td>₹ 400.00</td>
</tr>
<tr>
<td><strong>Y TOTAL</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>X + Y</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>GRAND TOTAL</strong></td>
<td></td>
<td></td>
<td></td>
<td>₹ 154,527.60</td>
</tr>
</tbody>
</table>

| AREA (sqm) | RATE OF CONSTRUCTION (per sqm) | ₹ 7,023.98 |
| AREA (sqft) | RATE OF CONSTRUCTION (per sqft) | ₹ 656.45 |
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

<table>
<thead>
<tr>
<th>Plan Layout</th>
<th>Plinth/Floor</th>
<th>Roof Profile</th>
</tr>
</thead>
<tbody>
<tr>
<td>Two rooms opening out to a verandah</td>
<td>Normal plinth design.</td>
<td>Filler slab flat roof</td>
</tr>
</tbody>
</table>

### Recommendations for construction systems

<table>
<thead>
<tr>
<th>Components</th>
<th>Recommended Specifications</th>
<th>Specific Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Foundations</td>
<td>• Strip footing in brick with cement mortar or as per the soil conditions</td>
<td></td>
</tr>
<tr>
<td>Plinth</td>
<td>• Minimum 30 cm high plinth level</td>
<td></td>
</tr>
<tr>
<td>Wall</td>
<td>• 200 mm thk stone concrete block masonry</td>
<td>• Thick adobe wall acts as thermal barrier</td>
</tr>
<tr>
<td>Wall Finish</td>
<td>• ferrocement plaster</td>
<td></td>
</tr>
<tr>
<td>Roof Structure</td>
<td>• Filler slab flat roof</td>
<td>• Rigid connections between all roof members to increase stability.</td>
</tr>
<tr>
<td>Roof Cover</td>
<td>• RCC</td>
<td></td>
</tr>
<tr>
<td>Floor</td>
<td>• IPC flooring</td>
<td></td>
</tr>
</tbody>
</table>
### Typical Plan

- **Parapet wall**
- **RCC beam**
- **200 mm thick stone c block masonry in 1:1 cement mortar**
- **RCC band**
- **IPC flooring**
- **Filler slab**

### Typical Section AA'

- **Entry**
- **Room**
  - 3000 x 3000 mm
  - lvl + 450 mm
- **Verandah**
  - 1500 mm wide
  - lvl + 1200 mm

### Area Statement:

<table>
<thead>
<tr>
<th>Item</th>
<th>Area</th>
<th>Sq.m</th>
<th>Sq.ft</th>
</tr>
</thead>
<tbody>
<tr>
<td>Room 1</td>
<td>9.17</td>
<td>98.70</td>
<td></td>
</tr>
<tr>
<td>Room 2</td>
<td>9.35</td>
<td>100.64</td>
<td></td>
</tr>
<tr>
<td>Verandah</td>
<td>10.03</td>
<td>107.96</td>
<td></td>
</tr>
<tr>
<td>Carpet Area</td>
<td>18.52</td>
<td>199.34</td>
<td></td>
</tr>
<tr>
<td>Built up Area</td>
<td>33.18</td>
<td>357.14</td>
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---

**BIHAR**

---

**BR-04**
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<thead>
<tr>
<th>SR. NO.</th>
<th>ITEM OF WORK</th>
<th>Quantity</th>
<th>Unit</th>
<th>Rate per unit (Rs)</th>
<th>Cost (Rs)</th>
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</thead>
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<tr>
<td></td>
<td>RCC Foundation and column</td>
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<tr>
<td></td>
<td>Excavation</td>
<td>12.96</td>
<td>cu.m</td>
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<tr>
<td></td>
<td>Cement concrete 1:4:8</td>
<td>1.3</td>
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<td>₹ 8,801.00</td>
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<tr>
<td></td>
<td>Steel reinforcement</td>
<td>288.07</td>
<td>kg</td>
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<td>₹ 13,539.29</td>
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<tr>
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<td>Wooden formwork</td>
<td>45.54</td>
<td>sq.m</td>
<td>₹ 332.00</td>
<td>₹ 15,119.28</td>
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<tr>
<td></td>
<td>R.C.C. 1:2:4</td>
<td>5.93</td>
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<td>₹ 40,146.10</td>
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<td>R.C.C. Plinth Beam</td>
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<tr>
<td></td>
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<td>₹ 620.46</td>
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<td>₹ 55,460.00</td>
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<td>Wooden formwork</td>
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<td>sq.m</td>
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<td>₹ 9,412.20</td>
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<td>R.C.C. 1:2:4</td>
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<td>₹ 23,965.80</td>
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<td></td>
<td>R.C.C. Ground floor beam</td>
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<td></td>
<td>Steel reinforcement</td>
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<td>kg</td>
<td>₹ 47.00</td>
<td>₹ 55,460.00</td>
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<tr>
<td></td>
<td>Wooden formwork</td>
<td>28.35</td>
<td>sq.m</td>
<td>₹ 332.00</td>
<td>₹ 9,412.20</td>
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<tr>
<td></td>
<td>R.C.C. 1:2:4</td>
<td>3.54</td>
<td>cu.m</td>
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<tr>
<td></td>
<td>R.C.C. Slab</td>
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<td>12.15</td>
<td>sq.m</td>
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<td>₹ 7,897.50</td>
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<tr>
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<td>Walling</td>
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</tr>
<tr>
<td></td>
<td>Bamboo wall</td>
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<td></td>
<td>₹ 11,598.00</td>
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</tr>
<tr>
<td></td>
<td>C channel sections</td>
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<td></td>
<td>₹ 23,932.00</td>
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<td>Plastering 1:4 double layer</td>
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<td>₹ 43,032.00</td>
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<tr>
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<td>Doors and windows</td>
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<td></td>
<td>₹ 10,000.00</td>
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<tr>
<td></td>
<td>Plastering - Ceiling</td>
<td></td>
<td></td>
<td>₹ 8,150.00</td>
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</tr>
<tr>
<td></td>
<td>Whitewashing</td>
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<td></td>
<td>₹ 10,000.00</td>
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</tr>
<tr>
<td></td>
<td>TOTAL</td>
<td></td>
<td></td>
<td>₹ 409,528.51</td>
<td>₹ 409,528.51</td>
</tr>
<tr>
<td></td>
<td>GRAND TOTAL</td>
<td></td>
<td></td>
<td>₹ 409,528.51</td>
<td>₹ 409,528.51</td>
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</tbody>
</table>

Cost breakup

<table>
<thead>
<tr>
<th>Item</th>
<th>Cost (INR)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>₹ 409,528.51</td>
</tr>
</tbody>
</table>

| AREA (sqm)                        | ₹ 409,528.51|
| RATE OF CONSTRUCTION (per sqm)    | ₹ 18,614.33  |
| AREA (sqft)                       | 235.4       |
| RATE OF CONSTRUCTION (per sqft)   | ₹ 1,739.71   |
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, Sheikhpura, 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.

<table>
<thead>
<tr>
<th>Recommendations for Built Form</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plan Layout</td>
</tr>
<tr>
<td>Two rooms opening out to a verandah</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Recommendations for construction systems</th>
</tr>
</thead>
<tbody>
<tr>
<td>Components</td>
</tr>
<tr>
<td>Foundations</td>
</tr>
<tr>
<td>Plinth</td>
</tr>
<tr>
<td>Wall</td>
</tr>
<tr>
<td>Wall Finish</td>
</tr>
<tr>
<td>Roof Structure</td>
</tr>
<tr>
<td>Roof Cover</td>
</tr>
<tr>
<td>Floor</td>
</tr>
</tbody>
</table>
**BR-05**

**Area Statement:**

<table>
<thead>
<tr>
<th>Item</th>
<th>Area Sq.m</th>
<th>Area Sq.ft</th>
</tr>
</thead>
<tbody>
<tr>
<td>Room 1</td>
<td>9.17</td>
<td>98.70</td>
</tr>
<tr>
<td>Room 2</td>
<td>9.35</td>
<td>100.64</td>
</tr>
<tr>
<td>Verandah</td>
<td>10.03</td>
<td>107.96</td>
</tr>
<tr>
<td>Carpet Area</td>
<td>18.52</td>
<td>199.34</td>
</tr>
<tr>
<td>Built up Area</td>
<td>33.18</td>
<td>357.14</td>
</tr>
</tbody>
</table>

**Typical Plan**

- Room dimensions: 3000 x 3000 mm lvl +450 mm
- Verandah: 1500 mm wide lvl +1200 mm

**Typical Section AA’**

- Load bearing wall in Brick/Concrete block masonry
- Earth Fill
- Continuous Shq
- RCC Bands
- Ferro concrete Cha
<table>
<thead>
<tr>
<th>Item</th>
<th>Cost (INR)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Building material cost</td>
<td>₹ 208,801.40</td>
</tr>
<tr>
<td>Labour cost</td>
<td>₹ 63,250.00</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>₹ 272,051.40</td>
</tr>
</tbody>
</table>

**SR. NO. | ITEM OF WORK | Quantity | Unit | Rate per unit (Rs) | Cost     |
<table>
<thead>
<tr>
<th></th>
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<th></th>
<th></th>
<th></th>
<th></th>
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</thead>
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<tr>
<td><strong>BUILDING MATERIAL COST</strong></td>
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<td>1</td>
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<td>pieces</td>
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<td>₹ 97,500.00</td>
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<td>Coarse sand</td>
<td>4.01</td>
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<td>₹ 4,812.00</td>
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<tr>
<td>3</td>
<td>Fine sand</td>
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<td>4</td>
<td>Cement</td>
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<td>bags</td>
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<td>5</td>
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<td>₹ 705.00</td>
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<td>7</td>
<td>stee 10mm dia</td>
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<td>quintals</td>
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<td>₹ 9,200.00</td>
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<td>8</td>
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<td>₹ 1,353.00</td>
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<td>9</td>
<td>Rod binding wire</td>
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<tr>
<td>11</td>
<td>Whitewash</td>
<td>lumpsum</td>
<td></td>
<td></td>
<td>₹ 10,000.00</td>
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<tr>
<td>12</td>
<td>Hardware-binding wire, nails, lashes, ropes</td>
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<td>₹ 3,000.00</td>
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<tr>
<td>13</td>
<td>Doors and windows with steel frame and Ply ventilator (1' x 2')</td>
<td>lumpsum</td>
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<td></td>
<td>₹ 10,000.000</td>
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<tr>
<td>14</td>
<td>Ferrocement Roof channels For 3 roof channel 3.6mx 4.5m</td>
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<td>₹ 900.00</td>
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<td></td>
<td>Labour</td>
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<td></td>
<td>Bar tenders</td>
<td>1 man days</td>
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<td>₹ 450.00</td>
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<tr>
<td><strong>X TOTAL</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>₹ 208,801.40</td>
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<tr>
<td><strong>LABOUR COST</strong></td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Skilled spl. Mason</td>
<td>5</td>
<td>no.s</td>
<td>₹ 500.00</td>
<td>₹ 2,500.00</td>
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<tr>
<td>2</td>
<td>Skilled mason</td>
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<td>no.s</td>
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<td><strong>X + Y TOTAL</strong></td>
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<td></td>
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<td>₹ 272,051.40</td>
</tr>
</tbody>
</table>

**GRAND TOTAL**

| AREA (sqm) | ₹ 22 |
| RATE OF CONSTRUCTION (per sqm) | ₹ 12,365.97 |
| AREA (sqft) | 235.4 |
| RATE OF CONSTRUCTION (per sqft) | ₹ 1,155.70 |
- 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.

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<tr>
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<th>Plinth/Floor</th>
<th>Roof Profile</th>
</tr>
</thead>
<tbody>
<tr>
<td>Two rooms opening out to a verandah</td>
<td>High plinth design.</td>
<td>GI Sheet Sloping roof</td>
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</tbody>
</table>

### Recommendations for construction systems

<table>
<thead>
<tr>
<th>Components</th>
<th>Recommended Specifications</th>
<th>Specific Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Foundations</td>
<td>• Continuous strip foundation/ as per the soil condition</td>
<td></td>
</tr>
<tr>
<td>Plinth</td>
<td>• Minimum 30 cm high plinth level</td>
<td></td>
</tr>
<tr>
<td>Wall</td>
<td>• Wall in Rat trap Brick and Cement complete with horizontal RCC bands</td>
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</tr>
<tr>
<td>Wall Finish</td>
<td>• exposed brick/ cement plaster</td>
<td></td>
</tr>
<tr>
<td>Roof Structure</td>
<td>• Sloping roof with Bamboo/timber understructure</td>
<td></td>
</tr>
<tr>
<td>Roof Cover</td>
<td>• GI sheet</td>
<td></td>
</tr>
<tr>
<td>Floor</td>
<td>• IPC flooring</td>
<td></td>
</tr>
</tbody>
</table>
**Area Statement:**

<table>
<thead>
<tr>
<th>Item</th>
<th>Area (Sq.m)</th>
<th>Area (Sq.ft)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Room 1</td>
<td>9.17</td>
<td>98.70</td>
</tr>
<tr>
<td>Room 2</td>
<td>9.35</td>
<td>100.64</td>
</tr>
<tr>
<td>Verandah</td>
<td>10.03</td>
<td>107.96</td>
</tr>
<tr>
<td>Carpet Area</td>
<td>18.52</td>
<td>199.34</td>
</tr>
<tr>
<td>Built up Area</td>
<td>33.18</td>
<td>357.14</td>
</tr>
</tbody>
</table>

**Typical Plan**

- Room: 3000 x 3000 mm lvl +450 mm
- Verandah: 1500 mm wide lvl +1200 mm
- Entry lvl 00 mm

**Typical Section AA’**

- Brick masonry in Rat
- Concrete block masonry

- 24 years kar ACC 1 80% sand
- Voids filled with 80% sand

**TYPICAL PLAN**
| SR. NO. | ITEM OF WORK | Quantity | Unit | Rate per unit (Rs) | Cost  
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>BUILDING MATERIAL COST</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Brick in foundation</td>
<td>5375</td>
<td>pieces</td>
<td>₹ 6.50</td>
<td>₹ 34,937.50</td>
</tr>
<tr>
<td>2</td>
<td>Brick in rattrap walls</td>
<td>6986</td>
<td>pieces</td>
<td>₹ 6.50</td>
<td>₹ 45,409.00</td>
</tr>
<tr>
<td>3</td>
<td>Coarse sand</td>
<td>3</td>
<td>cu.m</td>
<td>₹ 1200.00</td>
<td>₹ 3600.00</td>
</tr>
<tr>
<td>4</td>
<td>Fine sand</td>
<td>12</td>
<td>cu.m</td>
<td>₹ 700.00</td>
<td>₹ 8400.00</td>
</tr>
<tr>
<td>5</td>
<td>Cement</td>
<td>85</td>
<td>bags</td>
<td>₹ 350.00</td>
<td>₹ 29750.00</td>
</tr>
<tr>
<td>6</td>
<td>Chips - 12mm</td>
<td>0.6</td>
<td>cu.m</td>
<td>₹ 1175.00</td>
<td>₹ 705.00</td>
</tr>
<tr>
<td>7</td>
<td>Chips - 40mm metal</td>
<td>0.2</td>
<td>cu.m</td>
<td>₹ 1175.00</td>
<td>₹ 235.00</td>
</tr>
<tr>
<td>8</td>
<td>Steele 10mm dia</td>
<td>2</td>
<td>quintals</td>
<td>₹ 4600.00</td>
<td>₹ 9200.00</td>
</tr>
<tr>
<td>9</td>
<td>steel 6mm dia</td>
<td>0.3</td>
<td>quintals</td>
<td>₹ 4510.00</td>
<td>₹ 1353.00</td>
</tr>
<tr>
<td>10</td>
<td>Rod binding wire</td>
<td>5</td>
<td>kg</td>
<td>₹ 75.00</td>
<td>₹ 375.00</td>
</tr>
<tr>
<td>11</td>
<td>Shuttering material</td>
<td></td>
<td></td>
<td></td>
<td>₹ 3000.00</td>
</tr>
<tr>
<td>12</td>
<td>Whitewash</td>
<td></td>
<td></td>
<td></td>
<td>₹ 5000.00</td>
</tr>
<tr>
<td>13</td>
<td>Hardware-binding wire, nails, lashes, ropes</td>
<td></td>
<td></td>
<td></td>
<td>₹ 3000.00</td>
</tr>
<tr>
<td>14</td>
<td>Doors and windows with steel frame and Ply ventilator (1' x 2')</td>
<td></td>
<td></td>
<td></td>
<td>₹ 10000.00</td>
</tr>
<tr>
<td>15</td>
<td>CGI Sheet roof with bamboo bamboo king post / fink roof truss</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bamboo 12 ft 3 inch dia</td>
<td>50</td>
<td>no.s</td>
<td>₹ 300.00</td>
<td>₹ 15000.00</td>
<td></td>
</tr>
<tr>
<td>Nails and rubber/nylon straps</td>
<td></td>
<td></td>
<td></td>
<td>₹ 3000.00</td>
<td></td>
</tr>
<tr>
<td>CGI sheets (10 sheets 10’ long 750mm wide. 3mm- 2 bundles</td>
<td>110</td>
<td>kg</td>
<td>₹ 58.00</td>
<td>₹ 6380.00</td>
<td></td>
</tr>
<tr>
<td>Masons</td>
<td>2</td>
<td>man days</td>
<td>₹ 450.00</td>
<td>₹ 9000.00</td>
<td></td>
</tr>
<tr>
<td>Labor</td>
<td>12</td>
<td>man days</td>
<td>₹ 320.00</td>
<td>₹ 3840.00</td>
<td></td>
</tr>
<tr>
<td>Blacksmith</td>
<td>1</td>
<td>man days</td>
<td>₹ 450.00</td>
<td>₹ 450.00</td>
<td></td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td></td>
<td></td>
<td></td>
<td>₹ 184,534.50</td>
<td></td>
</tr>
</tbody>
</table>

**LABOUR COST**

<table>
<thead>
<tr>
<th>Item</th>
<th>Cost (INR)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Skilled spl. Mason</td>
<td>₹ 500.00</td>
</tr>
<tr>
<td>Skilled mason</td>
<td>₹ 450.00</td>
</tr>
<tr>
<td>Unskilled mason</td>
<td>₹ 350.00</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td>₹ 57500.00</td>
</tr>
</tbody>
</table>

| **X + Y** | ₹ 242034.50 |

**AREA TOTAL**

| Rate of construction (per sqm) | ₹ 11001.57 |
| AREA (sqm) | 22 |
| RATE OF CONSTRUCTION (per sqft) | ₹ 1028.18 |
| AREA (sqft) | 235.4 |
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

<table>
<thead>
<tr>
<th>TYPOLOGY</th>
<th>APPLICABLE HOUSING ZONES</th>
<th>TOTAL AREA Sq.m/Sq.ft</th>
</tr>
</thead>
<tbody>
<tr>
<td>CG-01</td>
<td>Zone A</td>
<td>29.79 Sq.m</td>
</tr>
<tr>
<td>CG-02</td>
<td>Zone A</td>
<td>45.67 Sq.m</td>
</tr>
<tr>
<td>CG-03</td>
<td>Zone B</td>
<td>24.09 Sq.m</td>
</tr>
<tr>
<td>CG-04</td>
<td>Zone B</td>
<td>31.08 Sq.m</td>
</tr>
<tr>
<td>CG-05</td>
<td>Zone C</td>
<td>37.57 Sq.m</td>
</tr>
<tr>
<td>CG-06</td>
<td>Zone C</td>
<td>52.61 Sq.m</td>
</tr>
<tr>
<td>CG-07</td>
<td>Zone D</td>
<td>32.11 Sq.m</td>
</tr>
<tr>
<td>CG-08</td>
<td>Zone D</td>
<td>44.80 Sq.m</td>
</tr>
<tr>
<td>CG-09</td>
<td>Zone A,B,C &amp; D</td>
<td>44.89 Sq.m</td>
</tr>
</tbody>
</table>

CG-01

CG-02

CG-03

CG-04

CG-05

CG-06

CG-07

CG-08

CG-09
**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. Suraipur
6. Balampur
7. Jashpur

**Resources Available**
- Timber And Bamboo
- Fired Brick, Fly Ash Brick
- Thatch

---

**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

<table>
<thead>
<tr>
<th>Plan Layout</th>
<th>Plinth/Floor</th>
<th>Roof Profile</th>
</tr>
</thead>
<tbody>
<tr>
<td>This plan type includes a single room with a two way pitch roof extended over the open verandah in the front</td>
<td>Normal plinth design.</td>
<td>Sloped roof.</td>
</tr>
</tbody>
</table>

### Recommendations for construction systems

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

- **450 mm wide, 100mm thick concrete apron to protect foundation**
- **230x230mm Brick Column with 10mm dia central reinforcement**
- **max 450mm Roof overhang**
- **Wattle partition for room segregation**
- **Ridge line**
- **300mm dia vent opening in gable wall**
- **230mm thick Brick wall/Rat trap/300mm thick Cob wall with ferro-cement plaster**

### TYPICAL PLAN

- **Entry**
- **Room 1740 x 2700 mm**
- **Verandah 1700 x 2700 mm**
- **Exterior Kitchen**

### Area Statement:

<table>
<thead>
<tr>
<th>Item</th>
<th>Area Sq.m</th>
<th>Area Sq.ft</th>
</tr>
</thead>
<tbody>
<tr>
<td>Room</td>
<td>8.74</td>
<td>97.52</td>
</tr>
<tr>
<td>Kitchen</td>
<td>4.57</td>
<td>49.62</td>
</tr>
<tr>
<td>Verandah</td>
<td>8.63</td>
<td>92.89</td>
</tr>
<tr>
<td>Carpet Area</td>
<td>13.66</td>
<td>147.04</td>
</tr>
<tr>
<td>Built up Area</td>
<td>29.79</td>
<td>320.66</td>
</tr>
</tbody>
</table>
## Cost Breakup

<table>
<thead>
<tr>
<th>Item</th>
<th>Cost (INR)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Foundation</td>
<td>₹ 28,581.30</td>
</tr>
<tr>
<td>Wall</td>
<td>₹ 80,878.00</td>
</tr>
<tr>
<td>Roof</td>
<td>₹ 32,800.00</td>
</tr>
<tr>
<td>Door window</td>
<td>₹ 3,000.00</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>₹ 145,259.30</td>
</tr>
</tbody>
</table>

### Table 1: Foundation Cost Estimate

<table>
<thead>
<tr>
<th>SR. NO.</th>
<th>ITEM OF WORK</th>
<th>Quantity</th>
<th>Unit</th>
<th>Rate per unit (Rs)</th>
<th>Cost (Rs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>FOUNDATION</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>P.C.C.</td>
<td>1.019</td>
<td>cu.m</td>
<td>₹ 2,700.00</td>
<td>₹ 2,751.30</td>
</tr>
<tr>
<td></td>
<td>Brickwork</td>
<td>3220</td>
<td>pieces</td>
<td>₹ 4.00</td>
<td>₹ 12,880.00</td>
</tr>
<tr>
<td></td>
<td>R.C.C. Plinth Beam</td>
<td>0.35</td>
<td>cu.m</td>
<td>₹ 7,000.00</td>
<td>₹ 2,450.00</td>
</tr>
<tr>
<td></td>
<td>Labour</td>
<td></td>
<td></td>
<td>₹ 10,500.00</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>W TOTAL</strong></td>
<td></td>
<td></td>
<td></td>
<td>₹ 28,581.30</td>
</tr>
</tbody>
</table>

### Table 2: Walls Cost Estimate

<table>
<thead>
<tr>
<th>SR. NO.</th>
<th>ITEM OF WORK</th>
<th>Quantity</th>
<th>Unit</th>
<th>Rate per unit (Rs)</th>
<th>Cost (Rs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>WALLEYS</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Bamboo Screen</td>
<td>4</td>
<td>sq.m</td>
<td>₹ 250.00</td>
<td>₹ 1,000.00</td>
</tr>
<tr>
<td></td>
<td>Brickwork</td>
<td>13744</td>
<td>pieces</td>
<td>₹ 4.00</td>
<td>₹ 54,976.00</td>
</tr>
<tr>
<td></td>
<td>Doors</td>
<td>1</td>
<td>per unit</td>
<td>₹ 1,000.00</td>
<td>₹ 1,000.00</td>
</tr>
<tr>
<td></td>
<td>RBC Columns</td>
<td>12</td>
<td>per unit</td>
<td>₹ 750.00</td>
<td>₹ 9,000.00</td>
</tr>
<tr>
<td></td>
<td>Windows</td>
<td>4</td>
<td>per unit</td>
<td>₹ 500.00</td>
<td>₹ 2,000.00</td>
</tr>
<tr>
<td></td>
<td>R.C.C. Lintel Beam</td>
<td>0.986</td>
<td>cu.m</td>
<td>₹ 7,000.00</td>
<td>₹ 6,902.00</td>
</tr>
<tr>
<td></td>
<td>Labour</td>
<td></td>
<td></td>
<td>₹ 9,000.00</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>X TOTAL</strong></td>
<td></td>
<td></td>
<td></td>
<td>₹ 83,878.00</td>
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</tbody>
</table>

### Table 3: Structure Roof Cost Estimate

<table>
<thead>
<tr>
<th>SR. NO.</th>
<th>ITEM OF WORK</th>
<th>Quantity</th>
<th>Unit</th>
<th>Rate per unit (Rs)</th>
<th>Cost (Rs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>STRUCTURE ROOF</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Timber Truss</td>
<td>5.29</td>
<td>cu.ft</td>
<td>₹ 500.00</td>
<td>₹ 2,645.00</td>
</tr>
<tr>
<td></td>
<td>Distributer Purlins (bamboo slits)</td>
<td>8</td>
<td>piece</td>
<td>₹ 320.00</td>
<td>₹ 2,560.00</td>
</tr>
<tr>
<td></td>
<td>Metal Ties</td>
<td>6</td>
<td>per kg</td>
<td>₹ 55.00</td>
<td>₹ 330.00</td>
</tr>
<tr>
<td></td>
<td>Timber roof for Verandah</td>
<td>1.65</td>
<td>cu.ft</td>
<td>₹ 500.00</td>
<td>₹ 825.00</td>
</tr>
<tr>
<td></td>
<td>Bamboo split Purlins For Verandah</td>
<td>4.5</td>
<td>piece</td>
<td>₹ 320.00</td>
<td>₹ 1,440.00</td>
</tr>
<tr>
<td></td>
<td>Labour</td>
<td></td>
<td></td>
<td>₹ 15,000.00</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Y TOTAL</strong></td>
<td></td>
<td></td>
<td></td>
<td>₹ 22,800.00</td>
</tr>
</tbody>
</table>

### Table 4: Roof Cost Estimate

<table>
<thead>
<tr>
<th>SR. NO.</th>
<th>ITEM OF WORK</th>
<th>Quantity</th>
<th>Unit</th>
<th>Rate per unit (Rs)</th>
<th>Cost (Rs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>ROOF</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Country tiles</td>
<td>5100</td>
<td>per unit</td>
<td>₹ 1.65</td>
<td>₹ 5,000.00</td>
</tr>
<tr>
<td></td>
<td>Labour</td>
<td></td>
<td></td>
<td>₹ 5,000.00</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Z TOTAL</strong></td>
<td></td>
<td></td>
<td></td>
<td>₹ 10,000.00</td>
</tr>
<tr>
<td></td>
<td><strong>W+X+Y+Z</strong></td>
<td></td>
<td></td>
<td></td>
<td>₹ 145,259.30</td>
</tr>
</tbody>
</table>

**Grand Total**: ₹ 145,259.30
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

<table>
<thead>
<tr>
<th>Plan Layout</th>
<th>Plinth/Floor</th>
<th>Roof Profile</th>
</tr>
</thead>
<tbody>
<tr>
<td>This plan type proposes two structures, two room each enclosing a courtyard in the middle</td>
<td>Normal plinth design.</td>
<td>Sloped roof.</td>
</tr>
</tbody>
</table>

### Recommendations for construction systems

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

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
Area Statement:

<table>
<thead>
<tr>
<th>Item</th>
<th>Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Room 1</td>
<td>9.69 Sq.m</td>
</tr>
<tr>
<td>Room 2</td>
<td>7.03 Sq.m</td>
</tr>
<tr>
<td>Room 3</td>
<td>9.69 Sq.m</td>
</tr>
<tr>
<td>Room 4</td>
<td>7.03 Sq.m</td>
</tr>
<tr>
<td>Verandah</td>
<td>9.44 Sq.m</td>
</tr>
<tr>
<td>Carpet Area</td>
<td>33.44 Sq.m</td>
</tr>
<tr>
<td>Built up Area</td>
<td>45.67 Sq.m</td>
</tr>
<tr>
<td>SR. NO.</td>
<td>Description</td>
</tr>
<tr>
<td>--------</td>
<td>------------------------------------------</td>
</tr>
<tr>
<td>1</td>
<td>FOUNDATION</td>
</tr>
<tr>
<td></td>
<td>P.C.C.</td>
</tr>
<tr>
<td></td>
<td>Brickwork</td>
</tr>
<tr>
<td></td>
<td>Precast R.C.C. Column holder</td>
</tr>
<tr>
<td></td>
<td>R.C.C. Lintel Beam</td>
</tr>
<tr>
<td>W</td>
<td>TOTAL</td>
</tr>
<tr>
<td>2</td>
<td>WALLS</td>
</tr>
<tr>
<td></td>
<td>Wattle and Daub</td>
</tr>
<tr>
<td></td>
<td>Doors</td>
</tr>
<tr>
<td></td>
<td>Windows</td>
</tr>
<tr>
<td></td>
<td>Labour cost</td>
</tr>
<tr>
<td>X</td>
<td>TOTAL</td>
</tr>
<tr>
<td>3</td>
<td>STRUCTURE Column, Cross bracings and Roof</td>
</tr>
<tr>
<td></td>
<td>Timber Column</td>
</tr>
<tr>
<td></td>
<td>Bamboo Roof truss</td>
</tr>
<tr>
<td></td>
<td>Bamboo Ties</td>
</tr>
<tr>
<td></td>
<td>Bamboo Purlins</td>
</tr>
<tr>
<td></td>
<td>Bamboo purlins for shaded court</td>
</tr>
<tr>
<td></td>
<td>Bamboo rafters for shaded court</td>
</tr>
<tr>
<td>Y</td>
<td>TOTAL</td>
</tr>
<tr>
<td>4</td>
<td>ROOF</td>
</tr>
<tr>
<td></td>
<td>Bamboo Sheets</td>
</tr>
<tr>
<td></td>
<td>Labour Cost</td>
</tr>
<tr>
<td>Z</td>
<td>TOTAL</td>
</tr>
<tr>
<td></td>
<td>GRAND TOTAL (W+X+Y+Z)</td>
</tr>
<tr>
<td></td>
<td>AREA (sqm)</td>
</tr>
<tr>
<td></td>
<td>RATE OF CONSTRUCTION (per sqm)</td>
</tr>
<tr>
<td></td>
<td>AREA (sqft)</td>
</tr>
<tr>
<td></td>
<td>RATE OF CONSTRUCTION (per sqft)</td>
</tr>
</tbody>
</table>
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

Resources Available
- Stone, Cob, Fired Clay

---

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

<table>
<thead>
<tr>
<th>Plan Layout</th>
<th>Plinth/Floor</th>
<th>Roof Profile</th>
</tr>
</thead>
<tbody>
<tr>
<td>This plan type includes a long single room with a two way pitch roof.</td>
<td>Normal plinth design.</td>
<td>Sloped roof.</td>
</tr>
<tr>
<td>Suitable for families who can afford only very small houses that can be</td>
<td></td>
<td></td>
</tr>
<tr>
<td>incremented later.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Recommendations for construction systems

<table>
<thead>
<tr>
<th>Components</th>
<th>Recommended Specifications</th>
<th>Specific Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Foundations</td>
<td>Brick/stone foundation in cement mortar.</td>
<td></td>
</tr>
<tr>
<td>Plinth</td>
<td>Minimum 30 cm high plinth.</td>
<td></td>
</tr>
<tr>
<td>Wall</td>
<td>230 mm thick cob walls built on 230 mm thick brick walls which terminate at sill level.</td>
<td>Thick adobe wall acts as thermal barrier</td>
</tr>
<tr>
<td>Wall Finish</td>
<td>Ferrocement plaster</td>
<td></td>
</tr>
<tr>
<td>Roof Structure</td>
<td>Roof slope angle – Min 25 &amp; Max 33.</td>
<td>Rigid connections between all roof members to increase stability.</td>
</tr>
<tr>
<td>Roof Cover</td>
<td>Country Tiles/ CGI sheet with Timber Under structure.</td>
<td>Woven reed mats can be used below the tiles as false ceiling for thermal insulation.</td>
</tr>
<tr>
<td>Floor</td>
<td>Plain cement flooring or paved bricks</td>
<td></td>
</tr>
</tbody>
</table>
Area Statement:

<table>
<thead>
<tr>
<th>Item</th>
<th>Area Sq.m</th>
<th>Area Sq.ft</th>
</tr>
</thead>
<tbody>
<tr>
<td>Room</td>
<td>9.60</td>
<td>103.33</td>
</tr>
<tr>
<td>Kitchen</td>
<td>5.57</td>
<td>60.00</td>
</tr>
<tr>
<td>Store</td>
<td>3.15</td>
<td>33.90</td>
</tr>
<tr>
<td>Carpet Area</td>
<td>18.32</td>
<td>197.20</td>
</tr>
<tr>
<td>Built up Area</td>
<td>24.09</td>
<td>259.30</td>
</tr>
</tbody>
</table>

CG-03 Alternate design
### Cost estimate

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

**Cost breakup**

<table>
<thead>
<tr>
<th>Item</th>
<th>Cost (INR)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Foundation</td>
<td>18122</td>
</tr>
<tr>
<td>Wall</td>
<td>₹ 31,640.00</td>
</tr>
<tr>
<td>Roof</td>
<td>₹ 47,737.90</td>
</tr>
<tr>
<td>Door window</td>
<td>₹ 4,000.00</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>₹ 101,499.90</td>
</tr>
</tbody>
</table>

**C H H A T T I S G A R H**
This typology is applicable to Housing Zone B

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

Resources Available
- Stone, Cob, Fired Clay

**DESIGN HIGHLIGHTS**

- Suitable for families who can afford only very small houses that can be incrementated 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

<table>
<thead>
<tr>
<th>Recommendations for Built Form</th>
<th>Plinth/Floor</th>
<th>Roof Profile</th>
</tr>
</thead>
<tbody>
<tr>
<td>It is an ‘L’ type plan, Suitable for families who can afford only very small houses that can be incrementated later.</td>
<td>Normal plinth design.</td>
<td>Sloped roof.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Recommendations for construction systems</th>
<th>Specific Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Components</td>
<td><strong>Recommended Specifications</strong></td>
</tr>
<tr>
<td>Foundations</td>
<td>Brick/stone foundation in cement mortar.</td>
</tr>
<tr>
<td>Plinth</td>
<td>Minimum 30 cm high plinth</td>
</tr>
<tr>
<td>Wall</td>
<td>230 mm thick rat trap masonry wall in bricks and cement till sill level and 230 mm thick cob walls above sill level</td>
</tr>
<tr>
<td>Wall Finish</td>
<td>Ferrocement plaster</td>
</tr>
<tr>
<td>Roof Structure</td>
<td>Roof slope angle – Min 25 &amp; Max 33.</td>
</tr>
<tr>
<td>Roof Cover</td>
<td>Country Tiles/ CGI sheet with Timber Under structure.</td>
</tr>
<tr>
<td>Floor</td>
<td>Cement flooring</td>
</tr>
</tbody>
</table>
Area Statement:

<table>
<thead>
<tr>
<th>Item</th>
<th>Area (Sq.m)</th>
<th>Area (Sq.ft)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Room 1</td>
<td>13.67</td>
<td>147.14</td>
</tr>
<tr>
<td>Room 2</td>
<td>9.19</td>
<td>98.92</td>
</tr>
<tr>
<td>Toilet</td>
<td>1.61</td>
<td>17.33</td>
</tr>
<tr>
<td>Carpet Area</td>
<td>22.86</td>
<td>246.07</td>
</tr>
<tr>
<td>Built up Area</td>
<td>31.08</td>
<td>334.55</td>
</tr>
<tr>
<td>SR. NO.</td>
<td>ITEM OF WORK</td>
<td>Quantity</td>
</tr>
<tr>
<td>---------</td>
<td>-------------------------------------</td>
<td>----------</td>
</tr>
<tr>
<td>1</td>
<td>FOUNDATION</td>
<td></td>
</tr>
<tr>
<td></td>
<td>P.C.C.</td>
<td>1.06</td>
</tr>
<tr>
<td></td>
<td>Brickwork</td>
<td>3840</td>
</tr>
<tr>
<td></td>
<td>R.C.C. Plinth Beam</td>
<td>0.34</td>
</tr>
<tr>
<td></td>
<td>Labour</td>
<td></td>
</tr>
<tr>
<td>W</td>
<td>TOTAL</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>WALLS</td>
<td></td>
</tr>
<tr>
<td></td>
<td>230mm Brick/Rattrap wall</td>
<td>3726</td>
</tr>
<tr>
<td></td>
<td>Cob Wall</td>
<td>8.38</td>
</tr>
<tr>
<td></td>
<td>Doors</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Window 1</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Labour Cost</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Lintel Beam</td>
<td>0.9</td>
</tr>
<tr>
<td>X</td>
<td>TOTAL</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>STRUCTURE ROOF</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Roof Beam</td>
<td>0.9</td>
</tr>
<tr>
<td></td>
<td>Timber truss</td>
<td>5.29</td>
</tr>
<tr>
<td></td>
<td>RBC Columns</td>
<td>12</td>
</tr>
<tr>
<td></td>
<td>Half split Bamboo</td>
<td>12</td>
</tr>
<tr>
<td></td>
<td>Bamboo Rafters</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td>Labour</td>
<td></td>
</tr>
<tr>
<td>Y</td>
<td>TOTAL</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>ROOF</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Country tiles (80 tiles per sq m)</td>
<td>2816</td>
</tr>
<tr>
<td></td>
<td>Labour cost</td>
<td></td>
</tr>
<tr>
<td>Z</td>
<td>TOTAL</td>
<td></td>
</tr>
<tr>
<td></td>
<td>GRAND TOTAL (W+X+Y+Z)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>AREA (sqm)</td>
<td>33</td>
</tr>
<tr>
<td></td>
<td>RATE OF CONSTRUCTION (per sqm)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>AREA (sqft)</td>
<td>353.1</td>
</tr>
<tr>
<td></td>
<td>RATE OF CONSTRUCTION (per sqft)</td>
<td></td>
</tr>
</tbody>
</table>
**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

<table>
<thead>
<tr>
<th>Plan Layout</th>
<th>Plinth/Floor</th>
<th>Roof Profile</th>
</tr>
</thead>
<tbody>
<tr>
<td>This plan type includes two rooms with a long parchi in the front having kitchen on one end.</td>
<td>Normal plinth design.</td>
<td>Sloped roof.</td>
</tr>
</tbody>
</table>

### Recommendations for construction systems

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

<table>
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<th>Item</th>
<th>Area</th>
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<tbody>
<tr>
<td>Room 1</td>
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<tr>
<td>Room 2</td>
<td>9.12</td>
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<tr>
<td>Kitchen</td>
<td>3.56</td>
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<tr>
<td>Verandah</td>
<td>8.48</td>
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<td>Carpet Area</td>
<td>21.8</td>
</tr>
<tr>
<td>Built up Area</td>
<td>37.57</td>
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</table>

**Typical Section AA’**

- Ridge plate
- CG/Compressed bamboo corrugated sheet
- Truss Type T1 (Timber/Bamboo)
- 300 mm dia gable wall opening
- Max 450mm roof overhang
- 230 x 200mm RCC Roof beam
- Timber tie to support mezzanine floor
- 230 x 200mm RCC Lintel beam
- 300mm thick Adobe wall with mesh reinforced ferro-cement plaster for external surface (above sill level)
- 230 mm flat trap bond in brick masonry with cement mortar up to sill level (900mm)
- 210 x 75mm RCC Pith beam
- 450 mm wide, 100mm thick concrete apron to protect foundation
- Strip foundation in brick/stone/block masonry
- 300 mm thick P.C.C layer

**Typical Plan**

- 300 mm dia circular gable wall opening
- Ridge plate
- 230 x 200mm RCC Roof beam
- Timber tie to support mezzanine floor
- CG/Compressed bamboo corrugated sheet
- Truss type T1 (Timber/Bamboo)
- 300 mm dia gable wall opening
- Max 450mm roof overhang
- 230 x 200mm RCC Roof beam
- Timber tie to support mezzanine floor
- 230 x 200mm RCC Lintel beam
- 300mm thick Adobe wall with mesh reinforced ferro-cement plaster for external surface (above sill level)
- 230 mm flat trap bond in brick masonry with cement mortar up to sill level (900mm)
- 210 x 75mm RCC Pith beam
- 450 mm wide, 100mm thick concrete apron to protect foundation
- Strip foundation in brick/stone/block masonry
- 300 mm thick P.C.C layer

**Room**

- 3200 x 2900mm

**Kitchen**

- 1800 x 1800mm

**Verandah**

- 6600 x 1800mm

**Truss Type T1 (Timber/Bamboo)**

- Timber tie to support mezzanine floor
| SR. NO. | Item | Unit | Quantity | Rate per unit (Rs) | Cost  
<table>
<thead>
<tr>
<th></th>
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</tr>
</thead>
<tbody>
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<td>FOUNDATION</td>
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<td></td>
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</tr>
<tr>
<td></td>
<td>P.C.C.</td>
<td>cum</td>
<td>1.961</td>
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<td>₹ 5,294.70</td>
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<td>₹ 4,532.50</td>
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<td></td>
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<td>₹ 3,150.00</td>
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<td></td>
<td></td>
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<td></td>
<td>Mud Plaster Stabilized with chicken mesh</td>
<td>per sqm</td>
<td>70</td>
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<td>Adobe wall</td>
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<td>RBC Columns</td>
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<td>17</td>
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<td>Windows</td>
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<td>₹ 3,000.00</td>
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<td>STRUCTURE ROOF</td>
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<tr>
<td></td>
<td>Timber Truss</td>
<td>per cu ft</td>
<td>5.29</td>
<td>₹ 500.00</td>
<td>₹ 2,645.00</td>
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<tr>
<td></td>
<td>Distributer Purlins (bamboo slits)</td>
<td>per piece</td>
<td>8</td>
<td>₹ 320.00</td>
<td>₹ 2,560.00</td>
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<tr>
<td></td>
<td>Metal Ties</td>
<td>per kg</td>
<td>6</td>
<td>₹ 55.00</td>
<td>₹ 330.00</td>
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<tr>
<td></td>
<td>Timber roof for Verandah</td>
<td>per cu ft</td>
<td>1.3</td>
<td>₹ 500.00</td>
<td>₹ 650.00</td>
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<tr>
<td></td>
<td>Bamboo split Purlins For Verandah</td>
<td>per piece</td>
<td>4.5</td>
<td>₹ 320.00</td>
<td>₹ 1,440.00</td>
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<tr>
<td></td>
<td>Labour</td>
<td></td>
<td></td>
<td></td>
<td>₹ 9,000.00</td>
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<td>Y TOTAL</td>
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<tr>
<td></td>
<td>Country tiles</td>
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<td>₹ 5,000.00</td>
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<tr>
<td></td>
<td>Z TOTAL</td>
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<td></td>
<td>₹ 10,000.00</td>
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<tr>
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<td>W+X+Y+Z</td>
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<td></td>
<td>₹ 150,426.20</td>
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</tbody>
</table>

**GRAND TOTAL**<br>₹ 150,426.20

**AREA (sqm)**<br>32

**RATE OF CONSTRUCTION (per sqm)**<br>₹ 4,700.82

**AREA (sqft)**<br>342.4

**RATE OF CONSTRUCTION (per sqft)**<br>₹ 439.33
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. Janjir Champa
9. Baloda Bazar
10. Barrabara
11. Gariyband

Resources Available:
- Burnt Clay/Fly ash

**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 |  |
Area Statement:

<table>
<thead>
<tr>
<th>Item</th>
<th>Area</th>
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</thead>
<tbody>
<tr>
<td>Room 1</td>
<td>9.69</td>
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<tr>
<td>Room 2</td>
<td>9.49</td>
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<tr>
<td>Kitchen</td>
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<tr>
<td>Store</td>
<td>5.94</td>
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<tr>
<td>Verandah 1</td>
<td>6.05</td>
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<td>Verandah 2</td>
<td>8.42</td>
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<td>Carpet Area</td>
<td>28.52</td>
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<tr>
<td>Built up Area</td>
<td>52.61</td>
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</tbody>
</table>

**TYPICAL PLAN**

- Ridge plate
- OS/M Coated Sandwich sheet
- Truss Type T1 (Timber/Aluminum)
- 230 x 75mm RCC Roof band
- 230 x 75mm RCC Lintel band
- Mezzanine floor
- 200x150mm timber tie to support mezzanine
- Burnt brick jaali for light and ventilation
- 230 mm SatTrap bond in brick masonry with cement mortar
- 115 brick work in staggered walls in cement mortar
- 238 x 75mm RCC P.W.H. Band
- 450 mm wide, 100mm thick concrete apron to protect foundation
- Timber post to support verandah roof
- 450 mm wide, 100mm thick concrete apron to protect foundation
- Toothing left in alternate brick course for extension
- Windows fixed to brick wall with metal holdfast
- Burnt brick pavers for light and ventilation
- 230 mm SatTrap bond in brick masonry with cement mortar
- 115 brick work in staggered walls in cement mortar
- 400mm thick P.C.C. layer
## CG-06 Cost estimate

### Cost Breakup

<table>
<thead>
<tr>
<th>Item</th>
<th>Cost (INR)</th>
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<tbody>
<tr>
<td>Foundation</td>
<td>₹46,043.60</td>
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<tr>
<td>Wall</td>
<td>₹123,846.00</td>
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<tr>
<td>Roof</td>
<td>₹45,395.00</td>
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<tr>
<td>Door window</td>
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<tr>
<td><strong>Total</strong></td>
<td><strong>₹222,284.60</strong></td>
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</table>

### Item of Work

<table>
<thead>
<tr>
<th>SR. NO.</th>
<th>ITEM OF WORK</th>
<th>Unit</th>
<th>Quantity</th>
<th>Rate per unit (Rs)</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td><strong>FOUNDATION</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>P.C.C.</td>
<td></td>
<td>cu.m</td>
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<td>Brickwork</td>
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<td>₹5,000.00</td>
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<tr>
<td><strong>W</strong></td>
<td><strong>TOTAL</strong></td>
<td></td>
<td></td>
<td></td>
<td>₹46,043.60</td>
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<td><strong>WALLS</strong></td>
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</tr>
<tr>
<td>Mud Plaster Stabalized with chicken mesh</td>
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<td>80</td>
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<tr>
<td>Windows</td>
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<td>per unit</td>
<td>8</td>
<td>₹500.00</td>
<td>₹4,000.00</td>
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<td></td>
</tr>
<tr>
<td>Timber Truss</td>
<td></td>
<td>per cu ft</td>
<td>5.29</td>
<td>₹500.00</td>
<td>₹2,645.00</td>
</tr>
<tr>
<td>Distributer Purlins (bamboo slits)</td>
<td>per piece</td>
<td></td>
<td></td>
<td>₹320.00</td>
<td>₹2,560.00</td>
</tr>
<tr>
<td>Metal Ties</td>
<td></td>
<td>per kg</td>
<td>6</td>
<td>₹55.00</td>
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<td>Timber roof for Verandah</td>
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<td>per cu ft</td>
<td>2.6</td>
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<td>Bamboo split Purlins For Verandah</td>
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<td>₹320.00</td>
<td>₹2,560.00</td>
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<tr>
<td>Labour</td>
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<td>₹5,000.00</td>
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<td>₹5,000.00</td>
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<td><strong>GRAND TOTAL</strong></td>
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### Area Breakup

<table>
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<th>AREA (sqm)</th>
<th>Rate of Construction (per sqm)</th>
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<td>50</td>
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<table>
<thead>
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<th>AREA (sqft)</th>
<th>Rate of Construction (per sqft)</th>
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<tbody>
<tr>
<td>535</td>
<td>₹415.49</td>
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</table>
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.

<table>
<thead>
<tr>
<th>Recommendations for Built Form</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Plan Layout</strong></td>
</tr>
<tr>
<td>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.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Recommendations for construction systems</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Components</strong></td>
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<tr>
<td>Foundation</td>
</tr>
<tr>
<td>Plinth</td>
</tr>
<tr>
<td>Wall</td>
</tr>
<tr>
<td>Wall Finish</td>
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<tr>
<td>Roof Structure</td>
</tr>
<tr>
<td>Roof Cover</td>
</tr>
<tr>
<td>Floor</td>
</tr>
</tbody>
</table>

This typology is applicable to Housing Zone D

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

Zone D comprise 5 districts:
1. Sukhma
2. Bijapur
3. Dantewada
4. Kondagaon
5. Narayanpur

Resources Available:
- Bamboo, stone, mud
Area Statement:

<table>
<thead>
<tr>
<th>Item</th>
<th>Area (Sq.m)</th>
<th>Area (Sq.ft)</th>
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<tbody>
<tr>
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<td>8.00</td>
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<tr>
<td>Room 2</td>
<td>8.00</td>
<td>86.11</td>
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<td>Kitchen</td>
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<td>3.30</td>
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<td>Carpet Area</td>
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<td>Built up Area</td>
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<td>345.63</td>
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Typical Section AA'
<table>
<thead>
<tr>
<th>SR. NO.</th>
<th>Unit</th>
<th>Quantity</th>
<th>Rate per unit (Rs)</th>
<th>Cost</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>FOUNDATION</td>
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<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>P.C.C.</td>
<td>cu.m</td>
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<td>Brickwork</td>
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<td>₹ 4.00</td>
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<td>₹ 7,000.00</td>
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<td>Labour</td>
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<tr>
<td>W</td>
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<td></td>
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<tr>
<td>2</td>
<td>WALLS</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>Mud Plaster Stabalized with chicken me</td>
<td>per sqm</td>
<td>23</td>
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</tr>
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<td></td>
<td>Windows</td>
<td>per unit</td>
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<tr>
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<td>0.564</td>
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<td></td>
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<tr>
<td></td>
<td>Timber Truss</td>
<td>per cu ft</td>
<td>5.29</td>
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<tr>
<td></td>
<td>Distributer Purlins (bamboo slits)</td>
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</tr>
<tr>
<td></td>
<td>Metal Ties</td>
<td>per kg</td>
<td>6</td>
<td>₹ 55.00</td>
</tr>
<tr>
<td></td>
<td>Timber roof for Verandah</td>
<td>per cu ft</td>
<td>1.3</td>
<td>₹ 500.00</td>
</tr>
<tr>
<td></td>
<td>Bamboo split Purlins For Verandah</td>
<td>per piece</td>
<td>4</td>
<td>₹ 320.00</td>
</tr>
<tr>
<td></td>
<td>Labour</td>
<td></td>
<td></td>
<td>₹ 4,000.00</td>
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<tr>
<td>Y</td>
<td>TOTAL</td>
<td></td>
<td></td>
<td>₹ 11,465.00</td>
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<tr>
<td>4</td>
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<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Bamboo corrugated sheet</td>
<td>per unit</td>
<td>24</td>
<td>₹ 1,000.00</td>
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<tr>
<td></td>
<td>Labour</td>
<td></td>
<td></td>
<td>₹ 5,000.00</td>
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<tr>
<td>Z</td>
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<tr>
<td>W+X+Y+Z</td>
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<tr>
<td></td>
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<td>44</td>
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<td>RATE OF CONSTRUCTION (per sqm)</td>
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<td>AREA (sqft)</td>
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<td>RATE OF CONSTRUCTION (per sqft)</td>
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<td>₹ 376.36</td>
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CG-08

This typology is applicable to Housing Zone D

Zone D highlights: monthly mean temperatures are above 18 degree celsius. 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

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.

<table>
<thead>
<tr>
<th>Recommendations for Built Form</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Plan Layout</strong></td>
</tr>
<tr>
<td>layout- Two rooms and a kitchen.</td>
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</table>

<table>
<thead>
<tr>
<th>Recommendations for construction systems</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Components</strong></td>
</tr>
<tr>
<td>Foundation</td>
</tr>
<tr>
<td>Plinth</td>
</tr>
<tr>
<td>Wall</td>
</tr>
<tr>
<td>Wall Finish</td>
</tr>
<tr>
<td>Roof Structure</td>
</tr>
<tr>
<td>Roof Cover</td>
</tr>
<tr>
<td>Floor</td>
</tr>
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</table>
## CG - 08
### Cost estimate

#### Cost breakup

<table>
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<tr>
<th>Item</th>
<th>Cost (INR)</th>
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<tbody>
<tr>
<td>Foundation</td>
<td>₹ 42,000.00</td>
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<tr>
<td>Wall</td>
<td>₹ 89,590.00</td>
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<tr>
<td>Roof</td>
<td>₹ 47,900.00</td>
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<tr>
<td>Door window</td>
<td>₹ 7,000.00</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>₹ 186,490.00</td>
</tr>
</tbody>
</table>

### SR. NO. | ITEM OF WORK                                      | Unit  | Quantity | Rate per unit (Rs) | Cost   |
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
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<td>FOUNDATION</td>
<td></td>
<td></td>
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</tr>
<tr>
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<td>₹ 2,800.00</td>
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<td></td>
<td></td>
<td>₹ 5,000.00</td>
</tr>
<tr>
<td></td>
<td><strong>TOTAL</strong></td>
<td></td>
<td></td>
<td></td>
<td>₹ 42,000.00</td>
</tr>
<tr>
<td>2</td>
<td>WALLS</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Mud Plaster Stabalized with chicken mesh</td>
<td>per sqm</td>
<td>24</td>
<td>₹ 200.00</td>
<td>₹ 4,800.00</td>
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<tr>
<td></td>
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<td>pieces</td>
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<td>Doors</td>
<td>per unit</td>
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<td>₹ 1,000.00</td>
<td>₹ 4,000.00</td>
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<tr>
<td></td>
<td>Windows</td>
<td>per unit</td>
<td>6</td>
<td>₹ 500.00</td>
<td>₹ 3,000.00</td>
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<tr>
<td></td>
<td>R.C.C Lintel Beam</td>
<td>cu.m</td>
<td>0.598</td>
<td>₹ 7,000.00</td>
<td>₹ 4,186.00</td>
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<tr>
<td></td>
<td>Labour</td>
<td></td>
<td></td>
<td></td>
<td>₹ 7,000.00</td>
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<td><strong>TOTAL</strong></td>
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<td>₹ 96,590.00</td>
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<td>STRUCTURE ROOF</td>
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<td></td>
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</tr>
<tr>
<td></td>
<td>Timber Truss</td>
<td>per cu ft</td>
<td>18.1</td>
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<tr>
<td></td>
<td>Metal Ties</td>
<td>per kg</td>
<td>6</td>
<td>₹ 55.00</td>
<td>₹ 330.00</td>
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<tr>
<td></td>
<td>Bamboo split Purlins For Verandah</td>
<td>per piece</td>
<td>11</td>
<td>₹ 320.00</td>
<td>₹ 3,520.00</td>
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<tr>
<td></td>
<td>Labour</td>
<td></td>
<td></td>
<td></td>
<td>₹ 4,000.00</td>
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<tr>
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<td><strong>TOTAL</strong></td>
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<td></td>
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<td>28</td>
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<td>₹ 28,000.00</td>
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<tr>
<td></td>
<td>Labour</td>
<td></td>
<td></td>
<td></td>
<td>₹ 3,000.00</td>
</tr>
<tr>
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<td></td>
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<td><strong>W+X+Y+Z</strong></td>
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<td>₹ 186,490.00</td>
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<tr>
<td></td>
<td><strong>GRAND TOTAL</strong></td>
<td></td>
<td></td>
<td></td>
<td>₹ 186,490.00</td>
</tr>
</tbody>
</table>

**Area (sqm):** 51
**Rate of construction (per sqm):** ₹ 3,656.67

**Area (sqft):** 545.7
**Rate of construction (per sqft):** ₹ 341.74
### DESIGN HIGHLIGHTS
- Incrementality is inbuilt in the design. Evolves into a house locally known as chaurhandi. 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.

<table>
<thead>
<tr>
<th>Components</th>
<th>Recommended Specifications</th>
<th>Specific Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Foundation</td>
<td>• strip foundation with brick and cement mortar</td>
<td>• In case of black cotton soil should go to 60 cm, else minimum 45 cm.</td>
</tr>
<tr>
<td>Pinth</td>
<td>• Minimum 30 cm high plinth</td>
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</tr>
<tr>
<td>Wall</td>
<td>• 230 mm unburnt clay brick wall with mesh reinforcement.</td>
<td>• Thick adobe wall acts as thermal barrier</td>
</tr>
<tr>
<td>Wall Finish</td>
<td>• Ferrocement plaster</td>
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</tr>
<tr>
<td>Roof Structure</td>
<td>• Roof slope angle – min 25 &amp; max 33.</td>
<td>• Rigid connections between all roof members to increase stability.</td>
</tr>
<tr>
<td>Roof Cover</td>
<td>• Compressed corrugated bamboo mat sheets/ CGI sheets/ country tiles with locally available timber with bamboo as under-structure.</td>
<td>• Woven reed mats can be used below the tiles as false ceiling for thermal insulation.</td>
</tr>
<tr>
<td>Floor</td>
<td>• cement flooring</td>
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</tr>
<tr>
<td>SR. NO.</td>
<td>ITEM OF WORK</td>
<td>Unit</td>
</tr>
<tr>
<td>-------</td>
<td>---------------------------</td>
<td>------</td>
</tr>
<tr>
<td>1</td>
<td>FOUNDATION</td>
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</tr>
<tr>
<td></td>
<td>P.C.C.</td>
<td>cu.m</td>
</tr>
<tr>
<td></td>
<td>Brickwork</td>
<td>pieces</td>
</tr>
<tr>
<td></td>
<td>R.C.C. Plinth Beam</td>
<td>cu.m</td>
</tr>
<tr>
<td></td>
<td>Labour</td>
<td></td>
</tr>
<tr>
<td>W</td>
<td>TOTAL</td>
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</tr>
<tr>
<td>2</td>
<td>WALLS</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Adobe</td>
<td>cu.m</td>
</tr>
<tr>
<td></td>
<td>Brickwork</td>
<td>pieces</td>
</tr>
<tr>
<td></td>
<td>Doors</td>
<td>per unit</td>
</tr>
<tr>
<td></td>
<td>Windows</td>
<td>per unit</td>
</tr>
<tr>
<td></td>
<td>R.C.C. Lintel Beam</td>
<td>cu.m</td>
</tr>
<tr>
<td></td>
<td>Labour</td>
<td></td>
</tr>
<tr>
<td>X</td>
<td>TOTAL</td>
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</tr>
<tr>
<td>3</td>
<td>STRUCTURE ROOF</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Timber Truss</td>
<td>per cu ft</td>
</tr>
<tr>
<td></td>
<td>Distributer Purlins (bamboo slits)</td>
<td>per piece</td>
</tr>
<tr>
<td></td>
<td>Metal Ties</td>
<td>per kg</td>
</tr>
<tr>
<td></td>
<td>Timber roof for Verandah</td>
<td>per cu ft</td>
</tr>
<tr>
<td></td>
<td>Bamboo split Purlins For Verandah</td>
<td>per piece</td>
</tr>
<tr>
<td></td>
<td>Labour</td>
<td></td>
</tr>
<tr>
<td>Y</td>
<td>TOTAL</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>ROOF</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Bamboo corrugated sheet</td>
<td>per unit</td>
</tr>
<tr>
<td></td>
<td>Labour</td>
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<td>Z</td>
<td>TOTAL</td>
<td></td>
</tr>
<tr>
<td>W+X+Y+Z</td>
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<td></td>
</tr>
</tbody>
</table>

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 |
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 house 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.
The type designs recommended for the Zone A of the State responds to different physical & socio-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

### Recommendations for Built Form

<table>
<thead>
<tr>
<th>Plan Layout</th>
<th>Plinth/Floor</th>
<th>Roof Profile</th>
</tr>
</thead>
<tbody>
<tr>
<td>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.</td>
<td>Normal Plinth design</td>
<td>Sloped roof</td>
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</table>

### Recommendations for construction systems

<table>
<thead>
<tr>
<th>Components</th>
<th>Recommended Specifications</th>
<th>Specific Comments</th>
</tr>
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<tbody>
<tr>
<td>Foundation</td>
<td>Continuous Coursed rubble foundation with cement mortar.</td>
<td></td>
</tr>
<tr>
<td>Plinth</td>
<td>Crushed stone with sand filling with 75 mm Plinth band provided at plinth level</td>
<td></td>
</tr>
<tr>
<td>Wall</td>
<td>350 mm thick coursed rubble wall.</td>
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</tr>
<tr>
<td>Wall Finish</td>
<td>Cement plaster with pointing.</td>
<td></td>
</tr>
<tr>
<td>Roof Structure</td>
<td>It consists of three parts. Roof with Bamboo under structure, Bamboo loft, false ceiling with thermocol insulation.</td>
<td></td>
</tr>
<tr>
<td>Roof Cover</td>
<td>Roof Cover 0.63 mm CGI sheet</td>
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</tr>
<tr>
<td>Floor</td>
<td>Mud Flooring</td>
<td></td>
</tr>
<tr>
<td>Door and Windows</td>
<td>Wooden shutter door and window.</td>
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<tr>
<td>Trombe Wall</td>
<td>Proposed on the southern facade.</td>
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</tr>
<tr>
<td>S. No.</td>
<td>Components</td>
<td>Amount (₹)</td>
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<td>Bands</td>
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<td>Roofing including false ceiling</td>
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<td>Wood work(D/W) &amp; D/W painting</td>
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<td>9</td>
<td>Pointing &amp; Plastering</td>
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<td>10</td>
<td>Plinth protection</td>
<td>1,021.7</td>
</tr>
<tr>
<td>11</td>
<td>Trombe wall</td>
<td>6,830.6</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>1,31,828/-</td>
</tr>
<tr>
<td></td>
<td>Cost Indexing 30% extra with respect to HP SOR 2009</td>
<td>39,548.48</td>
</tr>
<tr>
<td></td>
<td><strong>Total cost of core house(approx.)</strong></td>
<td>1,71,377/-</td>
</tr>
</tbody>
</table>
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

<table>
<thead>
<tr>
<th>Plan Layout</th>
<th>Plinth/Floor</th>
<th>Roof Profile</th>
</tr>
</thead>
<tbody>
<tr>
<td>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.</td>
<td>Normal Plinth design</td>
<td>Sloped roof</td>
</tr>
</tbody>
</table>

Recommendations for construction systems

<table>
<thead>
<tr>
<th>Components</th>
<th>Recommended Specifications</th>
<th>Specific Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Foundation</td>
<td>Continuous Coursed rubble foundation with cement mortar.</td>
<td></td>
</tr>
<tr>
<td>Plinth</td>
<td>Crushed stone with sand filling with 75 mm Plinth band provided at plinth level.</td>
<td></td>
</tr>
<tr>
<td>Wall</td>
<td>350 mm thick coursed rubble wall.</td>
<td></td>
</tr>
<tr>
<td>Wall Finish</td>
<td>Cement plaster with pointing.</td>
<td></td>
</tr>
<tr>
<td>Roof Structure</td>
<td>It consists of three parts. Roof with Bamboo under structure, Bamboo loft, false ceiling with thermocol insulation.</td>
<td></td>
</tr>
<tr>
<td>Roof Cover</td>
<td>Roof Cover 0.63 mm CGI sheet</td>
<td></td>
</tr>
<tr>
<td>Floor</td>
<td>Mud Flooring</td>
<td></td>
</tr>
<tr>
<td>Door and Windows</td>
<td>Mild steel door and window</td>
<td></td>
</tr>
</tbody>
</table>
HP-02A

Total Cost `1,63,289/-

HIMACHAL PRADESH

TYPICAL PLAN

TYPICAL SECTION

RIDGE LVL +4450MM
EAVE LVL +3300MM
LINTEL LVL +2520MM
SILL LVL +1350 MM
PLINHT LVL +450MM
GROUND LVL ±000MM

350MM THICK LOAD WALL IN COURSED RUBBLE MASONRY
100MM Ø HALF SPLIT BAMBOO PURFLN @ 500MM
150MM BAMBOO RIDGE BEAM
150MM Ø HALF SPLIT BAMBOO HOLDER
150MM Ø BAMBOO Rafter TIED TO HOLDER
75MM THICK LINTEL BAND
75MM THICK SILL BAND
75MM Ø BAMBOO POST
75MM THICK PLINTH BAND
PCC FOUNDATION FOR BAMBOO POST
600MM THICK P.C.C.

KITCHEN 2.6M X 3.2M LVL +300MM
ROOM 2.6M X 3.2M LVL +300MM
VERANDAH 2.9M X 1.6M LVL +300MM
TOILET 2.6M X 1.6M LVL +300MM

350 X 350 MM POST WITH 10MM Ø REIN.
22 GAUGE CGI SHEET ANCHORED WITH BAMBOO PURFLN
100MM Ø HALF SPLIT BAMBOO HOLDER
75MM Ø BAMBOO Rafter TIED TO HOLDER
75MM THICK LINTEL BAND
75MM THICK SILL BAND
75MM Ø BAMBOO POST
75MM THICK PLINTH BAND
PCC FOUNDATION FOR BAMBOO POST
600MM THICK P.C.C.

TYPICAL PLAN

Total Cost `1,63,289/-

HIMACHAL PRADESH
### Cost Estimation of the Core House for Zone B, HP-B-01

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Components</th>
<th>Amount (₹)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Excavation</td>
<td>2,550.405</td>
</tr>
<tr>
<td>2</td>
<td>Filling</td>
<td>585.75</td>
</tr>
<tr>
<td>3</td>
<td>Foundation and Plinth masonry</td>
<td>37,235.41</td>
</tr>
<tr>
<td>4</td>
<td>Flooring Finish</td>
<td>100</td>
</tr>
<tr>
<td>5</td>
<td>Superstructure</td>
<td>40,502.89</td>
</tr>
<tr>
<td>6</td>
<td>Bands</td>
<td>8,386.1</td>
</tr>
<tr>
<td>7</td>
<td>Roofing</td>
<td>20,619.3</td>
</tr>
<tr>
<td>8</td>
<td>D/W &amp; D/W painting</td>
<td>8,632.6</td>
</tr>
<tr>
<td>9</td>
<td>Pointing &amp; Plastering</td>
<td>5,942.35</td>
</tr>
<tr>
<td>10</td>
<td>Plinth protection</td>
<td>1,052.3</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td><strong>1,25,607/-</strong></td>
</tr>
<tr>
<td></td>
<td>Cost Indexing 30% extra with respect to HP SOR 2009</td>
<td><strong>37,682.13</strong></td>
</tr>
<tr>
<td></td>
<td><strong>Total cost of core house(approx.)</strong>*</td>
<td><strong>1,63,289/-</strong></td>
</tr>
</tbody>
</table>
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

### Recommendations for Built Form

<table>
<thead>
<tr>
<th>Plan Layout</th>
<th>Plinth/Floor</th>
<th>Roof Profile</th>
</tr>
</thead>
<tbody>
<tr>
<td>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.</td>
<td>Normal Plinth design</td>
<td>Sloped roof</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Recommendations for construction systems</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Components</strong></td>
</tr>
<tr>
<td>Foundations</td>
</tr>
<tr>
<td>Plinth</td>
</tr>
<tr>
<td>Wall</td>
</tr>
<tr>
<td>Wall Finish</td>
</tr>
<tr>
<td>Roof Structure</td>
</tr>
<tr>
<td>Roof Cover</td>
</tr>
<tr>
<td>Floor</td>
</tr>
<tr>
<td>Door and Windows</td>
</tr>
</tbody>
</table>
HIMACHAL PRADESH

**TYPICAL PLAN**

- **PARAPET LVL +3925MM**
- **EAVE LVL +3325MM**
- **LINTEL LVL +2625MM**
- **SILL LVL +1350 MM**
- **PLINTH LVL +450MM**
- **GROUND LVL ±00MM**

---

**TYPICAL SECTION**

- **350MM THICK PARAPET WALL**
- **100 MM THICK FILLER SLAB**
- **22 GAUGE GGI SHEET ANCHORED WITH BAMBOO PURLIN**
- **75MM Ø BAMBOO RAFTER**
- **75MM Ø HALF SPLIT BAMBOO PURLIN TIED TO HOLDER**
- **75MM THICK LINTEL BAND**
- **150MM Ø BAMBOO POST**
- **75MM THICK PLINTH BAND**
- **PCC FOUNDATION FOR BAMBOO POST**
- **100MM THICK P.C.C.**
### Cost Estimation of the Core House for Zone B, HP-B-02

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Components</th>
<th>Amount (₹)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Excavation</td>
<td>2,550,405</td>
</tr>
<tr>
<td>2</td>
<td>Filling</td>
<td>390.50</td>
</tr>
<tr>
<td>3</td>
<td>Foundation and Plinth masonry</td>
<td>37,235.41</td>
</tr>
<tr>
<td>4</td>
<td>Flooring Finish</td>
<td>100</td>
</tr>
<tr>
<td>5</td>
<td>Superstructure</td>
<td>44,548.5</td>
</tr>
<tr>
<td>6</td>
<td>Bands</td>
<td>7,197.8</td>
</tr>
<tr>
<td>7</td>
<td>Roofing</td>
<td>8,944.55</td>
</tr>
<tr>
<td>8</td>
<td>D/W &amp; D/W painting</td>
<td>7,684</td>
</tr>
<tr>
<td>9</td>
<td>Pointing &amp; Plastering</td>
<td>5,246.2</td>
</tr>
<tr>
<td>10</td>
<td>Plinth protection</td>
<td>1,052.3</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td><strong>1,14,949.7/-</strong></td>
</tr>
<tr>
<td></td>
<td>Cost Indexing 30% extra with respect to HP SOR 2009</td>
<td><strong>34,484.90</strong></td>
</tr>
<tr>
<td></td>
<td><strong>Total cost of core house(approx.)</strong></td>
<td><strong>1,49,435/-</strong></td>
</tr>
</tbody>
</table>
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

<table>
<thead>
<tr>
<th>Plan Layout</th>
<th>Plinth/Floor</th>
<th>Roof Profile</th>
</tr>
</thead>
<tbody>
<tr>
<td>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 &amp; bath.</td>
<td>Normal Plinth design</td>
<td>Sloped roof</td>
</tr>
</tbody>
</table>

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

HP-03A

Total Cost ` 1,08,561/-

Typical Plan

Typical Section
### Cost Estimation of the Core House for Zone C, HP-C-01

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Components</th>
<th>Amount (₹)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Excavation</td>
<td>2,102.95</td>
</tr>
<tr>
<td>2</td>
<td>Filling</td>
<td>642.16</td>
</tr>
<tr>
<td>3</td>
<td>Foundation and Plinth masonry</td>
<td>31,279.15</td>
</tr>
<tr>
<td>4</td>
<td>Flooring Finish</td>
<td>100.00</td>
</tr>
<tr>
<td>5</td>
<td>Superstructure</td>
<td>12,698.15</td>
</tr>
<tr>
<td>6</td>
<td>Bands</td>
<td>6,074.10</td>
</tr>
<tr>
<td>7</td>
<td>Roofing</td>
<td>17,177.65</td>
</tr>
<tr>
<td>8</td>
<td>Wood work(D/W) &amp; D/W painting</td>
<td>8,647.90</td>
</tr>
<tr>
<td>9</td>
<td>Pointing &amp; Plastering</td>
<td>3,772.30</td>
</tr>
<tr>
<td>10</td>
<td>Plinth protection</td>
<td>3,772.30</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td><strong>83,508.41</strong></td>
</tr>
</tbody>
</table>

Cost Indexing 30% extra with respect to HP SOR 2009: 25,052.52

Total cost of core house (approx.)*: 1,08,561/-

---

*Cost Indexing 30% extra with respect to HP SOR 2009.
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

---

### Recommendations for Built Form

<table>
<thead>
<tr>
<th>Plan Layout</th>
<th>Plinth/Floor</th>
<th>Roof Profile</th>
</tr>
</thead>
<tbody>
<tr>
<td>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.</td>
<td>Normal Plinth design</td>
<td>Sloped roof</td>
</tr>
</tbody>
</table>

### Recommendations for construction systems

<table>
<thead>
<tr>
<th>Components</th>
<th>Recommended Specifications</th>
<th>Specific Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Foundations</td>
<td>Continuous Coursed rubble foundation with cement mortar.</td>
<td></td>
</tr>
<tr>
<td>Plinth</td>
<td>Crushed stone with sand filling with 75 mm Plinth band provided at plinth level</td>
<td></td>
</tr>
<tr>
<td>Wall</td>
<td>230 mm thick coursed rubble wall.</td>
<td></td>
</tr>
<tr>
<td>Wall Finsh</td>
<td>Cement plaster with pointing.</td>
<td></td>
</tr>
<tr>
<td>Roof Structure</td>
<td>Bamboo under structure, Bamboo loft space for storage</td>
<td></td>
</tr>
<tr>
<td>Roof Cover</td>
<td>0.63 mm CGI sheet on the core house and toilet, Thatch roof on Verandah.</td>
<td></td>
</tr>
<tr>
<td>Floor</td>
<td>Mud Flooring</td>
<td></td>
</tr>
<tr>
<td>Door and Windows</td>
<td>Mild steel door and window</td>
<td></td>
</tr>
</tbody>
</table>
Total Cost ` 1,14,355/-

- 350MM THICK PARAPET WALL
- 100 MM THICK FILLER SLAB
- 22 GAUGE CGI SHEET ANCHORED WITH BAMBOO PURLIN
- 75MM Ø BAMBOO RAFTER
- 75MM Ø HALF SPLIT BAMBOO PURLIN TIED TO HOLDER
- 75MM THICK LINTEL BAND
- 150MM Ø BAMBOO POST
- 75MM THICK PLINTH BAND
- PCC FOUNDATION FOR BAMBOO POST

- 100MM THICK P.C.C.

**TYPICAL PLAN**

**TYPICAL SECTION**

**HIMACHAL PRADESH**

**HP-03B**
### Cost Estimation of the Core House for Zone C, HP-C-02

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Components</th>
<th>Amount (₹)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Excavation</td>
<td>1,872.37</td>
</tr>
<tr>
<td>2</td>
<td>Filling</td>
<td>804.50</td>
</tr>
<tr>
<td>3</td>
<td>Foundation and Plinth masonry</td>
<td>27,322.72</td>
</tr>
<tr>
<td>4</td>
<td>Flooring Finish</td>
<td>100</td>
</tr>
<tr>
<td>5</td>
<td>Superstructure</td>
<td>23,104.48</td>
</tr>
<tr>
<td>6</td>
<td>Bands</td>
<td>5,316.75</td>
</tr>
<tr>
<td>7</td>
<td>Roofing</td>
<td>18,457.75</td>
</tr>
<tr>
<td>8</td>
<td>D/W including Painting</td>
<td>6,244.1</td>
</tr>
<tr>
<td>9</td>
<td>Pointing &amp; Plastering</td>
<td>3,744.25</td>
</tr>
<tr>
<td>10</td>
<td>Plinth protection</td>
<td>998.75</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td><strong>87,965.7/-</strong></td>
</tr>
<tr>
<td></td>
<td>Cost Indexing 30% extra with respect to HP SOR 2009</td>
<td><strong>26,389.7</strong></td>
</tr>
<tr>
<td></td>
<td><strong>Total cost of core house (approx.)</strong></td>
<td><strong>1,14,355/-</strong></td>
</tr>
</tbody>
</table>
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 HOUSING TYPOLOGIES AT A GLANCE

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

JH-01

JH-02

JH-03

JH-04

JH-05

JH-06

JH-07

JH-08
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

<table>
<thead>
<tr>
<th>Plan Layout</th>
<th>Plinth/Floor</th>
<th>Roof Profile</th>
</tr>
</thead>
</table>

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

<table>
<thead>
<tr>
<th>Item</th>
<th>Area 1</th>
<th>Area 2</th>
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<tbody>
<tr>
<td>Room</td>
<td>11.92</td>
<td>128.30</td>
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<tr>
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<td>2.97</td>
<td>31.97</td>
</tr>
<tr>
<td>Verandah</td>
<td>3.63</td>
<td>39.07</td>
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<td>Carpet Area</td>
<td>14.89</td>
<td>160.27</td>
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<tr>
<td>Built up Area</td>
<td>22.51</td>
<td>242.30</td>
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</tbody>
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Typical Plan

Typical Section AA'

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
### Cost Breakup

<table>
<thead>
<tr>
<th>Item</th>
<th>Cost (INR)</th>
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<tbody>
<tr>
<td>Foundation</td>
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<tr>
<td>Roof</td>
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<tr>
<td>Door window</td>
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### JH-01 Cost Estimate

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<th>SR. NO.</th>
<th>ITEM OF WORK</th>
<th>Unit</th>
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<th>Rate per unit (Rs)</th>
<th>Cost</th>
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<td>1</td>
<td>FOUNDATION</td>
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<tr>
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<td>2828</td>
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<td>₹ 11,312.00</td>
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<tr>
<td></td>
<td>R.C.C. Plinth Beam</td>
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<td>6.6475</td>
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<td>Plinth Filling for Room</td>
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<td>Labour</td>
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<td></td>
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<td>WALLS</td>
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<tr>
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<td>Wattle and daub panel(Tall)</td>
<td>per sqm</td>
<td>48.56</td>
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<td>₹ 6,534.00</td>
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<td>Wattle and daub panel(short)</td>
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<td>Mud plaster for daub 1 (short)</td>
<td>per sqm</td>
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<td>Mud plaster for daub 2 ( tall)</td>
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<td>Stabilized mud plaster for exterior 1 (short)</td>
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<tr>
<td></td>
<td>Windows</td>
<td>per unit</td>
<td>5</td>
<td>₹ 500.00</td>
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<td></td>
<td>RBIC Columns</td>
<td>per unit</td>
<td>6</td>
<td>₹ 800.00</td>
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<td>X TOTAL</td>
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<td>₹ 36,563.20</td>
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<td>3</td>
<td>STRUCTURE ROOF</td>
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<td>Bamboo columns 1</td>
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<td>Bamboo columns 2</td>
<td>pieces</td>
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<td>Bamboo perimeter tie</td>
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<td>Bamboo for splits</td>
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<td>Bamboo for intermediate floor</td>
<td>pieces</td>
<td>5</td>
<td>₹ 150.00</td>
<td>₹ 750.00</td>
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<tr>
<td></td>
<td>Labour</td>
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<td></td>
<td></td>
<td>₹ 12,000.00</td>
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<tr>
<td>Y TOTAL</td>
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<td></td>
<td></td>
<td>₹ 25,500.00</td>
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<td>ROOF</td>
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<tr>
<td></td>
<td>CGI Sheets</td>
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<td>18</td>
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<td>₹ 14,400.00</td>
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<tr>
<td></td>
<td>Thatch</td>
<td>cum</td>
<td>13.12</td>
<td>₹ 100.00</td>
<td>₹ 1,312.00</td>
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<td>W+X+Y+Z</td>
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<td>₹ 106,696.40</td>
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</tbody>
</table>

**GRAND TOTAL**

<table>
<thead>
<tr>
<th>ITEM</th>
<th>Cost (INR)</th>
</tr>
</thead>
<tbody>
<tr>
<td>AREA (sqm)</td>
<td>₹ 106,696.40</td>
</tr>
<tr>
<td>RATE OF CONSTRUCTION (per sqm)</td>
<td>₹ 4,390.80</td>
</tr>
<tr>
<td>AREA (sqft)</td>
<td>260.01</td>
</tr>
<tr>
<td>RATE OF CONSTRUCTION (per sqft)</td>
<td>₹ 410.35</td>
</tr>
</tbody>
</table>
Highlights of the Prototype

- Built up area of the house is optimised to 28 sq.m. with possibility for incremental growth up to 3 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 while the other acts as a space for ancillary activities such as cooking & rearing cattle.

<table>
<thead>
<tr>
<th>Plan Layout</th>
<th>Plinth/Floor</th>
<th>Roof Profile</th>
</tr>
</thead>
<tbody>
<tr>
<td>Large open spaces in form of central courtyard, backyard or front yard. Elements like tulsi-kyari and intermediate loft - incorporated. Loft design structure.</td>
<td>High Plinth Floor</td>
<td>Flat roof.</td>
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</table>

<table>
<thead>
<tr>
<th>Components</th>
<th>Recommended Specifications</th>
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<tbody>
<tr>
<td>Foundations</td>
<td>Stone foundation with cement-sand packing</td>
</tr>
<tr>
<td>Plinth</td>
<td>Minimum (300 mm or 150mm more than last 50 year flood level)</td>
</tr>
<tr>
<td>Wall</td>
<td>Cob walls with mesh and cement plaster</td>
</tr>
<tr>
<td>Wall Finish</td>
<td>Stabilised mud plaster</td>
</tr>
<tr>
<td>Roof Structure</td>
<td>Roof slope angle – min. 25 &amp; max 45. Bamboo understructure</td>
</tr>
<tr>
<td>Roof Cover</td>
<td>CGI sheets</td>
</tr>
<tr>
<td>Floor</td>
<td>Cement flooring</td>
</tr>
<tr>
<td>Door and Windows</td>
<td>Mild steel door and window</td>
</tr>
</tbody>
</table>

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 a 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-existent 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. Saraikela
8. Simdega
9. West Singhbhum
10. East Singhbhum
### Area Statement:

<table>
<thead>
<tr>
<th>Item</th>
<th>Area</th>
<th>Sq.m</th>
<th>Sq.ft</th>
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<tbody>
<tr>
<td>Room</td>
<td>12.28</td>
<td>132.18</td>
<td></td>
</tr>
<tr>
<td>Verandah</td>
<td>9.08</td>
<td>97.74</td>
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<tr>
<td>Carpet Area</td>
<td>12.28</td>
<td>132.18</td>
<td></td>
</tr>
<tr>
<td>Built up Area</td>
<td>27.14</td>
<td>292.13</td>
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</tbody>
</table>

---

**TYPICAL PLAN**

**TYPICAL SECTION AA’**

- Roof projection of 450 mm
- J-hooks connecting timber purlins to roofing sheet
- Bamboo Truss Type T2
- Timber tie to support mezzanine floor
- 300 x 200 RC Roof beam
- 300 x 200 RC Lintel beam
- Cob walls with mesh and ferro-cement plaster on external surface (above sill level)
- Sill level
- 350 x 75 RC Plinth band
- 450 mm wide Concrete Apron
- P.C.C layer
- Random Rubble Foundation

---

**Room**

- 2000 x 4500 mm

**Verandah**

- 2000 x 4500 mm

- 230 x 230 Brick column with 10mm dia central reinforcement

---

**Random Rubble Foundation**

- Roof projection of 450 mm from wall
- 450 mm wide, 100mm thick concrete apron
- Bamboo truss type T2
- Cob walls with mesh and ferro-cement plaster on external surface (above sill level)
**J H-02**

**Cost estimate**

<table>
<thead>
<tr>
<th>Item</th>
<th>Cost (INR)</th>
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</thead>
<tbody>
<tr>
<td>Foundation</td>
<td>₹ 32,801.00</td>
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<tr>
<td>Wall</td>
<td>₹ 14,483.25</td>
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<tr>
<td>Roof</td>
<td>₹ 43,164.00</td>
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<tr>
<td>Door window</td>
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<tr>
<td><strong>Total</strong></td>
<td>₹ 92,448.25</td>
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</table>

### Walls

<table>
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<tr>
<th>Item</th>
<th>Unit</th>
<th>Quantity</th>
<th>Rate per unit (Rs)</th>
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</thead>
<tbody>
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<td>Labour</td>
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<td><strong>TOTAL</strong></td>
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<td></td>
<td></td>
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### Doors and Window

<table>
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</thead>
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<td>₹ 1,000.00</td>
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### Structure Roof

<table>
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<tr>
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<th>Unit</th>
<th>Quantity</th>
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<th>Cost</th>
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</thead>
<tbody>
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<td>₹ 1,000.00</td>
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### Roof

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### Column W+X+Y+Z

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<td>AREA (sqm)</td>
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</tr>
<tr>
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<tr>
<td>RATE OF CONSTRUCTION (per sqft)</td>
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</table>
This typology is applicable to Zone B

Zone B highlights: presence of mining related 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

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 around 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 tuhsi- kari and intermediate loft – incorporated. Loft design structure. | High Plinth Floor | Sloped roof. |

| Recommendations for construction systems |
| Components | 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. |
| | Covered with sheet & has treated timber understructure. |
| Roof Cover | Bengal tile. |
| Floor | Mud filling over plastic sheet |
**Area Statement:**

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<thead>
<tr>
<th>Item</th>
<th>Area</th>
<th>Sq.ft</th>
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<tbody>
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## Cost Breakup

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<tr>
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<tr>
<td>Doors/Windows</td>
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<tr>
<td>Floor and Roof</td>
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<td><strong>Total</strong></td>
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## Cost Estimate

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<th>SR. NO.</th>
<th>CS Area (sqm)</th>
<th>Quantity</th>
<th>Volume (cum)</th>
<th>Material Cost (₹)</th>
<th>Rate per unit (₹/sqm)</th>
<th>Unit</th>
<th>Labour Cost (₹)</th>
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<td><strong>3 INTERMEDIATE FLOOR AND ROOF</strong></td>
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<td></td>
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**Highlights of the Prototype - JH-D-01**

- Built up area of the house is optimised to 51.90 sq.m. with possibility 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 around a central courtyard.
- Courtyard ventilates the surrounding rooms, provides a space for interaction.

**Recommendations for Built Form**

<table>
<thead>
<tr>
<th>Plan Layout</th>
<th>Plinth/Floor</th>
<th>Roof Profile</th>
</tr>
</thead>
</table>

**Recommendations for construction systems**

<table>
<thead>
<tr>
<th>Components</th>
<th>Recommended Specifications</th>
</tr>
</thead>
</table>
| 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 |

**This typology is applicable to Zone B & C**

**Zone B highlights:** presence of mining related 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
Area Statement:

<table>
<thead>
<tr>
<th>Item</th>
<th>Sq.m</th>
<th>Sq.ft</th>
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</thead>
<tbody>
<tr>
<td>Room 1</td>
<td>7.36</td>
<td>79.22</td>
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<tr>
<td>Room 2</td>
<td>12.61</td>
<td>135.73</td>
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<td>Carpet Area</td>
<td>19.97</td>
<td>214.96</td>
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<tr>
<td>Built up Area</td>
<td>26.24</td>
<td>282.45</td>
</tr>
</tbody>
</table>

**TYPICAL PLAN**

- Room 2000 x 3500 mm
- Room 3500 x 3500 mm

**TYPICAL SECTION AA’**

- 300mm thick stone concrete masonry block
- Wooden Truss type T2
- 450mm wide apron
- Roof Overhang
- Cement plaster or painting on exterior walls

- 75mm thick Lintel band
- Mezzanine Floor
- 450 mm Roof overhang
- Bengal hills/CGI sheet
- Bamboo/Timber Truss Type T2
- 75mm thick Roof Band
- Stone Foundation
- P.C.C layer
- 450mm wide concrete apron
- Pinth Band
- 300mm thick stone concrete masonry block

**J HARKHAND**

**J H-04**
<table>
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<th>SR. NO.</th>
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<th>Unit</th>
<th>Quantity</th>
<th>Rate per unit (Rs)</th>
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<td>₹ 4,023.00</td>
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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. Lohardaga
4. Chatra
5. Gumla
6. Hazaribagh
7. Koderma
8. Giridih

Resources Available
- Timber And Bamboo
- Fly Ash Brick
- Stone

This typology is applicable to Zone D

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. Lohardaga
6. Gumla
7. Hazaribagh
8. Koderma
9. Giridih

Resources Available
- Timber And Bamboo
- Fly Ash Brick
- Stone

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

<table>
<thead>
<tr>
<th>Plan Layout</th>
<th>Plinth/Floor</th>
<th>Roof Profile</th>
</tr>
</thead>
</table>

Recommendations for construction systems

<table>
<thead>
<tr>
<th>Components</th>
<th>Recommended Specifications</th>
</tr>
</thead>
</table>
| 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 |
Area Statement:

<table>
<thead>
<tr>
<th>Item</th>
<th>Area (Sq.m)</th>
<th>Area (Sq.ft)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Room</td>
<td>12.30</td>
<td>132.40</td>
</tr>
<tr>
<td>Verandah</td>
<td>8.30</td>
<td>89.34</td>
</tr>
<tr>
<td>Carpet Area</td>
<td>12.30</td>
<td>132.40</td>
</tr>
<tr>
<td>Built up Area</td>
<td>25.87</td>
<td>278.46</td>
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</table>
**JH-05 Cost estimate**

**Cost breakups**

<table>
<thead>
<tr>
<th>Item</th>
<th>Cost (INR)</th>
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<tbody>
<tr>
<td>Foundation</td>
<td>₹ 25,638.00</td>
</tr>
<tr>
<td>Wall</td>
<td>₹ 35,703.50</td>
</tr>
<tr>
<td>Roof</td>
<td>₹ 32,760.00</td>
</tr>
<tr>
<td>Door window</td>
<td>₹ 3,000.00</td>
</tr>
<tr>
<td>Total</td>
<td>₹ 97,101.50</td>
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</table>

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Foundation</th>
</tr>
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<tbody>
<tr>
<td>1</td>
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</tr>
<tr>
<td></td>
<td><strong>P.C.C.</strong></td>
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<tr>
<td></td>
<td><strong>Brickwork</strong></td>
</tr>
<tr>
<td></td>
<td><strong>R.C.C. Plinth Beam</strong></td>
</tr>
<tr>
<td></td>
<td><strong>Plinth Filling for Otta</strong></td>
</tr>
<tr>
<td></td>
<td><strong>Plinth Filling for Room</strong></td>
</tr>
<tr>
<td></td>
<td><strong>Labour</strong></td>
</tr>
<tr>
<td></td>
<td><strong>W TOTAL</strong></td>
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<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Walls</th>
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<tbody>
<tr>
<td>2</td>
<td><strong>Brick 1 (short)</strong></td>
</tr>
<tr>
<td></td>
<td><strong>Brick 2 (tall)</strong></td>
</tr>
<tr>
<td></td>
<td><strong>Labour</strong></td>
</tr>
<tr>
<td></td>
<td><strong>X TOTAL</strong></td>
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<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Door and Window</th>
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<tr>
<td>3</td>
<td><strong>Doors</strong></td>
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<td>₹ 3,000.00</td>
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</table>

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Structure Roof</th>
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<tbody>
<tr>
<td>4</td>
<td><strong>Lintel Band</strong></td>
</tr>
<tr>
<td></td>
<td><strong>Timber for Intermediate Floor</strong></td>
</tr>
<tr>
<td></td>
<td><strong>Bamboo for Intermediate Floor</strong></td>
</tr>
<tr>
<td></td>
<td><strong>Other materials for Intermediate Floor</strong></td>
</tr>
<tr>
<td></td>
<td><strong>Metal Ties</strong></td>
</tr>
<tr>
<td></td>
<td><strong>Timber truss</strong></td>
</tr>
<tr>
<td></td>
<td><strong>Timber roof for front room</strong></td>
</tr>
<tr>
<td></td>
<td><strong>Bamboo Splits</strong></td>
</tr>
<tr>
<td></td>
<td><strong>Labour</strong></td>
</tr>
<tr>
<td></td>
<td><strong>Y TOTAL</strong></td>
</tr>
<tr>
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<td>₹ 25,760.00</td>
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</table>

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Roof</th>
</tr>
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<tbody>
<tr>
<td>5</td>
<td><strong>Country tiles</strong></td>
</tr>
<tr>
<td></td>
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<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Grand Total</th>
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<tr>
<td>6</td>
<td><strong>AREA (sqm)</strong></td>
</tr>
<tr>
<td></td>
<td><strong>RATE OF CONSTRUCTION (per sqm)</strong></td>
</tr>
<tr>
<td></td>
<td><strong>AREA (sqft)</strong></td>
</tr>
<tr>
<td></td>
<td><strong>RATE OF CONSTRUCTION (per sqft)</strong></td>
</tr>
<tr>
<td></td>
<td>₹ 97,101.50</td>
</tr>
<tr>
<td></td>
<td>₹ 3.13838</td>
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<tr>
<td></td>
<td>331.058</td>
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<td>293.31</td>
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</table>
Highlights of the Prototype

- Built up area of the house is optimised to 25.86 sq.m. with possibility for incremental growth up to 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 cooking & rearing cattle.

Recommendations for Built Form

<table>
<thead>
<tr>
<th>Plan Layout</th>
<th>Plinth/Floor</th>
<th>Roof Profile</th>
</tr>
</thead>
</table>

Recommendations for construction systems

<table>
<thead>
<tr>
<th>Components</th>
<th>Recommended Specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Foundations</td>
<td></td>
</tr>
</tbody>
</table>
• 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  |
## Area Statement:

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<th>Sq.ft</th>
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</thead>
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<td></td>
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<tr>
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<td></td>
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<td>Carpet Area</td>
<td>12.30</td>
<td>132.40</td>
<td></td>
</tr>
<tr>
<td>Built up Area</td>
<td>25.87</td>
<td>278.46</td>
<td></td>
</tr>
</tbody>
</table>

---

### TYPICAL SECTION AA'

- 250 mm thick Adobe wall with 1:5 cement sandplaster on wiremesh
- 75 mm thick plinth band
- 450 mm wide concrete apron
- Stone Foundation
- P.C.C layer

---

### TYPICAL PLAN

- Bengal tiles/ CGI sheet over truss
- Bamboo/ timber truss type T1
- 450 mm Roof overhang
- 75 mm thick roof band
- Timber tie to support mezzanine floor
- 75 mm thick lintel band
- 350 mm thick Adobe wall with 1:5 cement sandplaster on wiremesh
- 75 mm thick plinth band
- 450 mm wide concrete apron
- Stone Foundation
- P.C.C layer

---

### TYPICAL PLAN

- Bengal tiles/ CGI sheet over truss
- Bamboo/ timber truss type T1
- 450 mm Roof overhang
- 75 mm thick roof band
- Timber tie to support mezzanine floor
- 75 mm thick lintel band
- 350 mm thick Adobe wall with 1:5 cement sandplaster on wiremesh
- 75 mm thick plinth band
- 450 mm wide concrete apron
- Stone Foundation
- P.C.C layer
<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Description</th>
<th>Unit</th>
<th>Quantity</th>
<th>Rate per unit (Rs)</th>
<th>Cost</th>
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<tr>
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<td></td>
<td></td>
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</tr>
<tr>
<td></td>
<td>P.C.C.</td>
<td>cum</td>
<td>1.2</td>
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<td>Brickwork</td>
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<td>₹ 2,940.00</td>
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<td>Plinth Filling for Otta</td>
<td>cum</td>
<td>3.87</td>
<td>₹ 200.00</td>
<td>₹ 774.00</td>
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<td>cum</td>
<td>7.875</td>
<td>₹ 200.00</td>
<td>₹ 1,575.00</td>
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<td></td>
<td>Labour</td>
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<td></td>
<td></td>
<td>₹ 8,800.00</td>
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<tr>
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<td><strong>TOTAL</strong></td>
<td></td>
<td></td>
<td></td>
<td>₹ 25,519.00</td>
</tr>
<tr>
<td>2</td>
<td><strong>WALLS</strong></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td></td>
<td>Adobe 1 (short)</td>
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<td>3.906</td>
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<td>₹ 7,812.00</td>
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<td></td>
<td>Adobe 2 (tall)</td>
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<td>21.66</td>
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<td>₹ 43,320.00</td>
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<td></td>
<td>Deductions</td>
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<td>₹ 12,500.00</td>
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<td></td>
<td>Labour</td>
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<td></td>
<td></td>
<td>₹ 12,500.00</td>
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<tr>
<td></td>
<td><strong>TOTAL</strong></td>
<td></td>
<td></td>
<td></td>
<td>₹ 51,132.00</td>
</tr>
<tr>
<td>3</td>
<td><strong>DOOR AND WINDOW</strong></td>
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<td></td>
</tr>
<tr>
<td></td>
<td>Doors</td>
<td>per unit</td>
<td>2</td>
<td>₹ 1,000.00</td>
<td>₹ 2,000.00</td>
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<td></td>
<td>Window</td>
<td>per unit</td>
<td>3</td>
<td>₹ 500.00</td>
<td>₹ 1,500.00</td>
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<td></td>
<td>Hand plaster and other finishes</td>
<td>lump sum</td>
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<td></td>
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<td></td>
<td></td>
<td>₹ 5,500.00</td>
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<tr>
<td>4</td>
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<td></td>
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<tr>
<td></td>
<td>Lintel Band</td>
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<td>0.616</td>
<td>7000</td>
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<td>5000</td>
<td>₹ 1,290.00</td>
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<td></td>
<td>Bamboo for Intermediate Floor</td>
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<td>16</td>
<td>₹ 150.00</td>
<td>₹ 2,400.00</td>
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<td>₹ 2,000.00</td>
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<td>500</td>
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<td></td>
<td>Timber roof for front room</td>
<td>per cu ft</td>
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<td>Bamboo Splits</td>
<td>per piece</td>
<td>8</td>
<td>₹ 150.00</td>
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<td></td>
<td>Labour</td>
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<td>Country tiles</td>
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<tr>
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<td>Other materials</td>
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<td>₹ 3,000.00</td>
<td>₹ 3,000.00</td>
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**Cost breakdown**

<table>
<thead>
<tr>
<th>Item</th>
<th>Cost (INR)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Foundation</td>
<td>₹ 25,519.00</td>
</tr>
<tr>
<td>Wall</td>
<td>₹ 51,132.00</td>
</tr>
<tr>
<td>Roof</td>
<td>₹ 35,260.00</td>
</tr>
<tr>
<td>Door window</td>
<td>₹ 3,500.00</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>₹ 115,411.00</td>
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</tbody>
</table>

**J HARKHAND**
This typology is applicable to all the housing zones in Jharkhand

Resources Available
- Timber And Bamboo
- Fly Ash Brick
- Stone

Highlights of the Prototype - JH07
- Built up area of the house is optimised to 22.80 sq.m. with possibility 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 cooking & rearing cattle.

Plan Layout
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.

Roof Cover •

Floor •

Recommendations for Built Form

<table>
<thead>
<tr>
<th>Plan Layout</th>
<th>Plinth/Floor</th>
<th>Roof Profile</th>
</tr>
</thead>
</table>

Recommendations for construction systems

<table>
<thead>
<tr>
<th>Components</th>
<th>Recommended Specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Foundations</td>
<td>• Stone foundation with cement mortar</td>
</tr>
<tr>
<td></td>
<td>• Minimum depth – 450mm</td>
</tr>
<tr>
<td></td>
<td>• Minimum width 450mm</td>
</tr>
<tr>
<td>Plinth</td>
<td>• Minimum(300mm or 150mm more than last 50 year flood level)</td>
</tr>
<tr>
<td>Wall</td>
<td>• 250 mm thk Rat-trap brick masonry or</td>
</tr>
<tr>
<td></td>
<td>• 250 mm thk stone block masonry</td>
</tr>
<tr>
<td></td>
<td>• load bearing</td>
</tr>
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<td>Wall Finish</td>
<td>• Stabilised Mud plastered finish.</td>
</tr>
<tr>
<td>Roof Structure</td>
<td>• Roof slope angle – min 38 &amp; max 45.</td>
</tr>
<tr>
<td></td>
<td>• Covered with sheet &amp; has treated bamboo/ Timber understructure.</td>
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<tr>
<td>Roof Cover</td>
<td>• Bengal tile.</td>
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<tr>
<td>Floor</td>
<td>• cement flooring</td>
</tr>
</tbody>
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Area Statement:

<table>
<thead>
<tr>
<th>Item</th>
<th>Area</th>
<th>Sq.ft</th>
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<tbody>
<tr>
<td>Room</td>
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<td>116.25</td>
</tr>
<tr>
<td>Verandah</td>
<td>7.70</td>
<td>82.88</td>
</tr>
<tr>
<td>Carpet Area</td>
<td>10.80</td>
<td>116.25</td>
</tr>
<tr>
<td>Built up Area</td>
<td>22.80</td>
<td>245.42</td>
</tr>
</tbody>
</table>

Precast brick panel & RC joist roofing system.
Partially Precast RC Joist 2no,
Precast Brick panels 18nos

Lintel band

250 mm thick Rat-trap masonry in bricks with 1:6 cement mortar or
250 mm stone blocks load bearing masonry wall

Plinth band

450 mm wide concrete apron
75 mm thk.

Brick Foundation

P.C.C layer
### Cost Estimate

#### Cost Breakup

<table>
<thead>
<tr>
<th>Item</th>
<th>Cost (INR)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Foundation</td>
<td>₹ 25,328.80</td>
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<tr>
<td>Wall</td>
<td>₹ 54,198.05</td>
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<tr>
<td>Roof</td>
<td>₹ 29,940.00</td>
</tr>
<tr>
<td>Door window</td>
<td>₹ 3,000.00</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>₹ 112,466.85</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>SR. NO.</th>
<th>Unit</th>
<th>Quantity</th>
<th>Rate per unit (Rs)</th>
<th>Cost</th>
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<tbody>
<tr>
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<td>FOUNDATION</td>
<td>cum</td>
<td>1.2</td>
<td>₹ 2,700.00</td>
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<tr>
<td></td>
<td>P.C.C.</td>
<td></td>
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<tr>
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<td>Brickwork</td>
<td>brick no.</td>
<td>2340</td>
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<tr>
<td></td>
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<td>cum</td>
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<tr>
<td></td>
<td>Plinth Filling for Otta</td>
<td>cum</td>
<td>3.45</td>
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<tr>
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<td>Plinth Filling for Room</td>
<td>cum</td>
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<tr>
<td></td>
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<tr>
<td><strong>W</strong> TOTAL</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>2</td>
<td>WALLS</td>
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<tr>
<td>Brick 1 (short)</td>
<td>per sqm</td>
<td>688</td>
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<tr>
<td>Brick 2 (tall)</td>
<td>per sqm</td>
<td>6510</td>
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<tr>
<td>Cement mortar</td>
<td>cum</td>
<td>13.271</td>
<td>₹ 550.00</td>
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<tr>
<td>RCC plinth &amp; lintel</td>
<td>cum</td>
<td>0.7</td>
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<td>RCC chajja</td>
<td>cum</td>
<td>0.101</td>
<td>₹ 7,000.00</td>
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<td><strong>X</strong> TOTAL</td>
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<td>₹ 54,198.05</td>
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<td></td>
<td>DOORS AND WINDOW</td>
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</tr>
<tr>
<td>Doors</td>
<td>per unit</td>
<td>1</td>
<td>₹ 1,000.00</td>
<td>₹ 1,000.00</td>
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<td>Window</td>
<td>per unit</td>
<td>4</td>
<td>₹ 500.00</td>
<td>₹ 2,000.00</td>
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<tr>
<td>Plaster and other finishes</td>
<td>lump sum</td>
<td></td>
<td></td>
<td>₹ 3,000.00</td>
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<tr>
<td>labour</td>
<td></td>
<td></td>
<td></td>
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<td>₹ 3,000.00</td>
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<tr>
<td>3</td>
<td>STRUCTURE ROOF</td>
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<td></td>
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</tr>
<tr>
<td>Partially precast RC joist</td>
<td>cum</td>
<td>0.22</td>
<td>7000</td>
<td>₹ 1,540.00</td>
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<tr>
<td>Brick Panels</td>
<td>per unit</td>
<td>18</td>
<td>650</td>
<td>₹ 11,700.00</td>
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<td>Labour</td>
<td></td>
<td></td>
<td></td>
<td>₹ 10,500.00</td>
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<td><strong>Y</strong> TOTAL</td>
<td></td>
<td></td>
<td></td>
<td>₹ 23,740.00</td>
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<tr>
<td>4</td>
<td>ROOF</td>
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<td></td>
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<tr>
<td>sheet</td>
<td>per piece</td>
<td>4</td>
<td>800</td>
<td>₹ 3,200.00</td>
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<tr>
<td>Other materials</td>
<td>lumpsum</td>
<td></td>
<td>₹ 3,000.00</td>
<td>₹ 3,000.00</td>
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<tr>
<td><strong>Z</strong> TOTAL</td>
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<td>W+X+Y+Z</td>
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<td></td>
<td></td>
<td>₹ 112,466.85</td>
</tr>
</tbody>
</table>

| 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 |
This typology is applicable to all the housing zones in Jharkhand

Resources Available
- Timber And Bamboo
- Fly Ash Brick
- Stone

Highlights of the Prototype - JH-D-05

- Built up area of the house is optimized to 25.86 sq.m. with possibility 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 the other acts as a space for ancillary activities such as cooking & rearing cattle.

<table>
<thead>
<tr>
<th>Recommendations for Built Form - ZONE D</th>
<th>Plinth/Floor</th>
<th>Roof Profile</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plan Layout</td>
<td>Normal plinth design</td>
<td>Sloped roof</td>
</tr>
<tr>
<td>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.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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

JH-08

A

D

B

C

J H A R K H A N D
Area Statement:

<table>
<thead>
<tr>
<th>Item</th>
<th>Area Sq.m</th>
<th>Area Sq.ft</th>
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</thead>
<tbody>
<tr>
<td>Room</td>
<td>12.30</td>
<td>132.40</td>
</tr>
<tr>
<td>Verandah</td>
<td>8.94</td>
<td>96.23</td>
</tr>
<tr>
<td>Carpet Area</td>
<td>12.30</td>
<td>132.40</td>
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<tr>
<td>Built up Area</td>
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<td>278.46</td>
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<td>SR. NO.</td>
<td>FOUNDATION</td>
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<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td></td>
<td>P.C.C.</td>
<td>cum</td>
</tr>
<tr>
<td></td>
<td>Brickwork</td>
<td>brick no.</td>
</tr>
<tr>
<td></td>
<td>R.C.C. Plinth Beam</td>
<td>cum</td>
</tr>
<tr>
<td></td>
<td>Plinth Filling for Ottas</td>
<td>cum</td>
</tr>
<tr>
<td></td>
<td>Plinth Filling for Room</td>
<td>cum</td>
</tr>
<tr>
<td></td>
<td>Labour</td>
<td></td>
</tr>
<tr>
<td></td>
<td>TOTAL</td>
<td></td>
</tr>
<tr>
<td>WALLS</td>
<td>Brick (short)</td>
<td>per sqm</td>
</tr>
<tr>
<td></td>
<td>Brick (tall)</td>
<td>per sqm</td>
</tr>
<tr>
<td></td>
<td>Cement mortar</td>
<td>cum</td>
</tr>
<tr>
<td></td>
<td>RCC plinth &amp; lintel</td>
<td>cum</td>
</tr>
<tr>
<td></td>
<td>RCC chajja</td>
<td>cum</td>
</tr>
<tr>
<td></td>
<td>Labour</td>
<td></td>
</tr>
<tr>
<td></td>
<td>TOTAL</td>
<td></td>
</tr>
<tr>
<td>DOOR AND WINDOW</td>
<td>Doors</td>
<td>per unit</td>
</tr>
<tr>
<td></td>
<td>Window</td>
<td>per unit</td>
</tr>
<tr>
<td></td>
<td>Plaster and other finishes</td>
<td>lump sum</td>
</tr>
<tr>
<td></td>
<td>Labour</td>
<td></td>
</tr>
<tr>
<td></td>
<td>TOTAL</td>
<td></td>
</tr>
<tr>
<td>STRUCTURE ROOF</td>
<td>Partially precast RC joist</td>
<td>cum</td>
</tr>
<tr>
<td></td>
<td>Brick Panels</td>
<td>per unit</td>
</tr>
<tr>
<td></td>
<td>Labour</td>
<td></td>
</tr>
<tr>
<td></td>
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</tr>
<tr>
<td>ROOF</td>
<td>sheet</td>
<td>per piece</td>
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<td></td>
<td>Other materials</td>
<td>lumpsum</td>
</tr>
<tr>
<td></td>
<td>TOTAL</td>
<td></td>
</tr>
</tbody>
</table>

\[ W+X+Y+Z = ₹ 112,466.85 \]

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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, Siddhi 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, Bilala, 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. Chhatarpur, 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 TYPOLOGIES AT A GLANCE

<table>
<thead>
<tr>
<th>TYPOLOGY</th>
<th>APPLICABLE HOUSING ZONES</th>
<th>TOTAL AREA Sq.m/Sq.ft</th>
</tr>
</thead>
<tbody>
<tr>
<td>MP-01</td>
<td>Zone A</td>
<td>27.09 Sq.m</td>
</tr>
<tr>
<td>MP-02</td>
<td>Zone A</td>
<td>27.78 Sq.m</td>
</tr>
<tr>
<td>MP-03</td>
<td>Zone B</td>
<td>32.25 Sq.m</td>
</tr>
<tr>
<td>MP-04</td>
<td>Zone B</td>
<td>59.29 Sq.m</td>
</tr>
<tr>
<td>MP-05</td>
<td>Zone G</td>
<td>33.79 Sq.m</td>
</tr>
<tr>
<td>MP-06</td>
<td>Zone C</td>
<td>45.43 Sq.m</td>
</tr>
<tr>
<td>MP-07</td>
<td>Zone F</td>
<td>77.94 Sq.m</td>
</tr>
<tr>
<td>MP-08</td>
<td>Zone E</td>
<td>42.00 Sq.m</td>
</tr>
<tr>
<td>MP-09</td>
<td>Zone D</td>
<td>35.10 Sq.m</td>
</tr>
</tbody>
</table>

**Images:**
- MP-01
- MP-02
- MP-03
- MP-04
- MP-05
- MP-06
- MP-07
- MP-08
- MP-09
**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

---

### 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.

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

**TYPICAL PLAN**

- 250mm dia Under Reamed Pile in BC soil/ use strip footing in normal soil/ use stub footing in hard soil

- 200 Brick/230 rat trap/flyash in 1:6 cement sand mortar or 143/190mm CSMB wall in 10% cement stabilised mud mortar

- Wood / T - iron frames with welded grill bars

- Precast RC joist (2000 x 150 x 150 mm) & plank/brick panel, alternatively use filler slab

- 450 mm wide, 100mm thick concrete apron to protect foundation

- Ventilator at ceiling level

**TYPICAL SECTION AA’**

**Area Statement:**

<table>
<thead>
<tr>
<th>Item</th>
<th>Area Sq.m</th>
<th>Area Sq.ft</th>
</tr>
</thead>
<tbody>
<tr>
<td>Room</td>
<td>13.45</td>
<td>144.77</td>
</tr>
<tr>
<td>Kitchen</td>
<td>4.32</td>
<td>46.50</td>
</tr>
<tr>
<td>Verandah</td>
<td>5.00</td>
<td>53.82</td>
</tr>
<tr>
<td>Carpet Area</td>
<td>17.77</td>
<td>191.28</td>
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<tr>
<td>Built up Area</td>
<td>27.09</td>
<td>291.60</td>
</tr>
</tbody>
</table>

**AREA STATEMENT:**

- Precast RC joist (2000 x 150 x 150 mm) & plank/brick panel, alternatively use filler slab

- Precast RC joist 200 x 15 x 15

- 200 x 75 mm RCC slab

- 200 x 75 mm RCC floor slab

- 408 mm roof overhang

- Wood / T - iron frames with welded grill bars

- 200 Brick/230 rat trap/flyash in 1:6 cement sand mortar or 143/190mm CSMB wall in 10% cement stabilised mud mortar

- 106 x 75mm RCC Plinth base

- 450 mm wide, 100mm thick concrete apron to protect foundation

- 250mm dia Under Reamed Pile in BC soil/ use strip footing in normal soil/ use stub footing in hard soil

- 150mm Brick P.C.C upper
MP-01
Alternative roofing

TYPICAL PLAN

Under Reamed Pile 25mm dia

200mm thick Brick/ Stone masonry block/ load-bearing hollow block in 1:6 cement sand mortar

Under Reamed Pile 20mm dia

Wood / T - iron frames with welded grill bars

Truss type TI(Timber/Bamboo)

450 mm wide, 100mm thick concrete apron to protect foundation

Ventilator at ceiling level

Room
1800 x 3350 mm

Kitchen
1800 x 2300 mm

Verandah
2000 x 2500 mm

Entry

TYPICAL SECTION AA'

MADHYA PRADESH
<table>
<thead>
<tr>
<th>S. No.</th>
<th>A</th>
<th>B DESCRIPTION</th>
<th>G QUANTITY</th>
<th>H DRIFT RATE</th>
<th>I COST</th>
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<tbody>
<tr>
<td>01</td>
<td>16</td>
<td>1d FOUNDATION</td>
<td>30</td>
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<td></td>
</tr>
<tr>
<td>02</td>
<td>27</td>
<td>1a Excavation in foundation</td>
<td>6.519 Cum</td>
<td>Rs. 93.80/Cum</td>
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<td>03</td>
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<td>Total volume of excavation</td>
<td>6.519 Cum</td>
<td>Rs. 93.80/Cum</td>
<td>Rs. 611.47</td>
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<tr>
<td>04</td>
<td>29</td>
<td>Filling</td>
<td>8.899 Cum</td>
<td>Rs. 93.80/Cum</td>
<td>Rs. 847.22</td>
</tr>
<tr>
<td>05</td>
<td>30</td>
<td>Total volume of filling</td>
<td>8.899 Cum</td>
<td>Rs. 93.80/Cum</td>
<td>Rs. 847.22</td>
</tr>
<tr>
<td>06</td>
<td>31</td>
<td>2 Lean concrete (1:4:6) with 20-12.5 mm chips</td>
<td>1.228 Cum</td>
<td>Rs. 262.60/Cum</td>
<td>Rs. 3223.66</td>
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<tr>
<td>07</td>
<td>32</td>
<td>3 Brick work in foundation</td>
<td>4.654 Cum</td>
<td>Rs. 3294.12/Cum</td>
<td>Rs. 15329.00</td>
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<tr>
<td>08</td>
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<td>3A Punth band</td>
<td>0.404 Cum</td>
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<td>Rs. 1385.96</td>
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<td>09</td>
<td>34</td>
<td>Total area of shuttering</td>
<td>4.0X3 Sqm</td>
<td>Rs. 158.70/Sqm</td>
<td>Rs. 680.70</td>
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<tr>
<td>10</td>
<td>35</td>
<td>Total volume of brickwork</td>
<td>8.055 Sqm</td>
<td>Rs. 65.70/Sqm</td>
<td>Rs. 1855.70</td>
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<tr>
<td>11</td>
<td>36</td>
<td>4 Reinforcement @70 kg/cum</td>
<td>28.245 Kg</td>
<td>Rs. 65.70/kg</td>
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<td>12</td>
<td>37</td>
<td>5 Flooring</td>
<td>25mm flooring: Flag stone</td>
<td>22.541 Sqm</td>
<td>Rs. 388.70/Sqm</td>
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<td>13</td>
<td>38</td>
<td>6 Walls</td>
<td>200 mm masonry wall</td>
<td>11.646 Cum</td>
<td>Rs. 3294.12/Cum</td>
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<td>14</td>
<td>39</td>
<td>Total volume of brickwork</td>
<td>11.646 Cum</td>
<td>Rs. 3294.12/Cum</td>
<td>Rs. 38363.09</td>
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<td>15</td>
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<td>7 Unit II</td>
<td>1096200 RCC lintel -4.8 TDR ALTHRO - 6 dia @ 175/C/C</td>
<td>0.450 Cum</td>
<td>Rs. 3429.52/Cum</td>
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<td>41</td>
<td>Total volume of RCC works</td>
<td>0.450 Cum</td>
<td>Rs. 3429.52/Cum</td>
<td>Rs. 1543.45</td>
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<tr>
<td>17</td>
<td>42</td>
<td>8 Shuttering</td>
<td>6.168 Sqm</td>
<td>Rs. 168.70/Sqm</td>
<td>Rs. 1034.78</td>
</tr>
<tr>
<td>18</td>
<td>43</td>
<td>9 Total area of shuttering</td>
<td>6.168 Sqm</td>
<td>Rs. 168.70/Sqm</td>
<td>Rs. 1034.78</td>
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<tr>
<td>19</td>
<td>44</td>
<td>10 Reinforcement @70 kg/cum</td>
<td>51.500 Kg</td>
<td>Rs. 65.70/kg</td>
<td>Rs. 3360.50</td>
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<table>
<thead>
<tr>
<th>S. No.</th>
<th>A</th>
<th>B DESCRIPTION</th>
<th>G QUANTITY</th>
<th>H DRIFT RATE</th>
<th>I COST</th>
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<tr>
<td>20</td>
<td></td>
<td>DUG DUGZ 12.5 DUG</td>
<td>30</td>
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<tr>
<td>21</td>
<td></td>
<td>6X6903.5 RCC lends - 4.8 TDR ALTHRO - 6 dia @ 175/C/C</td>
<td>0.225 Cum</td>
<td>Rs. 3429.52/Cum</td>
<td>Rs. 771.75</td>
</tr>
<tr>
<td>22</td>
<td></td>
<td>Total vol of RCC works</td>
<td>0.225 Cum</td>
<td>Rs. 3429.52/Cum</td>
<td>Rs. 771.75</td>
</tr>
<tr>
<td>23</td>
<td></td>
<td>8x Shuttering</td>
<td>4.100 Sqm</td>
<td>Rs. 168.70/Sqm</td>
<td>Rs. 691.67</td>
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<tr>
<td>24</td>
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<td>Total area of shuttering</td>
<td>4.100 Sqm</td>
<td>Rs. 168.70/Sqm</td>
<td>Rs. 691.67</td>
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<tr>
<td>25</td>
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<td>6 Reinforcement @70 kg/cum</td>
<td>15.750 Kg</td>
<td>Rs. 65.70/kg</td>
<td>Rs. 1034.78</td>
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<tr>
<td>26</td>
<td></td>
<td>9x Area of 1000sqc flat roof - 26.6 SqmX1.05</td>
<td>2.82 Cum</td>
<td>Rs. 3429.52/Cum</td>
<td>Rs. 9680.55</td>
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<tr>
<td>27</td>
<td></td>
<td>9x Reinforcement @95kg/cum</td>
<td>254.018 Kg</td>
<td>Rs. 65.70/kg</td>
<td>Rs. 16688.85</td>
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<td>28</td>
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<td>10x Total area of brickwork</td>
<td>4.654 Cum</td>
<td>Rs. 3294.12/Cum</td>
<td>Rs. 15329.00</td>
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<tr>
<td>29</td>
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<td>10x White washing</td>
<td>84.39 Sqm</td>
<td></td>
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<tr>
<td>30</td>
<td></td>
<td>10x Outside white wash</td>
<td>area</td>
<td></td>
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<tr>
<td>31</td>
<td></td>
<td>10x Overall total area of plaster to be used</td>
<td>147.99 Sqm</td>
<td>Rs. 20.60/Sqm</td>
<td>Rs. 2993.80</td>
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<tr>
<td>32</td>
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<td>11x Plastering</td>
<td>area</td>
<td></td>
<td></td>
</tr>
<tr>
<td>33</td>
<td></td>
<td>11x Inside plaster</td>
<td>area</td>
<td></td>
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<tr>
<td>34</td>
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<td>11x Total area of plaster to be used inside</td>
<td>84.92 Sqm</td>
<td>Rs. 107.40/Sqm</td>
<td>Rs. 9068.60</td>
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<td>35</td>
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<td>11x Outside pointing</td>
<td>area</td>
<td></td>
<td></td>
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<tr>
<td>36</td>
<td></td>
<td>11x Total area of plaster to be used outside</td>
<td>53.60 Sqm</td>
<td>Rs. 107.40/Sqm</td>
<td>Rs. 5647.52</td>
</tr>
<tr>
<td>37</td>
<td></td>
<td>12x Door windows</td>
<td>22.95 kg</td>
<td>Rs. 75.00/kg</td>
<td>Rs. 1722.25</td>
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<tr>
<td>38</td>
<td></td>
<td>13x Window frames 95x95x5.58</td>
<td>12.605 m</td>
<td>Rs. 75.00/kg</td>
<td>Rs. 2138.25</td>
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<tr>
<td>39</td>
<td></td>
<td>14x Total quantity for frames</td>
<td>38.550 Kg</td>
<td>Rs. 75.00/kg</td>
<td>Rs. 2138.25</td>
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<tr>
<td>40</td>
<td></td>
<td>15x Grand total</td>
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</table>

**MP-01 Cost estimate**

**MADHYA PRADESH**

**GRAND TOTAL – Rs. 425061.82**
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 Mandaur & Neemach & other tribal areas

Local building construction technology:

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

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.

<table>
<thead>
<tr>
<th>Components</th>
<th>Recommended Specifications</th>
</tr>
</thead>
</table>
| 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 |
### TYPICAL PLAN

- **Kitchen**: 3600 x 1900 mm, lvl +300mm
- **Room**: 3600 x 3500 mm, lvl +300mm
- **2100 x 1800 mm, lvl +300mm**
- **Entry**: 2100 x 1800 mm, lvl +300mm

### Area Statement:

<table>
<thead>
<tr>
<th>Item</th>
<th>Area</th>
<th>Sq.m</th>
<th>Sq.ft</th>
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<tbody>
<tr>
<td>Room</td>
<td>12.56</td>
<td>135.20</td>
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</tr>
<tr>
<td>Kitchen</td>
<td>6.90</td>
<td>74.27</td>
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<tr>
<td>Verandah</td>
<td>3.78</td>
<td>40.69</td>
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<tr>
<td>Carpet Area</td>
<td>19.46</td>
<td>209.47</td>
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<tr>
<td>Built up Area</td>
<td>27.78</td>
<td>299.02</td>
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### TYPICAL SECTION AA'

- **Precast RC Planks**: 3200 x 150 x 150 mm
- **450 mm wide, 100 mm thick concrete apron to protect foundation**
- **200 Brick/230 rat trap/flyash in 1:6 cement sand mortar or 143/190mm CMFB wall in 10% cement stabilised mud mortar**
- **Wood / T - iron frames with welded grill bars**

### PHASE I

- **Mad phusak / Brick coba**
- **100 x 50 x 10 mm RC Planks**
- **920 x 15 x 15 mm RC Joists**
- **200 x 75 mm RCC Roof band**
- **200 x 300 x 60 mm RC Planks**
- **200 Brick/230 rat trap/flyash in 1:6 cement sand mortar or 143/190mm CMFB wall in 10% cement stabilised mud mortar**
- **650 mm wide, 100 mm thick concrete apron to protect foundation**
- **250mm dia Under Reamed Pile in RC soil**
- **250mm dia Under Reamed Pile in RC soil**
- **180mm dia RCC Cover**
**Alternative roofing**

**Truss type T3 (Timber/Bamboo)**

- 450 mm wide, 100 mm thick concrete apron to protect foundations
- 200 mm thick Brick/Stone black masonry/Load-bearing hollow block masonry in 1:6 cement sand mortar
- **Wood / T - Iron frames with welded grill bars**

**Typical Section AA’**

- Ridge plate
- 200 x 75 mm RCC roof band
- 200 x 75 mm RCC Level band
- 200 mm thick Brick/Stucco wall at 1.5 cement sand mortar in 1:4/1:6 20mm RCC level in 1:8 cement stabilized mast mortar
- 200 x 75 mm RCC Pitch band
- 450 mm wide, 100 mm thick concrete apron to protect foundations
- 250 mm thick plaster Band / CMC roof in RCC until one step building in the final wall but cutback in beam unit
- 100 mm thick P.V.C layer

**Typical Plan**

- Kitchen
  - 3600 x 1900 mm
  - lvl +300 mm
- Room
  - 3600 x 3500 mm
  - lvl +300 mm
- Room
  - 2100 x 1800 mm
  - lvl 00 mm
- Entry
  - 200 mm thick Brick/Stone block masonry/load-bearing hollow block masonry in 1:6 cement sand mortar
- Truss type T2 (Timber/ Bamboo)

**MADHYA PRADESH**
<table>
<thead>
<tr>
<th></th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>G</th>
<th>H</th>
<th>I</th>
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<td></td>
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<td></td>
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<tr>
<td>18</td>
<td>16</td>
<td>1a Excavation in foundation</td>
<td>6.945 Cum</td>
<td>Rs.93.80/Cum</td>
<td>Rs. 651.45</td>
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<td>1b Filling</td>
<td>12.386 Cum</td>
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<td>Rs. 1,161.81</td>
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<td>29</td>
<td>30</td>
<td>1c Sand filling 75mm on trench</td>
<td>1,042 Cum</td>
<td>Rs.400.00/Cum</td>
<td>Rs. 416.71</td>
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<td>35</td>
<td>10</td>
<td>2 Lean concrete bed 100mm in 1:3:6</td>
<td>1,306 Cum</td>
<td>Rs.2626.00/Cum</td>
<td>Rs. 3,440.79</td>
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<td>12</td>
<td>3a 400 mm thick Brick work in foundation</td>
<td>9.421 Cum</td>
<td>Rs.3294.1/Cum</td>
<td>Rs. 14,634.60</td>
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<td>51</td>
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<td>3b 300 mm thick Brick work in foundation</td>
<td>9.421 Cum</td>
<td>Rs.3294.1/Cum</td>
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<td>3c 200 mm thick Brick work in foundation</td>
<td>9.421 Cum</td>
<td>Rs.3294.1/Cum</td>
<td>Rs. 14,634.60</td>
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<td>59</td>
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<td>TOTAL VOLUME OF BRICKWORK IN FOUNDATION</td>
<td>4,391 Cum</td>
<td>Rs.3294.1/Cum</td>
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<td>4b 75x200 RCC plinth band- 2.8mm tor 6 dia links @ 175 c/c</td>
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<td>Rs.3294.1/Cum</td>
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<tr>
<td>67</td>
<td>19</td>
<td>4c Shuttering</td>
<td>4.305 Sqm</td>
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<td>Rs. 726.25</td>
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<tr>
<td>71</td>
<td>20</td>
<td>4d Reinforcement @ 70 kg/cum</td>
<td>30.135 Kg</td>
<td>Rs.65.70/kg</td>
<td>Rs. 1,979.87</td>
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<td>75</td>
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<td>5 FLOORING</td>
<td>24.381 Sqm</td>
<td>Rs.389.70/Sqm</td>
<td>Rs. 950.12</td>
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<tr>
<td>89</td>
<td>22</td>
<td>6 Doors frames local wood 35x35d 6A</td>
<td>28.350 Kg</td>
<td>Rs.75.00/kg</td>
<td>Rs. 2,126.25</td>
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<td>93</td>
<td>23</td>
<td>7 Door Shutter 40mm thick local wood shutter</td>
<td>7.000 Sqm</td>
<td>Rs.900.00/Sqm</td>
<td>Rs. 6,300.00</td>
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<tr>
<td>97</td>
<td>24</td>
<td>8 Door frames local wood 35x35d 6A</td>
<td>28.350 Kg</td>
<td>Rs.75.00/kg</td>
<td>Rs. 2,126.25</td>
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</table>

**MP-02 Cost estimate**

- **Total Cost**
  - Walls: 11,936
  - Door Frames: 28,350
  - Local Wood Shutter: 7,000
  - Reinforcement @ 70 kg/cum: 24,150
  - RCC Ledge 62.5mm: 261
  - RCC Ledger (0.25 of 62.5mm): 85.6
  - Total area of shuttering: 5,405
  - Reinforcement @ 70 kg/cum: 18,270
  - Reinforcement @ 90 kg/cum: 262,521
  - Total Cost: 3,137,564.50
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

**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**

<table>
<thead>
<tr>
<th>Components</th>
<th>Recommended Specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Foundations</strong></td>
<td>• Strip foundation in normal soil of bearing capacity of 10T/sqm or higher</td>
</tr>
<tr>
<td></td>
<td>• Strip foundation in Black cotton soil not more than 1.5m deep.</td>
</tr>
<tr>
<td></td>
<td>• Masonry stub fndn with tie beam, Black cotton soil not more than 1.5m deep, single storey construction.</td>
</tr>
<tr>
<td></td>
<td>• Brick arch fndn with brick/ block/stone arch. BC soil not more than 1.5m deep.Hard rocky strata trenching difficult.</td>
</tr>
<tr>
<td></td>
<td>• Single Under-reamed Pile foundation, diameter and length as given in drawings.</td>
</tr>
<tr>
<td><strong>Plinth</strong></td>
<td>• Minimum (300 mm or 150mm more than last 50 year flood level)</td>
</tr>
<tr>
<td><strong>Wall</strong></td>
<td>• 20 cm thick brick/Stone masonry block or load-bearing hollow block walls may be constructed in 1:6 cement sand mortar.</td>
</tr>
<tr>
<td><strong>Wall Finish</strong></td>
<td>• cement plaster</td>
</tr>
<tr>
<td><strong>Roof Structure</strong></td>
<td>• RC plank joist system or</td>
</tr>
<tr>
<td></td>
<td>• Sloping roofs with Timber/bamboo understructure</td>
</tr>
<tr>
<td><strong>Roof Cover</strong></td>
<td>• PPC for flat roofs with waterproofing</td>
</tr>
<tr>
<td></td>
<td>• GI sheet</td>
</tr>
<tr>
<td><strong>Floor</strong></td>
<td>• cement concrete/ brick paving</td>
</tr>
<tr>
<td><strong>Door and Windows</strong></td>
<td>• Mild steel door and window</td>
</tr>
</tbody>
</table>
200 mm thick Stone block masonry/ load-bearing hollow block masonry in 1:6 cement sand mortar. Alternatively use 380 CRS wall in 1:8 cement mortar up to sill level + 200mm stone block masonry above sill.

Precast RC Joists

Wood/ T-iron frames with welded grill bars

max 450mm overhang

450 mm wide, 100mm thick concrete apron to protect foundation

Verandah

2400 x 1250 mm
lvl +300mm

Kitchen

2200 x 2400 mm
lvl +300mm

Bedroom

3650 x 3650 mm
lvl +300mm

Verandah

1800 x 2380 mm
lvl +300mm

Entry

W1

W1

W1

D1

D1

D1

W1

3852

1800

5652

2100

800

500

MP-03

Area Statement:

<table>
<thead>
<tr>
<th>Item</th>
<th>Area Sq.m</th>
<th>Area Sq.ft</th>
</tr>
</thead>
<tbody>
<tr>
<td>Room</td>
<td>15.49</td>
<td>166.73</td>
</tr>
<tr>
<td>Kitchen</td>
<td>5.46</td>
<td>58.77</td>
</tr>
<tr>
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TYPICAL PLAN

TYPICAL SECTION AA'
Alternative roofing

**Typical Plan**

- **Section AA’**
  - 200 mm thick brick masonry/ load-bearing hollow block masonry in 1:6 cement sand mortar. Alternatively use 380 CRG wall in 1:8 cement mortar up to G.L level + 200 mm stone block masonry above it.
  - Truss type T2 (Timber/Bamboo) max 450mm overhang
  - Ridge plate
  - CGI sheet
  - 400 mm stone strip/ stub foundation, or underreamed piles or R/B cul
  - 200 mm thick RCC type

**Typical Section**

- **Kitchen**
  - 2200 x 2400 mm
  - lvl +300mm

- **Bedroom**
  - 3650 x 3650 mm
  - lvl +300mm

- **Verandah**
  - 1800 x 2380 mm
  - lvl 00mm

- **Entry**
  - W1

- **450 mm wide, 100mm thick concrete apron to protect foundation**

- **100 mm thick P.C.C. layer**

- **450 mm wide, 100mm thick concrete apron to protect foundation**

- **max 450mm overhang**
### Cost Estimate

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<td>9c Reinforcement @70 kg/cum</td>
<td>15,356 Kg</td>
<td>Rs.65.70/kg</td>
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</tbody>
</table>

**Total Quantity**

- **100 RCC FOR FOUNDATION**
  - **9a** area of 100RCC flat roof 10% extra for projection: 2.93 Cum Rs.3429.9/Cum Rs.1064.43
  - **9b** Shuttering for house a: 30.135 Sqm Rs.168.70/Sqm Rs.5083.77
  - **9c** Reinforcement @ 90 kg/cum: 264.00 Kg Rs.65.70/kg Rs.17356.3

**Overall Quantity of plaster to be used**

- **10a** inside white washing area: 103.77 Sqm
- **10b** Outside white wash area:
  - **10b1** overall area: 20.94 Sqm Rs.107.40/Sqm Rs.2209.56
- **10b2** Outside plaster/painting area:
  - **10b21** total area of plaster to be used inside: 80.04 Sqm Rs.107.40/Sqm Rs.8596.33
- **10b22** total area of painting to be used outside: 65.70 Sqm Rs.53.70/Sqm Rs.3528.1

**Total quantity for frames**

- **13** Door frames local wood 35x35x6 ISA: 28.350 Kg Rs.75.00/kg Rs.2126.25
- **13a** Window Shutter 35mm thick local wood shutter
- **14** total area of wood shutter: 7.020 Sqm Rs.900.00/Sqm Rs.6318.09

**Grand Total**

- **14** total area of wood shutter: Rs.143020.17

---

### Total Quantity

- **Total Area of Shuttering**: 38,434.93 Sqm
- **Total Weight of Reinforcement**: 75,863 Kg
- **Total Volume of Concrete**: 69,499 Cubic Meters

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**MADHYA PRADESH**
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

![MP-04 Image]

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.

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

**Typical Plan**

- Room: 5200 x 3750 mm lvl +300mm
- Kitchen: 2000 x 3750 mm lvl +300mm
- Verandah: 1800 mm wide lvl +300mm

**Typical Section AA’**

- 450 mm wide, 100mm thick concrete apron to protect foundation
- Max 450mm overhang
- 400 RR stone strips/ stub foundation, or under reamed pile in BC soil
- Wood / T-iron frames with welded grill bars
- Bamboo / wooden members/Bali
- 200 mm thick Stone block masonry/ load-bearing hollow block masonry in 1:6 cement sand mortar. Alternatively use 380 CRS wall in 1:8 cement mortar up to sill level + 200mm stone block masonry above sill
- 400 mm wide, 100mm thick concrete apron to protect foundation

**Area Statement:**

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**MP-04 Cost estimate**

**MADHYA PRADESH**

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**GRAND TOTAL** Rs. 134943.30
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.

<table>
<thead>
<tr>
<th>Components</th>
<th>Recommended Specifications</th>
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<tbody>
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<td><strong>Foundations</strong></td>
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<td>• Strip foundation in Black cotton soil not more than 1.5m deep.</td>
</tr>
<tr>
<td></td>
<td>• Masonry stub fdn with tie beam, Black cotton soil not more than 1.5m deep, single storey construction.</td>
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<td>• Brick arch fdn with brick/ block/stone arch. BC soil not more than 1.5m deep. Hard rocky strata trenching difficult.</td>
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<td>• Single Under-reamed Pile foundation, diameter and length as given in drawings.</td>
</tr>
<tr>
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<tr>
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</tr>
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<td><strong>Roof Cover</strong></td>
<td>• GI sheet</td>
</tr>
<tr>
<td><strong>Floor</strong></td>
<td>• cement concrete/ brick paving</td>
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<tr>
<td><strong>Door and Windows</strong></td>
<td>• Mild steel door and window</td>
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Area Statement:

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<th>Sq.ft</th>
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Typical Plan and Section AA'
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<tr>
<td>76</td>
<td>7a</td>
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<tr>
<td>77</td>
<td>7b</td>
</tr>
<tr>
<td>78</td>
<td>B</td>
</tr>
</tbody>
</table>
| 80 | C | 39429.9/-
| 81 | D | 1841.53 |
| 82 | E | 180.20 |
| 83 | F | 5.340 Sqm |
| 84 | G | Rs. 168.70/-
| 85 | H | Rs. 00.00 |
| 86 | I | 37.380 Kg |
| 87 | J | Rs. 87.70/-
| 88 | 8b | Shuttering |
| 89 | 8c | Total area of shuttering |
| 90 | 8d | 5.340 Sqm |
| 91 | 8e | Rs. 168.70/-
| 92 | 8f | Rs. 00.00 |
| 93 | 9a | 400 x 200 R.C.C lintel 4-8 TOR ALTHRO + 6 dia @ 175/C |
| 94 | 9b | Total vol of concrete |
| 95 | 9c | 0.554 Cum |
| 96 | 9d | 39429.9/-
| 97 | 9e | 1841.53 |
| 98 | 9f | 5.340 Sqm |
| 99 | 9g | Rs. 168.70/-
| 100 | 9h | Rs. 00.00 |
| 101 | 10a | 400 x 200 R.C.C lintel 4-8 TOR ALTHRO + 6 dia @ 175/C |
| 102 | 10b | Total vol of concrete |
| 103 | 10c | 0.554 Cum |
| 104 | 10d | 39429.9/-
| 105 | 10e | 1841.53 |
| 106 | 10f | 5.340 Sqm |
| 107 | 10g | Rs. 168.70/-
| 108 | 10h | Rs. 00.00 |
| 109 | 11a | 400 x 200 R.C.C lintel 4-8 TOR ALTHRO + 6 dia @ 175/C |
| 110 | 11b | Total vol of concrete |
| 111 | 11c | 0.554 Cum |
| 112 | 11d | 39429.9/-
| 113 | 11e | 1841.53 |
| 114 | 11f | 5.340 Sqm |
| 115 | 11g | Rs. 168.70/-
| 116 | 11h | Rs. 00.00 |
| 117 | 12a | 400 x 200 R.C.C lintel 4-8 TOR ALTHRO + 6 dia @ 175/C |
| 118 | 12b | Total vol of concrete |
| 119 | 12c | 0.554 Cum |
| 120 | 12d | 39429.9/-
| 121 | 12e | 1841.53 |
| 122 | 12f | 5.340 Sqm |
| 123 | 12g | Rs. 168.70/-
| 124 | 12h | Rs. 00.00 |
| 125 | 13a | 400 x 200 R.C.C lintel 4-8 TOR ALTHRO + 6 dia @ 175/C |
| 126 | 13b | Total vol of concrete |
| 127 | 13c | 0.554 Cum |
| 128 | 13d | 39429.9/-
| 129 | 13e | 1841.53 |
| 130 | 13f | 5.340 Sqm |
| 131 | 13g | Rs. 168.70/-
| 132 | 13h | Rs. 00.00 |
| 133 | 14a | 400 x 200 R.C.C lintel 4-8 TOR ALTHRO + 6 dia @ 175/C |
| 134 | 14b | Total vol of concrete |
| 135 | 14c | 0.554 Cum |
| 136 | 14d | 39429.9/-
| 137 | 14e | 1841.53 |
| 138 | 14f | 5.340 Sqm |
| 139 | 14g | Rs. 168.70/-
| 140 | 14h | Rs. 00.00 |
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

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.

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</tr>
<tr>
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<td>• 1PCC for flat roofs with waterproofing&lt;br&gt;• GI sheet</td>
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**Area Statement:**

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<th>Area Sq.m</th>
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<tr>
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<td>B</td>
<td>G</td>
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<tr>
<td>22</td>
<td>1b</td>
<td>Filling</td>
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<tr>
<td>26</td>
<td>1c</td>
<td>Sand filling 75mm on trench</td>
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<td>2</td>
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<td>38</td>
<td>3</td>
<td>300 mm thick Brick work in foundation</td>
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<td>47</td>
<td>5a</td>
<td>75x200 RCC plinth band -2.8mm tor= 6 dia links @ 175 c/c</td>
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<td>51</td>
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<tr>
<td>53</td>
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<td>Total area of shuttering</td>
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<tr>
<td>55</td>
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<td>Reinforcement @70 kg/cum</td>
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<tr>
<td>56</td>
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<td>57</td>
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<td>FLOORING</td>
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<tr>
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<td>6a</td>
<td>20mm 1:4 CM on FBS in 1:4 CM with neat cement punning</td>
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**Table: Details of Construction Works**

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<tr>
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<td>Reinforcement @70 kg/cum</td>
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<td>9a</td>
<td>RCC LEDGE 62.5MM</td>
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<td>84</td>
<td>450x62.5 RCC ledge - 4.8 TOR+ 6 dia @ 175C/C</td>
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<td>0.200 Cum</td>
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<td>Long wall</td>
<td>3.639 Sqr</td>
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<td>Rs.614/Cum</td>
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<tr>
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<td>area of 100RCC flat roof - 26.6 Sqr</td>
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<td>Rs.9580/Cum</td>
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<td>Rs.4487/Cum</td>
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<td>Total area of white wash inside</td>
<td>104.32 Sqr</td>
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<td>111</td>
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<td>Outside white wash</td>
<td>area</td>
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<tr>
<td>117</td>
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<td>Overall total area of plaster to be used</td>
<td>169.42 Sqr</td>
<td>Rs.20.06/Sqr</td>
<td>Rs.3388.40</td>
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<td>12a</td>
<td>PLASTERING</td>
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<td>Inside plaster</td>
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<td>122</td>
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<td>Total area of plaster to be used inside</td>
<td>77.72 Sqr</td>
<td>Rs.107.40/Sqr</td>
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<td>126</td>
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<td>Outside plaster/pointing</td>
<td>area</td>
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**MP-06**

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<td>Total area of pointing to be used outside</td>
<td>65.10 Sqr</td>
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<td>MS FRAMES</td>
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<td>13a</td>
<td>Door frames local wood 35x35x6 ISA</td>
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<tr>
<td>137</td>
<td></td>
<td>Window frames 35x35x6 ISA</td>
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<td>Rs.75.00/Kg</td>
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<td>LOCAL WOOD SHUTTER</td>
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<td>142</td>
<td>13b</td>
<td>Door Shutter 40mm thick local wood shutter</td>
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<tr>
<td>145</td>
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<td>Window Shutter 85mm thick local wood shutter</td>
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<td>146</td>
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<td>Total area of wood shutter</td>
<td>7.020 Sqr</td>
<td>Rs.300.00/Sqr</td>
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<tr>
<td>149</td>
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</tbody>
</table>

**Grand Total:** Rs.151041.68
MP-07

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.

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<tr>
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<td>• Masonry stub fdn with tie beam, Black cotton soil not more than 1.5m deep, single storey construction.</td>
</tr>
<tr>
<td></td>
<td>• Brick arch fdn with brick/ block/stone arch. BC soil not more than 1.5m deep. Hard rocky strata trenching difficult.</td>
</tr>
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<tr>
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<td>• PPC for flat roofs with waterproofing</td>
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<td></td>
<td>• GI sheet</td>
</tr>
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<td>• Mild steel door and window</td>
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</tbody>
</table>
In good soil use 400 RR/CR stone masonry strip foundation in 1:8 cement mortar- or stub/stone arched footing in hard soil.

200 mm thick brick/stone masonry block/ hollow block or flyash block in 1:6 cement sand mortar

1800 mm wide verandah on all sides

Bamboo posts

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<td>52.78</td>
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<tr>
<td>Carpet Area</td>
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<tr>
<td>Built up Area</td>
<td>77.94</td>
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TYPICAL SECTION AA’ - SLOPING ROOF OPTION

Ridge plate
CGI sheet
Timber/Bamboo Truss
200 x 75 mm RCC Roof band
200 x 75 mm RCC Lintel band
200 mm thick brick/stone masonry block/ hollow block or flyash block in 1:6 cement sand mortar
200 x 75 mm Plinth band

In good soil use 400 RR/CR stone masonry strip foundation in 1:8 cement mortar- or stub/stone arched footing in hard soil.
<table>
<thead>
<tr>
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<th>B</th>
<th>G</th>
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</table>
MP-08

**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

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

**MADHYA PRADESH**

**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 understucture
- Burnt clay bricks
Area Statement:

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<th>Item</th>
<th>Area Sq.m</th>
<th>Area Sq.ft</th>
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<td>114.10</td>
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<tr>
<td>Kitchen</td>
<td>6.18</td>
<td>66.52</td>
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<tr>
<td>Verandah 1</td>
<td>10.80</td>
<td>116.25</td>
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<tr>
<td>Verandah 2</td>
<td>10.80</td>
<td>116.25</td>
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<tr>
<td>Carpet Area</td>
<td>16.78</td>
<td>180.62</td>
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<tr>
<td>Built up Area</td>
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</table>

TYPICAL PLAN

- Room: 3400 x 3000 mm lvl +300mm
- Kitchen: 2000 x 3000 mm lvl +300mm
- Verandah: 1800 mm wide lvl +300mm

TYPICAL SECTION AA'

- 230mm thick Rat Trap Brick or 200mm stone block masonry in 1:6 cement mortar or 143/190 CSMB wall in 10% stable mud mortar
- Cement Sand mortar 1:6

Additional notes:
- Mud phutka/bricks/cotba
- RCC channel/terracemement channels
- 200 x 75mm RCC roof band
- 200 x 75mm RCC lintel band
- 200mm thick brick / stone / block masonry/hollow block in 1:6 cement sand mortar
- Bamboo / wooden members / Bali
- Foundation type 1/2/3/4/5 45 per soil conditions
- 100 mm thick P.C. layer
TYPICAL SECTION AA’ - SLOPING ROOF OPTION
### MP-08 Cost estimate

<table>
<thead>
<tr>
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<th>B</th>
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<td>18</td>
<td>1a Excavation in foundation</td>
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<td>Window Shutter 35mm thick local wood shutter</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>54</td>
<td>Total area of wood shutter</td>
<td>7.020 Sqm</td>
<td>Rs.900.0/Sqm</td>
<td>Rs.6318.00</td>
<td></td>
</tr>
<tr>
<td>55</td>
<td>GRAND TOTAL</td>
<td></td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

**Rs.140909.40**
### MP-09

**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

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

**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
Area Statement:

<table>
<thead>
<tr>
<th>Item</th>
<th>Sq.m</th>
<th>Sq.ft</th>
</tr>
</thead>
<tbody>
<tr>
<td>Room</td>
<td>12.61</td>
<td>136.73</td>
</tr>
<tr>
<td>Kitchen</td>
<td>10.02</td>
<td>107.86</td>
</tr>
<tr>
<td>Verandah</td>
<td>8.10</td>
<td>87.19</td>
</tr>
<tr>
<td>Carpet Area</td>
<td>22.63</td>
<td>243.59</td>
</tr>
<tr>
<td>Built up Area</td>
<td>35.10</td>
<td>377.82</td>
</tr>
</tbody>
</table>

**Typical Plan**

- Kitchen: 4100 x 2400 mm, lvl+300 mm
- Verandah: 4500 x 1800 mm, lvl+300 mm

**Typical Section AA’**

- Attic: 50 dia. CCB treated mature bamboo purlin/local timber/30NB ms pipe
- Corrugated GCI sheet AS/RES specifications or MCT roofing
- Truss rafters are 65 dia treated bamboo/ local timber/40 NB ms pipe
- Struts and ties 40mm dia treated bamboo/ local timber/30 NB ms pipe

**Notes:**

- Future expansion of roof truss
- G.I. F.L. 
- P.L.
<table>
<thead>
<tr>
<th>A</th>
<th>B</th>
<th>G</th>
<th>H</th>
<th>I</th>
<th>J</th>
</tr>
</thead>
<tbody>
<tr>
<td>16</td>
<td>St.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>17</td>
<td><strong>FOUNDATION</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>1a Excavation in foundation</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>19</td>
<td>Total vol of excavation</td>
<td>8.221 Cum</td>
<td></td>
<td>Rs.93.80/Cum</td>
<td>Rs. 771.14</td>
</tr>
<tr>
<td>20</td>
<td>3b Filling</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>21</td>
<td>Total vol of filling</td>
<td>9.949 Cum</td>
<td></td>
<td>Rs.93.80/Cum</td>
<td>Rs. 933.20</td>
</tr>
<tr>
<td>22</td>
<td>1c Sand filling 75mm on trench</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>23</td>
<td>Total vol of sand</td>
<td>1.162 Cum</td>
<td></td>
<td>Rs.400.00/Cum</td>
<td>Rs.464.7/Cum</td>
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<tr>
<td>24</td>
<td>2c Lean concrete bed 100mm in 1:3:6</td>
<td></td>
<td>1.549 Cum</td>
<td></td>
<td></td>
</tr>
<tr>
<td>25</td>
<td>Total vol of lean concrete</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>26</td>
<td>3a 300 mm thick Brick work in foundation</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>27</td>
<td>3b 200 mm thick Brick work in foundation</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>28</td>
<td><strong>TOTAL VOLUME OF BRICKWORK IN FOUNDATION</strong></td>
<td>3.787 Cum</td>
<td></td>
<td>Rs.3294/Cum</td>
<td>Rs.4247/Cum</td>
</tr>
<tr>
<td>29</td>
<td>4a 75x200 RCC plinth band- 2.8mm tor + 6 dia links @ 175 t/c</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>30</td>
<td>Total vol</td>
<td>0.462 Cum</td>
<td></td>
<td>Rs.162/Cum</td>
<td>Rs.1212/Cum</td>
</tr>
<tr>
<td>31</td>
<td>4b Shuttering</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>32</td>
<td>Total area of shuttering</td>
<td>4.615 Sqm</td>
<td></td>
<td>Rs.168.75/Sqm</td>
<td>Rs. 778.50</td>
</tr>
<tr>
<td>33</td>
<td>4c Reinforcement @70 kg/cum</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>34</td>
<td>Total vol</td>
<td>32.66 Sqm</td>
<td></td>
<td>Rs.389.75/Sqm</td>
<td>Rs.12725.7/Sqm</td>
</tr>
<tr>
<td>35</td>
<td>5 FLOORING</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>36</td>
<td>200 mm masonry wall</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>37</td>
<td>Total vol</td>
<td>13.994 Cum</td>
<td></td>
<td>Rs.3294/Cum</td>
<td>Rs.4333/Cum</td>
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<tr>
<td>38</td>
<td>7a LINTEL BAND</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>39</td>
<td>100X200 RCC lintel -4-8 TOR ALTHRO+ 6 dia @ 175 t/c</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>40</td>
<td>Total vol of concrete</td>
<td>0.490 Cum</td>
<td></td>
<td>Rs.3430/Cum</td>
<td>Rs.1681/Cum</td>
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<tr>
<td>41</td>
<td>7b Shuttering</td>
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<td></td>
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</tr>
<tr>
<td>42</td>
<td>Total area of shuttering</td>
<td>4.900 Sqm</td>
<td></td>
<td>Rs.169/Cum</td>
<td>Rs.827/Cum</td>
</tr>
<tr>
<td>43</td>
<td>7c Reinforcement @70 kg/cum</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>44</td>
<td>Total vol</td>
<td>34.30 Kg</td>
<td></td>
<td>Rs.66/Cum</td>
<td>Rs.2254/Cum</td>
</tr>
<tr>
<td>45</td>
<td>8a RCC LEDGE 62.5MM</td>
<td></td>
<td></td>
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<tr>
<td>46</td>
<td>450X62.5 RCC ledge -4-8 TOHR+ 6 dia @ 175 t/c</td>
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<td></td>
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<td></td>
</tr>
<tr>
<td>47</td>
<td>Total vol of RCC works</td>
<td>0.169 Cum</td>
<td></td>
<td>Rs.3430/Cum</td>
<td>Rs.578/Cum</td>
</tr>
<tr>
<td>48</td>
<td>8b Shuttering</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>49</td>
<td>Total area of shuttering</td>
<td>3.075 Sqm</td>
<td></td>
<td>Rs.169/Cum</td>
<td>Rs.519/Cum</td>
</tr>
<tr>
<td>50</td>
<td>8c Reinforcement @70 kg/cum</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>51</td>
<td>Total vol</td>
<td>11.813 Kg</td>
<td></td>
<td>Rs.66/Cum</td>
<td>Rs.778/Cum</td>
</tr>
</tbody>
</table>

**MP-09 Cost estimate**

<table>
<thead>
<tr>
<th>A</th>
<th>B</th>
<th>G</th>
<th>H</th>
<th>I</th>
<th>J</th>
</tr>
</thead>
<tbody>
<tr>
<td>104</td>
<td>9a 100 RCC FOR ROOF IN M20</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>105</td>
<td><strong>area of 100KCC flat roof</strong></td>
<td></td>
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<tr>
<td>106</td>
<td>Veranda</td>
<td>2.84 Cum</td>
<td></td>
<td>Rs.3430/Cum</td>
<td>Rs.12640.99</td>
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<td>107</td>
<td><strong>Total volume of concrete</strong></td>
<td>3.69 Cum</td>
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<td>Rs.3430/Cum</td>
<td>Rs.12640.99</td>
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<td>108</td>
<td><strong>9b shuttering</strong></td>
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</tr>
<tr>
<td>109</td>
<td><strong>total area of shuttering</strong></td>
<td>38.70 Sqm</td>
<td></td>
<td>Rs.169/Cum</td>
<td>Rs.6528.31</td>
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<tr>
<td>110</td>
<td><strong>9c Reinforcement @ 90 kg/cum</strong></td>
<td></td>
<td>331.605 Kg</td>
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<td>Rs.65.70/Kg</td>
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<tr>
<td>111</td>
<td>WHITE WASHING</td>
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<td></td>
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<tr>
<td>112</td>
<td><strong>inside white washing area</strong></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>113</td>
<td><strong>Total area of white wash inside</strong></td>
<td>84.06 Sqm</td>
<td></td>
<td>Rs.20.00/Sqm</td>
<td>Rs. 2785.60</td>
</tr>
<tr>
<td>114</td>
<td><strong>10b OutSide white wash area</strong></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>115</td>
<td><strong>Overall total area of plaster to be used</strong></td>
<td>129.28 Sqm</td>
<td></td>
<td>Rs.20.00/Sqm</td>
<td>Rs. 2785.60</td>
</tr>
<tr>
<td>116</td>
<td><strong>11a PLASTERING</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>117</td>
<td><strong>inside plaster area</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>118</td>
<td><strong>Total area of plaster to be used outside</strong></td>
<td>67.28 Sqm</td>
<td></td>
<td>Rs.107.4/Sqm</td>
<td>Rs. 7225.8/sqm</td>
</tr>
<tr>
<td>119</td>
<td><strong>11b OutSide plaster/painting area</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>120</td>
<td><strong>Total area of painting to be used outside</strong></td>
<td>55.20 Sqm</td>
<td></td>
<td>Rs.53.7/Sqm</td>
<td>Rs.2964.2/sqm</td>
</tr>
<tr>
<td>121</td>
<td><strong>12a MS FRAMES</strong></td>
<td></td>
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<td></td>
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</tr>
<tr>
<td>122</td>
<td><strong>door frames local wood 30x30x6 ISM</strong></td>
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<tr>
<td>123</td>
<td><strong>Window frames 35x35x6 ISM</strong></td>
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<tr>
<td>124</td>
<td><strong>Total quantity for frames</strong></td>
<td>28.350 Kg</td>
<td></td>
<td>Rs.75.00/Kg</td>
<td>Rs. 2126.25</td>
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<tr>
<td>125</td>
<td><strong>12b LOCAL WOOD MULLTER</strong></td>
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<tr>
<td>126</td>
<td><strong>door Shutter 40mm thick local wood shutter</strong></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>127</td>
<td><strong>Window Shutter 35mm thick local wood shutter</strong></td>
<td></td>
<td>7.020 Sqm</td>
<td></td>
<td>Rs.900.0/Sqm</td>
</tr>
<tr>
<td>128</td>
<td><strong>Total area of wood shutter</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**GRAND TOTAL** Rs.149418.20
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 Sahayaridis 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 livelihood 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

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

**MAHARASHTRA**
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.

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

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
MH-K-01

Area Statement:

<table>
<thead>
<tr>
<th>Item</th>
<th>Sq.m</th>
<th>Sq.ft</th>
</tr>
</thead>
<tbody>
<tr>
<td>Room 1</td>
<td>10.49</td>
<td>112.91</td>
</tr>
<tr>
<td>Room 2</td>
<td>21.70</td>
<td>233.58</td>
</tr>
<tr>
<td>Room 3</td>
<td>10.06</td>
<td>108.29</td>
</tr>
<tr>
<td>Carpet Area</td>
<td>21.70</td>
<td>233.58</td>
</tr>
<tr>
<td>Built up Area</td>
<td>48.60</td>
<td>523.13</td>
</tr>
</tbody>
</table>

Konkan Zone A

MAHARASHTRA
<table>
<thead>
<tr>
<th>SR.NO.</th>
<th>ITEM OF WORK</th>
<th>Quantity</th>
<th>Unit</th>
<th>Rate (Rs)</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>CORE HOUSE</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A</td>
<td>FOUNDATION WORK</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Excavation of trench/pit of 0.6 m deep including and carting away as specified and stacking excavated mud for cob wall, etc. complete as directed</td>
<td>17.9</td>
<td>Cum.</td>
<td>277</td>
<td>4,958</td>
</tr>
<tr>
<td>2</td>
<td>Uncoursed Stone masonry in mud lime ash mortar 1&quot; thick for retaining wall, foundation and plinth etc. complete</td>
<td>7</td>
<td>Cum.</td>
<td>3,000</td>
<td>21,000</td>
</tr>
<tr>
<td>3</td>
<td>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.</td>
<td>32.6</td>
<td>Cum.</td>
<td>750</td>
<td>24,450</td>
</tr>
<tr>
<td></td>
<td>TOTAL FOR FOUNDATION WORK</td>
<td>50</td>
<td></td>
<td>408</td>
<td></td>
</tr>
<tr>
<td>B</td>
<td>SUPERSTRUCTURE</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Brick masonry up to cill level</td>
<td>10</td>
<td>Cum.</td>
<td>3,000</td>
<td>30,000</td>
</tr>
<tr>
<td>2</td>
<td>Adobe masonry above cill level</td>
<td>15</td>
<td>Cum.</td>
<td>600</td>
<td>9,000</td>
</tr>
<tr>
<td>3</td>
<td>RCC columns</td>
<td>12</td>
<td>No.</td>
<td>700</td>
<td>8,400</td>
</tr>
<tr>
<td>4</td>
<td>Roof RCC band</td>
<td>0.5</td>
<td>cu.m</td>
<td>4500</td>
<td>2,250</td>
</tr>
<tr>
<td>5</td>
<td>Lintel RCC band</td>
<td>0.5</td>
<td>cu.m</td>
<td>4500</td>
<td>2,250</td>
</tr>
<tr>
<td>6</td>
<td>Plinth RCC band</td>
<td>0.25</td>
<td>cu.m</td>
<td>4500</td>
<td>1,125</td>
</tr>
<tr>
<td>7</td>
<td>Steel in roof RCC band</td>
<td>32</td>
<td>kg</td>
<td>58</td>
<td>1,856</td>
</tr>
<tr>
<td>8</td>
<td>Steel in Lintel RCC band</td>
<td>32</td>
<td>kg</td>
<td>58</td>
<td>1,856</td>
</tr>
<tr>
<td>9</td>
<td>Steel in Plinth RCC band</td>
<td>16</td>
<td>kg</td>
<td>58</td>
<td>928</td>
</tr>
<tr>
<td></td>
<td>TOTAL FOR SUPER STRUCTURE</td>
<td>57,665</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C</td>
<td>PLASTERING &amp; FINISHING</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Finishing external wall vertical surfaces with mud plaster and rendering the surface</td>
<td>79</td>
<td>Sqm.</td>
<td>98</td>
<td>7,742</td>
</tr>
<tr>
<td>2</td>
<td>Finishing internal wall vertical surfaces with mud plaster finished with lime wash</td>
<td>76</td>
<td>Sqm.</td>
<td>98</td>
<td>7,448</td>
</tr>
<tr>
<td></td>
<td>TOTAL FOR PLASTERING &amp; FINISHING</td>
<td>15,190</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>TOTAL FOR CIVIL WORK</td>
<td>123,263</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>D</td>
<td>Roof with precast RCC plank and joint</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>GI sheet roof - 0.5mm thick for verandah and kitchen</td>
<td>50</td>
<td>No.</td>
<td>500</td>
<td>25,000</td>
</tr>
<tr>
<td>2</td>
<td>Bamboo understructure</td>
<td>75-100mm dia bamboo</td>
<td>25</td>
<td>130</td>
<td>3,250</td>
</tr>
<tr>
<td>3</td>
<td>Skilled artisan/carpenter</td>
<td>3</td>
<td>mandays</td>
<td>500</td>
<td>1,500</td>
</tr>
<tr>
<td>4</td>
<td>Labour</td>
<td>6</td>
<td>mandays</td>
<td>250</td>
<td>1,500</td>
</tr>
<tr>
<td></td>
<td>TOTAL FOR ROOFING</td>
<td>33,950</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>E</td>
<td>DOORS &amp; WINDOWS</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>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</td>
<td>3.8</td>
<td>Sqm.</td>
<td>4,500</td>
<td>17,100</td>
</tr>
</tbody>
</table>

**TOTAL COST PER HOUSE (Rs)**

- **GRAND TOTAL**: 193,663
- **TOTAL FOR ROOFING**: 33,950
- **TOTAL COST PER SQ M (Rs)**: 430.628889

---

MH-K-01

Cost estimate

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.

### 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.

<table>
<thead>
<tr>
<th>Recommendations for construction systems</th>
<th>Foundation</th>
<th>Plinth</th>
<th>Wall</th>
<th>Wall Finish</th>
<th>Roof Structure</th>
<th>Roof Cover</th>
<th>Floor</th>
<th>Door and Windows</th>
</tr>
</thead>
<tbody>
<tr>
<td>Components</td>
<td>Stone foundation with cement-sand packing</td>
<td>Minimum (300 mm or 150mm more than last 50 year flood level) with Plinth Band</td>
<td>reinforced brick columns</td>
<td>Stabilised mud plaster or exposed brick</td>
<td>Sloping roofs with timber understructure</td>
<td>CGI sheets/Country tiles with thatch insulation/ any other insulation material</td>
<td>Cement flooring/ brick paving</td>
<td>Mild steel door and window</td>
</tr>
<tr>
<td>Recommended Specifications</td>
<td>Brick foundation</td>
<td></td>
<td>stone with cement or rat trap till sill level</td>
<td>ferrocement plaster on Adobe walls</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Konkan Zone B

MAHARASHTRA
**MH-K-02**

**Area Statement:**

<table>
<thead>
<tr>
<th>Item</th>
<th>Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Room 1</td>
<td>15.39</td>
</tr>
<tr>
<td>Room 2</td>
<td>14.92</td>
</tr>
<tr>
<td>Carpet Area</td>
<td>30.32</td>
</tr>
<tr>
<td>Built up Area</td>
<td>36.00</td>
</tr>
</tbody>
</table>

**Typical Plan**

- Attic space for storage
- Hipped roof country tile / high wind area CGI sheet
- Parfins
- Rafter
- 450mm roof overhang
- 75mm Thk. RC Roof band
- 75mm Thk. RC Lintel band
- 340x340mm brick column with 10mm central rein.
- Wattle and daub partition wall
- 250mm brick masonry wall with rat trap bond
- 75mm Thk. RC Plinth band
- 450 mm wide Concrete Apron in 1:3:6 to protect foundation
- Stone Block / Brick masonry / Random rubble

**Typical Section AA’**

- 230mm brick masonry wall used rattrap bond up to sill level
- Wattle and daub partition wall
- 370x250mm brick column
- 450mm wide 1:3:6 concrete apron

**Konkan Zone B**

**Maharashtra**
## MH-K-02
### Cost estimate

<table>
<thead>
<tr>
<th>SR.NO.</th>
<th>ITEM OF WORK</th>
<th>Quantity</th>
<th>Unit</th>
<th>Rate (Rs)</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>A</strong></td>
<td>CORE HOUSE</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>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</td>
<td>17.4</td>
<td>Cum.</td>
<td>277</td>
<td>4,820</td>
</tr>
<tr>
<td>2</td>
<td>Uncoursed Stone masonry in mud lime mortar 1/8&quot; thick for retaining wall/foundation and plinth etc. complete</td>
<td>10.7</td>
<td>Cum.</td>
<td>4,500</td>
<td>48,150</td>
</tr>
<tr>
<td>3</td>
<td>Filling in trench/pit with excavated mud to get a uniform base watered and compressed at intervals with top finished with addition of cow dung slurry.</td>
<td>36.3</td>
<td>Cum.</td>
<td>750</td>
<td>27,225</td>
</tr>
<tr>
<td><strong>TOTAL FOR FOUNDATION WORK</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td><strong>80,195</strong></td>
</tr>
<tr>
<td><strong>B</strong></td>
<td>SUPERSTRUCTURE</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Brick masonry with Rat trap bond in super structure with cement mortar 1:6</td>
<td>13.5</td>
<td>Cum.</td>
<td>4,170</td>
<td>52,125</td>
</tr>
<tr>
<td>5</td>
<td>Brick masonry wall 9&quot; thick laid in mud mortar. Mud to be premixed slaked to required consistency</td>
<td>13.4</td>
<td>Cum.</td>
<td>1,200</td>
<td>16,080</td>
</tr>
<tr>
<td><strong>TOTAL FOR SUPER STRUCTURE</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td><strong>83,699</strong></td>
</tr>
<tr>
<td><strong>C</strong></td>
<td>PLASTERING &amp; FINISHING</td>
<td></td>
<td></td>
<td></td>
<td><strong>568</strong></td>
</tr>
<tr>
<td>6</td>
<td>Finishing pier surfaces with mud plaster and rendering the surface</td>
<td></td>
<td></td>
<td></td>
<td><strong>568</strong></td>
</tr>
<tr>
<td><strong>TOTAL FOR PLASTERING &amp; FINISHING</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td><strong>568</strong></td>
</tr>
<tr>
<td><strong>D</strong></td>
<td>Flooring</td>
<td></td>
<td></td>
<td></td>
<td><strong>21,312</strong></td>
</tr>
<tr>
<td>7</td>
<td>Providing and laying polished Shahabad stone 1/8&quot; X 1/8&quot;, 25 to 30mm thick and 30cm wide laid on a bed of cement mortar 1:6 including levelling surface before laying, cement float, mortar bedding, striking joints, curing, polishing, cleaning complete</td>
<td>33.3</td>
<td>Sq.m.</td>
<td>640</td>
<td>21,312</td>
</tr>
<tr>
<td><strong>TOTAL FOR FLOORING</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td><strong>21,312</strong></td>
</tr>
<tr>
<td><strong>E</strong></td>
<td>Roofing</td>
<td></td>
<td></td>
<td></td>
<td><strong>24,688</strong></td>
</tr>
<tr>
<td>8</td>
<td>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</td>
<td>44.5</td>
<td>Sq.m.</td>
<td>555</td>
<td>24,688</td>
</tr>
<tr>
<td><strong>TOTAL FOR ROOFING</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td><strong>24,688</strong></td>
</tr>
<tr>
<td><strong>F</strong></td>
<td>DOORS &amp; WINDOWS</td>
<td></td>
<td></td>
<td></td>
<td><strong>44,865</strong></td>
</tr>
<tr>
<td>9</td>
<td>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</td>
<td>5.67</td>
<td>Sqm.</td>
<td>4,500</td>
<td>25,515</td>
</tr>
<tr>
<td>10</td>
<td>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.</td>
<td>4.3</td>
<td>Sqm.</td>
<td>4,500</td>
<td>19,350</td>
</tr>
<tr>
<td><strong>TOTAL FOR DOORS &amp; WINDOWS</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td><strong>44,865</strong></td>
</tr>
<tr>
<td><strong>GRAND TOTAL</strong></td>
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<td></td>
<td></td>
<td></td>
<td><strong>255,337</strong></td>
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<tr>
<td><strong>TOTAL COST PER HOUSE (RS)</strong></td>
<td></td>
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<td></td>
<td></td>
<td><strong>255,337</strong></td>
</tr>
<tr>
<td><strong>AREA OF HOUSE (SQM)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td><strong>42</strong></td>
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<tr>
<td><strong>COST PER SQ.M (RS)</strong></td>
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<td></td>
<td></td>
<td><strong>6079.4524</strong></td>
</tr>
</tbody>
</table>
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.

<table>
<thead>
<tr>
<th>Recommendations for construction systems</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Components</strong></td>
</tr>
<tr>
<td>Foundations</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Plinth</td>
</tr>
<tr>
<td>Wall</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Wall Finish</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Roof Structure</td>
</tr>
<tr>
<td>Roof Cover</td>
</tr>
<tr>
<td>Floor</td>
</tr>
<tr>
<td>Door and Windows</td>
</tr>
</tbody>
</table>

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
Area Statement:

<table>
<thead>
<tr>
<th>Item</th>
<th>Area</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Sq.m</td>
</tr>
<tr>
<td>Room 1</td>
<td>15.38</td>
</tr>
<tr>
<td>Room 2</td>
<td>15.04</td>
</tr>
<tr>
<td>Carpet Area</td>
<td>30.42</td>
</tr>
<tr>
<td>Built up Area</td>
<td>37.02</td>
</tr>
</tbody>
</table>

**Konkan Zone C**

**MAHARASHTRA**
### CORE HOUSE

<table>
<thead>
<tr>
<th>A</th>
<th>FOUNDATION WORK</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Excavation of trench/pit in deep cutting and cutting away as specified and stacking excavated mud for cob wall, etc. complete as desired.</td>
</tr>
<tr>
<td>2</td>
<td>Uncoursed Stone masonry in mud mortar 1/8&quot; thick for foundation</td>
</tr>
<tr>
<td>3</td>
<td>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.</td>
</tr>
</tbody>
</table>

**TOTAL FOR FOUNDATION WORK**

45,845

<table>
<thead>
<tr>
<th>B</th>
<th>SUPERSTRUCTURE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Burnt Brick ledge wall in mud mortar 0/9&quot; thick till 3’0 level</td>
</tr>
<tr>
<td>2</td>
<td>Brick masonry PIERS 0/9&quot; thick and 1/24&quot; tail in mud mortar. Mud to be premixed/slaked with agricultural waste like husk, straw etc.</td>
</tr>
<tr>
<td>3</td>
<td>Brick masonry wall 0/9&quot; thick laid in mud mortar. Mud to be premixed slaked to required consistency</td>
</tr>
<tr>
<td>4</td>
<td>Wattle and Daub mortar mix and wooden slabs to required thickness</td>
</tr>
<tr>
<td>5</td>
<td>Roof RCC band</td>
</tr>
<tr>
<td>6</td>
<td>lintel RCC band</td>
</tr>
<tr>
<td>7</td>
<td>Plinth RCC band</td>
</tr>
<tr>
<td>8</td>
<td>Steel in Roof RCC band</td>
</tr>
<tr>
<td>9</td>
<td>Steel in lintel RCC band</td>
</tr>
<tr>
<td>10</td>
<td>Steel in Plinth RCC band</td>
</tr>
</tbody>
</table>

**TOTAL FOR SUPER STRUCTURE**

28,680

<table>
<thead>
<tr>
<th>C</th>
<th>PLASTERING &amp; FINISHING</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Finishing pier surfaces with mud plaster and rendering the surface</td>
</tr>
</tbody>
</table>

**TOTAL FOR PLASTERING & FINISHING**

568

<table>
<thead>
<tr>
<th>D</th>
<th>FLOORING</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Providing and laying polished Shatabad stone 1V X1D X 1/2&quot;, 25 to 30 mm thick and 30 cm 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</td>
</tr>
</tbody>
</table>

**TOTAL FOR FLOORING**

21,312

**TOTAL FOR CIVIL WORK**

105,405

<table>
<thead>
<tr>
<th>E</th>
<th>ROOFING</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>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</td>
</tr>
</tbody>
</table>

**TOTAL FOR ROOFING**

24,698

---

### 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 | Sqr. | 4,500 | 25,515 |
| 2 | Providing and fixing Country Wood windows double leaved with paneled 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 | Sqr. | 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)**

4105.89762

---

**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

---

**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 breathable 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 recyclability.
- 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.

---

<table>
<thead>
<tr>
<th>Components</th>
<th>Recommended Specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Foundations</td>
<td>• Stone foundation with cement-sand packing&lt;br&gt;• Brick foundation</td>
</tr>
<tr>
<td>Plinth</td>
<td>• Minimum (300 mm or 150mm more than last 50 year flood level) with Plinth Band</td>
</tr>
<tr>
<td>Wall</td>
<td>• Brick masonry with Rat trap bond till sill level&lt;br&gt;• Wattle &amp; Daub above sill level</td>
</tr>
<tr>
<td>Wall Finish</td>
<td>• Ferrocement plaster</td>
</tr>
<tr>
<td>Roof Structure</td>
<td>• Sloping pyramidal roofs with timber understructure</td>
</tr>
<tr>
<td>Roof Cover</td>
<td>• CGI sheets/Country tiles with thatch insulation/ any other insulation material</td>
</tr>
<tr>
<td>Floor</td>
<td>• Cement flooring/ brick paving</td>
</tr>
<tr>
<td>Door and Windows</td>
<td>• Mild steel door and window</td>
</tr>
</tbody>
</table>
**TYPICAL PLAN**

- **Room**
  - 2900 x 9000

- **Typical Section AA’**
  - 450 mm wide concrete apron
  - Wattle And Daub Wall above sill level with Ferro-cement plaster on external surface
  - Extent of loft or attic at lintel level
  - 250 x 250 mm brick column with reinforcement to support roof
  - 230/250 mm thick brick masonry or 200 mm thick stone block masonry in rat trap or English bond with 1:6 cement mortar upto sill level
  - Reinforced brick/concrete block masonry columns tied together with RCC plinth, lintel and roof band

**Typical Sections**

<table>
<thead>
<tr>
<th>Item</th>
<th>Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Room</td>
<td>26.32</td>
</tr>
<tr>
<td>Carpet Area</td>
<td>26.32</td>
</tr>
<tr>
<td>Built up Area</td>
<td>32.06</td>
</tr>
</tbody>
</table>

**MH-K-04A**

**Area Statement:**

- **Item**
  - **Room**
  - **Carpet Area**
  - **Built up Area**

- **Area**
  - **Sq.m**
  - **Sq.ft**

**Konkan Zone D**

**MAHARASHTRA**
### MH-K-04A Cost estimate

#### A FOUNDATION WORK

<table>
<thead>
<tr>
<th>SR NO</th>
<th>ITEM OF WORK</th>
<th>Quantity</th>
<th>Unit</th>
<th>Rate (Rs)</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>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</td>
<td>7.9</td>
<td>Cum.</td>
<td>277</td>
<td>2,188</td>
</tr>
<tr>
<td>2</td>
<td>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</td>
<td>28.2</td>
<td>Cum.</td>
<td>750</td>
<td>21,150</td>
</tr>
</tbody>
</table>

**TOTAL FOR FOUNDATION WORK**

| 23,338 |

#### B SUPERSTRUCTURE

<table>
<thead>
<tr>
<th>SR NO</th>
<th>ITEM OF WORK</th>
<th>Quantity</th>
<th>Unit</th>
<th>Rate (Rs)</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Uncoursed Stone masonry in mud mortar 2½&quot; thick for foundation and 1½&quot; for plinth walls</td>
<td>15</td>
<td>Cum.</td>
<td>3,000</td>
<td>45,000</td>
</tr>
<tr>
<td>2</td>
<td>Burnt Brick ledge wall 0'9&quot; thick till 3'0&quot; level to protect from water spray</td>
<td>9.4</td>
<td>Cum.</td>
<td>1,200</td>
<td>11,280</td>
</tr>
<tr>
<td>3</td>
<td>Brick masonry Piers 0'9&quot; thick and 6'0&quot; tall laid in mud mortar. Mud to be spread/stacked with agricultural waste like husk, straw etc.</td>
<td>16</td>
<td>each</td>
<td>500</td>
<td>8,000</td>
</tr>
</tbody>
</table>

**TOTAL FOR SUPER STRUCTURE**

| 79,345 |

#### C PLASTERING & FINISHING

<table>
<thead>
<tr>
<th>SR NO</th>
<th>ITEM OF WORK</th>
<th>Quantity</th>
<th>Unit</th>
<th>Rate (Rs)</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>Wattle and Daub infill with bamboo as wattle 4&quot; thick and mud mixed with cowdung etc. finished complete</td>
<td>32</td>
<td>Sqm.</td>
<td>150</td>
<td>4,800</td>
</tr>
<tr>
<td>5</td>
<td>Roof RCC band</td>
<td>0.5</td>
<td>cu.m</td>
<td>4500</td>
<td>2,250</td>
</tr>
<tr>
<td>6</td>
<td>Lintel RCC band</td>
<td>0.5</td>
<td>cu.m</td>
<td>4500</td>
<td>2,250</td>
</tr>
<tr>
<td>7</td>
<td>Plinth RCC band</td>
<td>0.25</td>
<td>cu.m</td>
<td>4500</td>
<td>1,125</td>
</tr>
<tr>
<td>8</td>
<td>Steel in Roof RCC band</td>
<td>32</td>
<td>kg</td>
<td>58</td>
<td>1,856</td>
</tr>
<tr>
<td>9</td>
<td>Steel in Lintel RCC band</td>
<td>32</td>
<td>kg</td>
<td>58</td>
<td>1,856</td>
</tr>
<tr>
<td>10</td>
<td>Steel in Plinth RCC band</td>
<td>16</td>
<td>kg</td>
<td>58</td>
<td>928</td>
</tr>
</tbody>
</table>

**TOTAL FOR PLASTERING & FINISHING**

| 6,115 |

#### D TOTAL FOR CIVIL WORK

| 108,799 |

#### E ROOFING

<table>
<thead>
<tr>
<th>SR NO</th>
<th>ITEM OF WORK</th>
<th>Quantity</th>
<th>Unit</th>
<th>Rate (Rs)</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>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</td>
<td>40.5</td>
<td>Sq.m.</td>
<td>555</td>
<td>22,478</td>
</tr>
</tbody>
</table>

**TOTAL FOR ROOFING**

| 22,478 |

#### F DOORS & WINDOWS

<table>
<thead>
<tr>
<th>SR NO</th>
<th>ITEM OF WORK</th>
<th>Quantity</th>
<th>Unit</th>
<th>Rate (Rs)</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>11</td>
<td>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</td>
<td>9.45</td>
<td>Sqm.</td>
<td>4,500</td>
<td>42,525</td>
</tr>
</tbody>
</table>

**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)**

| 3950.02173 |

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**Konkan Zone D**

**MAHARASHTRA**
A raised stone plinth or chauntha 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 breathable 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 recyclability.
- 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.

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

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
**Area Statement:**

<table>
<thead>
<tr>
<th>Item</th>
<th>Area</th>
<th>Sq.ft</th>
</tr>
</thead>
<tbody>
<tr>
<td>Room 1+2</td>
<td>25.50</td>
<td>274.48</td>
</tr>
<tr>
<td>Carpet Area</td>
<td>25.50</td>
<td>274.48</td>
</tr>
<tr>
<td>Built up Area</td>
<td>27.81</td>
<td>299.35</td>
</tr>
</tbody>
</table>

**TYPICAL PLAN TYPICAL SECTION AA’**

- 230 mm thick RC roof beam
- Timber tie for mezzanine floor
- 300 mm thick RC lintel beam
- 230/250 mm brick columns
- Wattle and Daub wall finished with Ferrocement plaster on the external surface
- 230mm brick masonry wall upto sill level
- Cement flooring
- 75 mm thick plinth band
- Compacted earth filling
- 450 mm wide concrete apron
- Attic above
- Ridge line
- Step
- 450 mm roof overhang
- 345 x 345 mm brick column to support roof
- Bamboo/ Wooden Truss type T4, 3 nos.
- 230mm brick masonry wall upto sill level
- Wattle and Daub Wall with Ferro-cement plaster on external surface above sill lvl.
<table>
<thead>
<tr>
<th>SR.NO.</th>
<th>ITEM OF WORK</th>
<th>Quantity</th>
<th>Unit</th>
<th>Rate (Rs)</th>
<th>Cost (Rs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>CORE HOUSE</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A</td>
<td>FOUNDATION WORK</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>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</td>
<td>7.1</td>
<td>Cum.</td>
<td>277</td>
<td>1,967</td>
</tr>
<tr>
<td>2</td>
<td>Uncoursed Stone masonry in mud lime ash mortar 1/4&quot; thick for retaining wall, foundation and plinth etc. complete</td>
<td>6.7</td>
<td>Cum.</td>
<td>3,000</td>
<td>20,100</td>
</tr>
<tr>
<td>3</td>
<td>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.</td>
<td>30</td>
<td>Cum.</td>
<td>750</td>
<td>22,500</td>
</tr>
<tr>
<td></td>
<td>TOTAL FOR FOUNDATION WORK</td>
<td></td>
<td></td>
<td></td>
<td>44,567</td>
</tr>
<tr>
<td>B</td>
<td>SUPERSTRUCTURE</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Burnt Brick ledge wall 0.9&quot; thick till 3/0&quot; level to protect from water spray</td>
<td>9.4</td>
<td>Cum.</td>
<td>1,200</td>
<td>11,280</td>
</tr>
<tr>
<td>5</td>
<td>Brick masonry Piers 0.9&quot; thick and 6.0&quot;* tall laid in mud mortar. Mud to be premixed/slaked with agricultural waste like husk, straw etc.</td>
<td>13</td>
<td>each</td>
<td>880</td>
<td>11,440</td>
</tr>
<tr>
<td>6</td>
<td>Wattle and Daub infill with bamboo as wattle 4&quot; thick and mud mixed with cowdung etc. finished complete.</td>
<td>50</td>
<td>Sq.m</td>
<td>150</td>
<td>7,500</td>
</tr>
<tr>
<td>7</td>
<td>Roof RCC band</td>
<td>0.25</td>
<td>cu.m</td>
<td>4500</td>
<td>1,125</td>
</tr>
<tr>
<td>8</td>
<td>Lintel RCC band</td>
<td>0.25</td>
<td>cu.m</td>
<td>4500</td>
<td>1,125</td>
</tr>
<tr>
<td>9</td>
<td>Plinth RCC band</td>
<td>0.25</td>
<td>cu.m</td>
<td>4500</td>
<td>1,125</td>
</tr>
<tr>
<td>10</td>
<td>Steel in Roof RCC band</td>
<td>16</td>
<td>kg</td>
<td>58</td>
<td>928</td>
</tr>
<tr>
<td>11</td>
<td>Steel in Lintel RCC band</td>
<td>16</td>
<td>kg</td>
<td>58</td>
<td>928</td>
</tr>
<tr>
<td>12</td>
<td>Steel in Plinth RCC band</td>
<td>16</td>
<td>kg</td>
<td>58</td>
<td>928</td>
</tr>
<tr>
<td></td>
<td>TOTAL FOR SUPER STRUCTURE</td>
<td></td>
<td></td>
<td></td>
<td>36,379</td>
</tr>
<tr>
<td>C</td>
<td>PLASTERING &amp; FINISHING</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Finishing pier surfaces with mud plaster and rendering the surface</td>
<td>42</td>
<td>Sq.m</td>
<td>98</td>
<td>4,116</td>
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<tr>
<td></td>
<td>TOTAL FOR PLASTERING &amp; FINISHING</td>
<td></td>
<td></td>
<td></td>
<td>4,116</td>
</tr>
<tr>
<td>D</td>
<td>Flooring</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Providing and laying polished Shabdi stone 3'0&quot; x 1'1/2&quot;, 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</td>
<td>25</td>
<td>Sq.m</td>
<td>640</td>
<td>16,000</td>
</tr>
<tr>
<td></td>
<td>TOTAL FOR FLOORING</td>
<td></td>
<td></td>
<td></td>
<td>16,000</td>
</tr>
<tr>
<td></td>
<td>TOTAL FOR CIVIL WORK</td>
<td></td>
<td></td>
<td></td>
<td>101,062</td>
</tr>
<tr>
<td>E</td>
<td>Roofing</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>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</td>
<td>45</td>
<td>Sq.m</td>
<td>555</td>
<td>24,975</td>
</tr>
<tr>
<td></td>
<td>TOTAL FOR ROOFING</td>
<td></td>
<td></td>
<td></td>
<td>24,975</td>
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<tr>
<td>F</td>
<td>DOORS &amp; WINDOWS</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>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</td>
<td>3.8</td>
<td>Sq.m</td>
<td>4,500</td>
<td>17,100</td>
</tr>
<tr>
<td></td>
<td>TOTAL FOR DOORS &amp;WINDOWS</td>
<td></td>
<td></td>
<td></td>
<td>17,100</td>
</tr>
<tr>
<td></td>
<td>GRAND TOTAL</td>
<td></td>
<td></td>
<td></td>
<td>143,137</td>
</tr>
<tr>
<td></td>
<td>TOTAL COST PER HOUSE (RS)</td>
<td></td>
<td></td>
<td></td>
<td>8419.80588</td>
</tr>
<tr>
<td></td>
<td>AREA OF HOUSE (SQM)</td>
<td></td>
<td></td>
<td></td>
<td>17</td>
</tr>
<tr>
<td></td>
<td>COST PER SQ.M (RS)</td>
<td></td>
<td></td>
<td></td>
<td>8419.80588</td>
</tr>
</tbody>
</table>
**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

---

**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 ‘chaitharas’ 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 ‘chaithara’ which is then sieved.
- The timber framed roof built of jungle/country wood can also be dismantable and members repaired/replaced if required.

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

TYPICAL SECTION AA’

MH-K-05A

Area Statement:

<table>
<thead>
<tr>
<th>Item</th>
<th>Area</th>
<th>Sq.m</th>
<th>Sq.ft</th>
</tr>
</thead>
<tbody>
<tr>
<td>Room 1</td>
<td>13.78</td>
<td>148.33</td>
<td></td>
</tr>
<tr>
<td>Room 2</td>
<td>13.78</td>
<td>148.33</td>
<td></td>
</tr>
<tr>
<td>Room 3</td>
<td>15.47</td>
<td>166.52</td>
<td></td>
</tr>
<tr>
<td>Carpet Area</td>
<td>43.03</td>
<td>463.17</td>
<td></td>
</tr>
<tr>
<td>Built up Area</td>
<td>51.65</td>
<td>555.96</td>
<td></td>
</tr>
</tbody>
</table>

Konkan Zone E

MAHARASHTRA
### Area Statement:

<table>
<thead>
<tr>
<th>Item</th>
<th>Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Room 1</td>
<td>13.78</td>
</tr>
<tr>
<td>Room 2</td>
<td>13.78</td>
</tr>
<tr>
<td>Room 3</td>
<td>15.47</td>
</tr>
<tr>
<td>Carpet Area</td>
<td>43.03</td>
</tr>
<tr>
<td>Built up Area</td>
<td>51.65</td>
</tr>
</tbody>
</table>

**TYPICAL PLAN**

- **R.C.C. L-PANEL ROOF**
- **75 mm thick RC roof band**
- **Loft or attic area**
- **75 mm thick RC lintel band**
- **Laterite stone/ Brick/ stone masonry walls in cement mortar**
- **Cement flooring**
- **15 mm thick plinth band**
- **Compacted earth filling**
- **450 mm wide concrete apron**
- **Stone Block / Brick masonry / Random rubble**

**TYPICAL SECTION AA’**

- **RC pre-cast joists, 3 nos.**
- **450 mm wide concrete apron**
- **UP**
- **Ridge line**
- **L-pan roof**
- **Laetrile Stone/ Brick/ stone masonry in cement mortar**
- **10 mm dia vertical reinforcement**

**Konkan Zone E**

**MAHARASHTRA**
<table>
<thead>
<tr>
<th>SR.NO.</th>
<th>ITEM OF WORK</th>
<th>Quantity</th>
<th>Unit</th>
<th>Rate (Rs)</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>a</td>
<td>CORE HOUSE</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A</td>
<td>FOUNDATION WORK</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>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</td>
<td>17.3</td>
<td>Cum.</td>
<td>277</td>
<td>4,752</td>
</tr>
<tr>
<td>2</td>
<td>Uncoursed Stone masonry in mud lime ash mortar 1½&quot; thick for retaining wall foundation and plinth etc. complete</td>
<td>6.75</td>
<td>Cum.</td>
<td>3,000</td>
<td>20,250</td>
</tr>
<tr>
<td>3</td>
<td>Filling in trench/pit with excavated mud to get a uniform base watered and compressed at intervals with top finished with addition of cow dung slurry.</td>
<td>32.6</td>
<td>Cum.</td>
<td>750</td>
<td>24,450</td>
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<tr>
<td></td>
<td>TOTAL FOR FOUNDATION WORK</td>
<td></td>
<td></td>
<td></td>
<td>49,492</td>
</tr>
<tr>
<td>B</td>
<td>SUPERSTRUCTURE</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Brick masonry</td>
<td>5.5</td>
<td>Cum.</td>
<td>3,000</td>
<td>16,500</td>
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<td>TOTAL FOR SUPER STRUCTURE</td>
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<td>16,500</td>
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<tr>
<td>C</td>
<td>PLASTERING &amp; FINISHING</td>
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<td></td>
</tr>
<tr>
<td>1</td>
<td>Finishing pier surfaces with finishing external wall vertical surfaces with mud plaster and rendering the surface with top coat mixed with cow dung/mud plaster and rendering the surface</td>
<td>9.99</td>
<td>Sq.m.</td>
<td>98</td>
<td>979</td>
</tr>
<tr>
<td>2</td>
<td>Finishing pier surfaces with finishing internal vertical surfaces with mud plaster finished with lime wash with mud plaster and rendering the surface</td>
<td>9.99</td>
<td>Sq.m.</td>
<td>22</td>
<td>220</td>
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<tr>
<td></td>
<td>TOTAL FOR PLASTERING &amp; FINISHING</td>
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<td></td>
<td></td>
<td>979</td>
</tr>
<tr>
<td></td>
<td>TOTAL FOR CIVIL WORK</td>
<td></td>
<td></td>
<td></td>
<td>66,971</td>
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<tr>
<td>E</td>
<td>Roofing</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>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</td>
<td>44.5</td>
<td>Sq.m.</td>
<td>555</td>
<td>24,698</td>
</tr>
<tr>
<td></td>
<td>TOTAL FOR ROOFING</td>
<td></td>
<td></td>
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<td>24,698</td>
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<tr>
<td>F</td>
<td>DOORS &amp; WINDOWS</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>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</td>
<td>5.67</td>
<td>Sq.m.</td>
<td>4,500</td>
<td>25,515</td>
</tr>
<tr>
<td>2</td>
<td>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.</td>
<td>4.3</td>
<td>Sq.m.</td>
<td>4,500</td>
<td>19,350</td>
</tr>
<tr>
<td></td>
<td>TOTAL FOR DOORS &amp; WINDOWS</td>
<td></td>
<td></td>
<td></td>
<td>44,865</td>
</tr>
<tr>
<td></td>
<td>GRAND TOTAL</td>
<td></td>
<td></td>
<td></td>
<td>136,534</td>
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<tr>
<td></td>
<td>TOTAL COST PER HOUSE (RS)</td>
<td></td>
<td></td>
<td>136,534</td>
<td></td>
</tr>
<tr>
<td></td>
<td>AREA OF HOUSE (SQM)</td>
<td></td>
<td></td>
<td>52</td>
<td></td>
</tr>
<tr>
<td></td>
<td>COST PER SQM (RS)</td>
<td></td>
<td></td>
<td>2625.64654</td>
<td></td>
</tr>
</tbody>
</table>
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 Godavari. Evolving from the mud of the region, walls of adobe with mud mortar and cob are suitable both 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 Manjira 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.

ZONE A
ZONE B
ZONE C
ZONE D
ZONE E
ZONE F
ZONE G
ZONE H
ZONE I

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

<table>
<thead>
<tr>
<th>TYPOLOGY</th>
<th>APPLICABLE HOUSING ZONES</th>
<th>TOTAL AREA Sq.m/Sq.ft</th>
</tr>
</thead>
<tbody>
<tr>
<td>MH-M-01</td>
<td>Zone A</td>
<td>48.18 Sq.m</td>
</tr>
<tr>
<td>MH-M-02</td>
<td>Zone B</td>
<td>41.06 Sq.m</td>
</tr>
<tr>
<td>MH-M-03</td>
<td>Zone C</td>
<td>76.67 Sq.m</td>
</tr>
<tr>
<td>MH-M-04</td>
<td>Zone D</td>
<td>64.00 Sq.m</td>
</tr>
<tr>
<td>MH-M-05</td>
<td>Zone E</td>
<td>31.25 Sq.m</td>
</tr>
<tr>
<td>MH-M-06</td>
<td>Zone F</td>
<td>52.11 Sq.m</td>
</tr>
<tr>
<td>MH-M-07</td>
<td>Zone G</td>
<td>40.14 Sq.m</td>
</tr>
<tr>
<td>MH-M-08</td>
<td>Zone H</td>
<td>71.52 Sq.m</td>
</tr>
<tr>
<td>MH-M-09</td>
<td>Zone I</td>
<td>32.40 Sq.m</td>
</tr>
</tbody>
</table>

![Image of MH-M-01](MN-M-01.png)

![Image of MH-M-02](MN-M-02.png)

![Image of MH-M-03](MN-M-03.png)

![Image of MH-M-04](MN-M-04.png)

![Image of MH-M-05](MN-M-05.png)

![Image of MH-M-06](MN-M-06.png)

![Image of MH-M-07](MN-M-07.png)

![Image of MH-M-08](MN-M-08.png)

![Image of MH-M-09](MN-M-09.png)
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

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.

<table>
<thead>
<tr>
<th>Components</th>
<th>Recommended Specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Foundations</td>
<td>Stone/Random rubble foundation</td>
</tr>
<tr>
<td>Plinth</td>
<td>Minimum (300 mm or 150mm more than last 50 year flood level)</td>
</tr>
<tr>
<td>Wall</td>
<td>Stone/brick masonry in rat trap bond</td>
</tr>
<tr>
<td>Wall Finish</td>
<td>Stabilised mud plaster/cement plaster/exposed brick wall with pointing</td>
</tr>
<tr>
<td>Roof Structure</td>
<td>Flat roofing system with Precast Rc channel</td>
</tr>
<tr>
<td>Roof Cover</td>
<td>Brick Coba/Mud Phuska</td>
</tr>
<tr>
<td>Floor</td>
<td>Cement flooring/brick paving</td>
</tr>
<tr>
<td>Door and Windows</td>
<td>Local timber/Mild steel door and window</td>
</tr>
</tbody>
</table>
**Area Statement:**

<table>
<thead>
<tr>
<th>Item</th>
<th>Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Living Room</td>
<td>18.6</td>
</tr>
<tr>
<td>Bedroom</td>
<td>11.10</td>
</tr>
<tr>
<td>Kitchen</td>
<td>5.70</td>
</tr>
<tr>
<td>Store room</td>
<td>2.56</td>
</tr>
<tr>
<td>Carpet Area</td>
<td>41.23</td>
</tr>
<tr>
<td>Built up Area</td>
<td>48.18</td>
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### Cost Estimate

<table>
<thead>
<tr>
<th>SR. NO.</th>
<th>ITEM OF WORK</th>
<th>Quantity</th>
<th>Unit</th>
<th>Rate (Rs)</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td><strong>CORE HOUSE</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A</td>
<td><strong>TERRACE CONSTRUCTION</strong></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>1</td>
<td>Grouting and excavation of space left to form the RCC and fitting of excavated material after sorting for reuse within the premises etc. consolidate.</td>
<td>81</td>
<td>Cum.</td>
<td>277</td>
<td>22,437</td>
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<td></td>
<td><strong>TOTAL FOR TERRACE WORK</strong></td>
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<td></td>
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<td>22,437</td>
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<tr>
<td>B</td>
<td><strong>FOUNDATION WORK</strong></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Excavation and excavation of space left to form the RCC, mud and carrying away as specified and stacking excavated mud for cob wall, etc. complete as directed.</td>
<td>10.08</td>
<td>Cum.</td>
<td>277</td>
<td>2,795</td>
</tr>
<tr>
<td>2</td>
<td>Uncoursed Stone masonry in mud lime ash mortar 16&quot; thick for retaining wall, foundation and plinth etc. complete.</td>
<td>11.97</td>
<td>Cum.</td>
<td>3,000</td>
<td>35,910</td>
</tr>
<tr>
<td>3</td>
<td>Ramming base with excavated mud to get a uniform platform for thatching roofed area 15cms high watered and compressed at intervals with top finished with addition of cowdung slurry.</td>
<td>30.5325</td>
<td>Cum.</td>
<td>750</td>
<td>22,899</td>
</tr>
<tr>
<td>4</td>
<td></td>
<td>4.875</td>
<td>Cum.</td>
<td>750</td>
<td>3,656</td>
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<td><strong>TOTAL FOR FOUNDATION WORK</strong></td>
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<td>65,260</td>
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<tr>
<td>B</td>
<td><strong>SUPERSTRUCTURE</strong></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Brick masonry with trap bond in super structure with cement mortar 1:4</td>
<td>20.8</td>
<td>Cum.</td>
<td>4,170</td>
<td>86,736</td>
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<tr>
<td>2</td>
<td>Roof RCC band</td>
<td>0.25</td>
<td>cu.m</td>
<td>4500</td>
<td>1,125</td>
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<tr>
<td>3</td>
<td>Lintel RCC band</td>
<td>0.25</td>
<td>cu.m</td>
<td>4500</td>
<td>1,125</td>
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<td></td>
<td><strong>TOTAL FOR SUPERSTRUCTURE</strong></td>
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<td>90,111</td>
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<tr>
<td>C</td>
<td><strong>PLASTERING &amp; FINISHING</strong></td>
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<td></td>
</tr>
<tr>
<td>1</td>
<td>Finishing external wall vertical surfaces with mud plaster and rendering the surface</td>
<td>56</td>
<td>Sqm.</td>
<td>98</td>
<td>5,488</td>
</tr>
<tr>
<td>2</td>
<td>Finishing internal wall vertical surfaces with mud plaster finished with lime wash.</td>
<td>51.2</td>
<td>Sqm.</td>
<td>98</td>
<td>5,018</td>
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<td></td>
<td><strong>TOTAL FOR PLASTERING &amp; FINISHING</strong></td>
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<td></td>
<td></td>
<td>10,506</td>
</tr>
<tr>
<td>D</td>
<td><strong>ROOFING</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Precast tiles of section 0.15mx0.15mx3m, with a 0.5mx0.5m flange</td>
<td>12</td>
<td>No.</td>
<td>1,000</td>
<td>12,000</td>
</tr>
<tr>
<td>2</td>
<td>Brick bats and mud phuska finishing over roof with cement dust mortar</td>
<td>6</td>
<td>Sqm.</td>
<td>650.00</td>
<td>3,900</td>
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<td></td>
<td><strong>TOTAL FOR ROOFING</strong></td>
<td></td>
<td></td>
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<td>15,900</td>
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<tr>
<td>E</td>
<td><strong>DOORS &amp; WINDOWS</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>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</td>
<td>5.67</td>
<td>Sqm.</td>
<td>4,500</td>
<td>25,515</td>
</tr>
<tr>
<td>2</td>
<td>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</td>
<td>1.89</td>
<td>Sqm.</td>
<td>4,500</td>
<td>8,505</td>
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<td><strong>TOTAL FOR DOORS &amp; WINDOWS</strong></td>
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<td>34,020</td>
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<td><strong>GRAND TOTAL</strong></td>
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<td></td>
<td><strong>TOTAL CDST PER HOUSE (Rs)</strong></td>
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<td>238,234</td>
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<tr>
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<td><strong>AREA OF HOUSE (SQM)</strong></td>
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<td><strong>COST PER SQM (Rs)</strong></td>
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<td>4886.849</td>
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</table>
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.

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

**TYPICAL SECTION AA'**

- **Over the roof Mud phuska / Brick coba**
- **Roof over passage in cgi sheet and thatch panel below**
- **Adobe Brick Stone block in English or rat trap bond**
- **Pillar**
- **450mm wide 1:3:6 concrete apron**
- **Random Rubble / Stone Concrete Block**
- **RC plank roof joists 310x15x15cm**

### Area Statement:

<table>
<thead>
<tr>
<th>Item</th>
<th>Area (Sq.m)</th>
<th>Area (Sq.ft)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Living Room</td>
<td>12.96</td>
<td>139.50</td>
</tr>
<tr>
<td>Bedroom</td>
<td>7.83</td>
<td>84.28</td>
</tr>
<tr>
<td>Kitchen</td>
<td>2.95</td>
<td>31.75</td>
</tr>
<tr>
<td>Store room</td>
<td>4.18</td>
<td>45.00</td>
</tr>
<tr>
<td>Carpet Area</td>
<td>28.58</td>
<td>307.64</td>
</tr>
<tr>
<td>Built up Area</td>
<td>41.06</td>
<td>441.97</td>
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</table>

**Marathwada Zone B**

**MAHARASHTRA**
<table>
<thead>
<tr>
<th>SR.NO.</th>
<th>ITEM OF WORK</th>
<th>Quantity</th>
<th>Unit</th>
<th>Rate (Rs)</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td><strong>FOUNDATION WORK</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>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</td>
<td>4.32</td>
<td>Cum.</td>
<td>277</td>
<td>1,197</td>
</tr>
<tr>
<td>2</td>
<td>Uncoursed Stone masonry in mud lime ash mortar 1/6&quot; thick for retaining wall, foundation and plinth etc. complete</td>
<td>2.7</td>
<td>Cum.</td>
<td>5,000</td>
<td>8,100</td>
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<tr>
<td>3</td>
<td>Filling in trench/pit with excavated mud to get a uniform base watered and compressed at intervals with top finished with addition of cow dung slurry.</td>
<td>30.6</td>
<td>Cum.</td>
<td>750</td>
<td>22,950</td>
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<tr>
<td></td>
<td><strong>TOTAL FOR FOUNDATION WORK</strong></td>
<td></td>
<td></td>
<td></td>
<td>32,247</td>
</tr>
<tr>
<td>B</td>
<td><strong>SUPERSTRUCTURE</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Brick masonry with Rat trap bond in super structure with cement mortar 1:4</td>
<td>18</td>
<td>Cum.</td>
<td>6,170</td>
<td>75,060</td>
</tr>
<tr>
<td>2</td>
<td>Roof RCC band</td>
<td>0.25</td>
<td>cu.m.</td>
<td>4500</td>
<td>1,125</td>
</tr>
<tr>
<td>3</td>
<td>Lintel RCC band</td>
<td>0.25</td>
<td>cu.m.</td>
<td>4500</td>
<td>1,125</td>
</tr>
<tr>
<td>4</td>
<td>Plinth RCC band</td>
<td>0.25</td>
<td>cu.m.</td>
<td>4500</td>
<td>1,125</td>
</tr>
<tr>
<td>5</td>
<td>Steel in Roof RCC band</td>
<td>16</td>
<td>kg</td>
<td>58</td>
<td>928</td>
</tr>
<tr>
<td>6</td>
<td>Steel in Lintel RCC band</td>
<td>16</td>
<td>kg</td>
<td>58</td>
<td>928</td>
</tr>
<tr>
<td>7</td>
<td>Steel in Plinth RCC band</td>
<td>16</td>
<td>kg</td>
<td>58</td>
<td>928</td>
</tr>
<tr>
<td></td>
<td><strong>TOTAL FOR SUPER STRUCTURE</strong></td>
<td></td>
<td></td>
<td></td>
<td>81,219</td>
</tr>
<tr>
<td>C</td>
<td><strong>PLASTERING &amp; FINISHING</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Finishing external wall vertical surfaces with mud plaster and rendering the surface</td>
<td>85</td>
<td>Sqm.</td>
<td>88</td>
<td>8,330</td>
</tr>
<tr>
<td>2</td>
<td>Finishing internal wall vertical surfaces with mud plaster finished with lime wash.</td>
<td>65</td>
<td>Sqm.</td>
<td>88</td>
<td>6,370</td>
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<tr>
<td></td>
<td><strong>TOTAL FOR PLASTERING &amp; FINISHING</strong></td>
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<td></td>
<td></td>
<td>14,700</td>
</tr>
<tr>
<td></td>
<td><strong>TOTAL FOR CIVIL WORK</strong></td>
<td></td>
<td></td>
<td></td>
<td>128,166</td>
</tr>
<tr>
<td>D</td>
<td><strong>ROOFING</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Precast RCC planks of size 1.5mx0.3m, with 1.6 kg 6mm steel per plank</td>
<td>24</td>
<td>No.</td>
<td>275</td>
<td>6,600</td>
</tr>
<tr>
<td>2</td>
<td>Precast RCC beam of size 0.15mx0.15m, 3.6m length</td>
<td>1</td>
<td>No.</td>
<td>2500</td>
<td>2,500</td>
</tr>
<tr>
<td>3</td>
<td>Insitu concrete mix 1:1.5:3 on top of planks and joint</td>
<td>0.25</td>
<td>cu.m.</td>
<td>4500</td>
<td>1,125</td>
</tr>
<tr>
<td>4</td>
<td>Steel in insitu concrete</td>
<td>13</td>
<td>kg</td>
<td>58</td>
<td>754</td>
</tr>
<tr>
<td>5</td>
<td>Mason</td>
<td>2</td>
<td>mandays</td>
<td>500</td>
<td>1,000</td>
</tr>
<tr>
<td>6</td>
<td>Labour</td>
<td>12</td>
<td>mandays</td>
<td>250</td>
<td>3,000</td>
</tr>
<tr>
<td>7</td>
<td>Bar bender</td>
<td>1</td>
<td>mandays</td>
<td>500</td>
<td>500</td>
</tr>
<tr>
<td>8</td>
<td>Brick bats and mud phuska finishing over roof with cement dust mortar</td>
<td>10</td>
<td>Sqm.</td>
<td>650.00</td>
<td>6,500</td>
</tr>
<tr>
<td></td>
<td><strong>TOTAL FOR ROOFING</strong></td>
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<td></td>
<td></td>
<td>21,979</td>
</tr>
</tbody>
</table>

**MH-M-02 Cost estimate**

<table>
<thead>
<tr>
<th>E</th>
<th>DOORS &amp; WINDOWS</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>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</td>
<td>4.85</td>
<td>Sqm.</td>
</tr>
<tr>
<td>2</td>
<td>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</td>
<td>4.85</td>
<td>Sqm.</td>
</tr>
<tr>
<td><strong>TOTAL FOR DOORS &amp; WINDOWS</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>GRAND TOTAL</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>TOTAL COST PER HOUSE (RS)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>AREA OF HOUSE (SQM)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>COST PER SQ.M (RS)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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

### 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.

<table>
<thead>
<tr>
<th>Components</th>
<th>Recommended Specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Foundations</td>
<td>Stone block/ Random rubble foundation</td>
</tr>
<tr>
<td>Plinth</td>
<td>Minimum (300 mm or 150mm more than last 50 year flood level)</td>
</tr>
<tr>
<td>Wall</td>
<td>300 mm thick brick/stone block masonry upto sill level</td>
</tr>
<tr>
<td></td>
<td>300 mm thick adobe wall construction above sill level</td>
</tr>
<tr>
<td></td>
<td>with horizontal RCC bands at plinth, sill and lintel level</td>
</tr>
<tr>
<td>Wall Finish</td>
<td>Stabilised mud plaster/ cement plaster/exposed brick wall with pointing/ferrocement plaster</td>
</tr>
<tr>
<td>Roof Structure</td>
<td>flat roofing system with RC joist and plank system reinforced with 6 mmand 8 mm dia rebars</td>
</tr>
<tr>
<td></td>
<td>lean to roofing system on the verandah with CGI sheet with timber understructure insulated with thatch</td>
</tr>
<tr>
<td>Roof Cover</td>
<td>Brick Coba/ Mud Phuska</td>
</tr>
<tr>
<td>Floor</td>
<td>cement flooring/ brick paving</td>
</tr>
<tr>
<td>Door and Windows</td>
<td>local timber/Mild steel door and window</td>
</tr>
</tbody>
</table>
MH-M-03

Area Statement:

<table>
<thead>
<tr>
<th>Item</th>
<th>Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Room 1</td>
<td>15.48 Sq.m</td>
</tr>
<tr>
<td>Room 2</td>
<td>15.72 Sq.m</td>
</tr>
<tr>
<td>Verandah</td>
<td>26.59 Sq.m</td>
</tr>
<tr>
<td>Carpet Area</td>
<td>36.89 Sq.m</td>
</tr>
<tr>
<td>Built up Area</td>
<td>76.67 Sq.m</td>
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</tbody>
</table>

Marathwada Zone C

MAHARASHTRA
## Cost Estimate

### A - FOUNDATION WORK

<table>
<thead>
<tr>
<th>SR.NO.</th>
<th>ITEM OF WORK</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>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</td>
</tr>
<tr>
<td>2</td>
<td>Uncoursed Stone masonry in mud lime mortar 1’6” thick for retaining wall, foundation and plinth etc. complete</td>
</tr>
<tr>
<td>3</td>
<td>Filling in trench/pit with excavated mud to get a uniform base watered and compressed at intervals with top finished with addition of cow dung slurry.</td>
</tr>
<tr>
<td>4</td>
<td>Ramming base with excavated mud to get a uniform platform for slates roofed area 15cms high watered and compressed at intervals with top finished with addition of cow dung slurry.</td>
</tr>
</tbody>
</table>

**TOTAL FOR FOUNDATION WORK**

<p>| | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
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<td>63,613</td>
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</table>

### B - SUPERSTRUCTURE

<table>
<thead>
<tr>
<th>SR.NO.</th>
<th>ITEM OF WORK</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Brick masonry upto cill level</td>
</tr>
<tr>
<td>2</td>
<td>Adobe masonry above cill level</td>
</tr>
<tr>
<td>3</td>
<td>RCC columns</td>
</tr>
<tr>
<td>4</td>
<td>Roof RCC band</td>
</tr>
<tr>
<td>5</td>
<td>Lintel RCC band</td>
</tr>
<tr>
<td>6</td>
<td>Plinth RCC band</td>
</tr>
<tr>
<td>7</td>
<td>Steel in Roof RCC band</td>
</tr>
<tr>
<td>8</td>
<td>Steel in Lintel RCC band</td>
</tr>
<tr>
<td>9</td>
<td>Steel in Plinth RCC band</td>
</tr>
</tbody>
</table>

**TOTAL FOR SUPER STRUCTURE**

<p>| | | | |</p>
<table>
<thead>
<tr>
<th></th>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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<td>56,359</td>
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### C - PLASTERING & FINISHING

<table>
<thead>
<tr>
<th>SR.NO.</th>
<th>ITEM OF WORK</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Finishing external wall vertical surfaces with mud plaster and rendering the surface.</td>
</tr>
<tr>
<td>2</td>
<td>Finishing internal wall vertical surfaces with mud plaster finished with lime wash.</td>
</tr>
</tbody>
</table>

**TOTAL FOR PLASTERING & FINISHING**

<p>| | | | |</p>
<table>
<thead>
<tr>
<th></th>
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<tbody>
<tr>
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<td>17,248</td>
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**TOTAL FOR CIVIL WORK**

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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
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<td>137,220</td>
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</tbody>
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### D - ROOF with precast RCC plank and joint

<table>
<thead>
<tr>
<th>SR.NO.</th>
<th>ITEM OF WORK</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Precast RCC planks of size 1.5mx0.3m, with 1.6 kg 8mm steel per plank</td>
</tr>
<tr>
<td>2</td>
<td>Precast RCC beam of size 0.15m x 0.15m, 3.5m length</td>
</tr>
<tr>
<td>3</td>
<td>In situ concrete mix 11.5:3:3 on top of planks and joint</td>
</tr>
<tr>
<td>4</td>
<td>Steel in in situ concrete</td>
</tr>
<tr>
<td>5</td>
<td>Mason</td>
</tr>
<tr>
<td>6</td>
<td>Labour</td>
</tr>
<tr>
<td>7</td>
<td>Bar bender</td>
</tr>
<tr>
<td>8</td>
<td>GCI sheet roof - 0.5mm thick for verandah and kitchen</td>
</tr>
<tr>
<td>9</td>
<td>Size 2740 x 900 (9 X7F)</td>
</tr>
<tr>
<td>10</td>
<td>Size 2135 x 900 (7 X7F)</td>
</tr>
<tr>
<td>11</td>
<td>Bamboo undersheathing</td>
</tr>
<tr>
<td>12</td>
<td>80-60mm dia bamboo</td>
</tr>
<tr>
<td>13</td>
<td>Bamboo</td>
</tr>
<tr>
<td>14</td>
<td>Labour</td>
</tr>
<tr>
<td>15</td>
<td>Nails and hardware</td>
</tr>
<tr>
<td>16</td>
<td>Brick bats and mud phuska finishing over roof with cement dust mortar</td>
</tr>
</tbody>
</table>

**TOTAL FOR ROOFING**

<p>| | | | |</p>
<table>
<thead>
<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td></td>
<td></td>
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<td>62,715</td>
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### E - DOORS & WINDOWS

<table>
<thead>
<tr>
<th>SR.NO.</th>
<th>ITEM OF WORK</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Providing and fixing country wood two leaved Door including mouldings, rebate hold fasts and finished with primer and paint inclusive of country teak wood frame without ventilators, windows and fanlights</td>
</tr>
<tr>
<td>2</td>
<td>Providing and fixing country wood single leaved Door including mouldings, rebate hold fasts and finished with primer and paint inclusive of country teak wood frame without ventilators, windows and fanlights</td>
</tr>
</tbody>
</table>

**TOTAL FOR DOORS & WINDOWS**

<p>| | | | |</p>
<table>
<thead>
<tr>
<th></th>
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</thead>
<tbody>
<tr>
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<td>37,800</td>
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**GRAND TOTAL**

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<tbody>
<tr>
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<td>237,735</td>
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**TOTAL COST PER HOUSE (RS)**

<table>
<thead>
<tr>
<th>AREA OF HOUSE (SQM)</th>
<th>75</th>
<th>316,7933</th>
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</thead>
</table>
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.

<table>
<thead>
<tr>
<th>Components</th>
<th>Recommended Specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Foundations</td>
<td>Strip foundation with Stone block/ brick masonry in cement mortar</td>
</tr>
<tr>
<td>Plinth</td>
<td>Minimum (300 mm or 150mm more than last 50 year flood level)</td>
</tr>
<tr>
<td>Wall</td>
<td>230 mm thk brick in english/rat trap bond or</td>
</tr>
<tr>
<td></td>
<td>200 mm thk stone block/laterite block masonry in 1:6 cement mortar</td>
</tr>
<tr>
<td></td>
<td>with horizontal RCC bands at pinth/ sill and lintel level</td>
</tr>
<tr>
<td>Wall Finish</td>
<td>Stabilised mud plaster/ cement plaster/exposed brick wall with pointing/ferrocement plaster</td>
</tr>
<tr>
<td>Roof Structure</td>
<td>Flat roofing system with RC ferrocement channels</td>
</tr>
<tr>
<td>Roof Cover</td>
<td>Brick Coba/ Mud Phuska</td>
</tr>
<tr>
<td>Floor</td>
<td>Cement flooring/ brick paving</td>
</tr>
<tr>
<td>Door and Windows</td>
<td>local timber/Mild steel door and window</td>
</tr>
</tbody>
</table>
**MH-M-04**

**Area Statement:**

<table>
<thead>
<tr>
<th>Item</th>
<th>Area Sq.m</th>
<th>Area Sq.ft</th>
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</thead>
<tbody>
<tr>
<td>Room 1</td>
<td>10.00</td>
<td>107.64</td>
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<tr>
<td>Room 2</td>
<td>10.00</td>
<td>107.64</td>
</tr>
<tr>
<td>Room 3</td>
<td>10.00</td>
<td>107.64</td>
</tr>
<tr>
<td>Room 4</td>
<td>10.00</td>
<td>107.64</td>
</tr>
<tr>
<td>Verandah</td>
<td>14.00</td>
<td>150.70</td>
</tr>
<tr>
<td>Carpet Area</td>
<td>39.00</td>
<td>419.80</td>
</tr>
<tr>
<td>Built up Area</td>
<td>64.00</td>
<td>688.90</td>
</tr>
</tbody>
</table>

**TYPICAL PLAN**

- Precast Ferrocement channel roof
- 230 mm thick brick/stone block masonry in 1:6 cement mortar
- 450 mm wide 1:3:6 concrete apron
- Shaded verandah
- Sloping roof with thatch panels and CGI sheet covering
- Columns to support sloping roof

**TYPICAL SECTION AA’**

- Multistorey brick cotta
- Precast RC Framed channels
- Min. 15 mm thick M20 Cement concrete
- 300 x 75 RC lintel band
- 230 mm thick brick in English or rat trap.
- 300 thick masonry blocks
- Black masonry in 1:6 cement mortar
- Cement concrete flooring
- Thin brick Pilot band
- 65 mm wide concrete apron
- Strip foundation in brick/stone block masonry with (1+4) cement mortar. Type F1/R2/F3

**Marathwada Zone D**

**MAHARASHTRA**
<table>
<thead>
<tr>
<th>SR.NO.</th>
<th>ITEM OF WORK</th>
<th>Quantity</th>
<th>Unit</th>
<th>Rate (Rs)</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>CORE HOUSE</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>TERRACE CONSTRUCTION</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Cutting and excavation of slope of hill to form terraces and stacking of excavated material after sorting for reuse within the premises etc. complete.</td>
<td>75</td>
<td>Cum.</td>
<td>277</td>
<td>20775.0</td>
</tr>
<tr>
<td>2</td>
<td>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.</td>
<td>47</td>
<td>Cum.</td>
<td>450</td>
<td>21150.0</td>
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<tr>
<td>2</td>
<td>TOTAL FOR TERRACE WORK</td>
<td></td>
<td></td>
<td></td>
<td>0.0</td>
</tr>
<tr>
<td>3</td>
<td>FOUNDATION WORK</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Excavation-Excavation of trench/plt. 0.6 m deep including and carting away as specified and stacking excavated mud for cob wall etc. complete as directed</td>
<td>4.3</td>
<td>Cum.</td>
<td>277</td>
<td>1191.1</td>
</tr>
<tr>
<td>4</td>
<td>Uncoursed Stone masonry in mud lime ash mortar 1 1/2&quot; thick for retaining wall foundation and plinth etc. complete.</td>
<td>2.7</td>
<td>Cum.</td>
<td>1,000</td>
<td>8100.0</td>
</tr>
<tr>
<td>5</td>
<td>Masonry in plinth to prepare for 6&quot; thick to get a smooth and flat surface and commenced at intervals with top finished with addition of cement between.</td>
<td>30.6</td>
<td>Cum.</td>
<td>750</td>
<td>22950.0</td>
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<tr>
<td>5</td>
<td>TOTAL FOR FOUNDATION WORK</td>
<td></td>
<td></td>
<td></td>
<td>32241.1</td>
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<tr>
<td>6</td>
<td>SUPERSTRUCTURE</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Brick masonry upto cill level</td>
<td>30</td>
<td>Cum.</td>
<td>1,000</td>
<td>90000.0</td>
</tr>
<tr>
<td>7</td>
<td>Roof RCC band</td>
<td>0.25</td>
<td>cu.m</td>
<td>4500</td>
<td>1125.0</td>
</tr>
<tr>
<td>8</td>
<td>lintel RCC band</td>
<td>0.25</td>
<td>cu.m</td>
<td>4500</td>
<td>1125.0</td>
</tr>
<tr>
<td>9</td>
<td>Plinth RCC band</td>
<td>0.25</td>
<td>cu.m</td>
<td>4500</td>
<td>1125.0</td>
</tr>
<tr>
<td>10</td>
<td>Steel in Roof RCC band</td>
<td>16</td>
<td>kg</td>
<td>58</td>
<td>928.0</td>
</tr>
<tr>
<td>11</td>
<td>Steel in lintel RCC band</td>
<td>16</td>
<td>kg</td>
<td>58</td>
<td>928.0</td>
</tr>
<tr>
<td>12</td>
<td>Steel in Plinth RCC band</td>
<td>16</td>
<td>kg</td>
<td>58</td>
<td>928.0</td>
</tr>
<tr>
<td>12</td>
<td>TOTAL FOR SUPER STRUCTURE</td>
<td></td>
<td></td>
<td></td>
<td>96159.0</td>
</tr>
<tr>
<td>13</td>
<td>PLASTERING &amp; FINISHING</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>Finishing external wall vertical surfaces with mud plaster and rendering the surface.</td>
<td>56</td>
<td>Sqm.</td>
<td>98</td>
<td>5488.0</td>
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<tr>
<td>14</td>
<td>Finishing internal wall vertical surfaces with mud plaster finished with lime wash.</td>
<td>120</td>
<td>Sqm.</td>
<td>98</td>
<td>11760.0</td>
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<tr>
<td>14</td>
<td>TOTAL FOR PLASTERING &amp; FINISHING</td>
<td></td>
<td></td>
<td></td>
<td>17248.0</td>
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<td>15</td>
<td>TOTAL FOR CIVIL WORK</td>
<td></td>
<td></td>
<td></td>
<td>145648.1</td>
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<tr>
<td>16</td>
<td>Ferroconcretion channel roof using precast channel of width 750mm, thickness 25mm and 350mm length, cast in 1/2 cement mortar, reinforced with chicken mesh and welded</td>
<td>14.0</td>
<td>No.</td>
<td>2000.0</td>
<td>28000.0</td>
</tr>
<tr>
<td>17</td>
<td>In-fill concrete 1.2-4 in valleys between channels</td>
<td>1.5</td>
<td>cu.m</td>
<td>9000.0</td>
<td>4500.0</td>
</tr>
<tr>
<td>18</td>
<td>Manpower for filling and placing channels and finishing in situ valley concrete.</td>
<td>2.0</td>
<td>M/ndays</td>
<td>500.0</td>
<td>1000.0</td>
</tr>
<tr>
<td>19</td>
<td>Skilled mason</td>
<td>15.0</td>
<td>M/ndays</td>
<td>250.0</td>
<td>3750.0</td>
</tr>
<tr>
<td>20</td>
<td>Labour</td>
<td>70</td>
<td>Sqm.</td>
<td>600.0</td>
<td>42000.0</td>
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<tr>
<td>20</td>
<td>TOTAL FOR ROOFING</td>
<td></td>
<td></td>
<td></td>
<td>79250.0</td>
</tr>
</tbody>
</table>

**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 |
1. 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**

<table>
<thead>
<tr>
<th>AREA OF HOUSE (SQM)</th>
<th>COST PER SQM (RS)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>70.0</td>
</tr>
<tr>
<td></td>
<td>3752.8</td>
</tr>
</tbody>
</table>

**GRAND TOTAL**

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>TOTAL COST PER HOUSE</td>
<td>262698.1</td>
</tr>
<tr>
<td>COST PER SQM (RS)</td>
<td>3752.8</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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 building construction technology:

- Stone
- Mud

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 advised. The plinth and foundation are built in with stone and puddled earth.

<table>
<thead>
<tr>
<th>Recommendations for construction systems</th>
</tr>
</thead>
<tbody>
<tr>
<td>Components</td>
</tr>
<tr>
<td>Foundations</td>
</tr>
<tr>
<td>Plinth</td>
</tr>
<tr>
<td>Wall</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Wall Finish</td>
</tr>
<tr>
<td>Roof Structure</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Roof Cover</td>
</tr>
<tr>
<td>Floor</td>
</tr>
<tr>
<td>Door and Windows</td>
</tr>
</tbody>
</table>
MH-M-05

Area Statement:

<table>
<thead>
<tr>
<th>Item</th>
<th>Area</th>
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</thead>
<tbody>
<tr>
<td>Room 1</td>
<td>11.98</td>
</tr>
<tr>
<td>Room 2</td>
<td>11.98</td>
</tr>
<tr>
<td>Carpet Area</td>
<td>21.95</td>
</tr>
<tr>
<td>Built up Area</td>
<td>31.25</td>
</tr>
</tbody>
</table>
MH-M-05
Cost estimate

<table>
<thead>
<tr>
<th>SR.NO.</th>
<th>ITEM OF WORK</th>
<th>Quantity</th>
<th>Unit</th>
<th>Rate (Rs)</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>CORE HOUSE</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A</td>
<td>EXCAVATION: Excavation of trench up to 4m deep including and covering away as specified and stacking excavated mud for cob wall etc., complete as directed</td>
<td>6.7</td>
<td>Cum.</td>
<td>277</td>
<td>1,856</td>
</tr>
<tr>
<td></td>
<td>Uncoursed Stone masonry in mud lime mortar 1” thick for retaining wall foundation and plinth etc., complete</td>
<td>7.5</td>
<td>Cum.</td>
<td>3,000</td>
<td>22,500</td>
</tr>
<tr>
<td></td>
<td>Filling in trench with excavated mud to get a uniform base level, with a final finished with additional mud</td>
<td>11.3</td>
<td>Cum.</td>
<td>750</td>
<td>8,475</td>
</tr>
<tr>
<td></td>
<td>TOTAL FOR FOUNDATION WORK</td>
<td></td>
<td></td>
<td></td>
<td>32,831</td>
</tr>
<tr>
<td>B</td>
<td>SUPERSTRUCTURE</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Rubble masonry upto cell level 400mm thick</td>
<td>9</td>
<td>Cum.</td>
<td>1,200</td>
<td>10,800</td>
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<tr>
<td></td>
<td>Stone block masonry 200mm thick</td>
<td>5</td>
<td>Cum.</td>
<td>1,000</td>
<td>15,000</td>
</tr>
<tr>
<td></td>
<td>Roof RCC band</td>
<td>0.25</td>
<td>cu.m</td>
<td>4500</td>
<td>1,125</td>
</tr>
<tr>
<td></td>
<td>Lintel RCC band</td>
<td>0.25</td>
<td>cu.m</td>
<td>4500</td>
<td>1,125</td>
</tr>
<tr>
<td></td>
<td>Cill RCC band</td>
<td>0.5</td>
<td>cu.m</td>
<td>4500</td>
<td>2,250</td>
</tr>
<tr>
<td></td>
<td>Plinth RCC band</td>
<td>0.5</td>
<td>cu.m</td>
<td>4500</td>
<td>2,250</td>
</tr>
<tr>
<td></td>
<td>Steel in Roof RCC band</td>
<td>16</td>
<td>kg</td>
<td>58</td>
<td>928</td>
</tr>
<tr>
<td></td>
<td>Steel in Lintel RCC band</td>
<td>16</td>
<td>kg</td>
<td>58</td>
<td>928</td>
</tr>
<tr>
<td></td>
<td>Steel in Cill RCC band</td>
<td>32</td>
<td>kg</td>
<td>58</td>
<td>1,856</td>
</tr>
<tr>
<td></td>
<td>Steel in Plinth RCC band</td>
<td>32</td>
<td>kg</td>
<td>58</td>
<td>1,856</td>
</tr>
<tr>
<td></td>
<td>TOTAL FOR SUPER STRUCTURE</td>
<td></td>
<td></td>
<td></td>
<td>38,118</td>
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</tbody>
</table>

### C PLASTERING & FINISHING

<table>
<thead>
<tr>
<th>Description</th>
<th>Quantity</th>
<th>Unit</th>
<th>Rate (Rs)</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Finishing external wall vertical surfaces with mud plaster and rendering the surface</td>
<td>60</td>
<td>Sqm.</td>
<td>98</td>
<td>5,880</td>
</tr>
<tr>
<td>2. Finishing internal wall vertical surfaces with mud plaster finished with lime wash</td>
<td>32</td>
<td>Sqm.</td>
<td>98</td>
<td>3,136</td>
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<tr>
<td><strong>TOTAL FOR PLASTERING &amp; FINISHING</strong></td>
<td></td>
<td></td>
<td></td>
<td><strong>9,016</strong></td>
</tr>
<tr>
<td><strong>TOTAL FOR CIVIL WORK</strong></td>
<td></td>
<td></td>
<td></td>
<td><strong>79,965</strong></td>
</tr>
</tbody>
</table>

### D ROOF WITH PRECAST RCC PLANK AND JOIST

<table>
<thead>
<tr>
<th>Description</th>
<th>Quantity</th>
<th>Unit</th>
<th>Rate (Rs)</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Precast RCC planks of size 1.5mx0.3m, with 1.6 kg 6mm steel per plank</td>
<td>60</td>
<td>No.</td>
<td>275</td>
<td>16,500</td>
</tr>
<tr>
<td>2. Precast RCC beam of size 0.15mx0.15m, 3.6m length</td>
<td>1</td>
<td>No.</td>
<td>2500</td>
<td>2,500</td>
</tr>
<tr>
<td>3. In-situ concrete mix 1:1.5:3 on top of planks and joist</td>
<td>1</td>
<td>cu.m</td>
<td>4500</td>
<td>4,500</td>
</tr>
<tr>
<td>4. Steel in in-situ concrete</td>
<td>25</td>
<td>kg</td>
<td>58</td>
<td>1,450</td>
</tr>
<tr>
<td>5. Mason</td>
<td>2</td>
<td>mandays</td>
<td>500</td>
<td>1,000</td>
</tr>
<tr>
<td>6. Labour</td>
<td>12</td>
<td>mandays</td>
<td>250</td>
<td>3,000</td>
</tr>
<tr>
<td>7. Bar bender</td>
<td>1</td>
<td>mandays</td>
<td>500</td>
<td>500</td>
</tr>
<tr>
<td>8. Brick bats and mud phuska finishing over roof with cement dust mortar</td>
<td>25</td>
<td>Sqm.</td>
<td>650.00</td>
<td>16,250</td>
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<tr>
<td><strong>TOTAL FOR ROOFING</strong></td>
<td></td>
<td></td>
<td></td>
<td><strong>45,700</strong></td>
</tr>
</tbody>
</table>

### E DOORS & WINDOWS

<table>
<thead>
<tr>
<th>Description</th>
<th>Quantity</th>
<th>Unit</th>
<th>Rate (Rs)</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>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</td>
<td>4.85</td>
<td>Sqm.</td>
<td>4,500</td>
<td>21,825</td>
</tr>
<tr>
<td><strong>TOTAL FOR DOORS &amp; WINDOWS</strong></td>
<td></td>
<td></td>
<td></td>
<td><strong>21,825</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Description</th>
<th>Quantity</th>
<th>Unit</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>GRAND TOTAL</strong></td>
<td></td>
<td></td>
<td><strong>147,490</strong></td>
</tr>
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</table>

<table>
<thead>
<tr>
<th>Description</th>
<th>Quantity</th>
<th>Unit</th>
<th>Rate (Rs)</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>TOTAL COST PER HOUSE (RS)</strong></td>
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<td></td>
<td></td>
<td><strong>147,490</strong></td>
</tr>
<tr>
<td><strong>AREA OF HOUSE (SQM)</strong></td>
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<td></td>
<td></td>
<td><strong>31</strong></td>
</tr>
<tr>
<td><strong>COST PER SQ.M (RS)</strong></td>
<td></td>
<td></td>
<td></td>
<td><strong>4757.73871</strong></td>
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</tbody>
</table>
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 advised. The plinth and foundation are built in with stone and puddled earth.

<table>
<thead>
<tr>
<th>Components</th>
<th>Recommended Specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Foundations</td>
<td>Strip foundation in Stone block/ Random rubble foundation</td>
</tr>
<tr>
<td>Plinth</td>
<td>Minimum (300 mm or 150mm more than last 50 year flood level)</td>
</tr>
<tr>
<td>Wall</td>
<td>200 mm thk stone block masonry in cement mortar</td>
</tr>
<tr>
<td>Wall Finish</td>
<td>Stabilised mud plaster/ cement plaster/exposed brick wall with pointing/ferrocement plaster</td>
</tr>
<tr>
<td>Roof Structure</td>
<td>flat roofing system with RC joist and plank system reinforced with 6 mm and 8 mm dia rebar</td>
</tr>
<tr>
<td>Roof Cover</td>
<td>Brick Coba/ Mud Phuska</td>
</tr>
<tr>
<td>Floor</td>
<td>cement flooring/ brick paving</td>
</tr>
<tr>
<td>Door and Windows</td>
<td>local timber/Mild steel door and window</td>
</tr>
</tbody>
</table>

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 building construction technology:

- Stone
- Mud
## Area Statement:

<table>
<thead>
<tr>
<th>Item</th>
<th>Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sq.m</td>
<td>Sq.ft</td>
</tr>
<tr>
<td>Room</td>
<td>14.50</td>
</tr>
<tr>
<td>Storage</td>
<td>5.07</td>
</tr>
<tr>
<td>Kitchen</td>
<td>5.40</td>
</tr>
<tr>
<td>Verandah</td>
<td>11.76</td>
</tr>
<tr>
<td>Carpet Area</td>
<td>25.54</td>
</tr>
<tr>
<td>Built up Area</td>
<td>52.11</td>
</tr>
</tbody>
</table>

### Typical Plan:

- **Pre-cast RCC plank and joist roofing system:**
  - RCC joists: 3100 x 150 x 150; nos. 4
  - RCC planks: 1400 x 300 x 60; nos. 50

- **Concrete apron:**
  - 200 mm thick stone block masonry in 1:6 cement mortar
  - 450 mm wide 1:3:6 concrete apron

- **Sloping roof:**
  - CGI sheet covering over verandah, with thatch panels underneath
  - 3600 x 5250

- **Columns to support sloping roof:**

- **Shaded courtyard:**
  - 3600 x 5250

- **Room:**
  - 2900 x 5000

- **Storage:**
  - 2900 x 1760

- **Kitchen:**
  - 3600 x 1500

### Typical Section AA’:

- **Pre-cast RCC plank and joist roofing system:**
- **Concrete apron:**
- **Sloping roof:**
- **Columns to support sloping roof:**
<table>
<thead>
<tr>
<th>SR.NO.</th>
<th>ITEM OF WORK</th>
<th>Quantity</th>
<th>Unit</th>
<th>Rate (Rs)</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>A 1</td>
<td>CORE HOUSE</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A 2</td>
<td>FOUNDATION WORK</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>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</td>
<td>10.8</td>
<td>Cum.</td>
<td>277</td>
<td>2,992</td>
</tr>
<tr>
<td>2</td>
<td>Uncoursed Stone masonry in mud lime ash mortar 1/4&quot; thick for retaining wall, foundation and plinth etc. complete</td>
<td>10.8</td>
<td>Cum.</td>
<td>3,000</td>
<td>32,400</td>
</tr>
<tr>
<td>3</td>
<td>Filling in trench/pit with excavated mud to get a uniform base watered and compressed at intervals with top finished with addition of cow dung slurry.</td>
<td>35.6</td>
<td>Cum.</td>
<td>750</td>
<td>26,700</td>
</tr>
<tr>
<td></td>
<td>TOTAL FOR FOUNDATION WORK</td>
<td></td>
<td></td>
<td></td>
<td>62,092</td>
</tr>
<tr>
<td>B 2</td>
<td>SUPERSTRUCTURE</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Brick masonry up to cill level</td>
<td>10</td>
<td>Cum.</td>
<td>3,000</td>
<td>30,000</td>
</tr>
<tr>
<td>2</td>
<td>Adobe masonry above cill level</td>
<td>15</td>
<td>Cum.</td>
<td>600</td>
<td>9,000</td>
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<tr>
<td>3</td>
<td>RCC columns</td>
<td>16</td>
<td>No.</td>
<td>700</td>
<td>11,200</td>
</tr>
<tr>
<td>4</td>
<td>Roof RCC band</td>
<td>0.25</td>
<td>cu.m</td>
<td>4500</td>
<td>1,125</td>
</tr>
<tr>
<td>5</td>
<td>Lintel RCC band</td>
<td>0.25</td>
<td>cu.m</td>
<td>4500</td>
<td>1,125</td>
</tr>
<tr>
<td>6</td>
<td>Plinth RCC band</td>
<td>0.25</td>
<td>cu.m</td>
<td>4500</td>
<td>1,125</td>
</tr>
<tr>
<td>7</td>
<td>Steel in Roof RCC band</td>
<td>16</td>
<td>kg</td>
<td>58</td>
<td>928</td>
</tr>
<tr>
<td>8</td>
<td>Steel in Lintel RCC band</td>
<td>16</td>
<td>kg</td>
<td>58</td>
<td>928</td>
</tr>
<tr>
<td></td>
<td>TOTAL FOR SUPER STRUCTURE</td>
<td></td>
<td></td>
<td></td>
<td>56,550</td>
</tr>
<tr>
<td>C 1</td>
<td>PLASTERING &amp; FINISHING</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Finishing external wall vertical surfaces with mud plaster and rendering the surface</td>
<td>56</td>
<td>Sqm.</td>
<td>98</td>
<td>5,488</td>
</tr>
<tr>
<td>2</td>
<td>Finishing internal wall vertical surfaces with mud plaster finished with lime wash</td>
<td>120</td>
<td>Sqm.</td>
<td>98</td>
<td>11,760</td>
</tr>
<tr>
<td></td>
<td>TOTAL FOR PLASTERING &amp; FINISHING</td>
<td></td>
<td></td>
<td></td>
<td>17,248</td>
</tr>
<tr>
<td>D 1</td>
<td>Roof with precast RCC plank and joint</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Precast RCC planks of size 1.5m x 0.3m, with 1.6 kg 6mm steel per plank</td>
<td>80</td>
<td>No.</td>
<td>275</td>
<td>22,000</td>
</tr>
<tr>
<td>2</td>
<td>Precast RCC beam of size 0.15m x 0.15m, 3.6m length</td>
<td>3</td>
<td>No.</td>
<td>2500</td>
<td>7,500</td>
</tr>
<tr>
<td>3</td>
<td>In situ concrete mix 1:1.5:3 on top of planks and joint</td>
<td>0.3</td>
<td>cu.m</td>
<td>4500</td>
<td>2,250</td>
</tr>
<tr>
<td>4</td>
<td>Steel in in situ concrete</td>
<td>50</td>
<td>kg</td>
<td>58</td>
<td>2,900</td>
</tr>
<tr>
<td>5</td>
<td>Mason</td>
<td>2</td>
<td>mandays</td>
<td>500</td>
<td>1,000</td>
</tr>
<tr>
<td>6</td>
<td>Labour</td>
<td>12</td>
<td>mandays</td>
<td>250</td>
<td>3,000</td>
</tr>
<tr>
<td>7</td>
<td>Bar bender</td>
<td>1</td>
<td>mandays</td>
<td>500</td>
<td>500</td>
</tr>
<tr>
<td>8</td>
<td>GI sheet roof - 0.5mm thick for verandah and kitchen</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8a</td>
<td>Size 2740 x 900 (P+3)</td>
<td>7</td>
<td>No.</td>
<td>500</td>
<td>3,500</td>
</tr>
<tr>
<td>8b</td>
<td>Size 2135 x 900 (7+3)</td>
<td>0</td>
<td>No.</td>
<td>425</td>
<td>-</td>
</tr>
<tr>
<td>8c</td>
<td>Bamboo understructure</td>
<td>15-100mm dia bamboo</td>
<td>20</td>
<td>120</td>
<td>2,600</td>
</tr>
<tr>
<td>8d</td>
<td>15-60mm dia bamboo</td>
<td>7</td>
<td>100</td>
<td>700</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Manpower</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9a</td>
<td>Skilled artisan/carpenter</td>
<td>3</td>
<td>mandays</td>
<td>500</td>
<td>1,500</td>
</tr>
<tr>
<td>9b</td>
<td>Labour</td>
<td>6</td>
<td>mandays</td>
<td>250</td>
<td>1,500</td>
</tr>
<tr>
<td>9c</td>
<td>Nails and Hardware</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9d</td>
<td>Iron</td>
<td>20</td>
<td>100</td>
<td>2,000</td>
<td></td>
</tr>
<tr>
<td>9e</td>
<td>Iron</td>
<td>10</td>
<td>500</td>
<td>5,000</td>
<td></td>
</tr>
<tr>
<td></td>
<td>TOTAL FOR ROOFING</td>
<td></td>
<td></td>
<td></td>
<td>57,450</td>
</tr>
</tbody>
</table>

**MH-M-06 Cost estimate**

| E 1 | DOORS & WINDOWS | 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 |
| E 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) | 3858.00357 |
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 building construction technology:

- Stone
- Mud
- Wattle & Daub
- timber

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.

<table>
<thead>
<tr>
<th>Components</th>
<th>Recommended Specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Foundations</td>
<td>Strip foundation in Stone block/ Random rubble foundation</td>
</tr>
<tr>
<td>Plinth</td>
<td>Minimum (300 mm or 150mm more than last 50 year flood level)</td>
</tr>
<tr>
<td>Wall</td>
<td>200 mm thk stone block/ Laterite stone in english or rat trap bond masonry in 1:6 cement mortar</td>
</tr>
<tr>
<td>Wall Finish</td>
<td>Stabilised mud plaster/ cement plaster/exposed brick wall with pointing/ferrocement plaster</td>
</tr>
<tr>
<td>Roof Structure</td>
<td>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</td>
</tr>
<tr>
<td>Roof Cover</td>
<td>Brick Coba/ Mud Phuska for flat roofs or Mangalore tiles</td>
</tr>
<tr>
<td>Floor</td>
<td>cement flooring/ brick paving</td>
</tr>
<tr>
<td>Door and Windows</td>
<td>local timber/Mild steel door and window</td>
</tr>
</tbody>
</table>
MH-M-07
Alternative roofing

Area Statement:

<table>
<thead>
<tr>
<th>Item</th>
<th>Area Sq.m</th>
<th>Area Sq.ft</th>
</tr>
</thead>
<tbody>
<tr>
<td>Room 1</td>
<td>16.80</td>
<td>180.83</td>
</tr>
<tr>
<td>Room 2</td>
<td>16.80</td>
<td>180.83</td>
</tr>
<tr>
<td>Carpet Area</td>
<td>33.88</td>
<td>364.68</td>
</tr>
<tr>
<td>Built up Area</td>
<td>40.14</td>
<td>432.06</td>
</tr>
</tbody>
</table>
### MH-M-07

#### Cost estimate

<table>
<thead>
<tr>
<th>SR.NO.</th>
<th>ITEM OF WORK</th>
<th>Quantity</th>
<th>Unit</th>
<th>Rate (Rs)</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>a CORE HOUSE</td>
<td><strong>TERRACE CONSTRUCTION</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 Cutting and excavation of slope of hill to form terrace and stacking of excavated material after sorting for reuse within the premises etc. complete</td>
<td>75</td>
<td>Cum.</td>
<td>277</td>
<td>20775.0</td>
<td></td>
</tr>
<tr>
<td>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 rollers etc. complete</td>
<td>47</td>
<td>Cum.</td>
<td>450</td>
<td>21150.0</td>
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<tr>
<td><strong>TOTAL FOR TERRACE WORK</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.0</td>
</tr>
<tr>
<td><strong>FOUNDATION WORK</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 Excavation: Excavation of trenches/pit 0.6m deep including and carting away as specified and stacking excavated mud for cob wall, etc. complete as directed</td>
<td>4.3</td>
<td>Cum.</td>
<td>277</td>
<td>1191.1</td>
<td></td>
</tr>
<tr>
<td>2 Uncoursed Stone masonry in mud lime ash mortar 1:6 thick for retaining wall, foundation and plinth etc. complete</td>
<td>2.7</td>
<td>Cum.</td>
<td>3000</td>
<td>8100.0</td>
<td></td>
</tr>
<tr>
<td>3 Using masonry cement to give a smooth face finish to the unreinforced masonry walls finished with addition of cement traces</td>
<td>30.6</td>
<td>Cum.</td>
<td>750</td>
<td>22950.0</td>
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<tr>
<td><strong>TOTAL FOR FOUNDATION WORK</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>32241.3</td>
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<tr>
<td><strong>SUPERSTRUCTURE</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>3 Brick masonry with flat trap bond in super structure with cement mortar 1:6</td>
<td>10</td>
<td>Cum.</td>
<td>4170</td>
<td>41700.0</td>
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</tr>
<tr>
<td>4 Roof RCC band</td>
<td>0.25</td>
<td>Cum.</td>
<td>4500</td>
<td>1125.0</td>
<td></td>
</tr>
<tr>
<td>5 lintel RCC band</td>
<td>0.25</td>
<td>Cum.</td>
<td>4500</td>
<td>1125.0</td>
<td></td>
</tr>
<tr>
<td>6 Plinth RCC band</td>
<td>0.25</td>
<td>Cum.</td>
<td>4500</td>
<td>1125.0</td>
<td></td>
</tr>
<tr>
<td>7 Steel in Roof RCC band</td>
<td>16</td>
<td>kg</td>
<td>58</td>
<td>928.0</td>
<td></td>
</tr>
<tr>
<td>8 Steel in lintel RCC band</td>
<td>16</td>
<td>kg</td>
<td>58</td>
<td>928.0</td>
<td></td>
</tr>
<tr>
<td>9 Steel in Plinth RCC band</td>
<td>16</td>
<td>kg</td>
<td>58</td>
<td>928.0</td>
<td></td>
</tr>
<tr>
<td><strong>TOTAL FOR SUPERSTRUCTURE</strong></td>
<td></td>
<td></td>
<td></td>
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<td>47859.0</td>
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<tr>
<td><strong>C PLASTERING &amp; FINISHING</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 Finishing external wall vertical surfaces with mud plaster and rendering the surface</td>
<td>37.7</td>
<td>Sqm.</td>
<td>98</td>
<td>3694.6</td>
<td></td>
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<tr>
<td>4 Finishing internal wall vertical surfaces with mud plaster finished with lime wash.</td>
<td>46.4</td>
<td>Sqm.</td>
<td>98</td>
<td>4547.2</td>
<td></td>
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<td><strong>TOTAL FOR PLASTERING &amp; FINISHING</strong></td>
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<td>8241.8</td>
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<td><strong>TOTAL FOR CIVIL WORK</strong></td>
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<td></td>
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<td>88341.9</td>
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<tr>
<td><strong>CIVIL WORK</strong></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>5 GCI sheet roof</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>10000.0</td>
</tr>
<tr>
<td>6 Wood (12 x 12 x 12) for 90-40mm dia bamboo</td>
<td>30</td>
<td></td>
<td>130</td>
<td>3900.0</td>
<td></td>
</tr>
<tr>
<td>7 50-60mm dia bamboo</td>
<td>10</td>
<td></td>
<td>100</td>
<td>1000.0</td>
<td></td>
</tr>
<tr>
<td><strong>TOTAL FOR ROOFING</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>19150.0</td>
</tr>
<tr>
<td><strong>DOORS &amp; WINDOWS</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 Providing and fitting country wood two leaved Door including mouldings, rebate holding fasts and finished with primer and paint inclusive of country teak wood frame without ventilators, windows and fanlights</td>
<td>3.8</td>
<td>Sqm.</td>
<td>4500</td>
<td>17100.0</td>
<td></td>
</tr>
<tr>
<td><strong>TOTAL FOR DOORS &amp; WINDOWS</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>17100.0</td>
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<tr>
<td><strong>GRAND TOTAL</strong></td>
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<td></td>
<td></td>
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<td>124591.9</td>
</tr>
</tbody>
</table>

**TOTAL COST PER HOUSE (RS)**

- AREA OF HOUSE (SQM): 31.5
- COST PER SQ.M (RS): 3955.3
The Design Prototype for Zone H 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.

### Highlights of the Prototype

- The Design Prototype for Zone H 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

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

<table>
<thead>
<tr>
<th>Item</th>
<th>Area</th>
<th>Sq.m</th>
<th>Sq.ft</th>
</tr>
</thead>
<tbody>
<tr>
<td>Room 1</td>
<td>10.46</td>
<td>112.59</td>
<td></td>
</tr>
<tr>
<td>Room 2</td>
<td>10.35</td>
<td>111.41</td>
<td></td>
</tr>
<tr>
<td>Room 3</td>
<td>10.46</td>
<td>112.59</td>
<td></td>
</tr>
<tr>
<td>Kitchen</td>
<td>10.35</td>
<td>111.41</td>
<td></td>
</tr>
<tr>
<td>Bathroom</td>
<td>2.43</td>
<td>26.16</td>
<td></td>
</tr>
<tr>
<td>Verandah</td>
<td>13.97</td>
<td>150.37</td>
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</tr>
<tr>
<td>Carpet Area</td>
<td>46.43</td>
<td>499.77</td>
<td></td>
</tr>
<tr>
<td>Built up Area</td>
<td>71.52</td>
<td>769.84</td>
<td></td>
</tr>
</tbody>
</table>

**Typical Plan**

- **Room**
  - 2700 x 4450
- **Bathroom**
  - 1350 x 1800
- **Verandah**
  - 2150 x 6500
- **Kitchen**
  - 4450 x 2700

**Typical Section AA’**

- Mud phuska / brick cola
- 150 x 30 x 06 RCC planks
- 260 x 15 x 15 RCC joists
- 230 x 75 RCC roof band
- 230 x 75 RCC lintel band
- 230/200 mm thick adobe wall above 900 mm sill level
- 200 mm stone block masonry in cement mortar up to 900 mm sill level
- 230 x 75 RCC First band
- Cement concrete floor (CC)
- Compacted earthfill
- Stone block Random rubble

**Marathwada Zone H**

**Maharashtra**
<table>
<thead>
<tr>
<th>SR.NO.</th>
<th>ITEM OF WORK</th>
<th>Quantity</th>
<th>Unit</th>
<th>Rate (Rs)</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td><strong>FOUNDATION WORK</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>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</td>
<td>6.7</td>
<td>Cum.</td>
<td>277</td>
<td>1,856</td>
</tr>
<tr>
<td>2</td>
<td>Uncoursed Stone masonry in mud lime ash mortar 1/2&quot; thick for retaining wall, foundation and plinth etc. complete</td>
<td>7.5</td>
<td>Cum.</td>
<td>3,000</td>
<td>22,500</td>
</tr>
<tr>
<td>3</td>
<td>Filling in trench/pit with excavated mud to get a uniform base watered and compressed at intervals with top finished with addition of cow dung slurry.</td>
<td>11.3</td>
<td>Cum.</td>
<td>750</td>
<td>8,475</td>
</tr>
<tr>
<td>4</td>
<td><strong>TOTAL FOR FOUNDATION WORK</strong></td>
<td></td>
<td></td>
<td></td>
<td>32,831</td>
</tr>
<tr>
<td>1</td>
<td><strong>SUPERSTRUCTURE</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Brick masonry up to sill level</td>
<td>10</td>
<td>Cum.</td>
<td>1,000</td>
<td>10,000</td>
</tr>
<tr>
<td>2</td>
<td>Adobe masonry above sill level</td>
<td>20</td>
<td>Cum.</td>
<td>600</td>
<td>12,000</td>
</tr>
<tr>
<td>3</td>
<td>RCC columns</td>
<td>20</td>
<td>no.</td>
<td>700</td>
<td>14,000</td>
</tr>
<tr>
<td>4</td>
<td>Roof RCC band</td>
<td>0.25</td>
<td>cu.m</td>
<td>4500</td>
<td>1,125</td>
</tr>
<tr>
<td>5</td>
<td>lintel RCC band</td>
<td>0.25</td>
<td>cu.m</td>
<td>4500</td>
<td>1,125</td>
</tr>
<tr>
<td>6</td>
<td>Plinth RCC band</td>
<td>0.25</td>
<td>cu.m</td>
<td>4500</td>
<td>1,125</td>
</tr>
<tr>
<td>7</td>
<td>Steel in Roof RCC band</td>
<td>16</td>
<td>kg</td>
<td>58</td>
<td>928</td>
</tr>
<tr>
<td>8</td>
<td>Steel in Lintel RCC band</td>
<td>16</td>
<td>kg</td>
<td>58</td>
<td>928</td>
</tr>
<tr>
<td>9</td>
<td>Steel in Plinth RCC band</td>
<td>16</td>
<td>kg</td>
<td>58</td>
<td>928</td>
</tr>
<tr>
<td>10</td>
<td><strong>TOTAL FOR SUPER STRUCTURE</strong></td>
<td></td>
<td></td>
<td></td>
<td>62,159</td>
</tr>
<tr>
<td>1</td>
<td><strong>PLASTERING &amp; FINISHING</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Finishing external wall vertical surfaces with mud plaster and rendering the surface</td>
<td>60</td>
<td>sqm</td>
<td>98</td>
<td>5,880</td>
</tr>
<tr>
<td>2</td>
<td>Finishing internal wall vertical surfaces with mud plaster finished with lime wash</td>
<td>32</td>
<td>sqm</td>
<td>98</td>
<td>3,136</td>
</tr>
<tr>
<td>1</td>
<td><strong>TOTAL FOR PLASTERING &amp; FINISHING</strong></td>
<td></td>
<td></td>
<td></td>
<td>9,016</td>
</tr>
<tr>
<td>1</td>
<td><strong>TOTAL FOR CIVIL WORK</strong></td>
<td></td>
<td></td>
<td></td>
<td>104,006</td>
</tr>
<tr>
<td>1</td>
<td><strong>DOORS &amp; WINDOWS</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Providing and fixing country wood two leaved Door including moldings, rebating hold fasts and finished with primer and paint inclusive of country teak wood frame without ventilators, windows and fanlights</td>
<td>4.9</td>
<td>sqm</td>
<td>4,500</td>
<td>22,050</td>
</tr>
<tr>
<td>1</td>
<td><strong>TOTAL FOR DOORS &amp; WINDOWS</strong></td>
<td></td>
<td></td>
<td></td>
<td>22,050</td>
</tr>
<tr>
<td>1</td>
<td><strong>GRAND TOTAL</strong></td>
<td></td>
<td></td>
<td></td>
<td>195,806</td>
</tr>
<tr>
<td>1</td>
<td><strong>TOTAL COST PER HOUSE (RS)</strong></td>
<td></td>
<td></td>
<td></td>
<td>195,806</td>
</tr>
<tr>
<td>2</td>
<td><strong>AREA OF HOUSE (SQM)</strong></td>
<td></td>
<td></td>
<td></td>
<td>60</td>
</tr>
<tr>
<td>1</td>
<td><strong>COST PER SQ.M (RS)</strong></td>
<td></td>
<td></td>
<td></td>
<td>3263-43167</td>
</tr>
</tbody>
</table>

**Marathwada Zone H**
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 building construction technology:
- Laterite stone
- Timber
- Mud

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.

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

<table>
<thead>
<tr>
<th>Item</th>
<th>Area Sq.m</th>
<th>Area Sq.ft</th>
</tr>
</thead>
<tbody>
<tr>
<td>Room 1</td>
<td>8.16</td>
<td>87.83</td>
</tr>
<tr>
<td>Room 2</td>
<td>6.48</td>
<td>69.75</td>
</tr>
<tr>
<td>Room 3</td>
<td>8.16</td>
<td>87.83</td>
</tr>
<tr>
<td>Kitchen</td>
<td>4.80</td>
<td>51.67</td>
</tr>
<tr>
<td>Carpet Area</td>
<td>26.78</td>
<td>288.26</td>
</tr>
<tr>
<td>Built up Area</td>
<td>32.40</td>
<td>348.75</td>
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</tbody>
</table>

Typical Plan and Section AA'
**MH-M-09 Cost estimate**

<table>
<thead>
<tr>
<th>SR.NO.</th>
<th>ITEM OF WORK</th>
<th>Quantity</th>
<th>Unit</th>
<th>Rate (Rs)</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>CORE HOUSE</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A</td>
<td>FOUNDATION WORK</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Excavation Excavation of trench pit 6 ft deep including and cutting away as specified and stacking excavated mud for cob wall, etc</td>
<td>7.6</td>
<td>Cum.</td>
<td>277</td>
<td>2,105</td>
</tr>
<tr>
<td>2</td>
<td>Uncoursed Stone masonry in mud lime ash mortar 1½” thick for retaining wall, foundation and plinth etc. complete with a uniform base watered and compressed at intervals with top finished with addition of consumable stones</td>
<td>7.6</td>
<td>Cum.</td>
<td>3,000</td>
<td>22,800</td>
</tr>
<tr>
<td>B</td>
<td>SUPERSTRUCTURE</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Brick masonry</td>
<td>18</td>
<td>Cum.</td>
<td>3,000</td>
<td>54,000</td>
</tr>
<tr>
<td>2</td>
<td>Roof RCC band</td>
<td>0.25</td>
<td>cu.m</td>
<td>4500</td>
<td>1,125</td>
</tr>
<tr>
<td>3</td>
<td>Lintel RCC band</td>
<td>0.25</td>
<td>cu.m</td>
<td>4500</td>
<td>1,125</td>
</tr>
<tr>
<td>4</td>
<td>Pilinth RCC band</td>
<td>0.25</td>
<td>cu.m</td>
<td>4500</td>
<td>1,125</td>
</tr>
<tr>
<td>5</td>
<td>Steel in Roof RCC band</td>
<td>16</td>
<td>kg</td>
<td>58</td>
<td>928</td>
</tr>
<tr>
<td>6</td>
<td>Steel in Lintel RCC band</td>
<td>16</td>
<td>kg</td>
<td>58</td>
<td>928</td>
</tr>
<tr>
<td>7</td>
<td>Steel in Pilinth RCC band</td>
<td>16</td>
<td>kg</td>
<td>58</td>
<td>928</td>
</tr>
<tr>
<td>B</td>
<td>TOTAL FOR SUPER STRUCTURE</td>
<td></td>
<td></td>
<td></td>
<td>60,159</td>
</tr>
<tr>
<td>C</td>
<td>PLASTERING &amp; FINISHING</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Finishing external wall vertical surfaces with mud plaster and rendering the surface</td>
<td>52.5</td>
<td>Sqm.</td>
<td>98</td>
<td>5,145</td>
</tr>
<tr>
<td>2</td>
<td>Finishing internal wall vertical surfaces with mud plaster finished with lime wash</td>
<td>33.5</td>
<td>Sqm.</td>
<td>98</td>
<td>3,283</td>
</tr>
<tr>
<td>C</td>
<td>TOTAL FOR PLASTERING &amp; FINISHING</td>
<td></td>
<td></td>
<td></td>
<td>8,428</td>
</tr>
<tr>
<td>C</td>
<td>TOTAL FOR CIVIL WORK</td>
<td></td>
<td></td>
<td></td>
<td>105,642</td>
</tr>
<tr>
<td>D</td>
<td>Roof with precast RCC plank and joist</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Precast RCC planks of size 1.5mx0.3m, with 1.6 kg 6mm steel per plank</td>
<td>76</td>
<td>No.</td>
<td>275</td>
<td>20,900</td>
</tr>
<tr>
<td>2</td>
<td>Precast RCC beam of size 0.15mx1.5m, 3.6m length</td>
<td>1</td>
<td>No.</td>
<td>2500</td>
<td>2,500</td>
</tr>
<tr>
<td>3</td>
<td>In-situ concrete mix 1:1.5:3 on top of planks and joist</td>
<td>0.5</td>
<td>cu.m</td>
<td>4500</td>
<td>2,250</td>
</tr>
<tr>
<td>4</td>
<td>Steel in in-situ concrete</td>
<td>25</td>
<td>kg</td>
<td>58</td>
<td>1,450</td>
</tr>
<tr>
<td>5</td>
<td>Mason</td>
<td>2</td>
<td>mandays</td>
<td>500</td>
<td>1,000</td>
</tr>
<tr>
<td>6</td>
<td>Labour</td>
<td>12</td>
<td>mandays</td>
<td>250</td>
<td>3,000</td>
</tr>
<tr>
<td>7</td>
<td>Bar bender</td>
<td>1</td>
<td>mandays</td>
<td>500</td>
<td>500</td>
</tr>
<tr>
<td>8</td>
<td>Brick bats and mud phuska finishing over roof with cement dust mortar</td>
<td>30</td>
<td>Sqm.</td>
<td>650.00</td>
<td>19,500</td>
</tr>
<tr>
<td>D</td>
<td>TOTAL FOR ROOFING</td>
<td></td>
<td></td>
<td></td>
<td>51,100</td>
</tr>
<tr>
<td>E</td>
<td>DOORS &amp; WINDOWS</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Providing and fixing country wood two leaved Door including mouldings, rebating hold lasts and finished with primer and paint inclusive of country teak wood frame without ventilators, windows and fansilghts</td>
<td>1.44</td>
<td>Sqm.</td>
<td>4,500</td>
<td>6,480</td>
</tr>
<tr>
<td>2</td>
<td>Providing and fixing country wood single leaved Door including mouldings, rebating hold lasts and finished with primer and paint inclusive of country teak wood frame without ventilators, windows and fansilghts</td>
<td>2.5</td>
<td>Sqm.</td>
<td>4,500</td>
<td>11,250</td>
</tr>
<tr>
<td>3</td>
<td>Providing and fixing country wood two leaved window including mouldings, rebating hold lasts and finished with primer and paint inclusive of country teak wood frame</td>
<td>0.96</td>
<td>Sqm.</td>
<td>4,500</td>
<td>4,320</td>
</tr>
<tr>
<td>E</td>
<td>TOTAL FOR DOORS &amp; WINDOWS</td>
<td></td>
<td></td>
<td></td>
<td>22,050</td>
</tr>
<tr>
<td>F</td>
<td>GRAND TOTAL</td>
<td></td>
<td></td>
<td></td>
<td>178,792</td>
</tr>
</tbody>
</table>

| | TOTAL COST PER HOUSE (Rs) | 178,792 |
| | AREA OF HOUSE (Sqm) | 27 |
| | COST PER SQM (Rs) | 6,21,933.33 |
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 HOUSING TYPOLOGIES AT A GLANCE

<table>
<thead>
<tr>
<th>TYPOLOGY</th>
<th>APPLICABLE HOUSING ZONES</th>
<th>TOTAL AREA Sq.m/Sq.ft</th>
</tr>
</thead>
<tbody>
<tr>
<td>MN-01A</td>
<td>Zone A</td>
<td>68.25 Sq.m 734.64 Sq.ft</td>
</tr>
<tr>
<td>MN-01B</td>
<td>Zone A</td>
<td>66.00 Sq.m 710.42 Sq.ft</td>
</tr>
<tr>
<td>MN-02</td>
<td>Zone B</td>
<td>29.98 Sq.m 322.70 Sq.ft</td>
</tr>
<tr>
<td>MN-03</td>
<td>Zone C</td>
<td>70.39 Sq.m 757.67 Sq.ft</td>
</tr>
</tbody>
</table>

**MN-01A**

**MN-01B**

**MN-02**

**MN-03**
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

---

- 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/pantry.
- 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**

<table>
<thead>
<tr>
<th>Plan Layout</th>
<th>Plinth/Floor</th>
<th>Roof Profile</th>
</tr>
</thead>
<tbody>
<tr>
<td>The house essentially consists of a front verandah about 9 feet in width</td>
<td>The house has an earthen plinth that is about 450 mm high.</td>
<td>A hipped or gable roof spans over the central bay</td>
</tr>
<tr>
<td>and which spans the entire frontage of the house.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

---

**Recommendations for construction systems**

<table>
<thead>
<tr>
<th>Components</th>
<th>Recommended Specifications</th>
<th>Specific Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Foundations</td>
<td>Nominal Strip foundation to support the plinth retention masonry and concrete pedestals</td>
<td>2, 8-mm rods with stirrups at every 200 mm can be provided as a plinth reinforcement band, on top of the plinth masonry.</td>
</tr>
<tr>
<td></td>
<td>as vertical support anchors.</td>
<td></td>
</tr>
<tr>
<td>Plinth</td>
<td>Stone or Stabilized Adobe Block Masonry plinth with earth back-filling.</td>
<td>2, 8-mm rods with stirrups at every 200 mm can be provided as a plinth reinforcement band, on top of the plinth masonry.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>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.</td>
</tr>
<tr>
<td>Wall</td>
<td>Brick/ Stone block masonry upto sill level 750 mm</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Ikra panelling system with bamboo frames</td>
<td></td>
</tr>
<tr>
<td>Wall Finish</td>
<td>Ferrocement plaster on Ikra panels</td>
<td>Optional: Cement based paint for external walls and lime rendering for internal walls.</td>
</tr>
<tr>
<td>Roof Structure</td>
<td>Sloping roofs with bamboo understructure</td>
<td></td>
</tr>
<tr>
<td>Floor</td>
<td>Plain cement flooring over RCC bed on a back filled plinth.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Stabilized Soil cement flooring, and Earthen flooring.</td>
<td></td>
</tr>
</tbody>
</table>
Area Statement:

<table>
<thead>
<tr>
<th>Item</th>
<th>Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Room 1</td>
<td>10.05</td>
</tr>
<tr>
<td>Room 2</td>
<td>14.07</td>
</tr>
<tr>
<td>Room 3</td>
<td>10.05</td>
</tr>
<tr>
<td>Veranda</td>
<td>26.00</td>
</tr>
<tr>
<td>Carpet Area</td>
<td>35.68</td>
</tr>
<tr>
<td>Built up Area</td>
<td>68.25</td>
</tr>
</tbody>
</table>
## MN-01A Cost estimate

### Cost breakup

<table>
<thead>
<tr>
<th>Item</th>
<th>Cost (INR)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Excavation</td>
<td>5,600</td>
</tr>
<tr>
<td>Foundation and Plinth</td>
<td>32,716</td>
</tr>
<tr>
<td>Walling and Walling structure</td>
<td>60,644</td>
</tr>
<tr>
<td>Doors and Windows</td>
<td>8,116</td>
</tr>
<tr>
<td>Roofing</td>
<td>53,032</td>
</tr>
<tr>
<td>Finishing works</td>
<td>19,048</td>
</tr>
<tr>
<td>Ext. Development</td>
<td>576</td>
</tr>
<tr>
<td>Electrical</td>
<td>14,800</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>194,532</strong></td>
</tr>
</tbody>
</table>

### Work Head Breakdown

<table>
<thead>
<tr>
<th>S No</th>
<th>Work Head</th>
<th>Material</th>
<th>Labour</th>
<th>Transport</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Excavation</td>
<td></td>
<td>5,600</td>
<td>-</td>
<td>5,600</td>
</tr>
<tr>
<td>2</td>
<td>Foundation and Plinth</td>
<td>20,466</td>
<td>7,250</td>
<td>5,000</td>
<td>32,716</td>
</tr>
<tr>
<td>3</td>
<td>Walling and Walling structure</td>
<td>32,044</td>
<td>25,600</td>
<td>3,000</td>
<td>60,644</td>
</tr>
<tr>
<td>4</td>
<td>Raised flooring</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>5</td>
<td>Doors and Windows</td>
<td>4,116</td>
<td>4,000</td>
<td>-</td>
<td>8,116</td>
</tr>
<tr>
<td>6</td>
<td>Roofing</td>
<td>37,032</td>
<td>14,000</td>
<td>2,000</td>
<td>53,032</td>
</tr>
<tr>
<td>7</td>
<td>Finishing works</td>
<td>9,248</td>
<td>8,800</td>
<td>1,000</td>
<td>19,048</td>
</tr>
<tr>
<td>8</td>
<td>Ext. Development</td>
<td>576</td>
<td>-</td>
<td>-</td>
<td>576</td>
</tr>
<tr>
<td>9</td>
<td>Electrical</td>
<td>12,800</td>
<td>2,000</td>
<td>-</td>
<td>14,800</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td><strong>116,282</strong></td>
<td><strong>67,250</strong></td>
<td><strong>11,000</strong></td>
<td><strong>194,532</strong></td>
</tr>
</tbody>
</table>

Add cost of toilet: 12,000

### Cost of Construction including toilet: 206,532

<table>
<thead>
<tr>
<th>Total Area of Construction (Initial Built A)</th>
<th>Rs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rate of Construction</td>
<td>Rs/sft</td>
</tr>
<tr>
<td>Pro-rata cost of Built area of 25 square metres</td>
<td>656</td>
</tr>
</tbody>
</table>

### Potential areas of reduction in costs

<table>
<thead>
<tr>
<th>Labour</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>If excavation is done by the house owners</td>
</tr>
<tr>
<td>2</td>
<td>If backfilling of earthen plinth is done by the house owners</td>
</tr>
<tr>
<td>3</td>
<td>If split bamboo framework is fixed by the house owners</td>
</tr>
<tr>
<td>4</td>
<td>If stabilised mud plaster is done by the house owners</td>
</tr>
<tr>
<td>5</td>
<td>If stabilised earthen floor is laid by the house owners</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Material</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>If bamboo is used as reinforcement instead of steel</td>
<td>(1,713)</td>
</tr>
<tr>
<td>If upper 1/3rd of mud plastered wall is not stabilised</td>
<td>(2,894)</td>
</tr>
</tbody>
</table>

### Net Cost of Construction of the Iniflat Built Area: 174,025
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

<table>
<thead>
<tr>
<th>Plan Layout</th>
<th>Plinth/Floor</th>
<th>Roof Profile</th>
</tr>
</thead>
<tbody>
<tr>
<td>The house essentially consists of a front verandah about 9 feet in width and which spans the entire frontage of the house.</td>
<td>The house has an earthen plinth that is about 450 mm high.</td>
<td>A hipped or gable roof spans over the central bay.</td>
</tr>
</tbody>
</table>

### Recommendations for construction systems

<table>
<thead>
<tr>
<th>Components</th>
<th>Recommended Specifications</th>
<th>Specific Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Foundations</td>
<td>• Nominal Strip foundation to support the plinth retention masonry and concrete pedestals as vertical support anchors.</td>
<td></td>
</tr>
<tr>
<td>Plinth</td>
<td>• Stone or Stabilized Adobe Block Masonry plinth with earth back-filling.</td>
<td>2.8-mm rods with stirrups at every 200 mm can be provided as a plinth reinforcement band, on top of the plinth masonry.</td>
</tr>
<tr>
<td>Wall</td>
<td>• 230 mm thick brick/ cement flyash brick masonry up to sill level</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Adobe/CSMB masonry above sill level in ferrocement plaster</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Horizontal bands at Plinth/ Sill/ Lintel level have been incorporated in the walls</td>
<td></td>
</tr>
<tr>
<td>Wall Finish</td>
<td>• Ferrocement plaster</td>
<td></td>
</tr>
<tr>
<td>Roof Structure</td>
<td>• Sloping roofs with bamboo understructure</td>
<td></td>
</tr>
<tr>
<td>Floor</td>
<td>• Plain cement flooring over RCC bed on a back filled plinth.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Stabilized Soil cement flooring, and Earthen flooring</td>
<td></td>
</tr>
</tbody>
</table>

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
**Area Statement:**

<table>
<thead>
<tr>
<th>Item</th>
<th>Area</th>
<th>Sq.ft</th>
</tr>
</thead>
<tbody>
<tr>
<td>Room 1</td>
<td>10.71</td>
<td>115.28</td>
</tr>
<tr>
<td>Room 2</td>
<td>10.76</td>
<td>115.49</td>
</tr>
<tr>
<td>Room 3</td>
<td>10.76</td>
<td>115.49</td>
</tr>
<tr>
<td>Veranda</td>
<td>25.94</td>
<td>279.22</td>
</tr>
<tr>
<td>Carpet Area</td>
<td>33.42</td>
<td>359.73</td>
</tr>
<tr>
<td>Built up Area</td>
<td>66.00</td>
<td>710.42</td>
</tr>
</tbody>
</table>

**SECTION AA’**

- Bamboo truss Type 4
- Bamboo purlins 50 mm
- Adobe/CSMB masonry above sill level in Ferrocement plaster
- Burnt brick or Cement Flyash brick masonry upto sill level
- RCC plinth Band
- Foundation as per local soil and flood condition

**Typical Plan**

- 24 Gauge CGI sheet or Tiles
- Bamboo purlins
- Bamboo Truss type 4, 75mm dia
- 75mm thick Roof band
- 75mm thick Lintel band
- Adobe/CSMB masonry above sill level in Ferrocement plaster
- Sill level
- 230mm thick Burnt Brick or cement flyash brick masonry upto sill level
- Plinth Band
- Foundation as per local soil and flood condition

**Area Statement:**

<table>
<thead>
<tr>
<th>Item</th>
<th>Area</th>
<th>Sq.ft</th>
</tr>
</thead>
<tbody>
<tr>
<td>Room 1</td>
<td>10.71</td>
<td>115.28</td>
</tr>
<tr>
<td>Room 2</td>
<td>10.76</td>
<td>115.49</td>
</tr>
<tr>
<td>Room 3</td>
<td>10.76</td>
<td>115.49</td>
</tr>
<tr>
<td>Veranda</td>
<td>25.94</td>
<td>279.22</td>
</tr>
<tr>
<td>Carpet Area</td>
<td>33.42</td>
<td>359.73</td>
</tr>
<tr>
<td>Built up Area</td>
<td>66.00</td>
<td>710.42</td>
</tr>
</tbody>
</table>
## Cost Estimate

### Item Cost (INR)

<table>
<thead>
<tr>
<th>S No</th>
<th>Work Head</th>
<th>Material</th>
<th>Labour</th>
<th>Transport</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Excavation</td>
<td>-</td>
<td>5,600</td>
<td>-</td>
<td>5,600</td>
</tr>
<tr>
<td>2</td>
<td>Foundation and Plinth</td>
<td>13,539</td>
<td>7,250</td>
<td>5,000</td>
<td>25,789</td>
</tr>
<tr>
<td>3</td>
<td>Walling and Walling structure</td>
<td>47,332</td>
<td>24,800</td>
<td>2,000</td>
<td>74,132</td>
</tr>
<tr>
<td>4</td>
<td>Raised flooring</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>5</td>
<td>Doors and Windows</td>
<td>4,116</td>
<td>4,000</td>
<td>-</td>
<td>8,116</td>
</tr>
<tr>
<td>6</td>
<td>Roofing</td>
<td>36,632</td>
<td>14,000</td>
<td>2,000</td>
<td>52,632</td>
</tr>
<tr>
<td>7</td>
<td>Finishing works</td>
<td>5,817</td>
<td>8,800</td>
<td>1,000</td>
<td>15,617</td>
</tr>
<tr>
<td>8</td>
<td>Ext. Development</td>
<td>576</td>
<td>-</td>
<td>-</td>
<td>576</td>
</tr>
<tr>
<td>9</td>
<td>Electrical</td>
<td>12,800</td>
<td>2,000</td>
<td>-</td>
<td>14,800</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td><strong>120,813</strong></td>
<td><strong>66,450</strong></td>
<td><strong>10,000</strong></td>
<td><strong>197,263</strong></td>
</tr>
</tbody>
</table>

**Cost of toilet construction**
- 12,000

**Cost of Construction including toilet**
- 209,263

### Potential areas of reduction in costs

<table>
<thead>
<tr>
<th>Labour</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1 If excavation is done by the house owners</td>
<td>-4,900</td>
</tr>
<tr>
<td>2 If backfilling of earthen plinth is done by the house owners</td>
<td>-1,400</td>
</tr>
<tr>
<td>3 If making of stabilised adobe blocks is done by the house owners</td>
<td>-15,600</td>
</tr>
<tr>
<td>4 If stabilised earthen floor is laid by the house owners</td>
<td>-4,800</td>
</tr>
</tbody>
</table>

### Material

| 5 If bamboo is used as reinforcement instead of steel | -3,344 |

**Net Cost of Construction of the Initial Built Area**
- 179,218
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

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.

<table>
<thead>
<tr>
<th>Plan Layout</th>
<th>Plinth/Floor</th>
<th>Roof Profile</th>
</tr>
</thead>
<tbody>
<tr>
<td>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.</td>
<td>Timber flooring on a raised floor with adequate lap joints and cement floor in the case of a masonry back-filled plinth.</td>
<td>A hipped or gable roof spans over the central bay.</td>
</tr>
</tbody>
</table>

**Recommendations for construction systems**

<table>
<thead>
<tr>
<th>Components</th>
<th>Recommended Specifications</th>
<th>Specific Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Foundations</td>
<td>Concrete pedestals as anchors for all vertical timber/treated bamboo supports (both main vertical supports and additional flooring supports).</td>
<td></td>
</tr>
<tr>
<td>Plinth</td>
<td>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.</td>
<td>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.</td>
</tr>
<tr>
<td>Wall</td>
<td>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 vertical timber posts.</td>
<td></td>
</tr>
<tr>
<td>Wall Finish</td>
<td>Linseed Oil (or similar) polish</td>
<td></td>
</tr>
<tr>
<td>Roof Structure</td>
<td>Hipped roof following the L-shaped plan in timber unstructure</td>
<td></td>
</tr>
<tr>
<td>Floor</td>
<td>Timber plank flooring fixed onto a timber/treated bamboo under-structure.</td>
<td>Cement floor on backfilled earth in the case of a masonry plinth.</td>
</tr>
</tbody>
</table>
TYPICAL PLAN

223

MN-02

AREA STATEMENT:

<table>
<thead>
<tr>
<th>Item</th>
<th>Room 1+2 Sq.m</th>
<th>Carpent Area Sq. ft</th>
<th>Built up Area Sq. ft</th>
</tr>
</thead>
<tbody>
<tr>
<td>Room 1+2</td>
<td>25.86</td>
<td>278.35</td>
<td>29.98</td>
</tr>
</tbody>
</table>
## Cost estimate

### Cost breakup

<table>
<thead>
<tr>
<th>Item</th>
<th>Cost (INR)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Excavation</td>
<td>4,200</td>
</tr>
<tr>
<td>Foundation and Plinth</td>
<td>12,912</td>
</tr>
<tr>
<td>Walling and Walling structure</td>
<td>72,151</td>
</tr>
<tr>
<td>Raised flooring</td>
<td>20,195</td>
</tr>
<tr>
<td>Doors and Windows</td>
<td>7,819</td>
</tr>
<tr>
<td>Roofing</td>
<td>42,888</td>
</tr>
<tr>
<td>Finishing works</td>
<td>5,000</td>
</tr>
<tr>
<td>Ext. Development</td>
<td>576</td>
</tr>
<tr>
<td>Electrical</td>
<td>14,800</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>180,541</strong></td>
</tr>
</tbody>
</table>

**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

<table>
<thead>
<tr>
<th>Labour</th>
<th>Material</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 If excavation is done by the house owners</td>
<td>(4,200)</td>
</tr>
<tr>
<td>2 If walling plank work is done by the house owners</td>
<td>(4,000)</td>
</tr>
<tr>
<td>3 If flooring plank work is done by the house owners</td>
<td>(3,000)</td>
</tr>
<tr>
<td>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)</td>
<td>(9,050)</td>
</tr>
<tr>
<td><strong>Net Cost of Construction of the Initial Built Area</strong></td>
<td><strong>172,291</strong></td>
</tr>
</tbody>
</table>
• 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

<table>
<thead>
<tr>
<th>Plan Layout</th>
<th>Plinth/Floor</th>
<th>Roof Profile</th>
</tr>
</thead>
<tbody>
<tr>
<td>The lay of the house is roughly in an L-shape, with one extension of the L housing.</td>
<td>The house is provided with a raised timber floor that is supported on either timber or bamboo flooring supports.</td>
<td>A hipped or gable roof spans over the central bay.</td>
</tr>
</tbody>
</table>

Recommendations for construction systems

<table>
<thead>
<tr>
<th>Components</th>
<th>Recommended Specifications</th>
<th>Specific Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Foundations</td>
<td>• Concrete pedestals as anchors for all vertical timber/treated bamboo supports (both main vertical supports and additional flooring supports).</td>
<td>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.</td>
</tr>
</tbody>
</table>
| 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. | 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 | • Ikra wall panelling system  
• RCC stubs/pedestals cast to hold bamboo vertical posts at plinth level  
• Horizontal RCC bands are incorporated at plinth/ Sill level | Optional: Cement based paint for external walls and lime rendering for internal walls. |
| Wall Finish | • Ferrocement plaster on Ikra panel | Treated bamboo roofing members (trusses, ties and purlins) support a roof with an angle of slope of 30 degrees. |
| Roof Structure | • Sloping roof with bamboo understructure |  |
| Floor | • Timber plank flooring fixed onto a timber/treated bamboo under-structure. |  |
### Area Statement:

<table>
<thead>
<tr>
<th>Item</th>
<th>Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Extension Bedroom 1</td>
<td>8.41</td>
</tr>
<tr>
<td>Extension Bedroom 2</td>
<td>8.41</td>
</tr>
<tr>
<td>Extension Veranda</td>
<td>17.52</td>
</tr>
<tr>
<td>Kitchen &amp; Dinning Room</td>
<td>25.3</td>
</tr>
<tr>
<td>Guest sleeping Platform</td>
<td>10.57</td>
</tr>
<tr>
<td>Carpet Area</td>
<td>52.57</td>
</tr>
<tr>
<td>Built up Area</td>
<td>70.39</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Item</th>
<th>Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Extension Bedroom 1</td>
<td>90.52</td>
</tr>
<tr>
<td>Extension Bedroom 2</td>
<td>90.52</td>
</tr>
<tr>
<td>Extension Veranda</td>
<td>188.58</td>
</tr>
<tr>
<td>Kitchen &amp; Dinning Room</td>
<td>272.33</td>
</tr>
<tr>
<td>Guest sleeping Platform</td>
<td>113.77</td>
</tr>
<tr>
<td>Carpet Area</td>
<td>565.86</td>
</tr>
<tr>
<td>Built up Area</td>
<td>757.67</td>
</tr>
</tbody>
</table>

### Typical Plan

- **24 gauge GI roofing sheets**
- **Bamboo truss**
- **15 x 5 MS U-clamp**
- **Bracing 75**
- **Bamboo icra panel with ferrocement plaster**
- **RCC SIB band**
- **RCC post holder**
- **Concrete block masonry**
- **RCC plinth band**
### Cost estimate

<table>
<thead>
<tr>
<th>ITEM OF WORK</th>
<th>Material</th>
<th>Labour</th>
<th>Transport</th>
<th>Total (INR)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Excavation</td>
<td>-</td>
<td>5,600</td>
<td>-</td>
<td>5,600</td>
</tr>
<tr>
<td>2 Foundation and Plinth</td>
<td>11,514</td>
<td>2,100</td>
<td>2,500</td>
<td>16,114</td>
</tr>
<tr>
<td>3 Walling and Walling structure</td>
<td>32,337</td>
<td>24,800</td>
<td>3,000</td>
<td>60,137</td>
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<tr>
<td>4 Raised flooring</td>
<td>14,861</td>
<td>6,000</td>
<td>2,000</td>
<td>22,861</td>
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<tr>
<td>5 Doors and Windows</td>
<td>4,917</td>
<td>4,000</td>
<td>-</td>
<td>8,917</td>
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<tr>
<td>6 Roofing</td>
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<tr>
<td>7 Finishing works</td>
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<td>1,000</td>
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<td>8 Ext. Development</td>
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<td>576</td>
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<td>9 Electrical</td>
<td>12,800</td>
<td>2,000</td>
<td>-</td>
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<td><strong>Total</strong></td>
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<td><strong>65,500</strong></td>
<td><strong>10,500</strong></td>
<td><strong>207,300</strong></td>
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</table>

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
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 Bangladeshi 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 HOUSING TYPOLOGIES AT A GLANCE

<table>
<thead>
<tr>
<th>TYPOLOGY</th>
<th>APPLICABLE HOUSING ZONES</th>
<th>TOTAL AREA Sq.m/Sq.ft</th>
</tr>
</thead>
<tbody>
<tr>
<td>ML-01</td>
<td>Zone A</td>
<td>35.19 Sq.m / 378.79 Sq.ft</td>
</tr>
<tr>
<td>ML-02</td>
<td>Zone B</td>
<td>56.23 Sq.m / 605.26 Sq.ft</td>
</tr>
<tr>
<td>ML-03</td>
<td>Zone C</td>
<td>43.81 Sq.m / 471.57 Sq.ft</td>
</tr>
<tr>
<td>ML-04A</td>
<td>Zone D</td>
<td>34.97 Sq.m / 376.42 Sq.ft</td>
</tr>
<tr>
<td>ML-04B</td>
<td>Zone D</td>
<td>35.55 Sq.m / 382.66 Sq.ft</td>
</tr>
<tr>
<td>ML-05</td>
<td>Zone E</td>
<td>52.84 Sq.m / 568.77 Sq.ft</td>
</tr>
</tbody>
</table>
This typology is applicable to Zone A

Zone 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 roofimg
- Adobe wall erection

Resources Available:
- Alluvial and lateritic soil Stable soil such as ‘moorum’. 

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

<table>
<thead>
<tr>
<th>Plan Layout</th>
<th>Plinth/Floor</th>
<th>Roof Profile</th>
</tr>
</thead>
<tbody>
<tr>
<td>The house essentially consists of a front verandah about 9 feet in width and which spans the entire frontage of the house.</td>
<td>The house has an earthen plinth that is about 450 mm high.</td>
<td>A hipped or gable roof spans over the central bay.</td>
</tr>
</tbody>
</table>

### Recommendations for construction systems

<table>
<thead>
<tr>
<th>Components</th>
<th>Recommended Specifications</th>
<th>Specific Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Foundations</td>
<td>• Stone block/ brick/rubble masonry</td>
<td></td>
</tr>
<tr>
<td>Plinth</td>
<td>• 450 mm raised plinth with rammed earth</td>
<td></td>
</tr>
</tbody>
</table>
| 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 sillage level | 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. | |
## Cost estimate

<table>
<thead>
<tr>
<th>S No</th>
<th>Item</th>
<th>Quantity</th>
<th>Unit</th>
<th>Rate (Rs)</th>
<th>Cost (Rs)</th>
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<td>Excavation</td>
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<td>cum</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>For plinth</td>
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<td>cum</td>
<td>-</td>
<td>-</td>
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<tr>
<td></td>
<td>For stub footings (bamboo bases and raised floors)</td>
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<td>man days</td>
<td>300</td>
<td>2,400</td>
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<td>aggregate</td>
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<td>bags</td>
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<td>man days</td>
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<td>Transport</td>
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<td>cum</td>
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<td>aggregate</td>
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<td>cum</td>
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<td>doors</td>
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<td>nails &amp; hardware</td>
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<td>LS</td>
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<td>man days</td>
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<td></td>
<td>Labor</td>
<td>8.0</td>
<td>man days</td>
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<td></td>
<td>Transport</td>
<td>2,500</td>
<td>-</td>
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<td>10</td>
<td>Provision and fixing of CGI sheet roofing, inclusive of all hardware</td>
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<td>11,930</td>
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<td>man days</td>
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<td>Transport</td>
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<tr>
<td>11</td>
<td>Laying of Plain cement flooring</td>
<td>0.7</td>
<td>cum</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>sand</td>
<td>0.5</td>
<td>cum</td>
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<td>man days</td>
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</tr>
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<td>Plastering of walls</td>
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<td>man days</td>
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<td>external</td>
<td>0.4</td>
<td>cum</td>
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<td>-</td>
</tr>
<tr>
<td></td>
<td>sand</td>
<td>0.3</td>
<td>cum</td>
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<td>bags</td>
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<td></td>
<td>Labor</td>
<td>2.0</td>
<td>man days</td>
<td>450</td>
<td>900</td>
</tr>
<tr>
<td>13</td>
<td>Painting and polishing</td>
<td>5.1</td>
<td>its</td>
<td>100</td>
<td>506</td>
</tr>
<tr>
<td></td>
<td>Oil for bamboo</td>
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<td>its</td>
<td>100</td>
<td>612</td>
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<td>Paint for plastered surfaces</td>
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<td>man days</td>
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<td>1,200</td>
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<tr>
<td></td>
<td>Total cost</td>
<td>104,166</td>
<td>-</td>
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</table>
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. Verandas 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.

<table>
<thead>
<tr>
<th>Components</th>
<th>Recommended Specifications</th>
<th>Specific Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Foundations</td>
<td>• Random stone masonry in CM or CC (40 cm) in 1:8 cement sand mortar</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Raised on back fill</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Plinth beam provided</td>
<td></td>
</tr>
<tr>
<td>Wall</td>
<td>• 200 mm Stone/concrete/brick mason in 1:6 upto sill level</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Ikra wall panelling in bamboo framing structure</td>
<td></td>
</tr>
<tr>
<td>Wall Finish</td>
<td>• Ferrocement plaster on Adobe wall</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• cement plaster upto sillevel</td>
<td></td>
</tr>
<tr>
<td>Roof Structure</td>
<td>• Sloping roof with bamboo/timber understructure</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• covered with CGI sheet held down with J bolts etc to counter wind loads</td>
<td></td>
</tr>
<tr>
<td>Floor</td>
<td>• Plain cement flooring over RCC bed on a back filled plinth:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Stabilized Soil cement flooring, and Earthen flooring.</td>
<td></td>
</tr>
</tbody>
</table>

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
Area Statement:

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<th>Item</th>
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<th>Area Sq.ft</th>
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<td>Storage</td>
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<td>Toilet</td>
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<td>14.21</td>
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<td>Verandah 1</td>
<td>5.32</td>
<td>57.26</td>
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<td>Verandah 2</td>
<td>5.26</td>
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<td>Carpet Area</td>
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<tr>
<td>Built up Area</td>
<td>56.23</td>
<td>605.26</td>
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</tbody>
</table>
TYPICAL SECTION AA'

- Ridge cap
- CGI sheet
- 8 mm dia J bolts tying down the CGI sheet to the purlins
- ~2 inch dia (~50 mm dia) bamboo purlins placed at 300 mm o/c
- 3 inch dia (~75 mm dia) bamboo rafters
- Split bamboo fixed to horizontal bamboo members as false ceiling
- Iron panel wall with ferro-cement plaster
- Stone block masonry in 1:6 CS mortar up to sill level
- RCC plinth beam with RCC or bamboo/wooden floor
- Random stone masonry in CM or CG(40:60) in 1:8 cement sand mortar
<table>
<thead>
<tr>
<th>SR.NO.</th>
<th>ITEM OF WORK</th>
<th>Quantity</th>
<th>unit</th>
<th>Rate</th>
<th>Cost</th>
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<td>cum</td>
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<td>-</td>
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<tr>
<td></td>
<td>For stub footings (bamboo bases and raised floors)</td>
<td>4.0</td>
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<td>600</td>
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<tr>
<td>2</td>
<td>PCC bed for column footings</td>
<td>1.5</td>
<td>cum</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>concrete (1:4:8)</td>
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<td>cum</td>
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<tr>
<td></td>
<td>aggregate</td>
<td>1.1</td>
<td>cum</td>
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<td>-</td>
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<tr>
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<td>mandays</td>
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<td></td>
<td>concrete (1:2:4)</td>
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<td>cum</td>
<td>-</td>
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<td>cum</td>
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<tr>
<td></td>
<td>Split bamboo infill</td>
<td>61.0</td>
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<td>100</td>
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<tr>
<td></td>
<td>Plastering of walling panels</td>
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<td>cum</td>
<td>-</td>
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<td></td>
<td>sand</td>
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<td>3 inch dia Bamboo</td>
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<td>nails &amp; hardware</td>
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<td>LS</td>
<td>1000</td>
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<tr>
<td></td>
<td>Labor</td>
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<td>mandays</td>
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<tr>
<td></td>
<td></td>
<td>doors</td>
<td>3.0</td>
<td>nos</td>
<td>300</td>
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<tr>
<td></td>
<td></td>
<td>nails &amp; hardware</td>
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<td>LS</td>
<td>500</td>
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<td></td>
<td>Labor</td>
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<td>mandays</td>
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<td>7</td>
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<td>LS</td>
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<td>8</td>
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<td>CGI sheets</td>
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<td>510</td>
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<td>Ridge members</td>
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<tr>
<td></td>
<td></td>
<td>nails &amp; hardware</td>
<td>1.0</td>
<td>LS</td>
<td>1000</td>
</tr>
<tr>
<td></td>
<td>Labor</td>
<td>2.0</td>
<td>mandays</td>
<td>300</td>
<td>600</td>
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<tr>
<td></td>
<td>Transport</td>
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<td>9</td>
<td>Laying of cement flooring on top of split bamboo &amp; chicken mesh</td>
<td>cement floor</td>
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<td></td>
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<td>chicken mesh</td>
<td>18.0</td>
<td>sqm</td>
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<tr>
<td></td>
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<td>Split bamboo</td>
<td>60.0</td>
<td>nos</td>
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<tr>
<td></td>
<td></td>
<td>sand</td>
<td>0.5</td>
<td>cum</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td></td>
<td>cement</td>
<td>4.2</td>
<td>bags</td>
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<td></td>
<td>Labor</td>
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<td>mandays</td>
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<td>1,800</td>
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<tr>
<td>10</td>
<td>Painting of doors and windows</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td></td>
<td>Labor</td>
<td>4.0</td>
<td>mandays</td>
<td>450</td>
<td>1,800</td>
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<tr>
<td></td>
<td>Total cost</td>
<td></td>
<td></td>
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<td>67,328</td>
</tr>
</tbody>
</table>
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.

<table>
<thead>
<tr>
<th>Components</th>
<th>Recommended Specifications</th>
<th>Specific Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Foundations</td>
<td>• Random stone masonry foundation in Cement mortar or CC(40 CM) in 1:8 cement sand mortar</td>
<td></td>
</tr>
<tr>
<td>Plinth</td>
<td>• Masonry plinth with back filled earth.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Raised floor supported on a two-layer system of primary and secondary timber members that support a wooden floor above.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Plinth beams incorporated</td>
<td></td>
</tr>
<tr>
<td>Wall</td>
<td>• Stone block masonry upto sill level</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Ikra wall panelling above sill level</td>
<td></td>
</tr>
<tr>
<td>Wall Finish</td>
<td>• ferrocement plaster</td>
<td></td>
</tr>
<tr>
<td>Roof Structure</td>
<td>• Sloping roofs with timber/bamboo understructure</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Treated bamboo roofing members (trusses, ties and purlins) support a roof with an angle of slope of 30 degrees</td>
<td></td>
</tr>
<tr>
<td>Floor</td>
<td>• Timber plank flooring fixed onto a timber/treated bamboo under-structure.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Cement floor on backfilled earth in the case of a masonry plinth.</td>
<td></td>
</tr>
</tbody>
</table>
ML-03

Area Statement:

<table>
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<tr>
<th>Item</th>
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<th>Area 2</th>
</tr>
</thead>
<tbody>
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<td>11.03</td>
<td>118.73</td>
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<tr>
<td>Room 2</td>
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<td>118.73</td>
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<td>Room 3</td>
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<tr>
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<td>Verandah</td>
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<td>Carpet Area</td>
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<tr>
<td>1</td>
<td>Excavation</td>
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<tr>
<td></td>
<td>For stub footings (bamboo bases and raised floors)</td>
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</tr>
<tr>
<td></td>
<td>Labor</td>
<td>4.0</td>
</tr>
<tr>
<td>2</td>
<td>PCC bed for column footings and in stone plinth trenches</td>
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<tr>
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<td>Labor</td>
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<td></td>
<td>Transport</td>
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<td>3</td>
<td>Erection of Stub Footings</td>
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<td></td>
<td>Transport</td>
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<tr>
<td></td>
<td>3 inch dia Bamboo</td>
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<td>Split bamboo infill</td>
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<td>Cement</td>
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<td>Labor</td>
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<tr>
<td>8</td>
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</tr>
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<td>9</td>
<td>Making and fixing of Doors and Windows</td>
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<td>4.1</td>
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<td>nails &amp; hardware</td>
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<td>12</td>
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</tr>
<tr>
<td></td>
<td>cement floor</td>
<td>0.7</td>
</tr>
<tr>
<td></td>
<td>sand</td>
<td>5.3</td>
</tr>
<tr>
<td></td>
<td>Labor</td>
<td>2.0</td>
</tr>
<tr>
<td>13</td>
<td>Plastering of walls</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Internal</td>
<td></td>
</tr>
<tr>
<td></td>
<td>cement mortar</td>
<td>0.1</td>
</tr>
<tr>
<td></td>
<td>sand</td>
<td>0.1</td>
</tr>
<tr>
<td></td>
<td>cement</td>
<td>0.6</td>
</tr>
<tr>
<td></td>
<td>Labor</td>
<td>2.0</td>
</tr>
<tr>
<td>14</td>
<td>Painting of walls</td>
<td></td>
</tr>
<tr>
<td></td>
<td>internal paint</td>
<td></td>
</tr>
<tr>
<td></td>
<td>external paint</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3 inch dia Bamboo</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Split bamboo infill</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Plastering of wall panels</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Cement</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Labor</td>
<td></td>
</tr>
</tbody>
</table>

**Total cost** 84,770
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

• 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.

<table>
<thead>
<tr>
<th>Components</th>
<th>Recommended Specifications</th>
<th>Specific Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Foundations</td>
<td>• Random stone masonry foundation in Cement mortar or CC(40 CM) in 1:8 cement sand mortar</td>
<td></td>
</tr>
</tbody>
</table>
| Plinth        | • Masonry plinth with back filled earth.  
• Plinth beams incorporated |                                                         |
| Wall          | • 200 mm thick Stone block / hollow concrete block masonry upto lintel level with Horizontal RCC bands incorporated |                                                         |
| Wall Finish   | • Ferrocement plaster                                           | Treated bamboo roofing members (trusses, ties and purins) support a roof with an angle of slope of 30 degrees |
| Roof Structure| • Sloping roofs with timber/bamboo understructure               |                                                         |
| Floor         | • Cement concrete flooring                                      | Cement floor on backfilled earth in the case of a masonry plinth. |
**ML-04B**

**Alternative layout**

**Area Statement:**

<table>
<thead>
<tr>
<th>Item</th>
<th>Area</th>
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<tr>
<td></td>
<td>Sq.m</td>
</tr>
<tr>
<td>Bed Room</td>
<td>10.98</td>
</tr>
<tr>
<td>Kitchen &amp; Dining</td>
<td>10.98</td>
</tr>
<tr>
<td>Toilet</td>
<td>1.84</td>
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<tr>
<td>Veranda</td>
<td>4.90</td>
</tr>
<tr>
<td>Carpet Area</td>
<td>24.47</td>
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<tr>
<td>Built up Area</td>
<td>35.55</td>
</tr>
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</table>

**TYPICAL SECTION AA’**

- **Purlin**
- **Truss type T1**
- **CGI sheets**
- **35X5 MS U-clamp**
- **75mm Lintel band**
- **200 mm Thick Stone masonry / hollow blocks i**
- **Steel/ timber frame window with steel grill**
- **75mm Sit band**
- **75mm Plinth band**
- **Cement concrete flooring**
- **Stone foundation**

**TYPICAL PLAN**

- **200 mm Thick Stone masonry / hollow blocks in 1:6**
- **450mm wide 1:3:6 concrete apron**
- **Loft above**
- **100 mm Partition wall**
- **Steel/ timber frame windows with steel grill**
- **Truss T1**
- **Purlin**
- **Stone wall up to 900mm**
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<thead>
<tr>
<th>SR.NO.</th>
<th>ITEM OF WORK</th>
<th>Quantity</th>
<th>Unit</th>
<th>Rate</th>
<th>Cost</th>
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<td>For pits</td>
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<td>cum</td>
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<tr>
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<td>5.0</td>
<td>mandays</td>
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<tr>
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<td>PCC bed in foundation</td>
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<td>cum</td>
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<tr>
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<td>concrete (1-4:3)</td>
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<td>sand</td>
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<td>-</td>
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</tr>
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<td>Erection of Stub Footings</td>
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<td>aggregate</td>
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<td>cum</td>
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<tr>
<td></td>
<td>concrete (1-2-4)</td>
<td>1.3</td>
<td>cum</td>
<td>-</td>
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<tr>
<td></td>
<td>sand</td>
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<td>cum</td>
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<td>aggregate</td>
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<td>cum</td>
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<td>cum</td>
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<td>windows</td>
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<td>nos</td>
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<tr>
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<td>nails &amp; hardware</td>
<td>1.0</td>
<td>l's</td>
<td>1000</td>
<td>1,000</td>
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<td></td>
<td>Labor</td>
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<tr>
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<td>nails &amp; hardware</td>
<td>1.0</td>
<td>l's</td>
<td>1000</td>
<td>1,000</td>
</tr>
<tr>
<td></td>
<td>Labor</td>
<td>8.0</td>
<td>mandays</td>
<td>300</td>
<td>2,400</td>
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<tr>
<td>9</td>
<td>Making and erecting the Bamboo roof framework</td>
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<td>2 inch dia Bamboo</td>
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<td>l's</td>
<td>1000</td>
<td>1,000</td>
</tr>
<tr>
<td></td>
<td>nails &amp; hardware</td>
<td>0.0</td>
<td>l's</td>
<td>1000</td>
<td>1,000</td>
</tr>
<tr>
<td></td>
<td>Labor</td>
<td>8.0</td>
<td>mandays</td>
<td>300</td>
<td>2,400</td>
</tr>
<tr>
<td>10</td>
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<td>Ridge members</td>
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<td>l's</td>
<td>1000</td>
<td>1,000</td>
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<tr>
<td></td>
<td>nails &amp; hardware</td>
<td>1.0</td>
<td>l's</td>
<td>1000</td>
<td>1,000</td>
</tr>
<tr>
<td></td>
<td>Labor</td>
<td>2.0</td>
<td>mandays</td>
<td>300</td>
<td>600</td>
</tr>
<tr>
<td></td>
<td>Transport</td>
<td>2.500</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Laying of Pisan cement flooring</td>
<td>1.2</td>
<td>cum</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>cement floor</td>
<td>0.9</td>
<td>cum</td>
<td>500</td>
<td>447</td>
</tr>
</tbody>
</table>

| 12 | Plastering of walls | 7.0 | bags | 350 | 2,455 |
|    | Internal            | 0.0 | cum  | 500 | -    |
|    | Cement mortar      | 0.0 | bags | 350 | -    |
|    | 13 | Painting and polishing | 0.2 | cum  | -    | -    |
|    | Oil for bamboo      | 0.7 | bags | 350 | 254  |
|    | Painting of doors and windows | 0.1 | cum  | 500 | 67   |

| 13 | Painting and polishing | 0.7 | bags | 350 | 254  |
|    | Oil for bamboo      | 0.7 | bags | 350 | 254  |
|    | Painting of doors and windows | 0.1 | cum  | 500 | 67   |

**Total cost**: 82,405
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.

- 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 (thul) 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 bambooos.
- 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.

<table>
<thead>
<tr>
<th>Components</th>
<th>Recommended Specifications</th>
<th>Specific Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Foundations</td>
<td>• Random stone masonry foundation in Cement mortar or CC(40 CM) in 1:8 cement sand mortar</td>
<td></td>
</tr>
<tr>
<td>Plinth</td>
<td>• Masonry plinth with back filled earth.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Plinth beams incorporated</td>
<td></td>
</tr>
<tr>
<td>Wall</td>
<td>• Brick masonry in Rat trap bond or stone masonry block or hollow concrete block masonry in cement sand mortar</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Alternatively ikar wall panelling can be done with timber framing</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• CGI sheet panelling with insulatoin</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Stone block upto sill level</td>
<td></td>
</tr>
<tr>
<td>Wall Finish</td>
<td>• Ferrocement plaster</td>
<td></td>
</tr>
<tr>
<td>Roof Structure</td>
<td>• Sloping roofs with timber/bamboo understructure</td>
<td>• Treated bamboo roofing members (trusses, ties and purlins) support a roof with an angle of slope of 30 degrees</td>
</tr>
<tr>
<td>Floor</td>
<td>• Cement concrete flooring</td>
<td>• Cement floor on backfilled earth in the case of a masonry plinth.</td>
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</table>
**ML-05**

### Area Statement:

<table>
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<tr>
<th>Item</th>
<th>Area</th>
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</thead>
<tbody>
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<tr>
<td>Room</td>
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<tr>
<td>Kitchen</td>
<td>8.55</td>
</tr>
<tr>
<td>Toilet</td>
<td>2.13</td>
</tr>
<tr>
<td>Veranda</td>
<td>18.32</td>
</tr>
<tr>
<td>Carpet Area</td>
<td>28.59</td>
</tr>
<tr>
<td>Built up Area</td>
<td>52.84</td>
</tr>
</tbody>
</table>

- Precast RC planks size 1500x300x50 mm
- Partially precast RC joist size 2000x150x100
- RC lintel band
- 12mm vertical steel bars
- RCC slab band
- Brick Masonry in Ratak Band or Stone Masonry Block or Hollow Block Masonry in Mortar
- RC plinth band
- Select Foundation As per soil and Flood condition
- 12mm vertical steel bars
- Precast RC planks size 1500x300x50 mm
- Brick Masonry in Ratak Band or Stone Masonry Block or Hollow Block Masonry in Mortar

![Diagram of ML-05 with annotations for construction details and area calculations](image-url)
Alternative Roofing system

Truss Type 1
50 mm dia Bamboo Purlins placed at 300 mm c/c
12x12mm wire mesh with 18 gauge GI wire at about 40 cm c/c
100 mm dia Horizontal Bamboo Members which Supports the Truss
75 mm dia Anchored Bamboo members
Thatch panels/EPS (Thermocol sheets)
CGI sheets
100 mm dia Vertical Bamboo Members which Supports the Truss
Stone concrete block Upto Sill Level
Select Foundation As per Soil and flood condition
<table>
<thead>
<tr>
<th>SR.NO.</th>
<th>ITEM OF WORK</th>
<th>Quantity</th>
<th>Unit</th>
<th>Rate</th>
<th>Cost</th>
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<tbody>
<tr>
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<td>Excavation</td>
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<td>cum</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>For plinth</td>
<td>4.0</td>
<td>man-days</td>
<td>300</td>
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<td>RCC bed in foundation</td>
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<td>cum</td>
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<td>cum</td>
<td>500</td>
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<td>cum</td>
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<td></td>
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<tr>
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<td>Labor</td>
<td>2.0</td>
<td>man-days</td>
<td>300</td>
<td>600</td>
</tr>
<tr>
<td></td>
<td>Transport</td>
<td></td>
<td></td>
<td></td>
<td>2,500</td>
</tr>
<tr>
<td>3</td>
<td>Erection of Stub Footings</td>
<td>0.0</td>
<td>cum</td>
<td>500</td>
<td>129</td>
</tr>
<tr>
<td></td>
<td>concrete (1.2-4)</td>
<td>0.0</td>
<td>cum</td>
<td>500</td>
<td>101</td>
</tr>
<tr>
<td></td>
<td>aggregate</td>
<td>0.4</td>
<td>cum</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>cement</td>
<td>2.3</td>
<td>bags</td>
<td>350</td>
<td>804</td>
</tr>
<tr>
<td></td>
<td>Labor</td>
<td>4.0</td>
<td>man-days</td>
<td>450</td>
<td>1,800</td>
</tr>
<tr>
<td></td>
<td>Transport</td>
<td></td>
<td></td>
<td></td>
<td>2,500</td>
</tr>
<tr>
<td>4</td>
<td>Provision of an RCC plinth, sk, &amp;intel and wall top reinforcement bands</td>
<td>0.0</td>
<td>cum</td>
<td>500</td>
<td>1.29</td>
</tr>
<tr>
<td></td>
<td>Stee</td>
<td>103.2</td>
<td>kg</td>
<td>45</td>
<td>4,696</td>
</tr>
<tr>
<td></td>
<td>concrete (1.2-4)</td>
<td>0.9</td>
<td>cum</td>
<td>500</td>
<td>1.29</td>
</tr>
<tr>
<td></td>
<td>aggregate</td>
<td>0.5</td>
<td>cum</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>cement</td>
<td>2.9</td>
<td>bags</td>
<td>350</td>
<td>1,033</td>
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<tr>
<td></td>
<td>Labor</td>
<td>1.0</td>
<td>man-days</td>
<td>450</td>
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<td></td>
<td>Transport</td>
<td></td>
<td></td>
<td></td>
<td>2,500</td>
</tr>
<tr>
<td>5</td>
<td>Provision of a Stabilised adobe wall</td>
<td>0.0</td>
<td>cum</td>
<td>500</td>
<td>77</td>
</tr>
<tr>
<td></td>
<td>adobe blocks</td>
<td>686.9</td>
<td>nos</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>cement mortar</td>
<td>0.2</td>
<td>cum</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>aggregate</td>
<td>0.0</td>
<td>cum</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>cement for mortar</td>
<td>0.9</td>
<td>bags</td>
<td>350</td>
<td>318</td>
</tr>
<tr>
<td></td>
<td>cement for blocks</td>
<td>3.6</td>
<td>bags</td>
<td>350</td>
<td>1,250</td>
</tr>
<tr>
<td></td>
<td>Labor</td>
<td>6.0</td>
<td>man-days</td>
<td>450</td>
<td>2,700</td>
</tr>
<tr>
<td>6</td>
<td>Bamboo wall panels that is fixed on to the main bamboo frame work</td>
<td>0.0</td>
<td>cum</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>GGL sheets</td>
<td>20.0</td>
<td>nos</td>
<td>510</td>
<td>10,200</td>
</tr>
<tr>
<td></td>
<td>3 inch dia Bamboo</td>
<td>40.0</td>
<td>nos</td>
<td>30</td>
<td>1,200</td>
</tr>
<tr>
<td></td>
<td>Plastering of walling panels</td>
<td>0.6</td>
<td>cum</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Sand</td>
<td>1.8</td>
<td>cum</td>
<td>500</td>
<td>318</td>
</tr>
<tr>
<td></td>
<td>Cement</td>
<td>10.8</td>
<td>cum</td>
<td>350</td>
<td>3,788</td>
</tr>
<tr>
<td></td>
<td>Labor</td>
<td>4.0</td>
<td>man-days</td>
<td>300</td>
<td>2,700</td>
</tr>
<tr>
<td>7</td>
<td>Making and fixing of Doors and Windows</td>
<td>0.0</td>
<td>cum</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Windows</td>
<td>4.0</td>
<td>nos</td>
<td>300</td>
<td>1,200</td>
</tr>
<tr>
<td></td>
<td>doors</td>
<td>3.0</td>
<td>nos</td>
<td>300</td>
<td>900</td>
</tr>
<tr>
<td></td>
<td>nails &amp; hardware</td>
<td>2.0</td>
<td>L5</td>
<td>500</td>
<td>1,000</td>
</tr>
<tr>
<td></td>
<td>Labor</td>
<td>4.0</td>
<td>man-days</td>
<td>300</td>
<td>3,600</td>
</tr>
<tr>
<td>8</td>
<td>Making and erecting the vertical and horizontal bamboo members</td>
<td>0.0</td>
<td>cum</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>4 inch dia Bamboo</td>
<td>53.0</td>
<td>nos</td>
<td>50</td>
<td>2,650</td>
</tr>
<tr>
<td></td>
<td>nails &amp; hardware</td>
<td>1.0</td>
<td>L5</td>
<td>1000</td>
<td>1,000</td>
</tr>
<tr>
<td></td>
<td>Labor</td>
<td>4.0</td>
<td>man-days</td>
<td>300</td>
<td>2,400</td>
</tr>
<tr>
<td>9</td>
<td>Total cost</td>
<td></td>
<td></td>
<td></td>
<td>89,695</td>
</tr>
</tbody>
</table>
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, Baitaranai, 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 ecosystem degradation and physical displacement from industrialization.
### ODISHA HOUSING TYPOLGIES AT A GLANCE

<table>
<thead>
<tr>
<th>TYPOLOGY</th>
<th>APPLICABLE HOUSING ZONES</th>
<th>TOTAL AREA Sq.m/Sq.ft</th>
</tr>
</thead>
<tbody>
<tr>
<td>OD-01</td>
<td>Zone A</td>
<td>40.79 sq.m</td>
</tr>
<tr>
<td>OD-02</td>
<td>Zone B</td>
<td>42.23 sq.m</td>
</tr>
<tr>
<td>OD-03</td>
<td>Zone C</td>
<td>69.00 sq.m</td>
</tr>
<tr>
<td>OD-04</td>
<td>Zone B</td>
<td>56.00 sq.m</td>
</tr>
<tr>
<td>OD-05</td>
<td>Zone C</td>
<td>50.79 sq.m</td>
</tr>
<tr>
<td>OD-06</td>
<td>Zone D</td>
<td>41.75 sq.m</td>
</tr>
</tbody>
</table>
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’.

Recommendations for Built Form

<table>
<thead>
<tr>
<th>Plan Layout</th>
<th>Plinth/Floor</th>
<th>Roof Profile</th>
</tr>
</thead>
<tbody>
<tr>
<td>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.</td>
<td>High Plinth level recommended</td>
<td>Light Weight Roof Recommended. Clay tiles on a wood and bamboo understructure are commonly used in roofs.</td>
</tr>
</tbody>
</table>

Recommendations for construction systems

<table>
<thead>
<tr>
<th>Components</th>
<th>Recommended Specifications</th>
<th>Specific Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Foundations</td>
<td>• Reinforced brick pedestal &lt;br&gt; • 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.</td>
<td>• Brick pedestal of 10”x10” size and 5’ depth, reinforced with 1 No. 12mmbar. &lt;br&gt; • In case of cohesive soils, such as clayey/ silty clay/ clayey silt, reinforced.</td>
</tr>
<tr>
<td>Plinth</td>
<td>• Minimum 30 cm and 30 cm projected from the walls to protect the foundation and provide stability to the structure.</td>
<td></td>
</tr>
<tr>
<td>Wall</td>
<td>• 2 brick thick column with rat trap bonded brick wall .&lt;br&gt; • Reinforcing bars embedded in brick masonry at the corners of all the rooms</td>
<td>• 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.</td>
</tr>
<tr>
<td>Wall Finish</td>
<td>• No wall finish required</td>
<td></td>
</tr>
<tr>
<td>Roof Structure</td>
<td>• Brick filler slab</td>
<td>• RCC filler slab 150mm thick using brick filler, provided as a pair of bricks</td>
</tr>
</tbody>
</table>
ODISHA

TYPICAL PLAN

TYPICAL SECTION AA’

Area Statement:

<table>
<thead>
<tr>
<th>Item</th>
<th>Area Sq.m</th>
<th>Area Sq.ft</th>
</tr>
</thead>
<tbody>
<tr>
<td>Room 1</td>
<td>9.75</td>
<td>104.95</td>
</tr>
<tr>
<td>Room 2</td>
<td>9.90</td>
<td>106.56</td>
</tr>
<tr>
<td>Kitchen &amp; Storage</td>
<td>5.94</td>
<td>63.94</td>
</tr>
<tr>
<td>Verandah</td>
<td>6.39</td>
<td>68.78</td>
</tr>
<tr>
<td>Carpet Area</td>
<td>27.23</td>
<td>293.10</td>
</tr>
<tr>
<td>Built up Area</td>
<td>40.79</td>
<td>439.06</td>
</tr>
</tbody>
</table>
SECTION AA’ - ALTERNATE ROOFING

- Bricks laid flat with M20 grade concrete filled in the joints kept 40 to 50 mm wide
- 150 mm thick Roof band
- 600 mm wide loft
- 75 mm thick lintel band
- Local wood or T-iron frames (with welded grill bars)
- Storage Shelf
- 250 mm thick brick wall in 1:6 cement sand mortar
- Dintel
- 150 mm thick Plinth beam
- 150 mm thick beam at Ground level
- 20 mm thick cement concrete flooring
- 40 mm dia. Under-treamed pile
- LDR Pile 2
- Foundation for piles
## Cost Breakup

<table>
<thead>
<tr>
<th>Item</th>
<th>Quantity</th>
<th>Unit</th>
<th>Rate</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Excavation for brick pedestal 1.2m depth</td>
<td>15</td>
<td>cu.m</td>
<td>80</td>
<td>1200</td>
</tr>
<tr>
<td>Brickwork with burnt clay bricks in foundation up to plinth</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Brick pedestal in cement mortar 1:4</td>
<td>1.5</td>
<td>cu.m</td>
<td>3000</td>
<td>4500</td>
</tr>
<tr>
<td>Brick wall between ground level and plinth beam in cement mortar 1:6</td>
<td>3.5</td>
<td>cu.m</td>
<td>2700</td>
<td></td>
</tr>
<tr>
<td>Brick Khoa 0.75mx0.75m, 75mm thick</td>
<td>1</td>
<td>cu.m</td>
<td>1800</td>
<td>1800</td>
</tr>
<tr>
<td>Brickwork in superstructure using flyash bricks of min wet compressive strength of 50 kg/cu.cm - in rat-trap bond, in cement mortar 1:4</td>
<td>17</td>
<td>cu.m</td>
<td>3200</td>
<td>54400</td>
</tr>
<tr>
<td>Plain Cement Concrete in foundation</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mix 1:4:8</td>
<td>0.6</td>
<td>cu.m</td>
<td>2700</td>
<td>1620</td>
</tr>
<tr>
<td>Mix 1:2:4</td>
<td>0.2</td>
<td>cu.m</td>
<td>3000</td>
<td>600</td>
</tr>
<tr>
<td>Reinforced cement concrete of 1:1:5:3 mix in superstructure</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Plinth beam of 0.25mx0.25m size</td>
<td>1.7</td>
<td>cu.m</td>
<td>4500</td>
<td>7650</td>
</tr>
<tr>
<td>Sill level band</td>
<td>0.5</td>
<td>cu.m</td>
<td>4500</td>
<td>2250</td>
</tr>
<tr>
<td>Lintel level band</td>
<td>0.5</td>
<td>cu.m</td>
<td>4500</td>
<td>2250</td>
</tr>
<tr>
<td>Roof level band</td>
<td>0.5</td>
<td>cu.m</td>
<td>4500</td>
<td>2250</td>
</tr>
<tr>
<td>Front verandah roof</td>
<td>0.5</td>
<td>cu.m</td>
<td>4500</td>
<td>2250</td>
</tr>
<tr>
<td>Concrete core of 100mmx100mm in corners and mid span of walls</td>
<td>0.7</td>
<td>cu.m</td>
<td>3000</td>
<td>2100</td>
</tr>
<tr>
<td>Steel</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>In Plinth beam</td>
<td>165</td>
<td>kg</td>
<td>58</td>
<td>9570</td>
</tr>
<tr>
<td>In Sill band</td>
<td>33</td>
<td>kg</td>
<td>58</td>
<td>1914</td>
</tr>
<tr>
<td>In lintel band</td>
<td>33</td>
<td>kg</td>
<td>58</td>
<td>1914</td>
</tr>
<tr>
<td>In front verandah roof</td>
<td>45</td>
<td>kg</td>
<td>58</td>
<td>2610</td>
</tr>
<tr>
<td>Single 12mm bar in concrete core</td>
<td>62</td>
<td>kg</td>
<td>58</td>
<td>3596</td>
</tr>
<tr>
<td>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</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Precast ferocementenement channel</td>
<td>8</td>
<td>No.</td>
<td>2000</td>
<td>16000</td>
</tr>
<tr>
<td>In-fill concrete 1:2:4 in valleys between channels</td>
<td>1.5</td>
<td>cu.m</td>
<td>3000</td>
<td>4500</td>
</tr>
<tr>
<td>Manpower for lifting and placing</td>
<td></td>
<td></td>
<td></td>
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</table>

**Total** 157,854/-
<table>
<thead>
<tr>
<th>Item Description</th>
<th>Quantity</th>
<th>Unit</th>
<th>Rate</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Skilled mason</td>
<td>2</td>
<td>Mandays</td>
<td>500</td>
<td>1000</td>
</tr>
<tr>
<td>Labour</td>
<td>15</td>
<td>Mandays</td>
<td>250</td>
<td>3750</td>
</tr>
<tr>
<td><strong>Openings</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8a precast RCC door-window frames 60mmx100mm</td>
<td>22</td>
<td>R.M</td>
<td>115</td>
<td>2530</td>
</tr>
<tr>
<td>8b Door shutter - solid core panel door 35mm thick</td>
<td>2.2</td>
<td>sq.m</td>
<td>1500</td>
<td>3300</td>
</tr>
<tr>
<td>Window shutter - local timber</td>
<td>0.15</td>
<td>cu.m</td>
<td>50000</td>
<td>7500</td>
</tr>
<tr>
<td><strong>Flooring</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rooms - CC tiles 300x300x15 on a 20mm cement mortar bed, sub-base of compacted</td>
<td>20</td>
<td>sq.m</td>
<td>450</td>
<td>9000</td>
</tr>
<tr>
<td>brick bats</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Verandah - Cement Concrete flooring - base floor of 1:2:4 concrete and finishing</td>
<td>12</td>
<td>sq.m</td>
<td>650</td>
<td>7800</td>
</tr>
<tr>
<td>layer of 1:2 cement mortar</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
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<td>157854</td>
<td></td>
</tr>
<tr>
<td>cost/sq.m</td>
<td></td>
<td></td>
<td>4510</td>
<td></td>
</tr>
</tbody>
</table>
• RCC frame structure on pile foundations with 300mm grade beam and 150mm lintel bands are constructed.

## Recommendations for Built Form

<table>
<thead>
<tr>
<th>Plan Layout</th>
<th>Plinth/Floor</th>
<th>Roof Profile</th>
</tr>
</thead>
<tbody>
<tr>
<td>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.</td>
<td>High Plinth level recommended.</td>
<td>Light Weight Roof Recommended.</td>
</tr>
</tbody>
</table>

## Recommendations for construction systems

<table>
<thead>
<tr>
<th>Components</th>
<th>Recommended Specifications</th>
<th>Specific Comments</th>
</tr>
</thead>
</table>
| 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           | • 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             | • 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 |
| Wall Finish      | • 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 Structure   | • Country Tiles with Timber Understructure.                     | • Woven reed mats can be used below the tiles as false ceiling for thermal insulation. |
Area Statement:

<table>
<thead>
<tr>
<th>Item</th>
<th>Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Room 1</td>
<td>100.10</td>
</tr>
<tr>
<td>Room 2</td>
<td>100.10</td>
</tr>
<tr>
<td>Kitchen</td>
<td>65.66</td>
</tr>
<tr>
<td>Toilet</td>
<td>21.21</td>
</tr>
<tr>
<td>Verandah</td>
<td>79.76</td>
</tr>
<tr>
<td>Carpet Area</td>
<td>297.52</td>
</tr>
<tr>
<td>Built up Area</td>
<td>454.56</td>
</tr>
</tbody>
</table>

TYPICAL PLAN

TYPICAL SECTION AA'
## Cost estimate

### Cost breakup

<table>
<thead>
<tr>
<th>Item</th>
<th>Item Number</th>
<th>Cost (INR)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Foundation</td>
<td></td>
<td>18,056/-</td>
</tr>
<tr>
<td>Flooring</td>
<td></td>
<td>36,950/-</td>
</tr>
<tr>
<td>Walls</td>
<td></td>
<td>63,034/-</td>
</tr>
<tr>
<td>Attic &amp; Roof</td>
<td></td>
<td>30,806/-</td>
</tr>
<tr>
<td>Doors &amp; Windows</td>
<td></td>
<td>9,242/-</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td><strong>158,088/-</strong></td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Item</th>
<th>Quantity</th>
<th>Unit</th>
<th>Cost (Rs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>75-100mm dia bamboo for Woven mat for walls in room and kitchen</td>
<td>32 No.</td>
<td></td>
<td>4160</td>
</tr>
<tr>
<td>Nails and hardware</td>
<td>lumsum</td>
<td></td>
<td>1500</td>
</tr>
<tr>
<td>Plastering bamboo wall - 1.5 m high, total surface area 15sq.m, 10mm thick</td>
<td>1 No.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Clayey soil for mud plaster</td>
<td>3.5 cu.m</td>
<td></td>
<td>1750</td>
</tr>
<tr>
<td>Cement for stabilisation of soil for external plaster</td>
<td>4 bags</td>
<td></td>
<td>1400</td>
</tr>
<tr>
<td>Manpower for plastering</td>
<td>8 mandays</td>
<td></td>
<td>2400</td>
</tr>
<tr>
<td>Attic floor</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>75-100mm dia bamboo</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Primary beam of bundled bamboo</td>
<td>2 No.</td>
<td></td>
<td>260</td>
</tr>
<tr>
<td>Secondary beams at 0.6m spacing</td>
<td>3 No.</td>
<td></td>
<td>390</td>
</tr>
<tr>
<td>50-60mm dia bamboo</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bamboo lattice work for attic floor</td>
<td>5 No.</td>
<td></td>
<td>500</td>
</tr>
<tr>
<td>CGI sheet gable roof over room and verandah with bamboo understructure</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bamboo for roof understructure</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>75-100mm bamboo for rafter (slpign)</td>
<td>4 No.</td>
<td></td>
<td>520</td>
</tr>
<tr>
<td>75-100mm bamboo for vertical support of rafter</td>
<td>3 No.</td>
<td></td>
<td>390</td>
</tr>
<tr>
<td>50-60mm bamboo for purlins</td>
<td>8 No.</td>
<td></td>
<td>1040</td>
</tr>
<tr>
<td>CGI sheet roof - 0.5mm thick for room</td>
<td>9 No.</td>
<td></td>
<td>4500</td>
</tr>
<tr>
<td>CGI sheet roof - 0.5mm thick for verandah and kitchen</td>
<td>9 No.</td>
<td></td>
<td>3600</td>
</tr>
<tr>
<td>Nails and hardware</td>
<td>lumsum</td>
<td></td>
<td>1000</td>
</tr>
<tr>
<td>Manpower for bamboo structure and roof</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Main frame for wall,roof and attic</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Artisan/Carpenter</td>
<td>4 Mandays</td>
<td></td>
<td>2000</td>
</tr>
<tr>
<td>Labour</td>
<td>6 Mandays</td>
<td></td>
<td>1800</td>
</tr>
<tr>
<td>Lattice work for walls and attic</td>
<td>15 Mandays</td>
<td></td>
<td>5250</td>
</tr>
<tr>
<td>Doors and windows</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Standard REC door-window frames</td>
<td>9.5 R.M.</td>
<td></td>
<td>1092.5</td>
</tr>
<tr>
<td>Door shutter - solid core panel door 35mm thick</td>
<td>3.5 sq.m</td>
<td></td>
<td>5250</td>
</tr>
<tr>
<td>Window shutter - local timber</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bamboo palm of 0.75m x 0.75m, made of bamboo splits and framed by bamboo</td>
<td>0.03 cu.m</td>
<td></td>
<td>1500</td>
</tr>
<tr>
<td>Manpower for installation</td>
<td>2 mandays</td>
<td></td>
<td>600</td>
</tr>
<tr>
<td>Flooring</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rooms - CC tiles 300x300x15 on a 20mm cement mortar bed, sub-base of compacted brick bats</td>
<td>20 sq.m</td>
<td></td>
<td>9000</td>
</tr>
<tr>
<td>Verandah - Cement Concrete flooring - base floor of 1:2:4 concrete and finishing layer of 1:2 cement mortar</td>
<td>7.5 sq.m</td>
<td></td>
<td>4875</td>
</tr>
<tr>
<td>Earthen floor using red clayey soil stabilized with rice husk ash</td>
<td>15 sq.m</td>
<td></td>
<td>2250</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td>158087.5</td>
</tr>
<tr>
<td>cost/sq.m</td>
<td></td>
<td></td>
<td>3755</td>
</tr>
</tbody>
</table>
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

<table>
<thead>
<tr>
<th>Plan Layout</th>
<th>Plinth/Floor</th>
<th>Roof Profile</th>
</tr>
</thead>
<tbody>
<tr>
<td>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.</td>
<td>Clay tiles on a wood and bamboo understructure are commonly used in roofs.</td>
<td></td>
</tr>
</tbody>
</table>

### Recommendations for construction systems

<table>
<thead>
<tr>
<th>Components</th>
<th>Recommended Specifications</th>
<th>Specific Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Foundations</td>
<td>• 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.</td>
<td>• The structure is tied at the plinth level with a minimum 6” deep plinth beam.</td>
</tr>
<tr>
<td>Plinth</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wall</td>
<td>• 250 mm thick earthen walls in traditional cob technique. • 400 mm RR masonry up to sill level</td>
<td>• The frame is braced with diagonal bamboo from plinth to attic level at wall corners.</td>
</tr>
<tr>
<td>Wall Finish</td>
<td>• The wall is plastered with a mud plaster made with clayey soil, sand, straw, dung and rice.</td>
<td>• Wherever affordable, the external plaster can be a cement-sand plaster.</td>
</tr>
<tr>
<td>Roof Structure</td>
<td>• Sloping roofs with timber/bamboo understructure</td>
<td>• Primary rafters to rest on wall plate fixed to a brick course or a cement concrete base.</td>
</tr>
<tr>
<td>Roof Cover</td>
<td>• CGI sheets</td>
<td></td>
</tr>
<tr>
<td>Floor</td>
<td>• 30mm concrete base 1:4:8 on flat brick soling, finished with cement screed.</td>
<td>• Earthen floor using red clayey soil stabilized with rice husk ash or 7%.</td>
</tr>
</tbody>
</table>

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.
Area Statement:

<table>
<thead>
<tr>
<th>Item</th>
<th>Area Sq.m</th>
<th>Area Sq.ft</th>
</tr>
</thead>
<tbody>
<tr>
<td>Room</td>
<td>21.55</td>
<td>231.96</td>
</tr>
<tr>
<td>Front Verandah</td>
<td>22.00</td>
<td>236.81</td>
</tr>
<tr>
<td>Kitchen</td>
<td>6.00</td>
<td>64.58</td>
</tr>
<tr>
<td>Back Verandah</td>
<td>9.00</td>
<td>96.88</td>
</tr>
<tr>
<td>Carpet Area</td>
<td>28.00</td>
<td>301.39</td>
</tr>
<tr>
<td>Built up Area</td>
<td>69.00</td>
<td>742.72</td>
</tr>
</tbody>
</table>

TYPICAL PLAN

Typical Section AA'
TYPICAL PLAN

TYPICAL SECTION AA'

ODISHA

Area Statement:

<table>
<thead>
<tr>
<th>Item</th>
<th>Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Room</td>
<td>16.80</td>
</tr>
<tr>
<td>Front Verandah</td>
<td>16.80</td>
</tr>
<tr>
<td>Kitchen</td>
<td>6.00</td>
</tr>
<tr>
<td>Back Verandah</td>
<td>6.00</td>
</tr>
<tr>
<td>Carpet Area</td>
<td>23.00</td>
</tr>
<tr>
<td>Built up Area</td>
<td>56.00</td>
</tr>
</tbody>
</table>
## Cost estimate

### Cost breakup

<table>
<thead>
<tr>
<th>Item</th>
<th>Cost (INR)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Foundation</td>
<td>14,900</td>
</tr>
<tr>
<td>Walls</td>
<td>60,816</td>
</tr>
<tr>
<td>Roof</td>
<td>35,079</td>
</tr>
<tr>
<td>Doors &amp; windows</td>
<td>4725.0</td>
</tr>
<tr>
<td>Flooring</td>
<td>21490.0</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>137,010</strong></td>
</tr>
</tbody>
</table>

### Item Cost Breakup

<table>
<thead>
<tr>
<th>S.No</th>
<th>Item</th>
<th>Quantity</th>
<th>Unit</th>
<th>Rate</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Excavation</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>For room and 600mm high half brick walls</td>
<td>14</td>
<td>cu.m</td>
<td>80</td>
<td>1120</td>
</tr>
<tr>
<td></td>
<td>For precast columns</td>
<td>0.5</td>
<td>cu.m</td>
<td>80</td>
<td>40</td>
</tr>
<tr>
<td>2</td>
<td>Random rubble stone masonry in mud mortar - foundation of room</td>
<td>5</td>
<td>cu.m</td>
<td>1200</td>
<td>6000</td>
</tr>
<tr>
<td>3</td>
<td>Sand fill and compaction</td>
<td>2</td>
<td>cu.m</td>
<td>450</td>
<td>900</td>
</tr>
<tr>
<td>4</td>
<td>Concrete work in foundation</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4a</td>
<td>PCC, Mix 1:4:8</td>
<td>2.2</td>
<td>cu.m</td>
<td>2700</td>
<td>5940</td>
</tr>
<tr>
<td>4b</td>
<td>Damp proof course 50mm thick in 1:2:4 concrete</td>
<td>3.6</td>
<td>sq.m</td>
<td>250</td>
<td>900</td>
</tr>
<tr>
<td>5</td>
<td>Brickwork in cement mortar</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5a</td>
<td>Brickwork in 1:6 cement mortar with burnt clay bricks in foundation up to plinth</td>
<td>0.6</td>
<td>cu.m</td>
<td>3000</td>
<td>1800</td>
</tr>
<tr>
<td>5b</td>
<td>Brickwork in superstructure in 1:6 cement mortar</td>
<td>10.5</td>
<td>cu.m</td>
<td>3500</td>
<td>36750</td>
</tr>
<tr>
<td>5c</td>
<td>Half brickwork till 600mm height in cement mortar 1:6</td>
<td>11</td>
<td>sq.m</td>
<td>550</td>
<td>6050</td>
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<tr>
<td>5d</td>
<td>Brickwork in parapet</td>
<td>0.3</td>
<td>cu.m</td>
<td>3500</td>
<td>1050</td>
</tr>
<tr>
<td>6</td>
<td>RCC</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>6a</td>
<td>Concrete 1:1.5:3 in RCC loft</td>
<td>0.3</td>
<td>cu.m</td>
<td>4500</td>
<td>1350</td>
</tr>
<tr>
<td>6b</td>
<td>Steel in RCC loft</td>
<td>22</td>
<td>kg</td>
<td>58</td>
<td>1276</td>
</tr>
<tr>
<td>6c</td>
<td>Precast RCC post of size 0.125mx0.125m, length 2.5m, mix 1:1.5:3, 5kg steel in 1 post</td>
<td>10</td>
<td>No.</td>
<td>800</td>
<td>8000</td>
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<tr>
<td>7</td>
<td>Roof with precast RCC plank and joist</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>7a</td>
<td>Precast RCC planks of size 1.5mx0.3m, with 1.6 kg 6mm steel per plank</td>
<td>24</td>
<td>No.</td>
<td>275</td>
<td>6600</td>
</tr>
<tr>
<td>7b</td>
<td>Precast RCC beam of size 0.15mx0.15m, 3.6m length</td>
<td>1</td>
<td>No.</td>
<td>2500</td>
<td>2500</td>
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<tr>
<td>7c</td>
<td>In-situ concrete mix 1:1.5:3 on top of planks and joist</td>
<td>0.25</td>
<td>cu.m</td>
<td>4500</td>
<td>1125</td>
</tr>
<tr>
<td>7d</td>
<td>Steel in in-situ concrete</td>
<td>13</td>
<td>kg</td>
<td>58</td>
<td>754</td>
</tr>
<tr>
<td>7e</td>
<td>Manpower</td>
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<tr>
<td></td>
<td>Mason</td>
<td>2</td>
<td>mandays</td>
<td>500</td>
<td>1000</td>
</tr>
<tr>
<td></td>
<td>Labour</td>
<td>12</td>
<td>mandays</td>
<td>250</td>
<td>3000</td>
</tr>
<tr>
<td></td>
<td>Bar bender</td>
<td>1</td>
<td>mandays</td>
<td>500</td>
<td>500</td>
</tr>
<tr>
<td></td>
<td>Description</td>
<td>Quantity</td>
<td>Unit</td>
<td>Rate (Rs)</td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>-----------------------------------------------------------------------------</td>
<td>----------</td>
<td>------</td>
<td>-----------</td>
<td></td>
</tr>
<tr>
<td>8a</td>
<td>GCI sheet roof - 0.5mm thick for verandah and kitchen</td>
<td>13</td>
<td>No.</td>
<td>500</td>
<td></td>
</tr>
<tr>
<td>8b</td>
<td>Size 2140 x 900 (7''x3'')</td>
<td>6</td>
<td>No.</td>
<td>425</td>
<td></td>
</tr>
<tr>
<td>8c</td>
<td>Bamboo understructure</td>
<td>35</td>
<td>No.</td>
<td>130</td>
<td></td>
</tr>
<tr>
<td></td>
<td>75-100mm dia bamboo</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>50-60mm dia bamboo</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8d</td>
<td>Manpower</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Skilledartisan/carpenter</td>
<td>3</td>
<td>Mandays</td>
<td>500</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Labour</td>
<td>6</td>
<td>Mandays</td>
<td>250</td>
<td></td>
</tr>
<tr>
<td>8e</td>
<td>Nails and hardware</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>9 Mud plastered bamboo wall - 1.5 m high, total surface area 15sq.m.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9a</td>
<td>75-100mm dia bamboo</td>
<td>8</td>
<td>No.</td>
<td>130</td>
<td></td>
</tr>
<tr>
<td>9b</td>
<td>50-60mm dia bamboo</td>
<td>25</td>
<td>No.</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td>9c</td>
<td>Clayey soil for mud plaster</td>
<td>2</td>
<td>cu.m</td>
<td>500</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Openings</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10a</td>
<td>Precast RCC door-window frames 60mmx100mm</td>
<td>15</td>
<td>R.M</td>
<td>115</td>
<td></td>
</tr>
<tr>
<td>10b</td>
<td>Window shutter 30mm thick - local timber</td>
<td>0.06</td>
<td>cu.m</td>
<td>50000</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Flooring</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11a</td>
<td>Rooms - CC tiles 300x300x15 on a 20mm cement mortar bed, sub-base of</td>
<td>11.2</td>
<td>sq.m</td>
<td>450</td>
<td></td>
</tr>
<tr>
<td>11b</td>
<td>Verandah - Cement Concrete flooring - base floor of 1:2.4 concrete and</td>
<td>23</td>
<td>sq.m</td>
<td>650</td>
<td></td>
</tr>
<tr>
<td>11c</td>
<td>Earthen floor using red clayey soil stabilized with rice husk ash</td>
<td>10</td>
<td>sq.m</td>
<td>150</td>
<td></td>
</tr>
<tr>
<td></td>
<td>GRAND TOTAL</td>
<td></td>
<td></td>
<td>137010</td>
<td></td>
</tr>
<tr>
<td></td>
<td>AREA (sqm)</td>
<td></td>
<td></td>
<td>48</td>
<td></td>
</tr>
<tr>
<td></td>
<td>RATE OF CONSTRUCTION (per sqm)</td>
<td></td>
<td></td>
<td>2854.4</td>
<td></td>
</tr>
<tr>
<td></td>
<td>AREA (sqft)</td>
<td></td>
<td></td>
<td>513.6</td>
<td></td>
</tr>
<tr>
<td></td>
<td>RATE OF CONSTRUCTION (per sqft)</td>
<td></td>
<td></td>
<td>266.8</td>
<td></td>
</tr>
</tbody>
</table>
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

- 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

<table>
<thead>
<tr>
<th>Plan Layout</th>
<th>Plinth/Floor</th>
<th>Roof Profile</th>
</tr>
</thead>
<tbody>
<tr>
<td>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.</td>
<td>High Plinth level recommended.</td>
<td>Light Weight Roof Recommended.</td>
</tr>
</tbody>
</table>

### Recommendations for construction systems

<table>
<thead>
<tr>
<th>Components</th>
<th>Recommended Specifications</th>
<th>Specific Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Foundations</td>
<td>• Alternatively, the earthen plinth can be plastered with a cement-sand (by volume of soil)</td>
<td>• Toe wall in brick masonry in cement mortar 1:6 till plinth level. • Alternatively, laterite blocks can be used as strip footing.</td>
</tr>
<tr>
<td>Plinth</td>
<td>• RCC grade beam of 1:1.5:3 mix.</td>
<td></td>
</tr>
<tr>
<td>Wall</td>
<td>250 mm thk stone masonry wall in 1:6 cement mortar</td>
<td></td>
</tr>
<tr>
<td>Wall Finish</td>
<td>• The wall is plastered with a mud plaster made with clayey soil, sand, straw, dung and rice husk ash.</td>
<td>• Wherever affordable, the external plaster can be a cement-sand plaster</td>
</tr>
<tr>
<td>Roof Structure</td>
<td>• 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.</td>
<td>• Corrugated Galvanized Iron sheet of minimum 0.35mm thickness tied to bamboo understructure through J bolts with galvanized and bitumen washers.</td>
</tr>
</tbody>
</table>
| Roof Cover | • Country Tiles with Timber Understructure on verandah | • Woven reed mats can be used below the tiles as false ceiling for thermal insulation.
TYPICAL PLAN

- Bricks laid falt with M20 grade concrete filled in the joints
- 250mm thick Stone Block Masonry in CM
- Half Brick wall
- Local wood or T-iron frames (with welded grill bars)
- Precast RCC joist and Plank

TYPICAL SECTION AA'

- 250mm thick Stone Block Masonry in CM
- Local wood or T-iron frames (with welded grill bars)

ODISHA

Area Statement:

<table>
<thead>
<tr>
<th>Item</th>
<th>Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Room</td>
<td>11.13 Sq.m</td>
</tr>
<tr>
<td>Kitchen &amp; Storage</td>
<td>9.51  Sq.m</td>
</tr>
<tr>
<td>Veranda</td>
<td>24.25 Sq.m</td>
</tr>
<tr>
<td>Carpet Area</td>
<td>21.28 Sq.m</td>
</tr>
<tr>
<td>Built up Area</td>
<td>50.79 Sq.m</td>
</tr>
<tr>
<td>Built up Area</td>
<td>56.00 Sq.m</td>
</tr>
</tbody>
</table>
### Cost breakup

<table>
<thead>
<tr>
<th>Item</th>
<th>Cost (INR)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Foundation</td>
<td>44,835</td>
</tr>
<tr>
<td>Walls</td>
<td>58,660</td>
</tr>
<tr>
<td>Doors &amp; windows</td>
<td>6500.0</td>
</tr>
<tr>
<td>Flooring</td>
<td>6750.0</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>159,945</strong></td>
</tr>
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</table>

#### Cost estimate

<table>
<thead>
<tr>
<th>SR.NO.</th>
<th>Item</th>
<th>Quantity</th>
<th>Unit</th>
<th>Rate</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Excavation in soft soil upto 1 metre depth</td>
<td>12</td>
<td>cu.m</td>
<td>80</td>
<td>960</td>
</tr>
<tr>
<td>2</td>
<td>Random rubble masonry in mud mortar till plinth level</td>
<td>25</td>
<td>cu.m</td>
<td>1200</td>
<td>30000</td>
</tr>
<tr>
<td>3</td>
<td>Plain Cement Concrete 1:4:8 in foundation</td>
<td>3</td>
<td>cu.m</td>
<td>2750</td>
<td>8250</td>
</tr>
<tr>
<td>4</td>
<td>Providing a sand bed below random rubble masonry</td>
<td>2.5</td>
<td>cu.m</td>
<td>450</td>
<td>1125</td>
</tr>
<tr>
<td>5</td>
<td>Damp proof course 50mm thick in 1:2:4 concrete</td>
<td>18</td>
<td>sq.m</td>
<td>250</td>
<td>4500</td>
</tr>
<tr>
<td>6</td>
<td>Earthen walls 0.45m thick, using locally available soil - using clayey sandy soil with 10% gravel content, including labour and self-help from family</td>
<td>60</td>
<td>cu.m</td>
<td>600</td>
<td>36000</td>
</tr>
<tr>
<td>7</td>
<td>Precast RCC beam of mix 1:1.5:3, cross section 150mm, 150mm, 3m long</td>
<td>6</td>
<td>No.</td>
<td>1200</td>
<td>7200</td>
</tr>
<tr>
<td>7a</td>
<td>Clay tile roof(area 76 sq.m)</td>
<td>900</td>
<td>No.</td>
<td>10</td>
<td>9000</td>
</tr>
<tr>
<td>7b</td>
<td>Wood - for roof understructure</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.1mx0.125m, less than 3.5m length - for primary rafters</td>
<td>0.6</td>
<td>cu.m</td>
<td>25000</td>
<td>15000</td>
<td></td>
</tr>
<tr>
<td>0.1mx0.1m, for vertically supporting the primary rafter in its span</td>
<td>0.05</td>
<td>cu.m</td>
<td>25000</td>
<td>1250</td>
<td></td>
</tr>
<tr>
<td>0.06mx0.075m, 4.5m length for secondary rafter</td>
<td>0.5</td>
<td>cu.m</td>
<td>25000</td>
<td>12500</td>
<td></td>
</tr>
<tr>
<td>7c</td>
<td>Bamboo splits for roof purlins, made from 50mm dia</td>
<td>35</td>
<td>No.</td>
<td>100</td>
<td>3500</td>
</tr>
<tr>
<td>7d</td>
<td>Manpower</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Carpenter</td>
<td>2</td>
<td>mandays</td>
<td>500</td>
<td>1000</td>
</tr>
<tr>
<td></td>
<td>Labour</td>
<td>4</td>
<td>mandays</td>
<td>250</td>
<td>1000</td>
</tr>
<tr>
<td>8</td>
<td>Nails and hardware</td>
<td></td>
<td>lumsum</td>
<td></td>
<td>1500</td>
</tr>
<tr>
<td>8</td>
<td>Attic floor</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Wooden planks - size 300mm x 1000mm, 75mm thick for</td>
<td>30</td>
<td>No.</td>
<td>400</td>
<td>12000</td>
</tr>
<tr>
<td>No.</td>
<td>Item Description</td>
<td>Quantity</td>
<td>Rate (per unit)</td>
<td>Total Cost (Rs)</td>
<td></td>
</tr>
<tr>
<td>-----</td>
<td>-----------------------------------------------------------------------------------</td>
<td>----------</td>
<td>----------------</td>
<td>----------------</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>CGI sheet roof over verandah</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9a</td>
<td>Bamboo posts of min 80mm dia, 2.5 m high</td>
<td>7</td>
<td>130</td>
<td>910</td>
<td></td>
</tr>
<tr>
<td>9b</td>
<td>Bamboo rafter min 60mm dia for CGI sheet roof</td>
<td>5</td>
<td>100</td>
<td>500</td>
<td></td>
</tr>
<tr>
<td>9c</td>
<td>Skilled artisan</td>
<td>1</td>
<td>500</td>
<td>500</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Openings</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10a</td>
<td>Door-window frame in non-sal timber 80x60mm</td>
<td>0.12 cu.m</td>
<td>25000</td>
<td>3000</td>
<td></td>
</tr>
<tr>
<td>10b</td>
<td>Shutter of wooden planks 30mm thick</td>
<td>0.07 cu.m</td>
<td>50000</td>
<td>3500</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Flooring</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Earthen floor using red clayey soil stabilized with rice husk ash</td>
<td>45 sq.m</td>
<td>150</td>
<td>6750</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>GRAND TOTAL</strong></td>
<td></td>
<td><strong>Total</strong></td>
<td><strong>159945</strong></td>
<td></td>
</tr>
</tbody>
</table>

**AREA (sqm)**  
75

**RATE OF CONSTRUCTION (per sqm)**  
2132.6

**AREA (sqft)**  
802.5

**RATE OF CONSTRUCTION (per sqft)**  
199.3
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 due 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.

Recommendations for Built Form

<table>
<thead>
<tr>
<th>Plan Layout</th>
<th>Plinth/Floor</th>
<th>Roof Profile</th>
</tr>
</thead>
<tbody>
<tr>
<td>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.</td>
<td>Clay tiles on a wood and bamboo understructure are commonly used in roofs.</td>
<td></td>
</tr>
</tbody>
</table>

Recommendations for construction systems

<table>
<thead>
<tr>
<th>Components</th>
<th>Recommended Specifications</th>
<th>Specific Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Foundations</td>
<td>• 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.</td>
<td>• The structure is tied at the plinth level with a minimum 6” deep plinth beam.</td>
</tr>
<tr>
<td>Plinth</td>
<td>• 450mm thick earthen walls in traditional cob technique. • Bamboo frame using minimum 80mm dia-bamboo posts and bamboo splits.</td>
<td>• The frame is braced with diagonal bamboo from plinth to attic level at wall corners.</td>
</tr>
<tr>
<td>Wall</td>
<td>• Bamboo frame using minimum 80mm dia-bamboo posts and bamboo splits.</td>
<td>• Wherever affordable, the external plaster can be a cement-sand plaster.</td>
</tr>
<tr>
<td>Wall Finish</td>
<td>• The wall is plastered with a mud plaster made with clayey soil, sand, straw, dung and rice.</td>
<td>• Primary rafters to rest on wall plate fixed to a brick course or a cement concrete base.</td>
</tr>
<tr>
<td>Roof Structure</td>
<td>• Gable roofs of at least 25 degree slope on timber rafters and bamboo split purlins.</td>
<td></td>
</tr>
<tr>
<td>Roof Cover</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Floor</td>
<td>• 30mm concrete base 1:4:8 on flat brick soling, finished with cement screed.</td>
<td>• Earthen floor using red clayey soil stabilized with rice husk ash or %.</td>
</tr>
</tbody>
</table>
ODISHA

TYPICAL SECTION AA’

- Brick/ Block Column with 10 mm dia central reinforcement.
- 450mm roof overhang.
- Purlin.
- Ferrocement plaster.
- Timber/ bamboo rafter.
- Above the Sill lvl CSCMB/Adobe wall.
- 250 mm cement flyash or locally burnt clay brick with rat- trap bond.
- 75mm Thick plinth band.
- Random Rubble Foundation

TYPICAL PLAN

- Gable end
- Gable band
- Timber/ bamboo diagonal support bolted to rafters.
- 75mm Thick Roof band.
- Attic space.
- Tiler/ CGI sheet roof.
- Timber/ bamboo rafter.
- 75mm Thick Lintel band.
- 75mm Thick SILL band.
- 250 mm cement flyash or locally burnt clay brick with rat- trap bond.
- 75mm Thick plinth band.
- Random Rubble Foundation
- 100mm thick P.C.C layer.

Area Statement:

<table>
<thead>
<tr>
<th>Item</th>
<th>Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Room 1</td>
<td>10.08</td>
</tr>
<tr>
<td>Room 2</td>
<td>10.08</td>
</tr>
<tr>
<td>Kitchen</td>
<td>5.48</td>
</tr>
<tr>
<td>Verandah</td>
<td>7.43</td>
</tr>
<tr>
<td>Carpet Area</td>
<td>26.43</td>
</tr>
<tr>
<td>Built up Area</td>
<td>41.75</td>
</tr>
</tbody>
</table>
Cost estimate

Cost breakup

<table>
<thead>
<tr>
<th>Item</th>
<th>Cost (INR)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Foundation</td>
<td>20,930</td>
</tr>
<tr>
<td>Walls</td>
<td>97,815</td>
</tr>
<tr>
<td>Roof</td>
<td>31,895</td>
</tr>
<tr>
<td>Doors &amp; windows</td>
<td>11570.0</td>
</tr>
<tr>
<td>Flooring</td>
<td>19600.0</td>
</tr>
<tr>
<td>Total</td>
<td>181,810</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SR.NO.</th>
<th>Item</th>
<th>Quantity</th>
<th>Unit</th>
<th>Rate</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Foundation</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Excavation</td>
<td>17.5 cu.m</td>
<td></td>
<td>80</td>
<td>1400</td>
</tr>
<tr>
<td></td>
<td>For both rooms</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>For kitchen, verandah</td>
<td>5.4 cu.m</td>
<td></td>
<td>80</td>
<td>432</td>
</tr>
<tr>
<td>2</td>
<td>Sand fill compacted</td>
<td>1 cu.m</td>
<td></td>
<td>450</td>
<td>450</td>
</tr>
<tr>
<td>3</td>
<td>Concrete work</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4a</td>
<td>PCC 1:4:8 75mm thick in foundation masonry, Mix 1:4:8</td>
<td>1.8 cu.m</td>
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<td>4b</td>
<td>DPC 1:2:4, 50mm thick</td>
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<tr>
<td></td>
<td>Two rooms</td>
<td>10.6 sq.m</td>
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<tr>
<td></td>
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<td>3.75 sq.m</td>
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<td>5</td>
<td>Random rubble masonry in mud mortar in foundation, till 0.45m plinth</td>
<td>8.5 cu.m</td>
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<td>1200</td>
<td>10200</td>
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<td></td>
<td>Walls</td>
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<td>6</td>
<td>Pointing in 1:3 cement mortar external, above ground</td>
<td>9 sq.m</td>
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<td>7</td>
<td>Burnt brick masonry till plinth in 1:6 cement mortar</td>
<td>3 cu.m</td>
<td></td>
<td>3000</td>
<td>9000</td>
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<td>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</td>
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<td>8</td>
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<td>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</td>
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<td>9-3</td>
<td>RCC work - 1:1.5:3</td>
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<tr>
<td>9-4</td>
<td>Concrete in lintel band</td>
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<tr>
<td>9-5</td>
<td>Concrete in 0.6m wide loft</td>
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<td>Steel</td>
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<td>Steel in loft</td>
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<td>Roof in Micro Concrete Roofing(MCR) tiles of size 240mmx480mm on</td>
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<td>MCR tiles</td>
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<td>11-3</td>
<td>Timber wall plate 100mmx60mm</td>
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<td>11-4</td>
<td>Timber purlins @400mm spacing, 60x40mm</td>
<td>cu.m</td>
<td>0.35</td>
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<td>8750</td>
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<td>Bamboo 80-100mm dia for roof understructure</td>
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<td>11-6</td>
<td>Manpower</td>
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<tr>
<td>11-7</td>
<td>Carpenter</td>
<td>Mandays</td>
<td>3</td>
<td>500</td>
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<td>11-8</td>
<td>Skilled mason</td>
<td>Mandays</td>
<td>4</td>
<td>350</td>
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<td>11-9</td>
<td>Labour</td>
<td>Mandays</td>
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<td>11-10</td>
<td>Nails, binding wire and hardware</td>
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<td>12-1</td>
<td>Attic floor</td>
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<td>12-2</td>
<td>Precast beam 150x150, mix 1:1:5:3, 3m long</td>
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<td>Bamboo rafters 80-100mm dia</td>
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<td>780</td>
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<td>Bamboo 50-60mm dia for lattice work</td>
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<td>Horizontal bamboo at attic level and top of kitchen</td>
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<tr>
<td>12-6</td>
<td>Manpower - skilled artisan</td>
<td>Mandays</td>
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<td>500</td>
<td>1000</td>
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<td>13-1</td>
<td>Doors and windows</td>
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<tr>
<td>13-2</td>
<td>precast RCC frame 60mmx100mm</td>
<td>R.M.</td>
<td>13</td>
<td>115</td>
<td>1495</td>
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<tr>
<td>13-3</td>
<td>Door shutter 35mm solid core panel</td>
<td>sq.m</td>
<td>3</td>
<td>1500</td>
<td>4500</td>
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<td>13-4</td>
<td>Window shutter 30mm - local timber</td>
<td>cu.m</td>
<td>0.02</td>
<td>50000</td>
<td>1000</td>
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<td>13-5</td>
<td>precast concrete jaali 0.6mmx0.6m</td>
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<td>150</td>
<td>1200</td>
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<tr>
<td>13-6</td>
<td>Kitchen</td>
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</tr>
<tr>
<td>13-7</td>
<td>precast RCC frame 60mmx100mm</td>
<td>R.M.</td>
<td>5</td>
<td>115</td>
<td>575</td>
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<td>13-8</td>
<td>Door shutter 35mm solid core panel</td>
<td>sq.m</td>
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<td>precast concrete jaali 0.75mmx0.75m</td>
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<td>400</td>
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<td>Flooring</td>
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<td>14-2</td>
<td>Rooms - CC tiles 300x300x15 on a 20mm cement mortar bed, sub-base of</td>
<td>sq.m</td>
<td>20</td>
<td>450</td>
<td>9000</td>
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<tr>
<td>14-3</td>
<td>Verandah, kitchen- Cement Concrete flooring - base floor of 1:2:4 concrete and finishing layer of 1:2 cement mortar</td>
<td>sq.m</td>
<td>10</td>
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**GRAND TOTAL**

<table>
<thead>
<tr>
<th>Description</th>
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<tbody>
<tr>
<td>AREA (sqm)</td>
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<tr>
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<tr>
<td>AREA (sqft)</td>
<td>428.0</td>
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<tr>
<td>RATE OF CONSTRUCTION (per sqft)</td>
<td>424.8</td>
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</table>
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 available in the region due to the geology of the region.

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

<table>
<thead>
<tr>
<th>Resources Available</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stones are abundantly available in the region due to the geology of the region.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Plan Layout</th>
<th>Plinth/Floor</th>
<th>Roof Profile</th>
</tr>
</thead>
<tbody>
<tr>
<td>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.</td>
<td>Gable roofs using asbestos roofing sheets are the most common roofing material</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Components</th>
<th>Recommended Specifications</th>
<th>Specific Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Foundations</td>
<td>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.</td>
<td>The structure is tied at the plinth level with a minimum 6” deep plinth beam.</td>
</tr>
<tr>
<td>Wall</td>
<td>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.</td>
<td>Rat-trap bond masonry in 1:4 cement-mortar The frame is braced with diagonal bamboo.</td>
</tr>
<tr>
<td>Wall Finish</td>
<td>The wall is plastered with mud plaster made with clayey soil, sand, straw, dung and rice husk ash.</td>
<td>Wherever affordable, the external plaster can be a cement-sand plaster.</td>
</tr>
<tr>
<td>Roof Structure</td>
<td>Corrugated Galvanized Iron sheet of minimum 0.35mm thickness tied to bamboo understructure through J bolts with galvanized and bitumen asher</td>
<td>An underlayer of premade panels of bamboo mat (indicative size 1200x1800)</td>
</tr>
</tbody>
</table>
Area Statement:

<table>
<thead>
<tr>
<th>Item</th>
<th>Area Sq.m</th>
<th>Area Sq.ft</th>
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<tbody>
<tr>
<td>Room</td>
<td>20.97</td>
<td>225.72</td>
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<tr>
<td>Kitchen</td>
<td>6.65</td>
<td>71.58</td>
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<tr>
<td>Verandah</td>
<td>9.06</td>
<td>97.52</td>
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<td>Carpet Area</td>
<td>27.83</td>
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<tr>
<td>Built up Area</td>
<td>42.88</td>
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## Cost estimate

### Cost breakup

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<tr>
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<th>Cost (INR)</th>
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<tr>
<td>Walls</td>
<td>55,300</td>
</tr>
<tr>
<td>Roof</td>
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<tr>
<td>RCC</td>
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<td>Doors &amp; windows</td>
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</tr>
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<td>Flooring</td>
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### Item Details

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<td>Burnt brick masonry in foundation till plinth in 1:5 cement mortar</td>
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<td>Bamboo 50-60mm dia for rafters</td>
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</tr>
<tr>
<td></td>
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<td>5</td>
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<td>100</td>
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<tr>
<td>7e</td>
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<td></td>
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<td>Mandays</td>
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<tr>
<td></td>
<td>Skilled mason</td>
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<tr>
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<td>Mandays</td>
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<tr>
<td></td>
<td>Kitchen, verandah</td>
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</tr>
<tr>
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<td>Carpenter</td>
<td>1</td>
<td>Mandays</td>
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<tr>
<td></td>
<td>Skilled mason</td>
<td>1</td>
<td>Mandays</td>
<td>350</td>
<td>350</td>
</tr>
<tr>
<td></td>
<td>Labour</td>
<td>2</td>
<td>Mandays</td>
<td>250</td>
<td>500</td>
</tr>
<tr>
<td>7f</td>
<td>Nails, binding wire and hardware</td>
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<td></td>
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</tr>
<tr>
<td></td>
<td></td>
<td></td>
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<td></td>
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<tr>
<td></td>
<td>GRAND TOTAL</td>
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<td></td>
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<td></td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>Total</td>
<td>182780.5</td>
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<tr>
<td></td>
<td>AREA (sqm)</td>
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<td></td>
<td>42</td>
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</tr>
<tr>
<td></td>
<td>RATE OF CONSTRUCTION (per sqm)</td>
<td></td>
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<td>AREA (sqft)</td>
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<tr>
<td></td>
<td>RATE OF CONSTRUCTION (per sqft)</td>
<td></td>
<td></td>
<td>406.7</td>
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</tr>
</tbody>
</table>
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 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 is in districts Dungarpur, Udaipur, Bhilwara, Pratapgarh, Banswara, and 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 fulfill the basic shelter need of the people of the above-mentioned districts based.
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.

<table>
<thead>
<tr>
<th>Recommendations for Built Form</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plan Layout</td>
</tr>
<tr>
<td>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.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Recommendations for construction systems</th>
</tr>
</thead>
<tbody>
<tr>
<td>Components</td>
</tr>
<tr>
<td>Foundations</td>
</tr>
<tr>
<td>Bracings</td>
</tr>
<tr>
<td>Wall</td>
</tr>
<tr>
<td>Wall Finish</td>
</tr>
<tr>
<td>Roof Structure</td>
</tr>
<tr>
<td>Roof Cover</td>
</tr>
<tr>
<td>Floor</td>
</tr>
<tr>
<td>Door and Windows</td>
</tr>
<tr>
<td>Tie Beams</td>
</tr>
</tbody>
</table>
Cost Estimate for ZONE-A Design 01

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

<table>
<thead>
<tr>
<th>Components</th>
<th>Recommended Specifications</th>
<th>Specific Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Foundations</td>
<td>Continuous Coursed Rubble foundation in cement-sand mortar as per specifications.</td>
<td></td>
</tr>
</tbody>
</table>
| 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 Finish      | • 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.                                   |                   |
RJ - 01B

area statement:

RAJASTHAN

TYPICAL PLAN

TYPICAL SECTION AA'

Coping stone 50mm thick
Parapet top Level +100 mm
Jali in Parapet wall masonry
Finish Roof Level +550 mm
RCC Lintel Band +300 mm
Ventilator(concrete Jali)
50mm thick Stone slabs
50mm thick Stone Chajja
Lintel Level +200 mm
RCC Lintel Band
Mild steel window frame & shutter
Sill Level +1400 mm
50mm thick Roof Slab
25mm Rough Kota Stone
20mm Cement mortar
150 mm Stone Khirana
Plinth Band +450 mm
RCC Plinth Band
Ground Level
Coursed Random Rubble
Step Foundation
PCC base 150 mm thick

60mm Stone Patli Roofing
Roof Band
Lintel Band

SCALE

A

A'

0 0.5 m 1.5 m 3.0 m

RJ-01B

ĂƌĞĂƐƚĂƚĞŵĞŶƚ͗
Cost Estimate for ZONE-A Design 02

<table>
<thead>
<tr>
<th>SL. NO.</th>
<th>BUILDING COMPONENT</th>
<th>LABOR COST (₹)</th>
<th>TOTAL (LABOR + MATERIAL) (₹)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Foundation</td>
<td>7282</td>
<td>34083</td>
</tr>
<tr>
<td>2.</td>
<td>RCC wall bands</td>
<td>1332</td>
<td>11361</td>
</tr>
<tr>
<td></td>
<td>Plinth band</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Lintel band</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Roof band</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td>Walling</td>
<td>7839</td>
<td>48369</td>
</tr>
<tr>
<td>4.</td>
<td>Roof structure</td>
<td>347</td>
<td>18933</td>
</tr>
<tr>
<td>5.</td>
<td>Roof finish</td>
<td>3103</td>
<td>7452</td>
</tr>
<tr>
<td>6.</td>
<td>Doors and windows</td>
<td>408</td>
<td>10028</td>
</tr>
<tr>
<td>7.</td>
<td>Chajja (Shading device)</td>
<td>57</td>
<td>368</td>
</tr>
<tr>
<td>8.</td>
<td>Flooring</td>
<td>1401</td>
<td>8702</td>
</tr>
<tr>
<td>9.</td>
<td>Wall finishes</td>
<td>5937</td>
<td>19349</td>
</tr>
<tr>
<td>10.</td>
<td>Embellishment</td>
<td>500</td>
<td></td>
</tr>
</tbody>
</table>

|                         |                         |                |                             |
|-------------------------|-------------------------|----------------|
| ESTIMATED COST OF CORE HOUSE |                | 159146        |
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. Rajasthan District
8. Chittaurgarh District
9. Ajmer District

Resources Available
- Stone and steel

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

- 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 jali 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.

<table>
<thead>
<tr>
<th>Components</th>
<th>Recommended Specifications</th>
<th>Specific Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Foundations</td>
<td>Continuous Coursed Rubble foundation in cement-sand mortar as per specifications.</td>
<td></td>
</tr>
<tr>
<td>RCC Wall Bands</td>
<td>Plinth bands</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1. 100 mm RCC Plinth band is provided at plinth level as per specifications.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Eave Bands</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1. 75 mm RCC Plinth band is provided at eave level as per specifications.</td>
<td></td>
</tr>
<tr>
<td>Wall</td>
<td>Compressed Stabilized Earth block wall in mud mortar as per specifications</td>
<td></td>
</tr>
<tr>
<td>Wall Finish</td>
<td>Cement pointing on external surfaces and cement plaster on internal wall surfaces as per detail.</td>
<td></td>
</tr>
<tr>
<td>Roof Structure</td>
<td>C.G.I. Steel tubes as per specifications.</td>
<td></td>
</tr>
<tr>
<td>Roof Finish</td>
<td>CGI sheets tied to purlins with J/U hooks.</td>
<td></td>
</tr>
<tr>
<td>Floor</td>
<td>Unpolished kota stone/ Karegi flooring as per detail.</td>
<td></td>
</tr>
<tr>
<td>Door and Windows</td>
<td>Mild Steel frame and shutter as per specifications.</td>
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</tr>
<tr>
<td>Tie Beams</td>
<td>Tie-Beam is provided at the floor level as per detail.</td>
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# Cost Estimate for ZONE-B Design 01

<table>
<thead>
<tr>
<th>S. NO.</th>
<th>COMPONENT</th>
<th>LABOR COST (₹)</th>
<th>TOTAL(LABOR + MATERIAL) (₹)</th>
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<tbody>
<tr>
<td>1.</td>
<td>Foundation</td>
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<tr>
<td></td>
<td>Lintel band</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Roof band</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td>Walling</td>
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<td>36590</td>
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<td>4.</td>
<td>Roof structure</td>
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<td>Roof finish</td>
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<td>21495</td>
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</tr>
<tr>
<td>7.</td>
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<td>6341</td>
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<tr>
<td>9.</td>
<td>Embellishment</td>
<td></td>
<td>3800</td>
</tr>
</tbody>
</table>

## ESTIMATED COST OF CORE HOUSE

163765
• 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.

<table>
<thead>
<tr>
<th>Components</th>
<th>Recommended Specifications</th>
<th>Specific Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Foundations</td>
<td>Continuous Coursed Rubble foundation in cement-sand mortar as per specifications.</td>
<td></td>
</tr>
</tbody>
</table>
| 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 Finish        | 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’

- ROOF RIDGE LINE
- VERANDAH
- TOILET BATH
- LVL +450 MM
- MULTIPURPOSE ROOM: 3.5M X 3M
- COOKING AREA
- CATTLE SHED
- ENTRY
- FODDER STORAGE
- LVL +450 MM
- STORE: 1.8M X 3M
- WIDTH = 1050MM
- TREAD = 225MM
- RISER = 150 MM
- BRICK COLUMN
- ENTRY
- CATTLE SHED
- TOILET
- BATH
- Plinth Level +2250 mm
- Plinth Level +450 mm
- Ground Level 0 mm

0.8mm CGI Sheet
60 mm Dia. Steel Rafter

RJ - 02B
Total Cost ` 148285/-

RAJASTHAN

TYPICAL PLAN
### Cost Estimate for ZONE-B Design 02

<table>
<thead>
<tr>
<th>S. NO.</th>
<th>BUILDING COMPONENT</th>
<th>LABOR COST (₹)</th>
<th>TOTAL (LABOR + MATERIAL) (₹)</th>
</tr>
</thead>
<tbody>
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<tr>
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<td>Plinth band</td>
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<td></td>
</tr>
<tr>
<td></td>
<td>Lintel band</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>Roof band</td>
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<td></td>
</tr>
<tr>
<td>3</td>
<td>Walling</td>
<td>3198</td>
<td>41715</td>
</tr>
<tr>
<td>4</td>
<td>Roof structure</td>
<td>346</td>
<td>18921</td>
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<td>5</td>
<td>Roof finish</td>
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<td>7448</td>
</tr>
<tr>
<td>6</td>
<td>Doors and windows</td>
<td>408</td>
<td>10028</td>
</tr>
<tr>
<td>7</td>
<td>Chajja (Shading device)</td>
<td>57</td>
<td>368</td>
</tr>
<tr>
<td>8</td>
<td>Flooring</td>
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<td>9</td>
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**ESTIMATED COST OF CORE HOUSE**: 148285

### Cost breakup

<table>
<thead>
<tr>
<th>Item</th>
<th>Cost (INR)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Foundation</td>
<td>33023/-</td>
</tr>
<tr>
<td>Walls</td>
<td>69295/-</td>
</tr>
<tr>
<td>Roof</td>
<td>26369/-</td>
</tr>
<tr>
<td>Doors, Chajja, Windows and Embellishments</td>
<td>10896/-</td>
</tr>
<tr>
<td>Flooring</td>
<td>8702/-</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>148285/-</strong></td>
</tr>
</tbody>
</table>
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

<table>
<thead>
<tr>
<th>Components</th>
<th>Recommended Specifications</th>
<th>Specific Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Foundations</td>
<td>• Fly ash arch foundation in cement-sand/cement-lime-sand mortar as per specifications</td>
<td></td>
</tr>
</tbody>
</table>
| RCC Wall Bands | • Plinth bands  
1. Plinth band 75 mm RCC Plinth band is provided at plinth level as per specifications  
2. Lintel Bands  
1. 75 mm RCC Plinth band is provided at lintel level as per specifications  
3. 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 Finish    | • 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.                                    |                   |
## Cost Estimate for ZONE-C Design 01

<table>
<thead>
<tr>
<th>S. NO.</th>
<th>COMPONENT</th>
<th>LABOR COST (₹)</th>
<th>TOTAL (LABOR + MATERIAL) (₹)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Foundation</td>
<td>7029</td>
<td>32670</td>
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<tr>
<td>2</td>
<td>RCC wall bands</td>
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<td>Plinth band</td>
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<td></td>
</tr>
<tr>
<td></td>
<td>Lintel band</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Walling</td>
<td>3980</td>
<td>43759</td>
</tr>
<tr>
<td>4</td>
<td>Roof structure</td>
<td>1776</td>
<td>22415</td>
</tr>
<tr>
<td>5</td>
<td>Roof finish</td>
<td>3719</td>
<td>9619</td>
</tr>
<tr>
<td>6</td>
<td>Doors and windows</td>
<td>565</td>
<td>11921</td>
</tr>
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<td>7</td>
<td>Chajja (Shading device)</td>
<td>22</td>
<td>141</td>
</tr>
<tr>
<td>8</td>
<td>Flooring</td>
<td>801</td>
<td>6798</td>
</tr>
<tr>
<td>9</td>
<td>Wall finishes</td>
<td>7105</td>
<td>23093</td>
</tr>
<tr>
<td>10</td>
<td>Embellishment</td>
<td>26371</td>
<td>163244</td>
</tr>
</tbody>
</table>

ESTIMATED COST OF CORE HOUSE 163244
• The type design is developed by taking cue from the traditional housing topology 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 LAX.

<table>
<thead>
<tr>
<th>Components</th>
<th>Recommended Specifications</th>
<th>Specific Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Foundations</td>
<td>• Brick arch foundation in cement-sand/ cement-lime-sand mortar as per specifications</td>
<td></td>
</tr>
<tr>
<td>RCC Wall Bands</td>
<td>• Plinth bands&lt;br&gt;1. Plinth band 75 mm RCC Plinth band is provided at plinth level as per specifications&lt;br&gt;• Lintel Bands&lt;br&gt;1. 75 mm RCC Plinth band is provided at lintel level as per specifications&lt;br&gt;• Roof Bands&lt;br&gt;1. 75 mm RCC Plinth band is provided at roof level as per specifications</td>
<td></td>
</tr>
<tr>
<td>Wall</td>
<td>• Coursed rubble masonry in cement/cement-lime-sand mortar as per specifications</td>
<td></td>
</tr>
<tr>
<td>Wall Finish</td>
<td>• Cement pointing on external surfaces as per detail.</td>
<td></td>
</tr>
<tr>
<td>Roof Structure</td>
<td>• Stone path with cement-sand pointing</td>
<td></td>
</tr>
<tr>
<td>Roof Finish</td>
<td>• China mosaic laid on P.C.C/ lime terracing as per detailed specifications</td>
<td></td>
</tr>
<tr>
<td>Floor</td>
<td>• Unpolished kota stone/ Karegi flooring as per detail.</td>
<td></td>
</tr>
<tr>
<td>Door and Windows</td>
<td>• Mild Steel frame and shutter as per specifications.</td>
<td></td>
</tr>
<tr>
<td>Tie Beams</td>
<td>• Tie-Beam is provided at the floor level as per detail.</td>
<td></td>
</tr>
</tbody>
</table>
RAJASTHAN

VENTILATOR
STONE PATTI
CATTLE SHED
Thatch

± 0 mm
Ground Level

Plinth Level +450 mm

Sill Level +1400 mm

RCC Plinth band

Mild steel window frame & Shutter

Sil Level ±400 mm

50mm thick Stone sill

25mm Rough Kota Stone

20mm Cement mortar

150 mm Stone Khara nja

Plinth Level ±450 mm

RCC Lintel band

GROUND LEVEL ±0 mm

PCC base 150 mm thick

SCALE

0 0.5 m 1.5 m 3.0 m

ROOM
3M X 2.7M

KITCHEN

WASHING AREA

TANK

FODDER STORAGE

CATTLE SHED

LANDS

D

RAJASTHAN

TYPICAL PLAN

TYPICAL SECTION
### Cost Estimate for ZONE-C Design 02

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

### Cost breakdown

<table>
<thead>
<tr>
<th>Item</th>
<th>Cost (INR)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Foundation</td>
<td>39836/-</td>
</tr>
<tr>
<td>Walls</td>
<td>74480/-</td>
</tr>
<tr>
<td>Roof</td>
<td>34252/-</td>
</tr>
<tr>
<td>Doors, Chajja and Windows</td>
<td>10443/-</td>
</tr>
<tr>
<td>Flooring</td>
<td>12835/-</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>171846/-</strong></td>
</tr>
</tbody>
</table>

---

**RAJASTHAN**
• 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.

<table>
<thead>
<tr>
<th>Components</th>
<th>Recommended Specifications</th>
<th>Specific Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Foundations</td>
<td>• Continuous stepped brick foundation in cement-sand/cement-lime-sand mortar as per specification</td>
<td></td>
</tr>
<tr>
<td>RCC Wall Bands</td>
<td>• Plinth bands&lt;br&gt; 1. Plinth band 75 mm RCC Plinth band is provided at plinth level as per specifications&lt;br&gt; • Lintel Bands&lt;br&gt; 1. 75 mm RCC Plinth band is provided at lintel level as per specifications&lt;br&gt; • Roof Bands&lt;br&gt; 1. 75 mm RCC Plinth band is provided at roof level as per specifications</td>
<td></td>
</tr>
<tr>
<td>Wall</td>
<td>• 9” thick Rat trap brick wall with cement-sand/ cement-lime-sand mortar as per specification</td>
<td></td>
</tr>
<tr>
<td>Wall Finish</td>
<td>• Cement pointing on external surfaces as per detail.</td>
<td></td>
</tr>
<tr>
<td>Roof Structure</td>
<td>• Brick Jack Arch roof with Iron girders as primary structural members</td>
<td></td>
</tr>
<tr>
<td>Roof Finish</td>
<td>• China mosaic laid on P.C.C/ lime terracing as per detailed specifications</td>
<td></td>
</tr>
<tr>
<td>Floor</td>
<td>• Unpolished kota stone/ Karegi flooring as per detail.</td>
<td></td>
</tr>
<tr>
<td>Door and Windows</td>
<td>• Mild Steel frame and shutter as per specifications.</td>
<td></td>
</tr>
<tr>
<td>Tie Beams</td>
<td>• Tie-Beam is provided at the floor level as per detail.</td>
<td></td>
</tr>
</tbody>
</table>
## Cost Estimate for ZONE-D Design 01

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

<table>
<thead>
<tr>
<th>Components</th>
<th>Recommended Specifications</th>
<th>Specific Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Foundations</td>
<td>• Continuous Coursed Rubble foundation in cement-sand/ cement-lime-sand mortar as per specifications</td>
<td></td>
</tr>
</tbody>
</table>
| 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 Finish        | • 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.                                     |                  |
## Cost Estimate for ZONE-D Design 02

<table>
<thead>
<tr>
<th>S. NO.</th>
<th>COMPONENT</th>
<th>LABOR COST (₹)</th>
<th>TOTAL (LABOR + MATERIAL) (₹)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Foundation</td>
<td>9184</td>
<td>44808</td>
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<tr>
<td>2.</td>
<td>RCC wall bands</td>
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<td>9553</td>
</tr>
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<td>Plinth band</td>
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<td></td>
</tr>
<tr>
<td></td>
<td>Lintel band</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Roof band</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td>Walling</td>
<td>8093</td>
<td>34779</td>
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<tr>
<td>4.</td>
<td>Roof structure</td>
<td>6955</td>
<td>24115</td>
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<td>5.</td>
<td>Roof finish</td>
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<td>13107</td>
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<td>Doors and windows</td>
<td>3780</td>
<td>12939</td>
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<td>7.</td>
<td>Chajja</td>
<td>1388</td>
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<td>8.</td>
<td>Flooring</td>
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<td>Wall finishes</td>
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<td></td>
<td>44811</td>
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<tr>
<td></td>
<td>ESTIMATED COST OF CORE HOUSE</td>
<td></td>
<td>166208</td>
</tr>
<tr>
<td></td>
<td>Toilet block (Toilet + Bathing space)</td>
<td>8912</td>
<td>34482</td>
</tr>
</tbody>
</table>

### Cost Breakup

<table>
<thead>
<tr>
<th>Item</th>
<th>Cost (INR)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Foundation</td>
<td>44808/-</td>
</tr>
<tr>
<td>Walls</td>
<td>57637/-</td>
</tr>
<tr>
<td>Roof</td>
<td>37222/-</td>
</tr>
<tr>
<td>Doors, Chajja and Windows</td>
<td>16023/-</td>
</tr>
<tr>
<td>Flooring</td>
<td>10519/-</td>
</tr>
<tr>
<td>Total</td>
<td><strong>166209/-</strong></td>
</tr>
</tbody>
</table>
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 28°C. 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 characterised 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.
# Sikkim Housing Typologies at a Glance

<table>
<thead>
<tr>
<th>TYPOLOGY</th>
<th>APPLICABLE HOUSING ZONES</th>
<th>TOTAL AREA sq.m/sq.ft</th>
</tr>
</thead>
<tbody>
<tr>
<td>SK-01</td>
<td>Zone A &amp; B</td>
<td>27.05 sq.m 291.16 sq.ft</td>
</tr>
<tr>
<td>SK-02</td>
<td>Zone A &amp; B</td>
<td>22.84 sq.m 245.85 sq.ft</td>
</tr>
<tr>
<td>SK-03</td>
<td>Zone A &amp; B</td>
<td>24.80 sq.m 266.95 sq.ft</td>
</tr>
<tr>
<td>SK-04</td>
<td>Zone C</td>
<td>24.80 sq.m 266.95 sq.ft</td>
</tr>
<tr>
<td>SK-05</td>
<td>Zone C</td>
<td>26.39 sq.m 284.06 sq.ft</td>
</tr>
</tbody>
</table>
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

---

Recommendations for Built Form

<table>
<thead>
<tr>
<th>Plan Layout</th>
<th>Plinth/Floor</th>
<th>Roof Profile</th>
</tr>
</thead>
<tbody>
<tr>
<td>Layout designed to suit traditional needs: Multipurpose room with kitchen, A pooja room and toilet + bath</td>
<td>The house has an earthen plinth that is about 300 mm high.</td>
<td>A hipped roof with bamboo truss understructure or gable roof</td>
</tr>
</tbody>
</table>

---

Recommendations for construction systems

<table>
<thead>
<tr>
<th>Components</th>
<th>Recommended Specifications</th>
<th>Specific Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Foundations</td>
<td>• strip foundation with stone block masonry in 1:6 cement mortar</td>
<td></td>
</tr>
<tr>
<td>Plinth</td>
<td>• Stone block Masonry plinth with earth back-filling.</td>
<td></td>
</tr>
<tr>
<td>Wall</td>
<td>• 250 thk brick masonry upto sill level.</td>
<td>崖• 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.</td>
</tr>
<tr>
<td></td>
<td>• Ihra wall panelling with bamboo framing</td>
<td></td>
</tr>
<tr>
<td>Wall Finish</td>
<td>• Ferrocement plaster</td>
<td>Optional: Cement based paint for external walls and lime rendering for internal walls.</td>
</tr>
<tr>
<td>Roof Structure</td>
<td>• Sloping roof with bamboo understructure(truss)</td>
<td></td>
</tr>
<tr>
<td>Floor</td>
<td>• Plain cement flooring over RCC bed on a back filled plinth.</td>
<td></td>
</tr>
</tbody>
</table>
SK-01

Area statement:

<table>
<thead>
<tr>
<th>Item</th>
<th>Area</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Sq.m</td>
</tr>
<tr>
<td>Multipurpose Room</td>
<td>6.12</td>
</tr>
<tr>
<td>Kitchen</td>
<td>4.24</td>
</tr>
<tr>
<td>Pooja Room</td>
<td>4.59</td>
</tr>
<tr>
<td>Toilet &amp; Bathroom</td>
<td>2.16</td>
</tr>
<tr>
<td>Attic</td>
<td>5.83</td>
</tr>
<tr>
<td>Verandah</td>
<td>5.01</td>
</tr>
<tr>
<td>Carpet Area</td>
<td>24.11</td>
</tr>
<tr>
<td>Built up Area</td>
<td>27.05</td>
</tr>
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</table>
## Cost estimate

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

---

### Recommendations for Built Form

<table>
<thead>
<tr>
<th>Plan Layout</th>
<th>Plinth/Floor</th>
<th>Roof Profile</th>
</tr>
</thead>
<tbody>
<tr>
<td>Layout designed to suit traditional needs- Verandah, Multipurpose room with kitchen and an attic</td>
<td>The house has an earthen plinth that is about 300 mm high.</td>
<td>A hipped roof with bamboo truss understructure</td>
</tr>
</tbody>
</table>

### Recommendations for construction systems

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

<table>
<thead>
<tr>
<th>Item</th>
<th>Area</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Sq.m</td>
</tr>
<tr>
<td>Multipurpose Room</td>
<td>12.76</td>
</tr>
<tr>
<td>Kitchen</td>
<td>4.80</td>
</tr>
<tr>
<td>Verandah</td>
<td>4.11</td>
</tr>
<tr>
<td>Attic</td>
<td>3.67</td>
</tr>
<tr>
<td>Carpet Area</td>
<td>21.34</td>
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<td>Built up Area</td>
<td>22.84</td>
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<tr>
<td>Carpet Area</td>
<td>24.11</td>
</tr>
<tr>
<td>Built up Area</td>
<td>27.05</td>
</tr>
</tbody>
</table>

**Typical Section AA’**

**Typical Plan**

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

### Recommendations for Built Form

<table>
<thead>
<tr>
<th>Plan Layout</th>
<th>Plinth/Floor</th>
<th>Roof Profile</th>
</tr>
</thead>
<tbody>
<tr>
<td>Layout designed to suit traditional needs - Multipurpose room with kitchen and toilet + bath</td>
<td>The house has an earthen plinth that is about 300 mm high.</td>
<td>A hipped roof</td>
</tr>
</tbody>
</table>

### Recommendations for Construction Systems

<table>
<thead>
<tr>
<th>Components</th>
<th>Recommended Specifications</th>
<th>Specific Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Foundations</td>
<td>• Concrete stub foundation&lt;br&gt;• Double Bamboo vertical posts grouted in CC stubs&lt;br&gt;• Stone block Masonry plinth with earth back-filling.</td>
<td>• The vertical supports can be connected to the rcc lintel band at the sill level using MS bolts.</td>
</tr>
<tr>
<td>Plinth</td>
<td>• Hollow concrete block masonry upto sill level&lt;br&gt;• Ikra wall panelling with bamboo framing above sill level&lt;br&gt;• The walls are incorporated with RCC bands at the plinth/sill level</td>
<td></td>
</tr>
<tr>
<td>Wall</td>
<td>• Ferrocement plaster&lt;br&gt;• Sloping roof with bamboo understructure (truss)</td>
<td>Optional: Cement based paint for external walls and lime rendering for internal walls.</td>
</tr>
<tr>
<td>Roof Structure</td>
<td>• Plain cement flooring over RCC bed on a backfilled plinth.</td>
<td></td>
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</tbody>
</table>
Area statement:

<table>
<thead>
<tr>
<th>Item</th>
<th>Area</th>
<th>Sq.m</th>
<th>Sq.ft</th>
</tr>
</thead>
<tbody>
<tr>
<td>Multipurpose Room</td>
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<tr>
<td>Kitchen</td>
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<td>37.67</td>
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<tr>
<td>Verandah</td>
<td>3.83</td>
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<tr>
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<tr>
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### SK-03
#### Cost estimate

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<td>1</td>
<td>Excavation</td>
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<tr>
<td>2</td>
<td>Trench filling</td>
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</tr>
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<td>3</td>
<td>Hand Packed Stone Soling</td>
<td>3192</td>
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<tr>
<td>4</td>
<td>CC (Cement Concretet) 1:3:6 mix</td>
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<td>5</td>
<td>Continuous HCB foundation 1:2:4 mix</td>
<td>852</td>
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<td>6</td>
<td>Plinth beam 1:2:4 mix column, window still tie, window lintel, lintel,jams around doors and windows</td>
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<td>7</td>
<td>Form work for all RCC</td>
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<tr>
<td>8</td>
<td>Door steps on coursed random rubble stone masonry with plaster</td>
<td>187</td>
</tr>
<tr>
<td>9</td>
<td>Flooring in 1:2:4 mix with floor clean neat cement to give smooth surface</td>
<td>6119</td>
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<tr>
<td>10</td>
<td>Walling in Hollow concrete block in 1:5 cement mortar till sill</td>
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<td>11</td>
<td>Cement Plaster 12mm thick 1:4 mix</td>
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<tr>
<td>12</td>
<td>Bamboo frame structure for walling</td>
<td>2600</td>
</tr>
<tr>
<td>13</td>
<td>Reinforced Ekra wall Paneling in bamboo frame</td>
<td>4773</td>
</tr>
<tr>
<td>14</td>
<td>Drill /auger mild steel bar and position mild steel bar</td>
<td>2722</td>
</tr>
<tr>
<td>15</td>
<td>Chicken wire mesh in Reinforced Ekra wall</td>
<td>3919</td>
</tr>
<tr>
<td>16</td>
<td>Door and window frames</td>
<td>2725</td>
</tr>
<tr>
<td>17</td>
<td>Door and window shutters</td>
<td>9633</td>
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<td>18</td>
<td>Provision of handles; sliding door bolt; tower bolt</td>
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<tr>
<td>19</td>
<td>Roofing under structure in locally available bamboo</td>
<td>5543</td>
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<tr>
<td>20</td>
<td>False ceiling in veranda</td>
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<tr>
<td>21</td>
<td>Roof finish in CGI Sheeting</td>
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</tr>
<tr>
<td>22</td>
<td>Roof Ridge finish complete</td>
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</tr>
<tr>
<td>23</td>
<td>CGI Sheet infill at eave ends</td>
<td>9388</td>
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<tr>
<td>24</td>
<td>White washing on wall</td>
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<tr>
<td>25</td>
<td>Primer paint in timber frame</td>
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<tr>
<td>26</td>
<td>Enamel paint work in all type of timber frame</td>
<td>214</td>
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<tr>
<td>27</td>
<td>Provision for electrification (LS)</td>
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</tr>
<tr>
<td>28</td>
<td>Provision for Chulla &amp; Chimney</td>
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<td>Sub total</td>
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<td>A1</td>
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<td>C</td>
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<td><strong>ESTIMATE COST OF CORE HOUSE (A2 +B +C )</strong></td>
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<td>Cost per sqft</td>
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</tr>
</tbody>
</table>

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**Sikkim**
### Recommendations for Built Form

<table>
<thead>
<tr>
<th>Plan Layout</th>
<th>Plinth/Floor</th>
<th>Roof Profile</th>
</tr>
</thead>
<tbody>
<tr>
<td>Layout designed to suit traditional needs - Multipurpose room with kitchen and a verandah</td>
<td>The house has an earthen plinth that is about 300 mm high.</td>
<td>A hipped roof with bamboo truss understructure</td>
</tr>
</tbody>
</table>

### Recommendations for construction systems

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

<table>
<thead>
<tr>
<th>Item</th>
<th>Area Sq.m</th>
<th>Area Sq.ft</th>
</tr>
</thead>
<tbody>
<tr>
<td>Multipurpose Room</td>
<td>13.65</td>
<td>146.93</td>
</tr>
<tr>
<td>Kitchen</td>
<td>3.50</td>
<td>37.67</td>
</tr>
<tr>
<td>Verandah</td>
<td>3.83</td>
<td>41.23</td>
</tr>
<tr>
<td>Carpet Area</td>
<td>17.35</td>
<td>186.76</td>
</tr>
<tr>
<td>Built up Area</td>
<td>24.80</td>
<td>266.95</td>
</tr>
</tbody>
</table>

### Typical Section AA’

- RCC Gable band
- Bamboo purlin
- Bamboo truss
- 40 x 6 MS Flat U-Clamp
- RCC Roof band
- 75 mm thick
- RCC lintel band
- 75 mm thick
- Ferro cement
- Floor-Exterior
- Hollow stone concrete
- Block 200 mm thick
- Masonry upto 800 mm
- RCC Fitch Band
- Foundation F1/F2

### Typical Plan

- Pointing/cement plaster
- Stone block wall
- 200 mm thick
- Interior Mud/Cement Plaster
- 12 mm dia Steel bar
- Bamboo truss

---

### Layout:

- NORTH DISTRICT
- WEST DISTRICT
- EAST DISTRICT
- SOUTH DISTRICT
<table>
<thead>
<tr>
<th>Sl.No.</th>
<th>Item of Work</th>
<th>Total (Rs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Excavation</td>
<td>1161</td>
</tr>
<tr>
<td>2</td>
<td>Trench filling and for continuous for HCB foundation</td>
<td>283</td>
</tr>
<tr>
<td>3</td>
<td>Hand Packed Stone Soling</td>
<td>3192</td>
</tr>
<tr>
<td>4</td>
<td>CC (cement concrete) 1:3:6 mix</td>
<td>14423</td>
</tr>
<tr>
<td>5</td>
<td>Continuous HCB foundation 1:2:4 mix Plinth beam 1:2:4 mix</td>
<td>699</td>
</tr>
<tr>
<td>6</td>
<td>Column, window still tie, window lintel, lintel,jambs around door, windows</td>
<td>20196</td>
</tr>
<tr>
<td>7</td>
<td>Form work for all RCC WORKS</td>
<td>2000</td>
</tr>
<tr>
<td>8</td>
<td>Door stepes on coursed random rubble stone mosnory with plaster</td>
<td>187</td>
</tr>
<tr>
<td>9</td>
<td>Flooring in 1 : 2 :4 mix with floor clean neat cement to give smooth surface</td>
<td>6020</td>
</tr>
<tr>
<td>10</td>
<td>Walling in Hollow concrete block in 1:5 cement mortor till lintel lvl</td>
<td>5107</td>
</tr>
<tr>
<td>11</td>
<td>Cement Plaster 12mm thick 1 :4 mix</td>
<td>11532</td>
</tr>
<tr>
<td>12</td>
<td>12mm thick cement plaster for steps</td>
<td>52</td>
</tr>
<tr>
<td>13</td>
<td>Door and window frames</td>
<td>2423</td>
</tr>
<tr>
<td>14</td>
<td>Door and window Shutters</td>
<td>9213</td>
</tr>
<tr>
<td>15</td>
<td>Provision of handles; sliding door bolt ; tower bolt</td>
<td>838</td>
</tr>
<tr>
<td>16</td>
<td>Roofing under structure in locally available bamboo</td>
<td>5554</td>
</tr>
<tr>
<td>17</td>
<td>False ceiling in veranda</td>
<td>4326</td>
</tr>
<tr>
<td>18</td>
<td>Roof finish in CGI Sheet</td>
<td>33796</td>
</tr>
<tr>
<td>19</td>
<td>Roof Ridge finish complete</td>
<td>3211</td>
</tr>
<tr>
<td>20</td>
<td>CGI Sheet infill at eave to roof lvl on either side of the truss system</td>
<td>9385</td>
</tr>
<tr>
<td>21</td>
<td>White washing on walling</td>
<td>380</td>
</tr>
<tr>
<td>22</td>
<td>Distempering</td>
<td>1064</td>
</tr>
<tr>
<td>23</td>
<td>Primer paint in timber frame</td>
<td>241</td>
</tr>
<tr>
<td>24</td>
<td>Enamel paint work in all type of timber frame</td>
<td>218</td>
</tr>
<tr>
<td>25</td>
<td>Provision for electrification (LS)</td>
<td>2000</td>
</tr>
<tr>
<td>26</td>
<td>Provision for Chulla &amp; Chimney</td>
<td>2000</td>
</tr>
<tr>
<td>27</td>
<td>Sub Total</td>
<td>139501</td>
</tr>
<tr>
<td>A1</td>
<td>Contractor's Profit (7.5% deduction from total)</td>
<td>10463</td>
</tr>
<tr>
<td>A2</td>
<td>Total ( Sr. No .27 - Sr. No. A1)</td>
<td>129038</td>
</tr>
<tr>
<td>B</td>
<td>Cost index :15% A2</td>
<td>19356</td>
</tr>
<tr>
<td>C</td>
<td>Loadind / unloading &amp; carriage cost (L. S.)</td>
<td>5000</td>
</tr>
<tr>
<td></td>
<td>ESTIMATE COST OF CORE HOUSE (A2 +B +C )</td>
<td>153394</td>
</tr>
<tr>
<td></td>
<td>Plinth area (sqft)</td>
<td>274</td>
</tr>
<tr>
<td></td>
<td>Cost per sqft</td>
<td>559.8321168</td>
</tr>
</tbody>
</table>
SK-05

This typography 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.

<table>
<thead>
<tr>
<th>Components</th>
<th>Recommended Specifications</th>
<th>Specific Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Foundations</td>
<td>• Concrete stub foundation</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Double Bamboo vertical posts grouted in CC stubs</td>
<td></td>
</tr>
<tr>
<td>Plinth</td>
<td>• Stone block Masonry plinth with earth back-filling.</td>
<td></td>
</tr>
<tr>
<td>Wall</td>
<td>• 200 mm thick stone block masonry up to sill level</td>
<td>Optional: Cement based paint for external walls and lime rendering for internal walls.</td>
</tr>
<tr>
<td></td>
<td>• Iku wall panelling above sill level with timber framing</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• The walls are incorporated with RCC obands at the plinth/ sill level</td>
<td></td>
</tr>
<tr>
<td>Wall Finish</td>
<td>• Ferrocement plaster</td>
<td></td>
</tr>
<tr>
<td>Roof Structure</td>
<td>• Sloping roof with bamboo understructure(truss) incorporated with U clamps and J bolts etc.</td>
<td></td>
</tr>
<tr>
<td>Floor</td>
<td>• Wooden flooring</td>
<td></td>
</tr>
</tbody>
</table>
SK-05

Area statement:

<table>
<thead>
<tr>
<th>Item</th>
<th>Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Multipurpose Room</td>
<td>14.64 Sq.m</td>
</tr>
<tr>
<td>Kitchen</td>
<td>3.61</td>
</tr>
<tr>
<td>Verandah</td>
<td>3.77</td>
</tr>
<tr>
<td>Carpet Area</td>
<td>18.45</td>
</tr>
<tr>
<td>Built up Area</td>
<td>26.39</td>
</tr>
<tr>
<td>SR.NO.</td>
<td>Item of Work</td>
</tr>
<tr>
<td>--------</td>
<td>------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>1</td>
<td>Excavation</td>
</tr>
<tr>
<td>2</td>
<td>Trench filling</td>
</tr>
<tr>
<td>3</td>
<td>Hand Packed Stone Soling</td>
</tr>
<tr>
<td>4</td>
<td>CC (Cement concrete )1:3:6 Mix concrete for steps</td>
</tr>
<tr>
<td>5</td>
<td>Plinth in coursed random rubble stone masonry 1:4:8 mix</td>
</tr>
<tr>
<td>6</td>
<td>Door steps on coursed random rubble stone masonry with plaster</td>
</tr>
<tr>
<td>7</td>
<td>Flooring in 1:2:4 mix with floor clean neat cement to give smooth surface</td>
</tr>
<tr>
<td>8</td>
<td>Timber post (vertical) for foundation</td>
</tr>
<tr>
<td>9</td>
<td>Timber post (vertical) and beams (Horizontal) frame structure in walling</td>
</tr>
<tr>
<td>10</td>
<td>Ekra wall peneling</td>
</tr>
<tr>
<td>11</td>
<td>Door and window frames</td>
</tr>
<tr>
<td>12</td>
<td>Door and window Shutters</td>
</tr>
<tr>
<td>13</td>
<td>Provision of handles; sliding door bolt ; tower bolt</td>
</tr>
<tr>
<td>14</td>
<td>Roofing u/s in local available timber</td>
</tr>
<tr>
<td>15</td>
<td>False Ceiling in varandha</td>
</tr>
<tr>
<td>16</td>
<td>Roof finish in CGI Sheet</td>
</tr>
<tr>
<td>17</td>
<td>Roof Ridge finish complete</td>
</tr>
<tr>
<td>18</td>
<td>White washing at both G.F. &amp; F.F. ( External)</td>
</tr>
<tr>
<td>19</td>
<td>Distempeing at both G.F. &amp; F.F. (External + Internal)</td>
</tr>
<tr>
<td>20</td>
<td>Primer paint in timber frame</td>
</tr>
<tr>
<td>21</td>
<td>Enamel paint work in all type of timber frame</td>
</tr>
<tr>
<td>22</td>
<td>Provision for Electrification</td>
</tr>
<tr>
<td>23</td>
<td>Provision for Chulla &amp; Chimney</td>
</tr>
<tr>
<td>24</td>
<td>Sub Total</td>
</tr>
<tr>
<td>25</td>
<td>Contractor’s Profit (7.5% deduction from total)</td>
</tr>
<tr>
<td>26</td>
<td>Total ( Sr. No .23 - Sr. No. A1)</td>
</tr>
<tr>
<td></td>
<td>Cost index :15% of item A2</td>
</tr>
<tr>
<td>A1</td>
<td>Loading / unloading &amp; carriage cost (L. S.)</td>
</tr>
<tr>
<td>A2</td>
<td>ESTIMATE COST OF CORE HOUSE (A2 +B +C )</td>
</tr>
<tr>
<td>B</td>
<td>Plinth area (sqft)</td>
</tr>
<tr>
<td>C</td>
<td>Cost per sqft</td>
</tr>
</tbody>
</table>
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 northwesterns. 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 HOUSING TYPOLOGIES AT A GLANCE

<table>
<thead>
<tr>
<th>TYPOLOGY</th>
<th>APPLICABLE HOUSING ZONES</th>
<th>TOTAL AREA</th>
</tr>
</thead>
<tbody>
<tr>
<td>TR-01</td>
<td>Zone B &amp; C</td>
<td>596.11 Sq.ft</td>
</tr>
<tr>
<td>TR-02</td>
<td>Zone A, B &amp; C</td>
<td>534.76 sq.ft</td>
</tr>
<tr>
<td>TR-03</td>
<td>Zone A, B &amp; C</td>
<td>523.35 sq.ft</td>
</tr>
<tr>
<td>TR-04</td>
<td>Zone B &amp; C</td>
<td>848.31 sq.ft</td>
</tr>
<tr>
<td>TR-05</td>
<td>Zone C</td>
<td>605.37 sq.ft</td>
</tr>
</tbody>
</table>
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.
### Overall Recommendations for Built Form

<table>
<thead>
<tr>
<th>Components</th>
<th>Types of Component</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ceiling and attic</td>
<td>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.</td>
<td></td>
</tr>
<tr>
<td>Openings</td>
<td>Phenol bonded or equivalent CK shutter framed with split bamboo/ local timber. GCI with timber frame. O1 or O2 with 25x25 MS angle frame. O1 or O2 with 65x90 precast RCC frame.</td>
<td></td>
</tr>
<tr>
<td>FL1</td>
<td>Plastic sheet as rising dampness stopper + 75mm sand bed + 300x300x16mm precast CC tiles (produced at local building centre of RDO store at block level).</td>
<td></td>
</tr>
<tr>
<td>FL2</td>
<td>Cement floor on flat brick soling</td>
<td></td>
</tr>
<tr>
<td>FL3</td>
<td>Bamboo floor in stilt house</td>
<td></td>
</tr>
<tr>
<td>Plinth and Steps</td>
<td>General Recommendations: 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 &amp; 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.</td>
<td></td>
</tr>
<tr>
<td>Foundations</td>
<td>F1 Wall footing in the soil with SBC 10tons /sqm.</td>
<td></td>
</tr>
<tr>
<td>F2</td>
<td>Precast RC stub with metal plate with holding down bolts.</td>
<td></td>
</tr>
<tr>
<td>F3</td>
<td>F2 type foundation with plinth on stilt in black cotton soil area or high flood area.</td>
<td></td>
</tr>
<tr>
<td>Wall</td>
<td>W1 250-300mm thick 5-10% cement stabilized rammed earth wall.</td>
<td></td>
</tr>
<tr>
<td>W2</td>
<td>600mm high rammed earth wall as per above specifications + CK plastered in 10% stabilized mud mortar on both sides.</td>
<td></td>
</tr>
<tr>
<td>W3</td>
<td>600mm high rammed earth wall as per above specifications + CK plastered in 1:5 cement mortar on both sides.</td>
<td></td>
</tr>
<tr>
<td>W4</td>
<td>75mm thick brick wall upto 600mm high in 1:4 cement mortar + CK plastered in 10% stabilized mud mortar on both sides.</td>
<td></td>
</tr>
<tr>
<td>W5</td>
<td>75mm thick brick wall upto 600mm high in 1:4 cement mortar + CK plastered in 1:5 cement mortar on both sides.</td>
<td></td>
</tr>
<tr>
<td>W6</td>
<td>Same as W1 + small local pebbles on the outside wall</td>
<td></td>
</tr>
<tr>
<td>W7</td>
<td>Split bamboo walls (CK) as in Tong house</td>
<td></td>
</tr>
<tr>
<td>W8</td>
<td>Partition wall in CK</td>
<td></td>
</tr>
<tr>
<td>ROOF</td>
<td>R1 GCI with crimp curve with least number of treated bamboo understructure.</td>
<td></td>
</tr>
<tr>
<td>R2</td>
<td>GCI sheet (do-chala) with treated bamboo understructure.</td>
<td></td>
</tr>
<tr>
<td>R3</td>
<td>GCI roof (Samoa type) in very high wind area – local specific</td>
<td></td>
</tr>
<tr>
<td>R4</td>
<td>Micro concrete tile roof with wind arresterers</td>
<td></td>
</tr>
<tr>
<td>R5</td>
<td>Thatch over GCI sheet for modified Tong house</td>
<td></td>
</tr>
</tbody>
</table>
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

- 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

<table>
<thead>
<tr>
<th>Components</th>
<th>Recommended Specifications</th>
<th>Specific Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Foundations</td>
<td>250 x 250 Brick Stub 20 Nos in 1:5 CM on 75 CC (1:5:10)</td>
<td>The brick specifications can differ as per site and house type falling under different multi hazard zones.</td>
</tr>
<tr>
<td></td>
<td>R.C. Band at GL, lintel and wall top (50 x 250) as horizontal seismic bands.</td>
<td></td>
</tr>
<tr>
<td>Wall</td>
<td>Walls 30 mm thk. ck wall plastered on external face in 1:4 cement mortar.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>143 Thk. cement stabilized mud block masonry in 10% stabilized mud mortar with 14 nos rc posts as vertical seismic bands.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>190mm thick 7% cement stab.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Mud brick in stab mud mortar (10%) wall till 900mm + ck plastered in 10% stabilized mud on both sides.</td>
<td></td>
</tr>
<tr>
<td>Roof</td>
<td>GCI Sheet (Char-Chala) with treated bamboo under structure/ or micro concrete tile roofing</td>
<td></td>
</tr>
<tr>
<td>Floor</td>
<td>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.</td>
<td></td>
</tr>
<tr>
<td>Opening</td>
<td>Phenol Bonded or equivalent ck shutter framed with split bamboo / local timber</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Alternatively use GCI shuttering framed with split bamboo/local timber.</td>
<td></td>
</tr>
<tr>
<td>Item</td>
<td>Area Sq.m</td>
<td>Area Sq.ft</td>
</tr>
<tr>
<td>--------------</td>
<td>-----------</td>
<td>------------</td>
</tr>
<tr>
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<td>77.18</td>
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<td>Verandah 1</td>
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<td>Verandah 2</td>
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<td>162.43</td>
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<td>Carpet Area</td>
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## Cost Estimate

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<th>S.No.</th>
<th>DESCRIPTION</th>
<th>QUANTITY</th>
<th>UNIT</th>
<th>UNIT RATE</th>
<th>AMOUNT</th>
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<tr>
<td>1</td>
<td>Excavation in foundation</td>
<td>9.303</td>
<td>cu.m.</td>
<td>142.32</td>
<td>1323.98</td>
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<td></td>
<td>Backfill 1/3rd of excavation</td>
<td>3.101</td>
<td>cu.m.</td>
<td>52.00</td>
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<td>17.020</td>
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<td>2</td>
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<td>0.216</td>
<td>cu.m.</td>
<td>4101.58</td>
<td>885.94</td>
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<td>total volume of Lean Concrete in foundation</td>
<td>0.765</td>
<td>cu.m.</td>
<td>5032.00</td>
<td>3850.42</td>
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<td>3</td>
<td>Brick Masonry in Foundation</td>
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<td></td>
<td>250x250 Post in 1:6 CM from base conc to underside of brick flat course at FL</td>
<td>0.928</td>
<td>cu.m.</td>
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<td>75x250 MM Flat Brick</td>
<td>0.752</td>
<td>cm.</td>
<td>5133.33</td>
<td>3859.63</td>
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<td>4</td>
<td>Total volume of Brick Masonry in Foundation</td>
<td>4.266</td>
<td>cu.m.</td>
<td>5032.00</td>
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<td>5</td>
<td>Plastering on plinth wall in 1:4 CM</td>
<td>14.495</td>
<td>sqm.</td>
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<td>Over 250x250 MM Stubs</td>
<td>0.056</td>
<td>cu.m.</td>
<td>6847.05</td>
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<td>kg.</td>
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<td>100x100 MM RCC Posts</td>
<td>0.303</td>
<td>cum.</td>
<td>6876.83</td>
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<td>Steel for the above @ 200kg/cum</td>
<td>60.600</td>
<td>kg.</td>
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<td>Flooring</td>
<td>55.08</td>
<td>sqm.</td>
<td>331.82</td>
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<td>Champa Kampa for Walls 12mm stabilized CM plaster</td>
<td>15.761</td>
<td>sq.m.</td>
<td>468.48</td>
<td>7383.64</td>
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<td>Champa Kampa in Windows</td>
<td>0.578</td>
<td>sqm.</td>
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<td>270.78</td>
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<td>15.761</td>
<td>sq.m.</td>
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<td>1852.87</td>
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<td>5083.54</td>
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<td>14</td>
<td>Brick Masonry (250x250 Post) in Veranda</td>
<td>0.045</td>
<td>cu.m.</td>
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<td>184.57</td>
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<td>15</td>
<td>150x100 MM RCC Continuous Band</td>
<td>0.344</td>
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<td>Steel for the above @ 200kg/cum</td>
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<td>100x100 MM RCC Piece Lintel over Opening</td>
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<td>Steel consumption</td>
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<td>kg.</td>
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<td>16</td>
<td>Horizontal 100 mm Kanak Kaich Bamboo</td>
<td>18.6</td>
<td>m.</td>
<td>28.75</td>
<td>616.11</td>
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<td>17</td>
<td>Vertical 100 mm Barak Bamboo in the Veranda</td>
<td>13.3</td>
<td>m.</td>
<td>28.75</td>
<td>440.66</td>
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<td>18</td>
<td>Vertical 50 mm Barak Bamboo for Window and Door Frame</td>
<td>21.0</td>
<td>m.</td>
<td>28.75</td>
<td>694.31</td>
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<td>19</td>
<td>30mm Bamboo for door &amp; window</td>
<td>64.04</td>
<td>m.</td>
<td>28.75</td>
<td>2117.32</td>
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<td>20</td>
<td>50mm Bamboo for door</td>
<td>13.2</td>
<td>m.</td>
<td>28.75</td>
<td>436.43</td>
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<td>21</td>
<td>Vertical 50 mm Barak Bamboo near Columns</td>
<td>29.4</td>
<td>m.</td>
<td>28.75</td>
<td>872.04</td>
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<td>22</td>
<td>Roofing GCI Sheet</td>
<td>77.3</td>
<td>sqm.</td>
<td>495.00</td>
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Total Cost `152,888/-
<p>| | | | |</p>
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<tr>
<td><strong>23</strong></td>
<td>Truss (Kanak Kaich Bamboo)</td>
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<td></td>
<td>Total length of 100mm for Rafter</td>
<td>20.1</td>
<td>m.</td>
</tr>
<tr>
<td></td>
<td>Total length of 50mm for Tie Members</td>
<td>13.1</td>
<td>m.</td>
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<tr>
<td></td>
<td>Total length of 50mm for Raking Members</td>
<td>34.230</td>
<td>m.</td>
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<tr>
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<td>Total length of 50mm for Purlins</td>
<td>74.3</td>
<td>m.</td>
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<td><strong>24</strong></td>
<td>Lean To (Kanak Kaich Bamboo)</td>
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<tr>
<td></td>
<td>Total length of 50 mm for Lean To Members</td>
<td>17.6</td>
<td>m.</td>
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<tr>
<td></td>
<td>Total length of 50mm for Lean To Purlins</td>
<td>80.8</td>
<td>m.</td>
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<tr>
<td></td>
<td>Add 15% of the bamboo works</td>
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<td></td>
</tr>
<tr>
<td><strong>25</strong></td>
<td>* All the bamboo lengths are increased by 15%</td>
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<td></td>
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</table>
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, severe landslides and high wind velocity

Available resources
• Bamboo
• Mud
• Timber
• Stone

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 handloom, 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.

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

Area Statement:

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<tr>
<th>Item</th>
<th>Sq.m</th>
<th>Sq.ft</th>
</tr>
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<tbody>
<tr>
<td>Room</td>
<td>18.90</td>
<td>203.44</td>
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<tr>
<td>Kitchen</td>
<td>8.97</td>
<td>96.55</td>
</tr>
<tr>
<td>Attic</td>
<td>6.75</td>
<td>72.66</td>
</tr>
<tr>
<td>Verandah</td>
<td>16.46</td>
<td>177.18</td>
</tr>
<tr>
<td>Carpet Area</td>
<td>34.96</td>
<td>376.31</td>
</tr>
<tr>
<td>Built up Area</td>
<td>49.68</td>
<td>534.76</td>
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TYPICAL SECTION AA’
# TR-02
## Cost estimate

### Cost breakup

<table>
<thead>
<tr>
<th>Item</th>
<th>Cost (INR)</th>
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<tbody>
<tr>
<td>Foundation</td>
<td>50,744/-</td>
</tr>
<tr>
<td>Flooring</td>
<td>15,683/-</td>
</tr>
<tr>
<td>Walls/Floors/Windows</td>
<td>40,808/-</td>
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<tr>
<td>Attic and Roof</td>
<td>60,048/-</td>
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<tr>
<td><strong>Total</strong></td>
<td><strong>1,67,619/-</strong></td>
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<table>
<thead>
<tr>
<th>S.NO</th>
<th>DESCRIPTION</th>
<th>QUANTITY</th>
<th>UNIT</th>
<th>UNIT RATE (/-)</th>
<th>AMOUNT</th>
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<tbody>
<tr>
<td>1</td>
<td>Excavation in foundation</td>
<td>8.333</td>
<td>cu.m.</td>
<td>142.32</td>
<td>1185.96</td>
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<td>2</td>
<td>Backfill 1/3rd of excavation</td>
<td>2.778</td>
<td>cu.m.</td>
<td>52.00</td>
<td>144.44</td>
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<tr>
<td>3</td>
<td>Plinth filling</td>
<td>15.202</td>
<td>cu.m.</td>
<td>52.00</td>
<td>790.49</td>
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<td>4</td>
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<td>0.893</td>
<td>cum</td>
<td>4761.51</td>
<td>4254.13</td>
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<td>5</td>
<td>Brick masonry in Foundation</td>
<td>0.938</td>
<td>cum</td>
<td>4101.58</td>
<td>3845.23</td>
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<td>6</td>
<td>125mm Wall in 1:4 CM</td>
<td>4.029</td>
<td>cum</td>
<td>4101.58</td>
<td>16526.42</td>
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<tr>
<td>7</td>
<td>RCC band at PL (50x250) M20 concrete in Foundation with 6mm dia@ 300 c/c steel bars</td>
<td>0.500</td>
<td>cum</td>
<td>6847.05</td>
<td>3422.24</td>
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<tr>
<td>8</td>
<td>Reinforcement for the abve @200kg/cum</td>
<td>99.963</td>
<td>kg</td>
<td>55.78</td>
<td>5575.91</td>
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<td>9</td>
<td>Anchor bar 10mm dia Steel Rod from plinth beam to top of toe wall</td>
<td>18.000</td>
<td>m</td>
<td>55.78</td>
<td>684.76</td>
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<td>10</td>
<td>Sand cushion under Flooring</td>
<td>3.300</td>
<td>cum</td>
<td>51.78</td>
<td>170.87</td>
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<td>11</td>
<td>Flat brick soling in 1:4 CM in Flooring</td>
<td>3.456</td>
<td>cum</td>
<td>51.78</td>
<td>178.95</td>
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<td>12</td>
<td>Neat Cement Finish with 1:6 CM in Flooring</td>
<td>44.146</td>
<td>sqm</td>
<td>331.82</td>
<td>14648.46</td>
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<td>13</td>
<td>1:4 CM plastering on Plinth wall</td>
<td>4.937</td>
<td>sqm</td>
<td>117.56</td>
<td>580.37</td>
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<td>14</td>
<td>7% cement+1% lime stabilized Rammed Earth</td>
<td>4.591</td>
<td>cum</td>
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<td>15</td>
<td>75x75x50 Brick stubs in Wall</td>
<td>0.208</td>
<td>cum</td>
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<td>854.41</td>
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<td>16</td>
<td>Brick Masonry in Veranda</td>
<td>0.070</td>
<td>cum</td>
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<td>287.11</td>
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<td>17</td>
<td>Supporting 100mm Barak bamboo in walls</td>
<td>57.930</td>
<td>m</td>
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<td>18</td>
<td>100mm Kanak Kaich bamboo in walls (Horizontal supporting structure)</td>
<td>99.864</td>
<td>m</td>
<td>28.75</td>
<td>2871.09</td>
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<td>19</td>
<td>75mm Diagonal Bracing in walls</td>
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<td>m</td>
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<td>431.25</td>
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<td>30mm Bamboo for window &amp; door</td>
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<td>m</td>
<td>28.75</td>
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<td>23</td>
<td>Champa Kampa in Windows</td>
<td>1.153</td>
<td>sqm</td>
<td>336.98</td>
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<td>24</td>
<td>Champa Kampa in Wall</td>
<td>62.933</td>
<td>sqm</td>
<td>468.48</td>
<td>29482.82</td>
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<td>14.321</td>
<td>sqm</td>
<td>117.56</td>
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<td>26</td>
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<td>20.856</td>
<td>m</td>
<td>28.75</td>
<td>599.61</td>
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### Cost Breakup

<table>
<thead>
<tr>
<th>S.NO</th>
<th>Description</th>
<th>Quantity</th>
<th>Unit</th>
<th>Unit Rate</th>
<th>Amount</th>
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<td>151.3</td>
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<td>28.75</td>
<td>4349.88</td>
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<td>Bamboo matt in Attic floor</td>
<td>7.954</td>
<td>sqm</td>
<td>426.98</td>
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<td>26</td>
<td>GCI roof sheeting (0.43)</td>
<td>75.695</td>
<td>sqm</td>
<td>495.00</td>
<td>37468.78</td>
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<td>Fabrication</td>
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<td>Bamboo under structure in roof</td>
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<td>Bamboo under structure in roof LEAN to</td>
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<td>m</td>
<td>28.75</td>
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<td></td>
<td><strong>167,619.84</strong></td>
</tr>
</tbody>
</table>

**Cost Breakup**

<table>
<thead>
<tr>
<th>Item</th>
<th>Cost (INR)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Foundation</td>
<td>50,744/-</td>
</tr>
<tr>
<td>Flooring</td>
<td>15,683/-</td>
</tr>
<tr>
<td>Walls/Floors/Windows</td>
<td>40,808/-</td>
</tr>
<tr>
<td>Attic and Roof</td>
<td>60,048/-</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>1,67,619/-</strong></td>
</tr>
</tbody>
</table>
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

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.

<table>
<thead>
<tr>
<th>Recommendations for construction systems</th>
</tr>
</thead>
<tbody>
<tr>
<td>Components</td>
</tr>
<tr>
<td>Foundations</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Wall</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Wall Finish</td>
</tr>
<tr>
<td>Roof</td>
</tr>
<tr>
<td>Floor</td>
</tr>
<tr>
<td>Opening</td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>
### Area Statement:

<table>
<thead>
<tr>
<th>Item</th>
<th>Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Room</td>
<td>16.21 sq.m</td>
</tr>
<tr>
<td>Kitchen</td>
<td>9.96 sq.m</td>
</tr>
<tr>
<td>Attic</td>
<td>7.67 sq.m</td>
</tr>
<tr>
<td>Verandah 1</td>
<td>10.10 sq.m</td>
</tr>
<tr>
<td>Verandah 2</td>
<td>5.44 sq.m</td>
</tr>
<tr>
<td>Carpet Area</td>
<td>35.48 sq.m</td>
</tr>
<tr>
<td>Built up Area</td>
<td>48.62 sq.m</td>
</tr>
</tbody>
</table>

### Typical Plan

- **Room**: 5.00 x 10.00
- **Kitchen**: 3.25 x 10.00
- **Veranda 1**: 5.50 x 18.00
- **Veranda 2**: 3.50 x 10.00
- **Bamboo mat on split bamboo (half) as understructure**
- **50 dia treated mature Kanak Kalach bamboo purlin**
- **35 mm U clamp**
- **50 dia treated mature Kanak Kanichi bamboo**
- **50 RCC sill band with 2-10tor long bars @ 6 dia @ 175 c/c links**
- **190 CS:MW masonry (7% cement+1% lime) in 2:5 cement+lime+sand mortar with lamp cement plaster**
- **16 mm 1.6 CM with neat cement finish on 75 flat brick siding in 1.4 CM or 300X300X16 precast CC tiles**
- **75 mm Sand cushion**

### Typical Section AA'

- **Corrugated GI sheet AS/RDD specifications**
- **Snow blocking in High End Apron level**
- **Snow blocking in High End Apron level**

---

**TRIPURA**

**TR-03**
<table>
<thead>
<tr>
<th>S.NO.</th>
<th>DESCRIPTION</th>
<th>QUANTITY</th>
<th>UNIT</th>
<th>UNIT RATE (INR)</th>
<th>AMOUNT (INR)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Excavation in foundation</td>
<td>11.802</td>
<td>cu.m.</td>
<td>142.32</td>
<td>1679.62523</td>
</tr>
<tr>
<td></td>
<td>Backfill 1/3rd of excavation</td>
<td>3.934</td>
<td>cu.m.</td>
<td>52.00</td>
<td>204.568</td>
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<tr>
<td></td>
<td>Plinth filling</td>
<td>14.578</td>
<td>cu.m.</td>
<td>52.00</td>
<td>758.03</td>
</tr>
<tr>
<td>2</td>
<td>Lean concrete (1:5:10) in Foundation</td>
<td>0.910</td>
<td>cu.m.</td>
<td>4761.51</td>
<td>4334.46</td>
</tr>
<tr>
<td>3</td>
<td>Brick Masonry in Foundation</td>
<td>1.031</td>
<td>cu.m.</td>
<td>4101.58</td>
<td>4229.75</td>
</tr>
<tr>
<td></td>
<td>Total volume of Brick Masonry in Foundation</td>
<td>3.988</td>
<td>cu.m.</td>
<td>5032.00</td>
<td>20068.245</td>
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<tr>
<td>4</td>
<td>RCC band at PL (50x250) M20 concrete in Foundation</td>
<td>0.512</td>
<td>cu.m.</td>
<td>6847.05</td>
<td>3504.83372</td>
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<tr>
<td></td>
<td>Steel for the above @ 200kg/cum</td>
<td>102.375</td>
<td>kg</td>
<td>55.78</td>
<td>5710.4775</td>
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<tr>
<td>5</td>
<td>10mm Dia. Steel Rod in Foundation</td>
<td>18.000</td>
<td>m.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>11.160</td>
<td>kg</td>
<td>55.78</td>
<td>622.5048</td>
</tr>
<tr>
<td>6</td>
<td>7% cement and 1% lime stabilized Rammed Earth Wall</td>
<td>5.943</td>
<td>cu.m.</td>
<td>3213.05</td>
<td>19093.6787</td>
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<tr>
<td>7</td>
<td>Flooding</td>
<td>43.390</td>
<td>sq.m.</td>
<td>331.82</td>
<td>14397.7594</td>
</tr>
<tr>
<td>8</td>
<td>Champa Kampa for Walls with both sides plastered in CM 12mm (with CWM)</td>
<td>63.807</td>
<td>sq.m.</td>
<td>468.48</td>
<td>29892.3961</td>
</tr>
<tr>
<td>9</td>
<td>1:4 CM on plinth wall</td>
<td>13.651</td>
<td>sq.m.</td>
<td>117.56</td>
<td>1604.80947</td>
</tr>
<tr>
<td>10</td>
<td>Brick Masonry (250x250 Post) in Veranda</td>
<td>0.070</td>
<td>cu.m.</td>
<td>4101.58</td>
<td>287.1106</td>
</tr>
<tr>
<td>11</td>
<td>Horizontal 100 mm Kanak Kaich Bamboo in the Wall</td>
<td>114.61</td>
<td>m.</td>
<td>28.75</td>
<td>3294.89375</td>
</tr>
<tr>
<td>12</td>
<td>Vertical 100 mm Barak Bamboo in the Wall</td>
<td>59.7</td>
<td>m.</td>
<td>28.75</td>
<td>1717.1225</td>
</tr>
<tr>
<td>13</td>
<td>Vertical 50 mm Barak Bamboo for Window and Door Frame</td>
<td>35.7</td>
<td>m.</td>
<td>28.75</td>
<td>1025.202</td>
</tr>
<tr>
<td>14</td>
<td>30mm Bamboo for window &amp; door</td>
<td>102.48</td>
<td>m.</td>
<td>28.75</td>
<td>2946.3</td>
</tr>
<tr>
<td>15</td>
<td>50mm Bamboo for door</td>
<td>19.8</td>
<td>m.</td>
<td>28.75</td>
<td>569.25</td>
</tr>
<tr>
<td>16</td>
<td>Diagonal 75 mm Kanak Kaich Bamboo Members</td>
<td>23.27</td>
<td>m.</td>
<td>28.75</td>
<td>669.14</td>
</tr>
<tr>
<td>17</td>
<td>Roofing GCI Sheet</td>
<td>105.4</td>
<td>sq.m.</td>
<td>495.00</td>
<td>52185.05</td>
</tr>
<tr>
<td>18</td>
<td>Truss (Kanak Kaich Bamboo)</td>
<td>34.4</td>
<td>m.</td>
<td>28.75</td>
<td>988.30</td>
</tr>
<tr>
<td>S.NO.</td>
<td>DESCRIPTION</td>
<td>QUANTITY</td>
<td>UNIT</td>
<td>UNIT RATE (INR)</td>
<td>AMOUNT (INR)</td>
</tr>
<tr>
<td>-------</td>
<td>--------------------------------------------------</td>
<td>----------</td>
<td>------</td>
<td>-----------------</td>
<td>--------------</td>
</tr>
<tr>
<td></td>
<td>Total length of 50mm for Tie Members</td>
<td>16.7</td>
<td>m.</td>
<td>28.75</td>
<td>479.08</td>
</tr>
<tr>
<td></td>
<td>Total length of 50mm for Raking Members</td>
<td>49.735</td>
<td>m.</td>
<td>28.75</td>
<td>1429.89</td>
</tr>
<tr>
<td></td>
<td>Total length of 50mm for Purlins</td>
<td>112.1</td>
<td>m.</td>
<td>28.75</td>
<td>3223.59</td>
</tr>
<tr>
<td></td>
<td>Lean To (Kanak Kaich Bamboo)</td>
<td>13.212</td>
<td>m.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total length of 50mm for Lean To Purlins</td>
<td>8.6</td>
<td>m.</td>
<td>28.75</td>
<td>246.48</td>
</tr>
<tr>
<td></td>
<td>Total length of 100mm Kanak Kaich Bamboo for Truss</td>
<td>34.4</td>
<td>m.</td>
<td>28.75</td>
<td>988.30</td>
</tr>
<tr>
<td></td>
<td>Total length of 50mm Kanak Kaich Bamboo for Truss</td>
<td>202.3</td>
<td>m.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>19</td>
<td>Attic</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Item no. 15.1 Half Bamboo length for Attic flooring</td>
<td>80.8</td>
<td>m.</td>
<td>28.75</td>
<td>2321.97938</td>
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<tr>
<td></td>
<td>Area of Bamboo Mat for Attic Flooring</td>
<td>7.5</td>
<td>sq.m.</td>
<td>28.75</td>
<td>215.74</td>
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<tr>
<td>20</td>
<td>* All the bamboo lengths are increased by 15%.</td>
<td></td>
<td></td>
<td></td>
<td>2862.70736</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td></td>
<td></td>
<td></td>
<td>181,988.11</td>
</tr>
</tbody>
</table>
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

- 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

<table>
<thead>
<tr>
<th>Components</th>
<th>Recommended Specifications</th>
<th>Specific Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Foundations</td>
<td>250 x 250 Brick Stub 20 Nos in 1:5 CM on 75 CC (1:5:10)</td>
<td>The brick specifications can differ as per site and house type falling under different multi hazard zones.</td>
</tr>
<tr>
<td></td>
<td>R.C. Band at GL, lintel and wall top (50 x 250)as horizontal seismic bands.</td>
<td></td>
</tr>
<tr>
<td>Wall</td>
<td>Walls 30 mm thk. ck wall plastered on external face in 1:4 cement mortar.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>143 Thk. cement stabilized mud block masonry in 10% stabilized mud mortar with 14 nos rc posts as vertical seismic bands.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>190mm thick 7% cement stab.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Mud brick in stab mud mortar (10%) wall till 900mm + ck plastered in 10% stabilized mud on both sides.</td>
<td></td>
</tr>
<tr>
<td>Roof</td>
<td>GCI Sheet (Char-Chala) with treated bamboo under structure/ or micro concrete tile roofing</td>
<td></td>
</tr>
<tr>
<td>Floor</td>
<td>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.</td>
<td></td>
</tr>
<tr>
<td>Opening</td>
<td>Phenol Bonded or equivalent ck shutter framed with split bamboo / local timber</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Alternatively use GCI shuttering framed with split bamboo/local timber.</td>
<td></td>
</tr>
</tbody>
</table>
Area Statement:

<table>
<thead>
<tr>
<th>Item</th>
<th>Area</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Sq.m</td>
</tr>
<tr>
<td>Room</td>
<td>15.32</td>
</tr>
<tr>
<td>Kitchen</td>
<td>6.28</td>
</tr>
<tr>
<td>Verandah 1+2+3+4</td>
<td>52.78</td>
</tr>
<tr>
<td>Carpet Area</td>
<td>21.98</td>
</tr>
<tr>
<td>Built up Area</td>
<td>78.81</td>
</tr>
</tbody>
</table>
## TR-04
### Cost estimate

### Cost breakup

<table>
<thead>
<tr>
<th>Item</th>
<th>Cost (INR)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Foundation</td>
<td>60,597/-</td>
</tr>
<tr>
<td>Flooring</td>
<td>27,542/-</td>
</tr>
<tr>
<td>Walls/Doors/ Windows</td>
<td>40,231/-</td>
</tr>
<tr>
<td>Roof</td>
<td>63,141/-</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>1,91,512/-</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>S.NO.</th>
<th>DESCRIPTION</th>
<th>QUANTITY</th>
<th>UNIT</th>
<th>UNIT RATE</th>
<th>AMOUNT</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Excavation in foundation</td>
<td>11.844</td>
<td>cu.m.</td>
<td>142.32</td>
<td>1685.66</td>
</tr>
<tr>
<td></td>
<td>Backfill 1/3rd of excavation</td>
<td>3.948</td>
<td>cu.m.</td>
<td>52.00</td>
<td>205.30</td>
</tr>
<tr>
<td></td>
<td></td>
<td>21.536</td>
<td>cu.m.</td>
<td>52.00</td>
<td>1119.85</td>
</tr>
<tr>
<td>2</td>
<td>Lean concrete 1:5:10 in Foundation</td>
<td>1.234</td>
<td>cum</td>
<td>4761.51</td>
<td>5873.73</td>
</tr>
<tr>
<td>3</td>
<td>Brick masonry in Foundation</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>250X250 Post in 1:5 CM from base conc to underside of brick flat course at PL</td>
<td>1.500</td>
<td>cum</td>
<td>4101.58</td>
<td>6152.37</td>
</tr>
<tr>
<td>4</td>
<td>125mm Wall in 1:4 CM</td>
<td>5.325</td>
<td>cum</td>
<td>5133.33</td>
<td>27333.08</td>
</tr>
<tr>
<td>5</td>
<td>RCC band at PL (50x250) M20 concrete in Foundation with 6mm dia@ 300 c/c steel bars</td>
<td>1.013</td>
<td>cum</td>
<td>6847.05</td>
<td>6932.64</td>
</tr>
<tr>
<td></td>
<td>Reinforcement for the above item @200kg/cum</td>
<td>202.500</td>
<td>kg</td>
<td>55.78</td>
<td>11295.45</td>
</tr>
<tr>
<td>6</td>
<td>10mm dia Steel Rod as anchor to bamboo posts</td>
<td>19.200</td>
<td>m</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>11.904</td>
<td>kg</td>
<td>55.78</td>
<td>664.01</td>
</tr>
<tr>
<td>7</td>
<td>Neat Cement Finish with 1:6 CM in Flooring</td>
<td>74.699</td>
<td>sqm</td>
<td>331.82</td>
<td>24786.66</td>
</tr>
<tr>
<td>8</td>
<td>1:4 cement plastering on Plinth wall</td>
<td>17.785</td>
<td>sqm</td>
<td>117.56</td>
<td>2090.83</td>
</tr>
<tr>
<td>9</td>
<td>7% cement+ 1% lime stabilized Rammed Earth in Wall</td>
<td>4.418</td>
<td>cum</td>
<td>3213.05</td>
<td>14195.18</td>
</tr>
<tr>
<td>10</td>
<td>250x50 Brick stubs in Wall</td>
<td>0.200</td>
<td>cum</td>
<td>5133.33</td>
<td>1028.99</td>
</tr>
<tr>
<td>11</td>
<td>Brick Masonry in Veranda</td>
<td>0.281</td>
<td>cum</td>
<td>5133.333</td>
<td>1442.47</td>
</tr>
<tr>
<td>12</td>
<td>Supporting 100mm Barak bamboo in walls</td>
<td>53.040</td>
<td>m</td>
<td>28.75</td>
<td>1524.90</td>
</tr>
<tr>
<td>13</td>
<td>100mm Kanak Kaich bamboo in walls (Horizontal supporting structure)</td>
<td>96.699</td>
<td>m</td>
<td>28.75</td>
<td>2780.10</td>
</tr>
<tr>
<td>14</td>
<td>75mm Diagnol Bracing in walls</td>
<td>12.41</td>
<td>m</td>
<td>28.75</td>
<td>356.79</td>
</tr>
<tr>
<td>15</td>
<td>50mm Bamboo for door &amp; window frame in walls</td>
<td>10</td>
<td>m</td>
<td>28.75</td>
<td>287.50</td>
</tr>
<tr>
<td>16</td>
<td>30mm Bamboo for door &amp; window frame</td>
<td>76.08</td>
<td>m</td>
<td>28.75</td>
<td>2187.30</td>
</tr>
<tr>
<td>S.NO.</td>
<td>DESCRIPTION</td>
<td>QUANTITY</td>
<td>UNIT</td>
<td>UNIT RATE</td>
<td>AMOUNT</td>
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<tr>
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<td>----------</td>
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<td>-----------</td>
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<tr>
<td>17</td>
<td>50mm Bamboo for door</td>
<td>13.2</td>
<td>m</td>
<td>28.75</td>
<td>379.50</td>
</tr>
<tr>
<td>18</td>
<td>Champa Kampa in Windows</td>
<td>1.153</td>
<td>sqm</td>
<td>468.48</td>
<td>540.16</td>
</tr>
<tr>
<td>19</td>
<td>Champa Kampa in Wall</td>
<td>31.548</td>
<td>sqm</td>
<td>468.48</td>
<td>14779.84</td>
</tr>
<tr>
<td>20</td>
<td>40 mm Jaali in Wall</td>
<td>2.500</td>
<td>sqm</td>
<td>291.67</td>
<td>729.17</td>
</tr>
<tr>
<td>21</td>
<td>GCI roof sheeting (Gz 18)</td>
<td>98.702</td>
<td>sqm</td>
<td>495.00</td>
<td>48857.27</td>
</tr>
<tr>
<td>22</td>
<td>Bamboo under structure in roof</td>
<td></td>
<td></td>
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</tr>
<tr>
<td></td>
<td>Normal Truss</td>
<td></td>
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<tr>
<td></td>
<td>100mm dia bamboo required</td>
<td>12.384</td>
<td>m</td>
<td>28.75</td>
<td>356.04</td>
</tr>
<tr>
<td></td>
<td>Raking member of 50mm dia</td>
<td>4.56</td>
<td>m</td>
<td>28.75</td>
<td>131.10</td>
</tr>
<tr>
<td>23</td>
<td>Tie member of 50mm dia</td>
<td>22.608</td>
<td>m</td>
<td>28.75</td>
<td>649.98</td>
</tr>
<tr>
<td>24</td>
<td>Purlin in roof understructure for scissor truss</td>
<td>92.272</td>
<td>m</td>
<td>28.75</td>
<td>2652.82</td>
</tr>
<tr>
<td>25</td>
<td>Bamboo under structure in roof</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Rafter of 100mm dia</td>
<td>10.52</td>
<td>m</td>
<td>28.75</td>
<td>302.45</td>
</tr>
<tr>
<td></td>
<td>Raking member of 50mm dia</td>
<td>6.586</td>
<td>m</td>
<td>28.75</td>
<td>189.35</td>
</tr>
<tr>
<td>26</td>
<td>Tie Member of 50mm dia</td>
<td>3.112</td>
<td>m</td>
<td>28.75</td>
<td>89.47</td>
</tr>
<tr>
<td>27</td>
<td>Bamboo under structure in roof LEAN to</td>
<td>42.716</td>
<td>m</td>
<td>28.75</td>
<td>1228.09</td>
</tr>
<tr>
<td>28</td>
<td>Purlin in roof understructure for Lean to</td>
<td>151.728</td>
<td>m</td>
<td>28.75</td>
<td>4362.18</td>
</tr>
<tr>
<td>29</td>
<td>Add labour for bamboo work 25%</td>
<td></td>
<td></td>
<td></td>
<td>4322.05</td>
</tr>
</tbody>
</table>

**Total Amount:** 191512.25
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.

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

<table>
<thead>
<tr>
<th>Components</th>
<th>Recommended Specifications</th>
<th>Specific Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Foundations</td>
<td>250 x 250 Brick Stub 20 Nos in 1:5 CM on 75 CC (1:5:10)</td>
<td></td>
</tr>
<tr>
<td>Wall</td>
<td>Walls 30 mm thk. ck wall plastered on external face in 1:4 cement mortar.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>143 Thk cement stabilized mud block masonry in 10% stabilized mud mortar with 14 nos rc posts as vertical seismic bands.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>190mm thick 7% cement stab.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Mud brick in stab mud mortar (10%) wall till 900mm + ck plastered in 10% stabilized mud on both sides.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>The brick specifications can differ as per site and house type falling under different multi hazard zones.</td>
<td></td>
</tr>
<tr>
<td>Roof</td>
<td>GCI Sheet (Char-Chala) with treated bamboo under structure/ or micro concrete tile roofing</td>
<td></td>
</tr>
<tr>
<td>Floor</td>
<td>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.</td>
<td></td>
</tr>
<tr>
<td>Opening</td>
<td>Phenol Bonded or equivalent ck shutter framed with split bamboo / local timber</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Alternatively use GCI shuttering framed with split bamboo/local timber.</td>
<td></td>
</tr>
</tbody>
</table>
## Area Statement:

<table>
<thead>
<tr>
<th>Item</th>
<th>Area (sq.m)</th>
<th>Area (sq.ft)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Room</td>
<td>23.2</td>
<td>249.72</td>
</tr>
<tr>
<td>Kitchen</td>
<td>2.69</td>
<td>28.96</td>
</tr>
<tr>
<td>Verandah</td>
<td>7.83</td>
<td>84.28</td>
</tr>
<tr>
<td>Deck</td>
<td>19.08</td>
<td>205.38</td>
</tr>
<tr>
<td>Carpet Area</td>
<td>25.89</td>
<td>278.68</td>
</tr>
<tr>
<td>Built up Area</td>
<td>56.24</td>
<td>605.37</td>
</tr>
</tbody>
</table>

**FLOOR PLAN DESIGN OPTION 5**

- **Toe wall 900 mm high CSMB or 250 thk brick wall with rat trap bond**
- **90 mm dia Shil barak treated bamboo posts**
- **Wall plastered with 1.5 cm on chicken wire mesh**
<table>
<thead>
<tr>
<th>S.NO.</th>
<th>DESCRIPTION</th>
<th>QUANTITY</th>
<th>UNIT</th>
<th>UNIT RATE INR</th>
<th>AMOUNT INR</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Excavation in foundation</td>
<td>10.122</td>
<td>cu.m.</td>
<td>142.32</td>
<td>1,440.53</td>
</tr>
<tr>
<td>2</td>
<td>Backfill 1/3rd of excavation</td>
<td>3.374</td>
<td>cu.m.</td>
<td>52.00</td>
<td>175.45</td>
</tr>
<tr>
<td>3</td>
<td>Plinth filling</td>
<td>16.910</td>
<td>cu.m.</td>
<td>52.00</td>
<td>879.30</td>
</tr>
<tr>
<td>4</td>
<td>Lean concrete (1:5:10) in Foundation</td>
<td>1.059</td>
<td>cu.m.</td>
<td>5548.5575</td>
<td>5,878.00</td>
</tr>
<tr>
<td>5</td>
<td>Brick Masonry in Foundation</td>
<td>1.134</td>
<td>cu.m.</td>
<td>4271.4713</td>
<td>4,845.45</td>
</tr>
<tr>
<td>6</td>
<td>12S MM Brick Wall in 1:4 CM</td>
<td>4.290</td>
<td>cu.m.</td>
<td>5032.00</td>
<td>21,587.28</td>
</tr>
<tr>
<td>7</td>
<td>RCC band at PL (50x250) M20 concrete in Foundation</td>
<td>0.329</td>
<td>cu.m.</td>
<td>6847.05</td>
<td>2,250.97</td>
</tr>
<tr>
<td>8</td>
<td>Reinforcement for the above item @200 kg/cum</td>
<td>65.750</td>
<td>kg</td>
<td>55.78</td>
<td>3,667.54</td>
</tr>
<tr>
<td>9</td>
<td>10 MM Dia. Steel Rod in Foundation</td>
<td>10.912</td>
<td>kg</td>
<td>55.78</td>
<td>608.67</td>
</tr>
<tr>
<td>10</td>
<td>7% cement+1% lime stabilized Rammed Earth Wall</td>
<td>3.825</td>
<td>cu.m.</td>
<td>3213.05</td>
<td>12,290.79</td>
</tr>
<tr>
<td>11</td>
<td>Flooring</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Flooring room- from ACAD dwg</td>
<td>25.361</td>
<td>sqm</td>
<td>331.82</td>
<td>8,415.29</td>
</tr>
<tr>
<td></td>
<td>Deck + Front veranda</td>
<td>25.046</td>
<td>sqm</td>
<td>82.955</td>
<td>2,077.69</td>
</tr>
<tr>
<td>12</td>
<td>Champa Kampa for Walls</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Item no. 7 total area of Champa Kampa</td>
<td>30.270</td>
<td>sq.m.</td>
<td>468.48</td>
<td>14,180.93</td>
</tr>
<tr>
<td>13</td>
<td>1:4 Cement stabilized mud wash on toe wall</td>
<td>137.976</td>
<td>sq.m.</td>
<td>10</td>
<td>1,379.76</td>
</tr>
<tr>
<td>14</td>
<td>Horizontal 100 mm Kanak Kaich Bamboo in the Wall</td>
<td>67.192</td>
<td>m.</td>
<td>28.75</td>
<td>1,931.78</td>
</tr>
<tr>
<td>15</td>
<td>Vertical 100 mm Barak Bamboo in the Wall</td>
<td>46.938</td>
<td>m.</td>
<td>28.75</td>
<td>1,349.48</td>
</tr>
<tr>
<td>16</td>
<td>Vertical 50 mm Barak Bamboo for Door Frame</td>
<td>9.7</td>
<td>m.</td>
<td>28.75</td>
<td>277.73</td>
</tr>
<tr>
<td>17</td>
<td>Diagonal 75 mm Kanak Kaich Bamboo Members</td>
<td>25.121</td>
<td>m.</td>
<td>28.75</td>
<td>722.22</td>
</tr>
<tr>
<td>18</td>
<td>30mm Bamboo for door</td>
<td>51.2</td>
<td>m.</td>
<td>28.75</td>
<td>1,472.00</td>
</tr>
<tr>
<td>19</td>
<td>50mm Bamboo for door</td>
<td>13.2</td>
<td>m.</td>
<td>28.75</td>
<td>379.50</td>
</tr>
<tr>
<td>20</td>
<td>40 mm Jaali in Wall</td>
<td>2.500</td>
<td>sqm</td>
<td>28.75</td>
<td>71.88</td>
</tr>
<tr>
<td>21</td>
<td>Roofing GCI Sheet</td>
<td>61.3</td>
<td>sq.m.</td>
<td>495.00</td>
<td>30,323.07</td>
</tr>
</tbody>
</table>

**Cost Estimate**

<table>
<thead>
<tr>
<th>Item</th>
<th>Cost (INR)</th>
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</thead>
<tbody>
<tr>
<td>Foundation</td>
<td>41,335/-</td>
</tr>
<tr>
<td>Flooring</td>
<td>22,784/-</td>
</tr>
<tr>
<td>Walls/Floors/Windows</td>
<td>21,764/-</td>
</tr>
<tr>
<td>Roof</td>
<td>38,091/-</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>1,23,972/-</strong></td>
</tr>
<tr>
<td>S.NO.</td>
<td>DESCRIPTION</td>
</tr>
<tr>
<td>-------</td>
<td>-------------------------------------------------</td>
</tr>
<tr>
<td>18</td>
<td>Truss (Kanak Kaich Bamboo)</td>
</tr>
<tr>
<td></td>
<td>Total length of 100mm for Rafter</td>
</tr>
<tr>
<td></td>
<td>Total length of 50mm for Tie Members</td>
</tr>
<tr>
<td></td>
<td>Total length of 50mm for Raking Members</td>
</tr>
<tr>
<td></td>
<td>Total length of 50mm for Purlins</td>
</tr>
<tr>
<td>19</td>
<td>Lean To (Kanak Kaich Bamboo)</td>
</tr>
<tr>
<td></td>
<td>Total length of 50mm for Lean To</td>
</tr>
<tr>
<td></td>
<td>Total length of 50mm for Lean To Purlins</td>
</tr>
<tr>
<td>20</td>
<td>Support Truss</td>
</tr>
<tr>
<td></td>
<td>Total length of 100mm for Rafter</td>
</tr>
<tr>
<td></td>
<td>Total length of 50mm for Raking Members</td>
</tr>
<tr>
<td></td>
<td>Total length of 50mm for Purlins</td>
</tr>
<tr>
<td></td>
<td>Total length of 100mm Kanak Kaich Bamboo for Truss</td>
</tr>
<tr>
<td></td>
<td>Total length of 50mm Kanak Kaich Bamboo for Truss</td>
</tr>
<tr>
<td>21</td>
<td>Add 15% for bamboo works</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>
DEMONSTRATION HOUSES IN TRIPURA FOR PMAY BENEFICIARIES
THE COMPLETE HOUSES: TRIPURA

NALCHHAR BLOCK

MOHANBHOG BLOCK

JAMPUIJOLA BLOCK

NALCHHAR BLOCK
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 sqft)
Cost= Rs 1,22,863/-
**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 sq ft)
Cost= Rs 1,22,863/-
TRIPURA
DEMONSTRATION HOUSE
BENEFICIARY: KAJOL SUTRADHAR
ZONE: B
MOHANBOG BLOCK

Typical Plan

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/-
**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 sqft)  
Cost= Rs 1,07,529/- 

**SECTION XX’**
TRIPURA

DEMONSTRATION HOUSE

BENEFICIARY: CHINU GHOSH
ZONE: B
NALCHHAR BLOCK

TYPICAL PLAN

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/-

TOTAL COVERED AREA OF VERANDA + ROOM = 386.98sft
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 (387sqft)
Cost= Rs 1,26,319/-
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 sqf)
Cost= Rs 1,51,543

TOTAL COVERED AREA OF VERANDA+ROOM
=38.07 SQM/ 409.63 SFT

TYPICAL PLAN
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
# SUMMARY OF COSTING: FOUR MODEL HOUSES

<table>
<thead>
<tr>
<th></th>
<th>ROOM + VERANDA AREA</th>
<th>COST OF ROOM + VERANDA</th>
<th>UNIT COST</th>
<th>SPECIFICATIONS</th>
<th>PEOPLE WHO TOOK THE LEAD ROLE</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHINU GHOSH</td>
<td>35.964 SQM/ 386.98 SFT</td>
<td>Rs. 1,03,326+ Rs. 22,993= Rs. 1,26,319</td>
<td>Rs. 326.427/ SFT</td>
<td>CSMB toe wall + CCB treated bamboo super structure with bamboo mat plastered in 1:5 CM + bamboo truss+ GCI roof</td>
<td>BDO, B B DAS, JE SUDHANGSHU BHOWMIK, TA NARAYAN CHANDRA DAS, MASON PARIMAL DAS</td>
</tr>
<tr>
<td>JHARNA DAS</td>
<td>38.07 SQM/ 409.633 SFT</td>
<td>Rs 1,27,207 + Rs 24,336= Rs 1,51,543</td>
<td>Rs 370/ SFT</td>
<td>CSMB full wall + 4 seismic bands at plinth, sill, lintel and roof level+ corner reinf. + CCB treated bamboo truss+ GCI roof</td>
<td>BDO, B B DAS, JE SUDHANGSHU BHOWMIK, TA NARAYAN CHANDRA DAS, MASON PARIMAL DAS</td>
</tr>
<tr>
<td>SUDHAN BENBARMA</td>
<td>36.325 SQM/ 390.867 SFT</td>
<td>Rs1,01,931+20,932 + RS = Rs1,22863</td>
<td>Rs 314.33/ SFT</td>
<td>Rat trap bonded toe wall + CCB treated bamboo super structure with bamboo mat plastered in 1:5 CM + bamboo truss+ GCI roof</td>
<td>BDO, MOLSOM, JE PRANA DEBBARMA, MASON SANJIT DEBBARMA</td>
</tr>
<tr>
<td>KALOJ SUTRADHAR</td>
<td>38.07 SQM/ 409.633 SFT</td>
<td>Rs1,07,529.29</td>
<td>Rs. 262.5/ SFT</td>
<td>CSMB toe wall + CCB treated bamboo super structure with bamboo mat plastered in 1:5 CM + bamboo truss+ GCI roof</td>
<td>BDO, ARINDAM DAS, GRAM PRADHAN TAPAN CHAKRABORTY MASON KANU DAS</td>
</tr>
</tbody>
</table>

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 Chakraborry 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.
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 Buildings Code 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 Typologies at a Glance

<table>
<thead>
<tr>
<th>TYPOLOGY</th>
<th>APPLICABLE HOUSING ZONES</th>
<th>TOTAL AREA Sq.ft/Sq.m</th>
</tr>
</thead>
<tbody>
<tr>
<td>UP-01</td>
<td>Zone A</td>
<td>344.5 Sq.ft</td>
</tr>
<tr>
<td>UP-02</td>
<td>Zone B</td>
<td>322.92 sq.ft</td>
</tr>
<tr>
<td>UP-03</td>
<td>Zone C</td>
<td>317.86 sq.ft</td>
</tr>
<tr>
<td>UP-04</td>
<td>Zone D</td>
<td>317.86 sq.ft</td>
</tr>
<tr>
<td>UP-05</td>
<td>Zone E</td>
<td>306.02 sq.ft</td>
</tr>
<tr>
<td>UP-06</td>
<td>Zone F</td>
<td>355.21 sq.ft</td>
</tr>
</tbody>
</table>
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.

- 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

<table>
<thead>
<tr>
<th>Plan Layout</th>
<th>Plinth/Floor</th>
<th>Roof Profile</th>
</tr>
</thead>
<tbody>
<tr>
<td>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.</td>
<td>High Plinth level recommended</td>
<td>Light Weight Roof Recommended</td>
</tr>
</tbody>
</table>

Recommendations for construction systems

<table>
<thead>
<tr>
<th>Components</th>
<th>Recommended Specifications</th>
<th>Specific Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Foundations</td>
<td>• Strip footing with large dressed stone with cement mortar till plinth level.</td>
<td>• Reducing the usage of concrete by recommending alternative to RCC framed structure.</td>
</tr>
<tr>
<td>Plinth</td>
<td>• Steel Reinforced RCC plinth beam at 750mm height from the ground.</td>
<td></td>
</tr>
<tr>
<td>Wall</td>
<td>• 2 brick thick column with rat trap bonded brick wall.</td>
<td>• Reinforcing bars recommended for openings larger than 0.6 m in width.</td>
</tr>
<tr>
<td></td>
<td>• Reinforcing bars embedded in brick masonry at the corners of all the rooms</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Seismic bands provided at sill level, lintel level and ceiling level.</td>
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</tr>
<tr>
<td>Wall Finish</td>
<td>• No wall finish required</td>
<td></td>
</tr>
<tr>
<td>Roof Structure</td>
<td>• RC plank &amp; joist roofing system</td>
<td></td>
</tr>
<tr>
<td>Roof Cover</td>
<td>• Mud phuska/ brick coba</td>
<td></td>
</tr>
<tr>
<td>Floor</td>
<td>• Plain Cement flooring</td>
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**Area Statement:**

<table>
<thead>
<tr>
<th>Item</th>
<th>Area Sq.m</th>
<th>Area Sq.ft</th>
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<tr>
<td>Room</td>
<td>14.21</td>
<td>152.96</td>
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<tr>
<td>Kitchen</td>
<td>3.92</td>
<td>42.19</td>
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<tr>
<td>Toilet</td>
<td>3.05</td>
<td>32.83</td>
</tr>
<tr>
<td>Verandah</td>
<td>5.00</td>
<td>53.82</td>
</tr>
<tr>
<td>Carpet Area</td>
<td>22.00</td>
<td>236.81</td>
</tr>
<tr>
<td>Built up Area</td>
<td>32.00</td>
<td>344.45</td>
</tr>
</tbody>
</table>

**TYPICAL SECTION AA’**

- 10 mm dia Steel bar
- 1800 X 300 X 65 mm RC Planes
- 330 mm Thick Brick wall in stretcher bond
- Bamboo Column
- Window
- Partition
- 1200 mm Wide Wall
- 3100 X 150 X 150 mm RC Joists
- Steel Window frame windows with steel grids
- 1500 X 300 X 60 mm RC Planes

**TYPICAL PLAN**
### Cost Estimate

#### UTTAR PRADESH

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Item</th>
<th>Unit</th>
<th>Quantity</th>
<th>Rates (INR)</th>
<th>Amount</th>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Site clearance and layout</td>
<td>LS</td>
<td>1.00</td>
<td>100.00</td>
<td>100.00</td>
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<td>2</td>
<td>Earth work in excavation of foundation, leveling of the bottom of the trench etc. complete (750mm wide and 750mm deep)</td>
<td>cum</td>
<td>15.13</td>
<td>228.38</td>
<td>3454.31</td>
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<tr>
<td>3</td>
<td>Providing and laying P.C.C. in foundation 100mm thick with 1:5:10 (12mm nominal size aggregates)</td>
<td>cum</td>
<td>2.18</td>
<td>2511.25</td>
<td>5465.74</td>
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<td>4</td>
<td>Providing Random Rubble Masonry with cement mortar in foundation up to plinth level, including setting of block, mixing of mud with appropriate qty. of powder</td>
<td>cum</td>
<td>3.31</td>
<td>1240.37</td>
<td>4101.05</td>
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<tr>
<td>5</td>
<td>Providing 1.5 thick brick column with cement mortar in pedestal foundation</td>
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<td>11289.62</td>
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<td>6</td>
<td>Providing and laying D.P.C. 25mm thick with 1:2:4 cement concrete and W.P. powder</td>
<td>sqm</td>
<td>6.01</td>
<td>92.88</td>
<td>558.41</td>
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<td>7</td>
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<td>0.69</td>
<td>3833.46</td>
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<td>8</td>
<td>Earth work in back filling of foundation</td>
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<td>9</td>
<td>Brick work in veranda in normal bond with 1:6 cement dust mortar</td>
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<td>4704.01</td>
<td>3904.45</td>
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<td>10</td>
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<td>750.00</td>
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<td>422.50</td>
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<tr>
<td>12</td>
<td>Brick work in steps with 1:6 cement dust mortar</td>
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<td>1.20</td>
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<td>13</td>
<td>Earthwork in excavation of soak pit and inspection chamber</td>
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<td>2.71</td>
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<td>14</td>
<td>Honeycombed brick work in soak pit and plaster work in inspection chamber</td>
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<td>1001.12</td>
<td>676.95</td>
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<td>Cement concrete floor with brick ballast</td>
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<td>16a</td>
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<td>4227.77</td>
<td>72228.81</td>
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<tr>
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<td>Brick work in normal bond with 1:6 cement dust mortar</td>
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<tr>
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<td>For door</td>
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<tr>
<td>16d</td>
<td>For Windows</td>
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<td>16e</td>
<td>Window</td>
<td>cum</td>
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<tr>
<td>16f</td>
<td>Ventilator</td>
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<td>18</td>
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<td>a</td>
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<td>0.35</td>
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<td>21</td>
<td>Providing and laying RCC lintel band 75mm thick with 1:2:4 cement concrete</td>
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<td>3835.46</td>
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<td>22</td>
<td>Providing ferrocement channel roof of 850mm span</td>
<td>sqm</td>
<td>31.62</td>
<td>1033.87</td>
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<td>23</td>
<td>Providing stone slab in sill and window breaker</td>
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<td>1.09</td>
<td>40.00</td>
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<td>24</td>
<td>Providing Stone slab for loft/ storage</td>
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<td>4.50</td>
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<td>180.00</td>
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<tr>
<td>25</td>
<td>Brick work in parapet in normal bond with 1:6 cement dust mortar</td>
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<td>3786.73</td>
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<tr>
<td>26</td>
<td>Providing P.C.C. Golia complete</td>
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<td>18.58</td>
<td>51.33</td>
<td>953.80</td>
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<td>27</td>
<td>Coping Stone</td>
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<td>2.30</td>
<td>50.00</td>
<td>115.00</td>
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<td><strong>TOTAL</strong></td>
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<td></td>
<td></td>
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<td><strong>PLUMBING AND OTHER FIXTURE FOR TOILET</strong></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>28</td>
<td>Indian sanitary Pan and water seal</td>
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<td>1.00</td>
<td>500.00</td>
<td>500.00</td>
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<tr>
<td>29</td>
<td>PVC pipe 4&quot;</td>
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<td>3.60</td>
<td>120.00</td>
<td>432.00</td>
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<td>PVC treeway tee 3&quot;</td>
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<td>80.00</td>
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<td>31</td>
<td>Plastic water tap</td>
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<td>32</td>
<td>Wash basin</td>
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<td>400.00</td>
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<tr>
<td><strong>TOTAL</strong></td>
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<td></td>
<td></td>
<td></td>
<td>1482.00</td>
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<td><strong>TOTAL COST OF HOUSE (INR)</strong></td>
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<td></td>
<td></td>
<td></td>
<td>164039.63</td>
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<tr>
<td><strong>AREA OF HOUSE (SQM)</strong></td>
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<td></td>
<td></td>
<td></td>
<td>26.10</td>
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<tr>
<td><strong>COST PER SQM (INR)</strong></td>
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<td>6285.04</td>
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</tbody>
</table>
- 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 reinforcement 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

<table>
<thead>
<tr>
<th>Plan Layout</th>
<th>Plinth/Floor</th>
<th>Roof Profile</th>
</tr>
</thead>
<tbody>
<tr>
<td>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.</td>
<td>Low Plinth level recommended</td>
<td>Flat Roof with vernacular practice for roof</td>
</tr>
</tbody>
</table>

### Recommendations for construction systems

<table>
<thead>
<tr>
<th>Components</th>
<th>Recommended Specifications</th>
<th>Specific Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Foundations</td>
<td>Reinforced Stone masonry with cement mortar in a strip foundation.</td>
<td>Optimum use of local material. Mud mortar is replaced by cement mortar for earthquake safety.</td>
</tr>
<tr>
<td>Plinth</td>
<td>Reinforced RCC plinth beam at 450mm height from the ground</td>
<td></td>
</tr>
</tbody>
</table>
| 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. |  |

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. Kanhiyarpur Nagar
14. Badaun
15. Moradabad
16. Jyotiba Phule Nagar

Resources Available:
- Cob/Adobe, Stone, Cob, Fired Clay Stone, Bamboo, Thatch
## Area Statement:

<table>
<thead>
<tr>
<th>Item</th>
<th>Area Sq.m</th>
<th>Area Sq.ft</th>
</tr>
</thead>
<tbody>
<tr>
<td>Room</td>
<td>14.01</td>
<td>150.80</td>
</tr>
<tr>
<td>Kitchen</td>
<td>3.50</td>
<td>37.67</td>
</tr>
<tr>
<td>Toilet</td>
<td>2.73</td>
<td>29.39</td>
</tr>
<tr>
<td>Verandah</td>
<td>4.00</td>
<td>43.06</td>
</tr>
<tr>
<td>Carpet Area</td>
<td>21.00</td>
<td>226.04</td>
</tr>
<tr>
<td>Built up Area</td>
<td>30.00</td>
<td>322.92</td>
</tr>
</tbody>
</table>

**Typical Plan**

- Room: 14.01 Sq.m (150.80 Sq.ft)
- Kitchen: 3.50 Sq.m (37.67 Sq.ft)
- Toilet: 2.73 Sq.m (29.39 Sq.ft)
- Verandah: 4.00 Sq.m (43.06 Sq.ft)
- Carpet Area: 21.00 Sq.m (226.04 Sq.ft)
- Built up Area: 30.00 Sq.m (322.92 Sq.ft)
Area Statement:

<table>
<thead>
<tr>
<th>Item</th>
<th>Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Room</td>
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<tr>
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<td>3.50</td>
</tr>
<tr>
<td>Toilet</td>
<td>2.73</td>
</tr>
<tr>
<td>Verandah</td>
<td>4.00</td>
</tr>
<tr>
<td>Carpet Area</td>
<td>21.00</td>
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<tr>
<td>Built up Area</td>
<td>30.00</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Item</th>
<th>Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Room</td>
<td>150.80</td>
</tr>
<tr>
<td>Kitchen</td>
<td>37.67</td>
</tr>
<tr>
<td>Toilet</td>
<td>29.39</td>
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<tr>
<td>Verandah</td>
<td>43.06</td>
</tr>
<tr>
<td>Carpet Area</td>
<td>226.04</td>
</tr>
<tr>
<td>Built up Area</td>
<td>322.92</td>
</tr>
<tr>
<td>S. No.</td>
<td>FOUNDATION</td>
</tr>
<tr>
<td>--------</td>
<td>------------</td>
</tr>
<tr>
<td>1</td>
<td>Site clearance and layout</td>
</tr>
<tr>
<td>2</td>
<td>Earth work in excavation of foundation, levelling the bottom of the trench etc. complete (600mm wide and 600mm deep)</td>
</tr>
<tr>
<td>3</td>
<td>Providing and laying P.C.C. in foundation 100mm thick with 1:5:10 (12mm nominal size aggregates)</td>
</tr>
<tr>
<td>4</td>
<td>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.</td>
</tr>
<tr>
<td></td>
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</tr>
<tr>
<td>5</td>
<td>Providing and laying D.P.C. 25mm thick with 1:2:4 cement concrete and WPC powder</td>
</tr>
<tr>
<td>6</td>
<td>Providing and laying RCC plinth beam 150mm thick with 1:2:4 cement concrete</td>
</tr>
<tr>
<td>7</td>
<td>Earth work in back filling of foundation</td>
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<table>
<thead>
<tr>
<th>FOUNDATION</th>
<th>SUPER STRUCTURE</th>
<th>UNIT</th>
<th>QUANTITY</th>
<th>RATE (INR)</th>
<th>AMOUNT</th>
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<tbody>
<tr>
<td>8</td>
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<td>0.43</td>
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<td>50.00</td>
<td>750.00</td>
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<tr>
<td>10</td>
<td>Bamboo fencing in veranda (50mm dia)</td>
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<td>16.25</td>
<td>26.00</td>
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<td>11</td>
<td>Brick work in steps with 1:6 cement dust mortar</td>
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<td>0.54</td>
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<td>12</td>
<td>Earthwork in excavation of soak pit and inspection chamber</td>
<td>cum</td>
<td>2.71</td>
<td>128.38</td>
<td>619.35</td>
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<tr>
<td>13</td>
<td>Honeycombed brick work in soak pit and plaster work in inspection chamber</td>
<td>cum</td>
<td>0.68</td>
<td>1001.12</td>
<td>676.95</td>
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<td>14</td>
<td>Cement conc floor with brick ballast</td>
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<td>9806.88</td>
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</tbody>
</table>

| 15a        | Brick work in super structure with hollow interlocking CSEB (300x150x100) in 1:10 cement mud mortar | cum  | 21.06    | 3274.53   | 69873.52 |
| 15b        | For door | cum  | 1.51     | 3274.53   |          |
| 15c        | For Windows/Ventilators | cum  | 1.79     | 3274.53   |          |
| 16         | Window Total Brickwork | cum  | 17.65    | 3274.53   | 57783.52 |
| 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.  | 6.00     | 400.00   | 2400.00 |
| TOTAL      |            |       |          |           | 65973.52  |

<table>
<thead>
<tr>
<th>SUPER STRUCTURE</th>
<th>ROOF</th>
<th>UNIT</th>
<th>QUANTITY</th>
<th>RATE (INR)</th>
<th>AMOUNT</th>
</tr>
</thead>
<tbody>
<tr>
<td>18</td>
<td>Providing stone patti roof over precast concrete beam</td>
<td>sqm</td>
<td>19.44</td>
<td>987.48</td>
<td>19196.57</td>
</tr>
<tr>
<td>19</td>
<td>Brick bats and mud phuska finishing over roof with cement dust mortar</td>
<td>sqm</td>
<td>19.44</td>
<td>623.11</td>
<td>12113.21</td>
</tr>
<tr>
<td>20</td>
<td>Providing stone slab in lintel over doors and windows</td>
<td>sqm</td>
<td>3.75</td>
<td>40.00</td>
<td>150.00</td>
</tr>
<tr>
<td>21</td>
<td>Providing stone slab in sill and window breaker</td>
<td>sqm</td>
<td>1.17</td>
<td>40.00</td>
<td>46.80</td>
</tr>
<tr>
<td>22</td>
<td>Providing Stone slab for loft/ storage</td>
<td>sqm</td>
<td>1.88</td>
<td>40.00</td>
<td>75.00</td>
</tr>
<tr>
<td>23</td>
<td>Brick work in parapet in normal bond with 1:6 cement dust mortar</td>
<td>cum</td>
<td>1.99</td>
<td>4704.01</td>
<td>9347.81</td>
</tr>
<tr>
<td>24</td>
<td>Providing PCC Gola complete</td>
<td>rm</td>
<td>18.00</td>
<td>51.33</td>
<td>924.03</td>
</tr>
<tr>
<td>25</td>
<td>Coping Stone</td>
<td>sqm</td>
<td>2.21</td>
<td>50.00</td>
<td>110.40</td>
</tr>
<tr>
<td>TOTAL</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>41963.81</td>
</tr>
</tbody>
</table>

| 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           |            |       |          |           | 14982.00 |

| TOTAL COST OF HOUSE (INR) | 14982.00 |
| AREA OF HOUSE (SQM) | 25.20 |
| COST PER SQM (INR) | 5983.31 |
• 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 construction. Mud phuska on top prevents the heat transfer through it.

### Recommendations for Built Form

<table>
<thead>
<tr>
<th>Plan Layout</th>
<th>Plinth/Floor</th>
<th>Roof Profile</th>
</tr>
</thead>
<tbody>
<tr>
<td>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</td>
<td>Average plinth height is recommended</td>
<td>Flat roof for closed spaces and sloping roof for semi open spaces.</td>
</tr>
</tbody>
</table>

### Recommendations for construction systems

<table>
<thead>
<tr>
<th>Components</th>
<th>Recommended Specifications</th>
<th>Specific Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Foundations</td>
<td>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.</td>
<td>Reducing the usage of concrete by recommending alternative to RCC framed structure.</td>
</tr>
<tr>
<td>Plinth</td>
<td>500 mm high plinth level is recommended for the house.</td>
<td></td>
</tr>
</tbody>
</table>
| 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.
### Area Statement:

<table>
<thead>
<tr>
<th>Item</th>
<th>Area</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Room</td>
<td>10.45</td>
<td>112.48</td>
</tr>
<tr>
<td>Kitchen</td>
<td>3.88</td>
<td>41.76</td>
</tr>
<tr>
<td>Toilet</td>
<td>2.31</td>
<td>24.86</td>
</tr>
<tr>
<td>Verandah 1</td>
<td>3.45</td>
<td>37.14</td>
</tr>
<tr>
<td>Verandah 2</td>
<td>3.86</td>
<td>41.55</td>
</tr>
<tr>
<td>Carpet Area</td>
<td>17.04</td>
<td>183.42</td>
</tr>
<tr>
<td>Built up Area</td>
<td>29.53</td>
<td>317.86</td>
</tr>
</tbody>
</table>

### Typical Plan

---

**Typical Section AA'**

- Parts Labeled: P1, P2, P3, P4, P5, P6
- Labels: Toilet, Kitchen, Room, Verandah
- Dimensions: 2700X3800, 1800X2100, 2700X1400

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**Typical Section BB'**

- Labels: T-iron Door/Window frames, Precast RCC plank, Precast RCC joint
- Dimensions: 1000X2000, 1500X1000

---

**Typical Plan**

- Labels: Brick/Block Masonary, RC Sill Band, Brick Panel Roof
- Dimensions: 2000X1000, 1000X500
<table>
<thead>
<tr>
<th>S. No.</th>
<th>ITEM</th>
<th>UNIT</th>
<th>QUANTITY</th>
<th>RATE (INR)</th>
<th>AMOUNT</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>FOUNDATION</strong></td>
<td>1</td>
<td>Site clearance and layout</td>
<td>LS</td>
<td>1.00</td>
<td>100.00</td>
</tr>
<tr>
<td>2</td>
<td>Earth work in excavation of foundation, levelling the bottom of the trench etc. (750mm wide and 750mm deep)</td>
<td>cum</td>
<td>15.45</td>
<td>223.30</td>
<td>3449.65</td>
</tr>
<tr>
<td>3</td>
<td>Providing and laying P.C.C. in foundation 100mm thick with 1:5:10 (12mm nominal size aggregates)</td>
<td>cum</td>
<td>1.84</td>
<td>2434.00</td>
<td>4480.51</td>
</tr>
<tr>
<td>4</td>
<td>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.</td>
<td>cum</td>
<td>9.04</td>
<td>1235.22</td>
<td>11161.79</td>
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<tr>
<td>5</td>
<td>Providing 1.5 brick thick column with cement mortar in pedestal foundation</td>
<td>cum</td>
<td>1.80</td>
<td>4662.30</td>
<td>8392.13</td>
</tr>
<tr>
<td>6</td>
<td>Providing and laying D.P.C. 25mm thick with 1:2:4 cement concrete and WPC powder</td>
<td>sqm</td>
<td>6.23</td>
<td>89.15</td>
<td>555.24</td>
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<tr>
<td>7</td>
<td>Earth work in back filling of foundation</td>
<td>cum</td>
<td>12.54</td>
<td>111.65</td>
<td>1400.09</td>
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<tr>
<td><strong>TOTAL</strong></td>
<td></td>
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<td></td>
<td></td>
<td>29539.41</td>
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<tr>
<td><strong>SUB STRUCTURE</strong></td>
<td>8</td>
<td>Brick work in veranda in normal bond with 1.6 cement dust mortar</td>
<td>cum</td>
<td>0.79</td>
<td>4662.30</td>
</tr>
<tr>
<td>9</td>
<td>Brick work in steps with 1.6 cement dust mortar</td>
<td>cum</td>
<td>0.72</td>
<td>4662.30</td>
<td>3356.85</td>
</tr>
<tr>
<td>10</td>
<td>Earthwork in excavation of soil pit and inspection chamber</td>
<td>cum</td>
<td>2.71</td>
<td>223.30</td>
<td>605.59</td>
</tr>
<tr>
<td>11</td>
<td>Honeycombed brick work in soak pit and plaster work in inspection chamber</td>
<td>cum</td>
<td>0.68</td>
<td>1001.71</td>
<td>677.36</td>
</tr>
<tr>
<td>12</td>
<td>Cement concrete floor with brick ballast</td>
<td>sqm</td>
<td>24.90</td>
<td>113.77</td>
<td>2832.89</td>
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<tr>
<td><strong>TOTAL</strong></td>
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<tr>
<td><strong>SUPER STRUCTURE</strong></td>
<td>13a</td>
<td>Brick masonry with Rat trap bond in super structure with cement mortar 1:4</td>
<td>cum</td>
<td>14.21</td>
<td></td>
</tr>
<tr>
<td>13b</td>
<td>Brick work in normal bond with 1.6 cement dust mortar</td>
<td>cum</td>
<td>0.11</td>
<td></td>
<td></td>
</tr>
<tr>
<td>13c</td>
<td>For door</td>
<td>cum</td>
<td>1.67</td>
<td></td>
<td></td>
</tr>
<tr>
<td>13d</td>
<td>For Windows</td>
<td>cum</td>
<td>0.43</td>
<td></td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>Total Brickwork</td>
<td>cum</td>
<td>11.95</td>
<td>4217.98</td>
<td>50389.44</td>
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<tr>
<td>15</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>a</td>
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<td>3.00</td>
<td>950.00</td>
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<tr>
<td>b</td>
<td>Grey window frame</td>
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<td>3.00</td>
<td>400.00</td>
<td>1200.00</td>
</tr>
<tr>
<td>16</td>
<td>Providing and laying RCC lintel band 75mm thick with 1:2:4 cement concrete</td>
<td>cum</td>
<td>0.09</td>
<td>3854.83</td>
<td>333.81</td>
</tr>
<tr>
<td>17</td>
<td>Providing stone slab chhaja over windows</td>
<td>sqm</td>
<td>1.04</td>
<td>860.00</td>
<td>894.40</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>55667.65</td>
</tr>
<tr>
<td><strong>ROOF</strong></td>
<td>18</td>
<td>Providing planks and joist roofing</td>
<td>sqm</td>
<td>19.75</td>
<td>927.89</td>
</tr>
<tr>
<td>19</td>
<td>Brick bats and mud phuska finishing over roof with cement dust mortar</td>
<td>sqm</td>
<td>19.75</td>
<td>625.80</td>
<td>12359.50</td>
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<tr>
<td>20</td>
<td>Providing MCR tile roof with bamboo framework</td>
<td>sqm</td>
<td>19.24</td>
<td>876.68</td>
<td>16887.32</td>
</tr>
<tr>
<td>21</td>
<td>Providing Stone slab for loft/ storage</td>
<td>sqm</td>
<td>1.90</td>
<td>860.00</td>
<td>1634.00</td>
</tr>
<tr>
<td>22</td>
<td>Brick work in parapet in normal bond with 1.6 cement dust mortar</td>
<td>cum</td>
<td>1.43</td>
<td>4662.30</td>
<td>6669.34</td>
</tr>
<tr>
<td>23</td>
<td>Providing PCC Gola complete</td>
<td>rm</td>
<td>17.77</td>
<td>51.36</td>
<td>912.62</td>
</tr>
<tr>
<td>24</td>
<td>Coping Stone</td>
<td>sqm</td>
<td>2.04</td>
<td>53.20</td>
<td>106.72</td>
</tr>
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<td><strong>TOTAL</strong></td>
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<td></td>
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<td>56877.28</td>
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<tr>
<td><strong>PLUMBING AND OTHER FIXTURE FOR TOILET</strong></td>
<td>25</td>
<td>Indian sanitary Pan and water seal</td>
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<td>500.00</td>
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<tr>
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<td>80.00</td>
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<td>70.00</td>
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<td>400.00</td>
<td>400.00</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1482.00</td>
</tr>
<tr>
<td><strong>TOTAL COST OF HOUSE (INR)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>154721.90</td>
</tr>
<tr>
<td><strong>AREA of HOUSE (SQM)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>15.30</td>
</tr>
<tr>
<td><strong>COST PER SQM (INR)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>5486.95</td>
</tr>
</tbody>
</table>
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

- 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.

<table>
<thead>
<tr>
<th>Recommendations for Built Form</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Plan Layout</strong></td>
</tr>
<tr>
<td>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</td>
</tr>
<tr>
<td><strong>Plinth/Floor</strong></td>
</tr>
<tr>
<td>High plinth height is recommended</td>
</tr>
<tr>
<td><strong>Roof Profile</strong></td>
</tr>
<tr>
<td>Light weight sloping roof is recommended</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Recommendations for construction systems</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Components</strong></td>
</tr>
<tr>
<td>Foundations</td>
</tr>
<tr>
<td>Plinth</td>
</tr>
<tr>
<td>Wall</td>
</tr>
<tr>
<td>Wall Finish</td>
</tr>
<tr>
<td>Roof Structure</td>
</tr>
<tr>
<td>Roof Cover</td>
</tr>
<tr>
<td>Floor</td>
</tr>
</tbody>
</table>
### TYPICAL PLAN

#### Room
- Area: 10.26 Sq.m
- Sq.ft: 110.44

#### Kitchen
- Area: 3.78 Sq.m
- Sq.ft: 40.69

#### Toilet
- Area: 2.16 Sq.m
- Sq.ft: 23.25

#### Verandah 1
- Area: 3.45 Sq.m
- Sq.ft: 37.14

#### Verandah 2
- Area: 3.86 Sq.m
- Sq.ft: 41.55

#### Carpet Area
- Area: 16.74 Sq.m
- Sq.ft: 180.19

#### Built up Area
- Area: 29.53 Sq.m
- Sq.ft: 317.86

### AREA STATEMENT:

<table>
<thead>
<tr>
<th>Item</th>
<th>Sq.m</th>
<th>Sq.ft</th>
</tr>
</thead>
<tbody>
<tr>
<td>Room</td>
<td>10.26</td>
<td>110.44</td>
</tr>
<tr>
<td>Kitchen</td>
<td>3.78</td>
<td>40.69</td>
</tr>
<tr>
<td>Toilet</td>
<td>2.16</td>
<td>23.25</td>
</tr>
<tr>
<td>Verandah 1</td>
<td>3.45</td>
<td>37.14</td>
</tr>
<tr>
<td>Verandah 2</td>
<td>3.86</td>
<td>41.55</td>
</tr>
<tr>
<td>Carpet Area</td>
<td>16.74</td>
<td>180.19</td>
</tr>
<tr>
<td>Built up Area</td>
<td>29.53</td>
<td>317.86</td>
</tr>
</tbody>
</table>
Alternative roofing
<table>
<thead>
<tr>
<th>S. No.</th>
<th>ITEM</th>
<th>UNIT</th>
<th>QUANTITY</th>
<th>RATE (INR)</th>
<th>AMOUNT</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Site clearance and layout</td>
<td>LS</td>
<td>1.00</td>
<td>100.00</td>
<td>100.00</td>
</tr>
<tr>
<td>2</td>
<td>Earth work in excavation of foundation, levelling the bottom of the trench etc. complete (600mm wide and 600mm deep)</td>
<td>cum</td>
<td>10.31</td>
<td>228.38</td>
<td>2354.55</td>
</tr>
<tr>
<td>3</td>
<td>Providing and laying P.C.C. in foundation 100mm thick with 1:5:10 (12mm nominal size aggregates)</td>
<td>cum</td>
<td>1.57</td>
<td>2567.02</td>
<td>4030.22</td>
</tr>
<tr>
<td>4</td>
<td>Providing brick masonry pedestal foundation and footing with cement mortar up to plinth level, including mixing of mortar with appropriate qty. of water etc.</td>
<td>cum</td>
<td>6.94</td>
<td>4172.96</td>
<td>28960.36</td>
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<tr>
<td>5</td>
<td>Providing 400 mm thick brick column with cement mortar in pedestal foundation</td>
<td>cum</td>
<td>1.80</td>
<td>4172.96</td>
<td>7511.33</td>
</tr>
<tr>
<td>6</td>
<td>Providing and laying D.P.C. 25mm thick with 1:2:4 cement concrete and WPC powder.</td>
<td>sqm</td>
<td>6.23</td>
<td>102.77</td>
<td>640.08</td>
</tr>
<tr>
<td>7a</td>
<td>Providing and laying RCC plinth beam 150mm thick with 1:2:4 cement concrete</td>
<td>rm</td>
<td>108.32</td>
<td>10.00</td>
<td>1083.20</td>
</tr>
<tr>
<td>7b</td>
<td>Bamboo split reinforcement in plinth beam</td>
<td>cum</td>
<td>12.54</td>
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<tr>
<td></td>
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<td>49256.56</td>
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<tr>
<td>9</td>
<td>Brick work in veranda in normal bond with 1:6 cement dust mortar</td>
<td>cum</td>
<td>0.79</td>
<td>4365.55</td>
<td>3457.84</td>
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<tr>
<td>10</td>
<td>Brick work in steps with 1:6 cement dust mortar</td>
<td>cum</td>
<td>0.72</td>
<td>4365.55</td>
<td>3143.20</td>
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<tr>
<td>11</td>
<td>Earthwork in excavation of soak pit and inspection chamber</td>
<td>cum</td>
<td>2.71</td>
<td>228.38</td>
<td>619.35</td>
</tr>
<tr>
<td>12</td>
<td>Honeycombed brick work in soak pit and plaster work in inspection chamber</td>
<td>cum</td>
<td>0.68</td>
<td>1006.76</td>
<td>680.77</td>
</tr>
<tr>
<td>13</td>
<td>Cement conc floor with brick ballast</td>
<td>sqm</td>
<td>24.20</td>
<td>117.56</td>
<td>2844.98</td>
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<td>10746.15</td>
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<td></td>
<td></td>
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<tr>
<td>14a</td>
<td>Brick masonry with Rat trap bond in super structure with cement mortar 1:4</td>
<td>cum</td>
<td>13.44</td>
<td>4172.96</td>
<td>56084.62</td>
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<tr>
<td>14b</td>
<td>Brick work in normal bond with 1:6 cement dust mortar</td>
<td>cum</td>
<td>3.27</td>
<td>4365.55</td>
<td>14275.36</td>
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<tr>
<td></td>
<td>Deductions:</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>14c</td>
<td>For door</td>
<td>cum</td>
<td>1.78</td>
<td>4172.96</td>
<td>7473.35</td>
</tr>
<tr>
<td>14d</td>
<td>For Windows</td>
<td>cum</td>
<td>0.80</td>
<td>4172.96</td>
<td>3350.98</td>
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<tr>
<td></td>
<td>Total Brickwork</td>
<td>cum</td>
<td>14.12</td>
<td>4172.96</td>
<td>59571.65</td>
</tr>
<tr>
<td>15</td>
<td>Corner vertical 8mm MS bar reinforcement for seismic zone</td>
<td>kg</td>
<td>22.00</td>
<td>50.00</td>
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<tr>
<td>16</td>
<td>Providing and fixing R.C.C. door/window frames complete</td>
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</tr>
<tr>
<td>16a</td>
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<td>2850.00</td>
</tr>
<tr>
<td>16b</td>
<td>Grey window frame</td>
<td>no.</td>
<td>3.00</td>
<td>400.00</td>
<td>1200.00</td>
</tr>
<tr>
<td></td>
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<td>70319.30</td>
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<td></td>
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</tr>
<tr>
<td>17</td>
<td>Providing and laying RCC sill band 75mm thick with 1:2:4 cement concrete</td>
<td>cum</td>
<td>0.40</td>
<td>4110.99</td>
<td>1645.69</td>
</tr>
<tr>
<td>18</td>
<td>Providing and laying RCC lintel band 75mm thick with 1:2:4 cement concrete</td>
<td>cum</td>
<td>0.47</td>
<td>4110.99</td>
<td>1920.37</td>
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<tr>
<td>19</td>
<td>Bamboo split reinforcement in sill and lintel band</td>
<td>rm</td>
<td>201.88</td>
<td>10.00</td>
<td>2018.80</td>
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<tr>
<td></td>
<td>TOTAL</td>
<td>25504.40</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>TOTAL</td>
<td>157308.40</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**TOTAL COST OF HOUSE (INR):**

- **FOUNDATION:** 49256.56
- **SUB STRUCTURE:** 10746.15
- **SUPER STRUCTURE:** 70319.30
- **ROOF:** 25504.40
- **PLUMBING AND OTHER FIXTURE FOR TOILET:** 1482.00

**UP-04 Cost estimate**

<table>
<thead>
<tr>
<th>Item</th>
<th>Cost (INR)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Foundation</td>
<td>49,257/-</td>
</tr>
<tr>
<td>Sub Structure and Super Structure</td>
<td>81,065/-</td>
</tr>
<tr>
<td>Roof</td>
<td>25,504/-</td>
</tr>
<tr>
<td>Plumbing &amp; other fixtures</td>
<td>1482/-</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>157,308/-</strong></td>
</tr>
</tbody>
</table>

**Cost breakdown:**

- Foundation: 49,257/-
- Sub Structure and Super Structure: 81,065/-
- Roof: 25,504/-
- Plumbing & other fixtures: 1482/-

**Total: 157,308/-**
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.

- 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

<table>
<thead>
<tr>
<th>Plan Layout</th>
<th>Plinth/Floor</th>
<th>Roof Profile</th>
</tr>
</thead>
<tbody>
<tr>
<td>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.</td>
<td>High plinth height is recommended</td>
<td>Combination of flat roof and sloping roof.</td>
</tr>
</tbody>
</table>

### Recommendations for construction systems

<table>
<thead>
<tr>
<th>Components</th>
<th>Recommended Specifications</th>
<th>Specific Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Foundations</td>
<td>• Brick strip footing with cement mortar till plinth level.</td>
<td>• Reducing the usage of concrete by recommending alternative to RCC framed structure.</td>
</tr>
<tr>
<td>Plinth</td>
<td>• 650 mm high plinth level is recommended for the house.</td>
<td></td>
</tr>
</tbody>
</table>
| 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.                    |                                                            |
Area Statement:

<table>
<thead>
<tr>
<th>Item</th>
<th>Area Sq.m</th>
<th>Area Sq.ft</th>
</tr>
</thead>
<tbody>
<tr>
<td>Room</td>
<td>10.26</td>
<td>110.44</td>
</tr>
<tr>
<td>Kitchen</td>
<td>3.94</td>
<td>42.41</td>
</tr>
<tr>
<td>Toilet</td>
<td>2.09</td>
<td>22.50</td>
</tr>
<tr>
<td>Verandah 1</td>
<td>3.57</td>
<td>38.43</td>
</tr>
<tr>
<td>Verandah 2</td>
<td>3.24</td>
<td>34.88</td>
</tr>
<tr>
<td>Carpet Area</td>
<td>16.88</td>
<td>181.70</td>
</tr>
<tr>
<td>Built up Area</td>
<td>28.43</td>
<td>306.02</td>
</tr>
</tbody>
</table>

Precast brick arch panel roof with mud phuska on top

Precast joist with cross section 125x150mm
Loft

230 thk Adobe masonry wall will ferrocement plaster/alternatively flyash/claybrick masonry wall
<table>
<thead>
<tr>
<th>S. No.</th>
<th>ITEM</th>
<th>UNIT</th>
<th>QUANTITY</th>
<th>RATE (INR)</th>
<th>AMOUNT</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>FOUNDATION</strong></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>1</td>
<td>Site clearance and layout</td>
<td>LS</td>
<td>1.00</td>
<td>100.00</td>
<td>100.00</td>
</tr>
<tr>
<td>2</td>
<td>Earth work in excavation of foundation, levelling the bottom of the</td>
<td>cum</td>
<td>15.34</td>
<td>203.00</td>
<td>3113.21</td>
</tr>
<tr>
<td></td>
<td>trench etc. complete (750mm wide and 750mm deep)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Providing and laying P.C.C. in foundation 100mm thick with 1:5:10</td>
<td>cum</td>
<td>1.83</td>
<td>2343.00</td>
<td>4284.88</td>
</tr>
<tr>
<td></td>
<td>(12mm nominal size aggregates)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Providing Random Rubble Masonry with cement mortar in foundation up</td>
<td>cum</td>
<td>15.05</td>
<td>1194.84</td>
<td>17982.35</td>
</tr>
<tr>
<td></td>
<td>to plinth level, including setting of block, mixing of mud with</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>appropriate qty. of water etc.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Providing and laying D.P.C. 25mm thick with 1:2:4 cement concrete</td>
<td>sqm</td>
<td>6.18</td>
<td>98.21</td>
<td>607.18</td>
</tr>
<tr>
<td></td>
<td>and WPC powder.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Earth work in back filling of foundation</td>
<td></td>
<td>20.46</td>
<td>101.50</td>
<td>2076.09</td>
</tr>
<tr>
<td></td>
<td><strong>TOTAL</strong></td>
<td></td>
<td></td>
<td></td>
<td>28164.31</td>
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<td><strong>SUB STRUCTURE</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Brick work in veranda in normal bond with 1:6 cement dust mortar</td>
<td>cum</td>
<td>1.01</td>
<td>4615.12</td>
<td>4644.82</td>
</tr>
<tr>
<td>8</td>
<td>Brick work in steps with 1:6 cement dust mortar</td>
<td>cum</td>
<td>0.72</td>
<td>4615.12</td>
<td>3322.89</td>
</tr>
<tr>
<td>9</td>
<td>Earthwork in excavation of soak pit and inspection chamber</td>
<td>cum</td>
<td>2.71</td>
<td>203.00</td>
<td>550.54</td>
</tr>
<tr>
<td>10</td>
<td>Honeycombed brick work in soak pit and plaster work in inspection</td>
<td>cum</td>
<td>0.68</td>
<td>969.99</td>
<td>655.91</td>
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<tr>
<td></td>
<td>chamber</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Cement conc floor with brick ballast</td>
<td>sqm</td>
<td>24.90</td>
<td>108.04</td>
<td>2690.30</td>
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<tr>
<td></td>
<td><strong>TOTAL</strong></td>
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<td></td>
<td></td>
<td>11864.44</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12a</td>
<td>Terracotta tile face mud block wall with cement mortar pointing in</td>
<td>cum</td>
<td>9.01</td>
<td>4615.12</td>
<td>4644.82</td>
</tr>
<tr>
<td></td>
<td>1:3 and mud mortar as binding material</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12b</td>
<td>For door</td>
<td>cum</td>
<td>0.95</td>
<td>4615.12</td>
<td>4361.87</td>
</tr>
<tr>
<td>12c</td>
<td>For Windows</td>
<td>cum</td>
<td>0.70</td>
<td>4615.12</td>
<td>3230.27</td>
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<tr>
<td>13</td>
<td>Total Brickwork</td>
<td>cum</td>
<td>7.36</td>
<td>2087.86</td>
<td>15364.45</td>
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<td>14</td>
<td>Providing and fixing R.C.C. door/window frames complete</td>
<td>cum</td>
<td>7.20</td>
<td>4615.12</td>
<td>33228.87</td>
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<tr>
<td>14a</td>
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<td>950.00</td>
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<tr>
<td>14b</td>
<td>Grey window frame</td>
<td>no.</td>
<td>3.00</td>
<td>400.00</td>
<td>1200.00</td>
</tr>
<tr>
<td>15</td>
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<td>cum</td>
<td>0.21</td>
<td>2343.00</td>
<td>483.38</td>
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<tr>
<td></td>
<td>concrete</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>Providing 500 mm projected RCC chhajja over windows</td>
<td>sqm</td>
<td>0.10</td>
<td>86.00</td>
<td>86.00</td>
</tr>
<tr>
<td></td>
<td><strong>TOTAL</strong></td>
<td></td>
<td></td>
<td></td>
<td>53212.71</td>
</tr>
<tr>
<td></td>
<td><strong>ROOF</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>Brick tile arch panel roof</td>
<td>sqm</td>
<td>24.8</td>
<td>1292.56</td>
<td>32055.52</td>
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<tr>
<td>18</td>
<td>Brick bats and mud phuska finishing over roof with cement dust</td>
<td>sqm</td>
<td>24.8</td>
<td>617.55</td>
<td>15315.13</td>
</tr>
<tr>
<td></td>
<td>mortar</td>
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<td></td>
<td></td>
<td></td>
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<tr>
<td>19</td>
<td>Providing MCR tile roof with bamboo framework</td>
<td>sqm</td>
<td>9.10</td>
<td>874.50</td>
<td>7957.91</td>
</tr>
<tr>
<td>20</td>
<td>Providing RCC slab for loft/ storage</td>
<td>sqm</td>
<td>1.90</td>
<td>860.00</td>
<td>1634.00</td>
</tr>
<tr>
<td>21</td>
<td>Brick work in parapet in normal bond with 1:6 cement dust mortar</td>
<td>cum</td>
<td>1.43</td>
<td>4615.12</td>
<td>6601.86</td>
</tr>
<tr>
<td>22</td>
<td>Providing RCC Gola complete</td>
<td>rm</td>
<td>17.77</td>
<td>48.50</td>
<td>861.84</td>
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<tr>
<td>23</td>
<td>Coping Stone</td>
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<td>52.00</td>
<td>106.26</td>
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<tr>
<td></td>
<td><strong>TOTAL</strong></td>
<td></td>
<td></td>
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<td>64532.54</td>
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<tr>
<td></td>
<td><strong>PLUMBING AND OTHER FIXTURE FOR TOILET</strong></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>24</td>
<td>Indian sanitary Pan and water seal</td>
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<td>1.00</td>
<td>500.00</td>
<td>500.00</td>
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<tr>
<td>25</td>
<td>PVC pipe 4&quot;</td>
<td>rm</td>
<td>3.60</td>
<td>120.00</td>
<td>432.00</td>
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<tr>
<td>26</td>
<td>PVC treeway tee 3&quot;</td>
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<td>80.00</td>
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<tr>
<td>27</td>
<td>Plastic water tap</td>
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<td>70.00</td>
<td>70.00</td>
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<td>28</td>
<td>Wash basin</td>
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<td>400.00</td>
</tr>
<tr>
<td></td>
<td><strong>TOTAL</strong></td>
<td></td>
<td></td>
<td></td>
<td>1482.00</td>
</tr>
<tr>
<td></td>
<td><strong>TOTAL COST OF HOUSE (INR)</strong></td>
<td></td>
<td></td>
<td></td>
<td>159256.00</td>
</tr>
<tr>
<td></td>
<td><strong>AREA of HOUSE (SQM)</strong></td>
<td></td>
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<td></td>
<td>159256.00</td>
</tr>
<tr>
<td></td>
<td><strong>COST PER SQM (INR)</strong></td>
<td></td>
<td></td>
<td></td>
<td>5647.38</td>
</tr>
</tbody>
</table>
Geographical conditions and occupation of people is the primary focus from which prototype for Zone 6 is derived. Benefitting 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

<table>
<thead>
<tr>
<th>Plan Layout</th>
<th>Plinth/Floor</th>
<th>Roof Profile</th>
</tr>
</thead>
<tbody>
<tr>
<td>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.</td>
<td>High plinth height is recommended</td>
<td>Flat roof with use of local material for roof.</td>
</tr>
</tbody>
</table>

### Recommendations for construction systems

<table>
<thead>
<tr>
<th>Components</th>
<th>Recommended Specifications</th>
<th>Specific Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Foundations</td>
<td>• Reinforced brick strip footing suggested. Non-erodible plaster finish of wall till plinth level of 60 m is suggested.</td>
<td>• Zone is under flood hazard prone area, therefore high plinth level recommended.</td>
</tr>
<tr>
<td>Plinth</td>
<td>• Seismic bands of cement concrete with bamboo reinforcement are suggested at plinth, sill and lintel level.</td>
<td></td>
</tr>
<tr>
<td>Wall</td>
<td>• Rat trap bonded brick wall with corner reinforcements is suggested for the seismic zone III of awadh region.</td>
<td>• Premium quality of soil is available, thus good strength of bricks available.</td>
</tr>
<tr>
<td>Wall Finish</td>
<td>• No wall finish required</td>
<td></td>
</tr>
<tr>
<td>Roof Structure</td>
<td>• RC plank &amp; joist</td>
<td></td>
</tr>
<tr>
<td>Roof Cover</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Floor</td>
<td>• Plain Cement flooring finish over bricks.</td>
<td></td>
</tr>
</tbody>
</table>

**Resources Available**
- Use of wood and mud for roofing.
- Mud
Area Statement:

<table>
<thead>
<tr>
<th>Item</th>
<th>Area</th>
<th>Sq.m</th>
<th>Sq.ft</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bed Room</td>
<td>14.21</td>
<td>152.96</td>
<td></td>
</tr>
<tr>
<td>Kitchen / Dining</td>
<td>3.34</td>
<td>35.95</td>
<td></td>
</tr>
<tr>
<td>Toilet cum Bath</td>
<td>2.60</td>
<td>28.00</td>
<td></td>
</tr>
<tr>
<td>Verandah</td>
<td>7.00</td>
<td>75.35</td>
<td></td>
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<tr>
<td>Carpet Area</td>
<td>21.00</td>
<td>226.04</td>
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</tr>
<tr>
<td>Built up Area</td>
<td>33.00</td>
<td>355.21</td>
<td></td>
</tr>
<tr>
<td>Built up Area</td>
<td>28.43</td>
<td>306.02</td>
<td></td>
</tr>
</tbody>
</table>

TYPICAL PLAN

- Bed room 3200 X 4440
- Toilet cum Bath 1300 X 2000
- Kitchen / Dining 1670 X 2000
- Cupboard and loft above

TYPICAL SECTION AA'

- 10 mm dia Steel bar
- 1800 X 300 X 65 mm RC Planks
- Purlin
- Ventilator
- 3400 X 150 X 150 mm RC Joists
- 1500 X 300 X 60 mm RC Planks

Material Specifications:

- 230 mm Thick Brick work in rattrap bond
- Steel/ timber frame windows with steel grill
- 75mm RC Plinth band
- 75mm RC sill band
- 75mm RC roof band
- Cement concrete flooring
- Compacted earth filling
- Select foundation as per soil and then consider

- Mud phuska / brick coba
- 10 mm dia Steel bar
- Purlin
- 75mm RC roof band
- 75mm RC sill band
- 75mm RC Plinth band
- Compacted earth filling

Construction Details:

- 230 mm Thick Brick work in rattrap bond
- Steel/ timber frame windows with steel grill
- 1500 X 300 X 60 mm RC Planks
- 1800 X 300 X 65 mm RC Planks
- 75mm RC roof band
- 10 mm dia Steel bar
- Purlin
- 75mm RC Plinth band
- Compacted earth filling
- Select foundation as per soil and then consider

- Mud phuska / brick coba
- 10 mm dia Steel bar
- Purlin
- 75mm RC roof band
- 75mm RC sill band
- 75mm RC Plinth band
- Compacted earth filling
- Select foundation as per soil and then consider
### UP-06

#### Cost estimate

<table>
<thead>
<tr>
<th>Item</th>
<th>Cost (INR)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Foundation</td>
<td>₹ 50,066.70</td>
</tr>
<tr>
<td>Substructure &amp; Superstructure</td>
<td>₹ 87,156.85</td>
</tr>
<tr>
<td>Roof</td>
<td>₹ 43,293.80</td>
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<tr>
<td><strong>Total</strong></td>
<td><strong>₹ 180,517.35</strong></td>
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</table>

#### Cost breakup

<table>
<thead>
<tr>
<th>S. No.</th>
<th>ITEM</th>
<th>UNIT</th>
<th>QUANTITY</th>
<th>RATE (INR)</th>
<th>AMOUNT</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Site clearance and layout</td>
<td>LS</td>
<td>1.00</td>
<td>100.00</td>
<td>100.00</td>
</tr>
<tr>
<td>2</td>
<td>Earth work in excavation of foundation, levelling the bottom of the trench etc. complete (600mm wide and 600mm deep)</td>
<td>cum</td>
<td>10.31</td>
<td>228.38</td>
<td>2354.55</td>
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<tr>
<td>3</td>
<td>Providing and laying P.C.C. in foundation 100mm thick with 1:5:10 (12mm nominal size aggregates)</td>
<td>cum</td>
<td>1.57</td>
<td>2687.00</td>
<td>4218.59</td>
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<tr>
<td>4</td>
<td>Providing brick masonry pedestal foundation and footing with cement mortar up to plinth level, including mixing of mortar with appropriate qty. of water etc</td>
<td>cum</td>
<td>6.94</td>
<td>4100.00</td>
<td>28454.00</td>
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<tr>
<td>5</td>
<td>Providing 1.5 thick brick column with cement mortar in pedestal Foundation</td>
<td>cum</td>
<td>1.68</td>
<td>4758.66</td>
<td>7994.54</td>
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<tr>
<td>6</td>
<td>Providing and laying D.P.C. 25mm thick with 1:2:4 cement concrete and WPC powder.</td>
<td>cm</td>
<td>5.78</td>
<td>102.46</td>
<td>591.97</td>
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<tr>
<td>7a</td>
<td>Providing and laying RCC plinth beam 150mm thick with 1:2:4 cement concrete</td>
<td>cm</td>
<td>0.87</td>
<td>4110.99</td>
<td>3562.75</td>
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<tr>
<td>7b</td>
<td>Bamboo split reinforcement in plinth beam</td>
<td>rm</td>
<td>100.48</td>
<td>10.00</td>
<td>1004.80</td>
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<tr>
<td>8</td>
<td>Earth work in back filling of foundation</td>
<td>cum</td>
<td>15.64</td>
<td>114.19</td>
<td>1785.50</td>
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<td><strong>TOTAL</strong></td>
<td></td>
<td></td>
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<td></td>
<td><strong>50066.70</strong></td>
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<table>
<thead>
<tr>
<th>S. No.</th>
<th>ITEM</th>
<th>UNIT</th>
<th>QUANTITY</th>
<th>RATE (INR)</th>
<th>AMOUNT</th>
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</thead>
<tbody>
<tr>
<td>9</td>
<td>Brick work in veranda in normal bond with 1:6 cement dust mortar</td>
<td>cum</td>
<td>0.83</td>
<td>5347.04</td>
<td>4438.18</td>
</tr>
<tr>
<td>10</td>
<td>Bamboo fencing in veranda (100mm dia)</td>
<td>Rm</td>
<td>15.00</td>
<td>50.00</td>
<td>750.00</td>
</tr>
<tr>
<td>11</td>
<td>Bamboo fencing in veranda (50mm dia)</td>
<td>Rm</td>
<td>16.25</td>
<td>26.00</td>
<td>422.50</td>
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<tr>
<td>12</td>
<td>Brick work in steps with 1:6 cement dust mortar</td>
<td>cm</td>
<td>0.54</td>
<td>5347.04</td>
<td>2887.40</td>
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<tr>
<td>13</td>
<td>Earthwork in excavation of soak pit and inspection chamber</td>
<td>cum</td>
<td>2.71</td>
<td>228.38</td>
<td>619.35</td>
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<tr>
<td>14</td>
<td>Honeycombed brick work in soak pit and plaster work in inspection chamber</td>
<td>cum</td>
<td>0.68</td>
<td>1000.99</td>
<td>676.87</td>
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<tr>
<td>15</td>
<td>Cement concrete floor with brick ballast</td>
<td>sqm</td>
<td>24.20</td>
<td>111.88</td>
<td>2707.39</td>
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<tr>
<td><strong>TOTAL</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td><strong>12501.69</strong></td>
</tr>
</tbody>
</table>
### 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 kg. 22.00 4.80 105.58 |
| **17** Corner vertical 8mm MS bar reinforcement for seismic zone |  
| **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 kg. 4110.99 1786.34 |
| **20** Providing and laying RCC lintel band 75mm thick with 1:2:4 cement concrete | cum 0.43 kg. 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 kg. 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 |
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 Dooras. The people native to this region are the Lepcha, Bhutias, Rai etc. basic plan comprises of a verandah in 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 department.
Protection against wildlife was extremely important. This caused the protection from wildlife creating stilt structures.

The sizes of houses varied with different configuration of verandahs, interior rooms & position of staircase. The Terai region is fairly tucked away in the dooars & are accessible through hill roads. although commuting with roads is maintained, it is still relatively remote. Rich in natural resources.
# West Bengal Housing Typologies at a Glance

<table>
<thead>
<tr>
<th>Typology</th>
<th>Applicable Housing Zones</th>
<th>Total Area Sq.m/Sq.ft</th>
</tr>
</thead>
<tbody>
<tr>
<td>WB-01A</td>
<td>Zone A</td>
<td>30.61/329.49</td>
</tr>
<tr>
<td>WB-01B</td>
<td>Zone A</td>
<td>51.03/549.29</td>
</tr>
<tr>
<td>WB-01C</td>
<td>Zone A</td>
<td>26.86/289.12</td>
</tr>
<tr>
<td>WB-02A</td>
<td>Zone B</td>
<td>37.00/398.27</td>
</tr>
<tr>
<td>WB-02B</td>
<td>Zone B</td>
<td>51.03/549.29</td>
</tr>
<tr>
<td>WB-03A</td>
<td>Zone C</td>
<td>26.65/286.86</td>
</tr>
<tr>
<td>WB-03B</td>
<td>Zone C</td>
<td>25/267</td>
</tr>
<tr>
<td>WB-04A</td>
<td>Zone D</td>
<td>26.00/279.86</td>
</tr>
<tr>
<td>WB-04B</td>
<td>Zone D</td>
<td>25.18/271.04</td>
</tr>
<tr>
<td>WB-04C</td>
<td>Zone D</td>
<td>40.30/433.79</td>
</tr>
</tbody>
</table>
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

Resources Available
- Locally available Mud
- Stone
- Thatch Roof

- 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.

<table>
<thead>
<tr>
<th>Recommendations for Built Form</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Plan Layout</strong></td>
</tr>
<tr>
<td>This plan type includes a single room with a two way pitch roof extended over the open verandah in the front</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Recommendations for construction systems</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Components</strong></td>
</tr>
<tr>
<td>Foundations</td>
</tr>
<tr>
<td>Plinth</td>
</tr>
<tr>
<td>Wall</td>
</tr>
<tr>
<td>Wall Finish</td>
</tr>
</tbody>
</table>
| 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 |  |
The document contains a typical section and plan for a building. The section AA' shows the structural elements such as brick columns with 12 mm dia bar at center, and the plan shows the layout of rooms with dimensions for each. The area statement provided in the table includes:

- **Room 1**: 9.24 Sq.m (99.46 Sq.ft)
- **Room 2**: 9.24 Sq.m (99.46 Sq.ft)
- **Attic**: 18.48 Sq.m (198.92 Sq.ft)
- **Carpet Area**: 38.16 Sq.m (410.75 Sq.ft)
- **Built up Area**: 30.61 Sq.m (329.49 Sq.ft)

These areas are calculated based on the given dimensions and structural components.
**Cost breakup**

<table>
<thead>
<tr>
<th>Item</th>
<th>Cost (INR)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Foundation</td>
<td>28880.00</td>
</tr>
<tr>
<td>Wall</td>
<td>95220.00</td>
</tr>
<tr>
<td>Mezzanine &amp; Roof</td>
<td>79688.00</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>203788.00</strong></td>
</tr>
</tbody>
</table>

---

**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 | | | | 3000.00 |
| **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 |
| **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**

<table>
<thead>
<tr>
<th>Plan Layout</th>
<th>Plinth/Floor</th>
<th>Roof Profile</th>
</tr>
</thead>
<tbody>
<tr>
<td>This plan type includes a single room with a two way pitch roof extended over the open verandah in the front</td>
<td>Normal plinth design.</td>
<td>Sloped roof.</td>
</tr>
</tbody>
</table>

**Recommendations for construction systems**

<table>
<thead>
<tr>
<th>Components</th>
<th>Recommended Specifications</th>
<th>Specific Comments</th>
</tr>
</thead>
</table>
| 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 |  |
## Area Statement:

<table>
<thead>
<tr>
<th>Item</th>
<th>Area</th>
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</thead>
<tbody>
<tr>
<td>Sq.m</td>
<td>Sq.ft</td>
</tr>
<tr>
<td>Room 1</td>
<td>9.24</td>
</tr>
<tr>
<td>Room 2</td>
<td>9.24</td>
</tr>
<tr>
<td>Attic</td>
<td>18.48</td>
</tr>
<tr>
<td>Verandah</td>
<td>16.67</td>
</tr>
<tr>
<td>Carpet Area</td>
<td>38.16</td>
</tr>
<tr>
<td>Built up Area</td>
<td>51.03</td>
</tr>
</tbody>
</table>

### Typical Section AA'

![Typical Section AA']

### Typical Plan

![Typical Plan]
<table>
<thead>
<tr>
<th>SR. NO.</th>
<th>ITEM OF WORK</th>
<th>Quantity</th>
<th>Unit</th>
<th>Rate per unit (Rs)</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>FOUNDATION</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>DPC</td>
<td>0.96</td>
<td>per cum</td>
<td>8000.00</td>
<td>1000.00</td>
</tr>
<tr>
<td></td>
<td>Brick</td>
<td>9980.00</td>
<td>per brick</td>
<td>7.00</td>
<td>69860.00</td>
</tr>
<tr>
<td></td>
<td>RCC plinth beam</td>
<td>0.11</td>
<td>per cum</td>
<td>8000.00</td>
<td>880.00</td>
</tr>
<tr>
<td></td>
<td>Labor</td>
<td></td>
<td></td>
<td></td>
<td>5000.00</td>
</tr>
<tr>
<td></td>
<td><strong>TOTAL</strong></td>
<td></td>
<td></td>
<td></td>
<td><strong>76740.00</strong></td>
</tr>
<tr>
<td>2</td>
<td>WALLS</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>RBC columns with rebar</td>
<td>16.00</td>
<td>per unit</td>
<td>750.00</td>
<td>12000.00</td>
</tr>
<tr>
<td></td>
<td>Cob wall verandah</td>
<td>15.65</td>
<td>per cum</td>
<td>200.00</td>
<td>3130.00</td>
</tr>
<tr>
<td></td>
<td>Cob wall above cill level</td>
<td>25.50</td>
<td>per cum</td>
<td>200.00</td>
<td>5100.00</td>
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<tr>
<td></td>
<td>Brick masonry below cill level</td>
<td>20.00</td>
<td>per cum</td>
<td>200.00</td>
<td>4000.00</td>
</tr>
<tr>
<td></td>
<td>Doors</td>
<td>4.00</td>
<td>per pc</td>
<td>900.00</td>
<td>3600.00</td>
</tr>
<tr>
<td></td>
<td>Windows</td>
<td>5.00</td>
<td>per pc</td>
<td>500.00</td>
<td>2500.00</td>
</tr>
<tr>
<td></td>
<td>Labor</td>
<td></td>
<td></td>
<td></td>
<td>10000.00</td>
</tr>
<tr>
<td></td>
<td><strong>TOTAL</strong></td>
<td></td>
<td></td>
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<td><strong>40330.00</strong></td>
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<tr>
<td>3</td>
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<tr>
<td></td>
<td>Staircase</td>
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<tr>
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<td>0.11</td>
<td>per cum</td>
<td>8000.00</td>
<td>880.00</td>
</tr>
<tr>
<td></td>
<td>75mm thk RCC floor</td>
<td>2.25</td>
<td>per cum</td>
<td>8000.00</td>
<td>18000.00</td>
</tr>
<tr>
<td></td>
<td><strong>TOTAL</strong></td>
<td></td>
<td></td>
<td></td>
<td><strong>20118.00</strong></td>
</tr>
<tr>
<td>4</td>
<td>ROOF</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>RCC roof beam</td>
<td>0.11</td>
<td>per cum</td>
<td>8000.00</td>
<td>880.00</td>
</tr>
<tr>
<td></td>
<td>Bamboo members 10’ long</td>
<td>50.00</td>
<td>pieces</td>
<td>320.00</td>
<td>16000.00</td>
</tr>
<tr>
<td></td>
<td>CGI sheet</td>
<td>585.30</td>
<td>per sqft</td>
<td>42.00</td>
<td>24582.60</td>
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<tr>
<td></td>
<td>Labor</td>
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<td></td>
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<td>10000.00</td>
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<td></td>
<td></td>
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<td><strong>51462.60</strong></td>
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</tbody>
</table>

**GRAND TOTAL (W+X+Y+Z) 188650.60**

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>AREA (sqm)</td>
<td>57.00</td>
</tr>
<tr>
<td>RATE OF CONSTRUCTION (per sqm)</td>
<td>3309.66</td>
</tr>
<tr>
<td>AREA (sqft)</td>
<td>609.90</td>
</tr>
<tr>
<td>RATE OF CONSTRUCTION (per sqft)</td>
<td>309.31</td>
</tr>
</tbody>
</table>
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

Recommendations for Built Form

<table>
<thead>
<tr>
<th>Plan Layout</th>
<th>Plinth/Floor</th>
<th>Roof Profile</th>
</tr>
</thead>
<tbody>
<tr>
<td>This plan type includes a single room with a two way pitch roof extended over the open verandah in the front</td>
<td>Normal plinth design.</td>
<td>Sloped roof.</td>
</tr>
</tbody>
</table>

Recommendations for construction systems

<table>
<thead>
<tr>
<th>Components</th>
<th>Recommended Specifications</th>
<th>Specific Comments</th>
</tr>
</thead>
</table>
| 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 |  

WEST BENGAL
## Area Statement:

<table>
<thead>
<tr>
<th>Item</th>
<th>Sq.m</th>
<th>Sq.ft</th>
</tr>
</thead>
<tbody>
<tr>
<td>Room</td>
<td>12.25</td>
<td>131.86</td>
</tr>
<tr>
<td>Verandah</td>
<td>8.72</td>
<td>93.86</td>
</tr>
<tr>
<td>Carpet Area</td>
<td>12.25</td>
<td>131.86</td>
</tr>
<tr>
<td>Built up Area</td>
<td>26.86</td>
<td>289.12</td>
</tr>
</tbody>
</table>

### TYPICAL SECTION AA’

Room
3500 x 3500 mm
M = 450 mm

250 mm Brick masonry in Rut-Trap band in cement mortar

### TYPICAL PLAN

- Ridge plate
- C.S.I. Shiny/Tile Roof
- Timber/Bamboo Truss Type T2
- Max 450 mm roof overhang
- 75 mm thick RC Roof band
- 75 mm thick RC UHf band
- 250 mm Brick masonry in Rut-Trap band in cement mortar
- 75 mm thick RC Plinth band
- Select foundation according to soil and flood conditions
## Cost Breakup

<table>
<thead>
<tr>
<th>Item</th>
<th>Cost (INR)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Foundation</td>
<td>38250.00</td>
</tr>
<tr>
<td>Wall</td>
<td>74130.00</td>
</tr>
<tr>
<td>Roof</td>
<td>37636.00</td>
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<tr>
<td>Total</td>
<td>150016.00</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SR. NO.</th>
<th>ITEM OF WORK</th>
<th>Quantity</th>
<th>Unit</th>
<th>Rate per unit (Rs)</th>
<th>Cost</th>
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<tr>
<td>1</td>
<td>FOUNDATION</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Brick</td>
<td>5930.00</td>
<td>per brick</td>
<td>5.00</td>
<td>29650.00</td>
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<tr>
<td></td>
<td>RCC plinth beam</td>
<td>0.45</td>
<td>per cum</td>
<td>8000.00</td>
<td>3600.00</td>
</tr>
<tr>
<td></td>
<td>Labor</td>
<td></td>
<td></td>
<td></td>
<td>5000.00</td>
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<tr>
<td>X</td>
<td>TOTAL</td>
<td></td>
<td></td>
<td></td>
<td>38250.00</td>
</tr>
<tr>
<td>2</td>
<td>WALLS</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Brick wall</td>
<td>9470.00</td>
<td>per brick</td>
<td>5.00</td>
<td>47350.00</td>
</tr>
<tr>
<td></td>
<td>RCC cill &amp; lintel beam</td>
<td>0.56</td>
<td>per cum</td>
<td>8000.00</td>
<td>4480.00</td>
</tr>
<tr>
<td></td>
<td>Doors</td>
<td>2.00</td>
<td>per pc</td>
<td>900.00</td>
<td>1800.00</td>
</tr>
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<td>Windows</td>
<td>1.00</td>
<td>per pc</td>
<td>500.00</td>
<td>500.00</td>
</tr>
<tr>
<td></td>
<td>Labor</td>
<td></td>
<td></td>
<td></td>
<td>20000.00</td>
</tr>
<tr>
<td>Y</td>
<td>TOTAL</td>
<td></td>
<td></td>
<td></td>
<td>74130.00</td>
</tr>
<tr>
<td>4</td>
<td>ROOF</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>RCC roof beam</td>
<td>0.45</td>
<td>per cum</td>
<td>8000.00</td>
<td>3600.00</td>
</tr>
<tr>
<td></td>
<td>Bamboo members 10’ long</td>
<td>10.00</td>
<td>pieces</td>
<td>320.00</td>
<td>3200.00</td>
</tr>
<tr>
<td></td>
<td>CGI sheet</td>
<td>258.00</td>
<td>per sqft</td>
<td>42.00</td>
<td>10836.00</td>
</tr>
<tr>
<td></td>
<td>Labor</td>
<td></td>
<td></td>
<td></td>
<td>20000.00</td>
</tr>
<tr>
<td>Z</td>
<td>TOTAL</td>
<td></td>
<td></td>
<td></td>
<td>37636.00</td>
</tr>
<tr>
<td>A</td>
<td>TOTAL (X+Y+Z)</td>
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<td></td>
<td></td>
<td>150016.00</td>
</tr>
<tr>
<td>B</td>
<td>TOILET COST</td>
<td></td>
<td></td>
<td></td>
<td>15000.00</td>
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<tr>
<td></td>
<td>GRAND TOTAL (A+B)</td>
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<tr>
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<td>AREA (sqm)</td>
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<tr>
<td></td>
<td>RATE OF CONSTRUCTION (per sqm)</td>
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<tr>
<td></td>
<td>RATE OF CONSTRUCTION (per sqft)</td>
<td>481.94</td>
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<td></td>
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</tbody>
</table>
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**

<table>
<thead>
<tr>
<th>Plan Layout</th>
<th>Plinth/Floor</th>
<th>Roof Profile</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sundarbans style or single room on ground with a staircase on one side &amp; verandah wrapped around on all sides.</td>
<td>Raised plinths. (4 ft. in heavy flood regions)</td>
<td>Pitched roof.</td>
</tr>
</tbody>
</table>

**Recommendations for construction systems**

<table>
<thead>
<tr>
<th>Components</th>
<th>Recommended Specifications</th>
<th>Specific Comments</th>
</tr>
</thead>
</table>
| 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 | • cement flooring | |

**WB-02A**

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 Medinipur
2. South 24 Parganas.

**Resources Available**

- Local available Mud
- Terra-cotta Tiles
- Stone

**West Bengal**
**Area Statement:**

<table>
<thead>
<tr>
<th>Item</th>
<th>Area</th>
<th>Square Feet</th>
</tr>
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<tr>
<td>Room 1</td>
<td>7.62</td>
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<tr>
<td>Room 2</td>
<td>5.29</td>
<td>56.94</td>
</tr>
<tr>
<td>Room 3</td>
<td>5.29</td>
<td>56.94</td>
</tr>
<tr>
<td>Verandah</td>
<td>16.25</td>
<td>174.92</td>
</tr>
<tr>
<td>Carpet Area</td>
<td>18.24</td>
<td>196.34</td>
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<td>Built up Area</td>
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<tr>
<td>SR. NO.</td>
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<td>Quantity</td>
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<td>------------------------------------</td>
<td>----------</td>
</tr>
<tr>
<td>1</td>
<td>FOUNDATION</td>
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</tr>
<tr>
<td></td>
<td>Brick</td>
<td>7260.00</td>
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<tr>
<td></td>
<td>RCC plinth beam</td>
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<tr>
<td>W</td>
<td>TOTAL</td>
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</tr>
<tr>
<td>1</td>
<td>STRUCTURE</td>
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</tr>
<tr>
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<td>RCC columns</td>
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<tr>
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<td>RCC lintel Beam</td>
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<tr>
<td>X</td>
<td>TOTAL</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>WALLS</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Brickwork</td>
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</tr>
<tr>
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<td>Wattle pannels</td>
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<tr>
<td></td>
<td>Mud plaster for daub</td>
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</tr>
<tr>
<td></td>
<td>Stabilised mud plaster for exterior</td>
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</tr>
<tr>
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<td>Doors</td>
<td>2.00</td>
</tr>
<tr>
<td></td>
<td>Windows</td>
<td>5.00</td>
</tr>
<tr>
<td></td>
<td>Labor</td>
<td></td>
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<tr>
<td>Y</td>
<td>TOTAL</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>ROOF</td>
<td></td>
</tr>
<tr>
<td></td>
<td>RCC roof beam</td>
<td>0.56</td>
</tr>
<tr>
<td></td>
<td>Bamboo members 10’ long</td>
<td>55.00</td>
</tr>
<tr>
<td></td>
<td>CGI sheet</td>
<td>515.00</td>
</tr>
<tr>
<td></td>
<td>Labor</td>
<td></td>
</tr>
<tr>
<td>Z</td>
<td>TOTAL</td>
<td></td>
</tr>
<tr>
<td></td>
<td>GRAND TOTAL (W+X+Y+Z)</td>
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<tr>
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<td>RATE OF CONSTRUCTION (per sqm)</td>
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<td>RATE OF CONSTRUCTION (per sqft)</td>
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**Cost breakup**

<table>
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<tr>
<th>Item</th>
<th>Cost (INR)</th>
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</thead>
<tbody>
<tr>
<td>Foundation</td>
<td>45780.00</td>
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<tr>
<td>Framed structure &amp; walls</td>
<td>92400.00</td>
</tr>
<tr>
<td>Roof</td>
<td>63710.00</td>
</tr>
<tr>
<td>Total</td>
<td>201890.00</td>
</tr>
</tbody>
</table>

**WEST BENG AL**
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.

**Resources Available**
- Local available Mud
- Terra-cotta Tiles
- Stone

**Recommendations for Built Form**

<table>
<thead>
<tr>
<th>Plan Layout</th>
<th>Plinth/Floor</th>
<th>Roof Profile</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sundarbans style or single room on ground with a staircase on one side &amp; verandah wrapped around on all sides.</td>
<td>Raised plinths. (4 ft. in heavy flood regions)</td>
<td>Pitched roof.</td>
</tr>
</tbody>
</table>

**Recommendations for construction systems**

<table>
<thead>
<tr>
<th>Components</th>
<th>Recommended Specifications</th>
<th>Specific Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Foundations</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Foundations</td>
<td>60 to 90 cm deep foundation.</td>
<td>Cob/earth foundation, compressed earth blocks, adobe blocks.</td>
</tr>
<tr>
<td></td>
<td>Fired brick with mud/cement mortar.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Sand packed dry stone foundation</td>
<td></td>
</tr>
<tr>
<td><strong>Plinth</strong></td>
<td>Raised plinths.</td>
<td>Addition of plinth &amp; lintel band.</td>
</tr>
<tr>
<td></td>
<td>RCC plinths &amp; lintel bands.</td>
<td></td>
</tr>
<tr>
<td><strong>Wall</strong></td>
<td>Fired brick &amp; stone – mud/cement mortar</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Adobe blocks, compressed earth blocks, rammed earth, cob with mud mortar.</td>
<td></td>
</tr>
<tr>
<td><strong>Wall Finish</strong></td>
<td>Mud plaster with cow dung or lime/cement.</td>
<td>Limewater over exposed masonry</td>
</tr>
<tr>
<td></td>
<td>Coating of a bituminous mix of silt &amp; burnt rubber with local adhesive.</td>
<td>Natural varnish &amp; resin coating over wooden areas.</td>
</tr>
<tr>
<td><strong>Roof Structure</strong></td>
<td>Timber, Bamboo, RCC, GI pipes- understructure.</td>
<td>Roof insulation.</td>
</tr>
<tr>
<td></td>
<td>Roof has an overhang for wall protection of 45-60cm.</td>
<td>Corrugated bamboo &amp; GI sheets.</td>
</tr>
<tr>
<td><strong>Roof Cover</strong></td>
<td>Thatch, terra-cotta flat &amp; country tiles, corrugated GI sheets.</td>
<td>Roof anchorage to its under structure &amp; wall.</td>
</tr>
<tr>
<td><strong>Floor</strong></td>
<td>cement flooring</td>
<td>Soorkhi</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Lime crete.</td>
</tr>
</tbody>
</table>
## TYPICAL SECTION AA'

<table>
<thead>
<tr>
<th>Item</th>
<th>Area Sq.m</th>
<th>Area Sq.ft</th>
</tr>
</thead>
<tbody>
<tr>
<td>Room 1</td>
<td>9.24</td>
<td>99.46</td>
</tr>
<tr>
<td>Room 2</td>
<td>9.24</td>
<td>99.46</td>
</tr>
<tr>
<td>Attic</td>
<td>18.48</td>
<td>198.92</td>
</tr>
<tr>
<td>Verandah</td>
<td>16.67</td>
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<tr>
<td>Carpet Area</td>
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<tr>
<td>Item</td>
<td>Cost (INR)</td>
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<tr>
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<tr>
<td>Roof</td>
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<tr>
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<table>
<thead>
<tr>
<th>ITEM OF WORK</th>
<th>Quantity</th>
<th>Unit</th>
<th>Rate per unit (Rs)</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>adidas work</td>
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<td>300.00</td>
<td>4710.00</td>
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<tr>
<td>RCC cill beam</td>
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<td>per cum</td>
<td>200.00</td>
<td>300.00</td>
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<tr>
<td>Doors</td>
<td>4.00</td>
<td>per pc</td>
<td>1000.00</td>
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<td>Windows</td>
<td>6.00</td>
<td>per pc</td>
<td>700.00</td>
<td>3000.00</td>
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<tr>
<td>Labor</td>
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<td>Y TOTAL</td>
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<tr>
<td>4 ROOF</td>
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<td>RCC roof band</td>
<td>2.25</td>
<td>per cum</td>
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<td>18000.00</td>
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<tr>
<td>Bamboo members 10’ long</td>
<td>40.00</td>
<td>pieces</td>
<td>320.00</td>
<td>12800.00</td>
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<tr>
<td>CGI sheet</td>
<td>700.00</td>
<td>per sqft</td>
<td>42.00</td>
<td>29400.00</td>
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<tr>
<td>Labor</td>
<td></td>
<td></td>
<td></td>
<td>10000.00</td>
</tr>
<tr>
<td>Z TOTAL</td>
<td></td>
<td></td>
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<td>70200.00</td>
</tr>
<tr>
<td>A TOTAL (W+X+Y+Z)</td>
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<tr>
<td>B TOILET COST</td>
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<tr>
<td>GRAND TOTAL (A+B)</td>
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<tr>
<td>AREA (sqm)</td>
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<td>RATE OF CONSTRUCTION (per sqm)</td>
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<tr>
<td>AREA (sqf)</td>
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<tr>
<td>RATE OF CONSTRUCTION (per sqf)</td>
<td>368.57</td>
<td></td>
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</tr>
</tbody>
</table>
- 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 understructure with 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

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<th>Roof Profile</th>
</tr>
</thead>
<tbody>
<tr>
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<td>Stilt structure or raised plinths.</td>
<td>Slopped roof. Roof anchoring.</td>
</tr>
</tbody>
</table>

### Recommendations for construction systems

<table>
<thead>
<tr>
<th>Components</th>
<th>Recommended Specifications</th>
<th>Specific Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Foundations</td>
<td>• Fired brick with mud/cement mortar. &lt;br&gt;• Sand packed dry stone foundation. &lt;br&gt;• RCC (for plinth beam)</td>
<td>• 60 to 90 cm deep foundation &lt;br&gt;• Stone with mud/cement mortar. &lt;br&gt;• Plum concrete with river boulders/stone.</td>
</tr>
<tr>
<td>Plinth</td>
<td>• Raised plinths. &lt;br&gt;• Stilt structure. &lt;br&gt;• Plum concrete.</td>
<td></td>
</tr>
<tr>
<td>Wall</td>
<td>• Fired brick &amp; stone – mud/cement mortar &lt;br&gt;• Timber, Bamboo precast RCC frame.</td>
<td>• Addition of plinth &amp; lintel band.</td>
</tr>
<tr>
<td>Wall Finish</td>
<td>• Mud plaster with cow dung or lime/cement. &lt;br&gt;• Natural varnish &amp; resin coating over wooden areas.</td>
<td>• Lime wash over exposed masonry</td>
</tr>
<tr>
<td>Roof Structure</td>
<td>• Pitched roof/  &lt;br&gt;• Timber, Bamboo, RCC, GI pipes- understructure.  &lt;br&gt;• Roof insulation.  &lt;br&gt;• Corrugated bamboo &amp; GI sheets.</td>
<td>• Roof has an overhang for wall protection of 45-60 cm.  &lt;br&gt;• Roof anchorage to it’s under structure &amp; wall.</td>
</tr>
<tr>
<td>Roof Cover</td>
<td>• Corrugated GI sheets with thatch/bamboo weave insulation, corrugated bamboo sheets or slate/stone shingles.</td>
<td></td>
</tr>
<tr>
<td>Floor</td>
<td>• cement flooring  &lt;br&gt;• Timber or Bamboo (for first floor)</td>
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</table>
WB-03A

Area statement

<table>
<thead>
<tr>
<th>Item</th>
<th>Sq.m</th>
<th>Sq.ft</th>
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<tbody>
<tr>
<td>Room 1</td>
<td>6.48</td>
<td>69.75</td>
</tr>
<tr>
<td>Room 2</td>
<td>6.48</td>
<td>69.75</td>
</tr>
<tr>
<td>Verandah</td>
<td>6.50</td>
<td>69.97</td>
</tr>
<tr>
<td>Carpet Area</td>
<td>13.32</td>
<td>143.38</td>
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<tr>
<td>Built up</td>
<td>26.65</td>
<td>286.86</td>
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</table>

TYPICAL PLAN

- Bamboo/Wood frame
- Stone/Concrete block masonry
Typical Section AA'

- Ridge plate
- C.G.L. Sheet
- Wooden/Bamboo Truss Type T1
- Max 450 mm roof overhang
- Wooden/Bamboo Post 100 mm dia
- Wooden/Bamboo railing
- Wooden plank floor
- Ground floor walls of 200 mm thick stone/concrete blocks in cement sand mortar
- Wooden staircase
- 75 mm thick RCC Plain band
- RCC precast block
- Select foundation as per soil and flood conditions

West Bengal
## Cost breakup

<table>
<thead>
<tr>
<th>Item</th>
<th>Cost (INR)</th>
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<tbody>
<tr>
<td>Foundation</td>
<td>41880.00</td>
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<tr>
<td>Stilt Structure &amp; walls</td>
<td>49000.00</td>
</tr>
<tr>
<td>First floor Structure, staircase &amp; walls</td>
<td>97925.00</td>
</tr>
<tr>
<td>Roof</td>
<td>43200.00</td>
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<tr>
<td><strong>Total</strong></td>
<td><strong>232005.00</strong></td>
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### 1. FOUNDATION

<table>
<thead>
<tr>
<th>Item</th>
<th>Quantity</th>
<th>Unit</th>
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<th>Cost</th>
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<tbody>
<tr>
<td>Stonework</td>
<td>11.30</td>
<td>per cum</td>
<td>2000.00</td>
<td>22600.00</td>
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<td>RCC plinth beam</td>
<td>0.96</td>
<td>per cum</td>
<td>8000.00</td>
<td>7680.00</td>
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<tr>
<td>Labor</td>
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<td></td>
<td></td>
<td>11600.00</td>
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<tr>
<td><strong>Total</strong></td>
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<td><strong>41880.00</strong></td>
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### 2. STILT LEVEL STRUCTURE & WALLS

<table>
<thead>
<tr>
<th>Item</th>
<th>Quantity</th>
<th>Unit</th>
<th>Rate per unit (Rs)</th>
<th>Cost</th>
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<tbody>
<tr>
<td>Wood for stilt band</td>
<td>46.00</td>
<td>per cum</td>
<td>300.00</td>
<td>13800.00</td>
</tr>
<tr>
<td>Stoneblock wall</td>
<td>7.60</td>
<td>per cum</td>
<td>2000.00</td>
<td>15200.00</td>
</tr>
<tr>
<td>Labor</td>
<td></td>
<td></td>
<td></td>
<td>20000.00</td>
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<tr>
<td><strong>Total</strong></td>
<td></td>
<td></td>
<td></td>
<td><strong>49000.00</strong></td>
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### 2. FIRST FLOOR STAIRCASE

<table>
<thead>
<tr>
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<th>Quantity</th>
<th>Unit</th>
<th>Rate per unit (Rs)</th>
<th>Cost</th>
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<tbody>
<tr>
<td>Timber beams</td>
<td>3.50</td>
<td>per cuft</td>
<td>500.00</td>
<td>1750.00</td>
</tr>
<tr>
<td>Timber planks</td>
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<td>per cuft</td>
<td>500.00</td>
<td>6250.00</td>
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<tr>
<td>Labor</td>
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<td></td>
<td></td>
<td>8000.00</td>
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<td><strong>Total</strong></td>
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<td></td>
<td></td>
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### 2. FIRST FLOOR STRUCTURE

<table>
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<th>Unit</th>
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<tr>
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<td>per cuft</td>
<td>500.00</td>
<td>3650.00</td>
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<tr>
<td>Wood for lintel band</td>
<td>10.00</td>
<td>per cuft</td>
<td>500.00</td>
<td>5000.00</td>
</tr>
<tr>
<td>Labor</td>
<td></td>
<td></td>
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<td>13500.00</td>
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<td><strong>Total</strong></td>
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### 3. FIRST FLOOR WALLS

<table>
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<td>Wattle</td>
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<tr>
<td>Daub</td>
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<td>15.00</td>
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<td>Doors</td>
<td>1.00</td>
<td>per pc</td>
<td>1000.00</td>
<td>1000.00</td>
</tr>
<tr>
<td>Windows</td>
<td>3.00</td>
<td>per pc</td>
<td>700.00</td>
<td>2100.00</td>
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<tr>
<td>Labor</td>
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<td></td>
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### 4. ROOF

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<th>Rate per unit (Rs)</th>
<th>Cost</th>
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<tbody>
<tr>
<td>Bamboo members 10' long</td>
<td>20.00</td>
<td>pieces</td>
<td>320.00</td>
<td>6400.00</td>
</tr>
<tr>
<td>CGI sheet</td>
<td>400.00</td>
<td>per sqft</td>
<td>42.00</td>
<td>16800.00</td>
</tr>
<tr>
<td>Labor</td>
<td></td>
<td></td>
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<tr>
<td><strong>Total</strong></td>
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**GRAND TOTAL (A+B+C+D+E+F)**: **232005.00**

<table>
<thead>
<tr>
<th>Item</th>
<th>Quantity</th>
<th>Unit</th>
<th>Rate of Construction (per sqm)</th>
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<td><strong>RATE OF CONSTRUCTION (per sqft)</strong></td>
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</tbody>
</table>
• It is a prevalent plan type which has been intervened with structural & material solutions
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<td></td>
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</tr>
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<td>• Stilt structure.</td>
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</tr>
<tr>
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</tr>
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<td></td>
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</tr>
<tr>
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<td></td>
<td>• Timber or Bamboo (for first floor)</td>
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</table>
WB-03B

**Area Statement:**

<table>
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<tr>
<th>Item</th>
<th>Area</th>
<th>Sq.ft</th>
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<tr>
<td>Room 1</td>
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<td>Room 2</td>
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<tr>
<td>Verandah</td>
<td>1.80</td>
<td>19.38</td>
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<tr>
<td>Carpet Area</td>
<td>18.60</td>
<td>200.21</td>
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<tr>
<td>Built up Area</td>
<td>24.48</td>
<td>263.50</td>
</tr>
</tbody>
</table>

**TYPICAL SECTION AA’**

- Compressed semi-rotten mat on Ridge plan
- Mild steel Wilde armature with RCC beam
- RCC beam to RCC beam with RCC base at total floor
- Revenue lines to support tarmac california
- Vertical lintel and brick for all openings
- Core concrete beam and cement plaster beam to two vertical cross-bracing with steel reinforcement bars
- 60 cm wide and 45 cm deep for foundation

**TYPICAL PLAN**

- Toilet: 1.2 x 1m
- Verandah: 5.6 x 1.6m
- Kamra/Bedroom 1: 3.6m x 3.2m
- Kamra/Bedroom 2: 2.7m x 3.2m
<table>
<thead>
<tr>
<th>SR. NO.</th>
<th>ITEM OF WORK</th>
<th>Quantity</th>
<th>Unit</th>
<th>Rate per unit (Rs)</th>
<th>Cost</th>
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<td>per brick</td>
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<td></td>
<td>RCC plinth beam</td>
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<td>per cum</td>
<td>8000.00</td>
<td>2400.00</td>
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<tr>
<td></td>
<td>Labor</td>
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<tr>
<td>1</td>
<td>FRAMED STRUCTURE &amp; WALLS</td>
<td></td>
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<tr>
<td></td>
<td>RCC lintel Beam</td>
<td>0.15</td>
<td>per cum</td>
<td>8000.00</td>
<td>1200.00</td>
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<td></td>
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<td>12.00</td>
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<td>1000.00</td>
<td>1800.00</td>
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<tr>
<td></td>
<td>Labor</td>
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<td>Y</td>
<td>TOTAL</td>
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<td>4</td>
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<td>RCC roof beam</td>
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<td>Labor</td>
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<tr>
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<td>119105.00</td>
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<tr>
<td>B</td>
<td>TOILET COST</td>
<td></td>
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<td></td>
<td>RATE OF CONSTRUCTION (per sqft)</td>
<td></td>
<td></td>
<td>501.33</td>
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</table>
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

- It is a light framed structure in timber with ties at plinth, sill lintel & roof level for protection against seismic activity.
- Efficient use of material is achieved 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 been provided for.
- In fill walls are light.

<table>
<thead>
<tr>
<th>Plan Layout</th>
<th>Plinth/Floor</th>
<th>Roof Profile</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rectangular linear plan flanked by a covered verandah or raised building structure to protect from wildlife.</td>
<td>Stilt structure or raised plinths.</td>
<td>Sloped roof pitched roof.</td>
</tr>
</tbody>
</table>

### Recommendations for Built Form

<table>
<thead>
<tr>
<th>Components</th>
<th>Recommended Specifications</th>
<th>Specific Comments</th>
</tr>
</thead>
</table>
| 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) | |
Area Statement:

<table>
<thead>
<tr>
<th>Item</th>
<th>Area</th>
<th>Sq.ft</th>
</tr>
</thead>
<tbody>
<tr>
<td>Room</td>
<td>12.5</td>
<td>134.55</td>
</tr>
<tr>
<td>Kitchen</td>
<td>2.87</td>
<td>30.89</td>
</tr>
<tr>
<td>Verandah</td>
<td>5.70</td>
<td>61.35</td>
</tr>
<tr>
<td>Carpet Area</td>
<td>15.77</td>
<td>169.75</td>
</tr>
<tr>
<td>Built up Area</td>
<td>26.00</td>
<td>279.86</td>
</tr>
</tbody>
</table>
### Cost Breakup

<table>
<thead>
<tr>
<th>Item</th>
<th>Cost (INR)</th>
<th>Item</th>
<th>Cost (INR)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Foundation</td>
<td>46609.00</td>
<td>Framed Structure &amp; Walls</td>
<td>56735.00</td>
</tr>
<tr>
<td>Roof</td>
<td>44380.00</td>
<td>Total</td>
<td>147724.00</td>
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</tbody>
</table>

#### Total

<table>
<thead>
<tr>
<th>Item</th>
<th>Cost (INR)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Foundation</td>
<td>46609.00</td>
</tr>
<tr>
<td>Framed Structure &amp; Walls</td>
<td>56735.00</td>
</tr>
<tr>
<td>Roof</td>
<td>44380.00</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>147724.00</strong></td>
</tr>
</tbody>
</table>

### Total (W+X+Y+Z)

<table>
<thead>
<tr>
<th>Item</th>
<th>Cost (INR)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Total</strong></td>
<td><strong>147724.00</strong></td>
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</tbody>
</table>

### AREA (sqm)

<table>
<thead>
<tr>
<th>Item</th>
<th>Cost (INR)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>AREA (sqm)</strong></td>
<td><strong>24.00</strong></td>
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</table>

### RATE OF CONSTRUCTION (per sqm)

<table>
<thead>
<tr>
<th>Item</th>
<th>Cost (INR)</th>
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<tbody>
<tr>
<td><strong>RATE OF CONSTRUCTION (per sqm)</strong></td>
<td><strong>6155.17</strong></td>
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</table>

### AREA (sqft)

<table>
<thead>
<tr>
<th>Item</th>
<th>Cost (INR)</th>
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</thead>
<tbody>
<tr>
<td><strong>AREA (sqft)</strong></td>
<td><strong>256.80</strong></td>
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</table>

### RATE OF CONSTRUCTION (per sqft)

<table>
<thead>
<tr>
<th>Item</th>
<th>Cost (INR)</th>
</tr>
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<tbody>
<tr>
<td><strong>RATE OF CONSTRUCTION (per sqft)</strong></td>
<td><strong>575.25</strong></td>
</tr>
</tbody>
</table>
- It is a light framed structure in timber with ties at plinth, sill lintel & roof level for protection against seismic activity.
- Efficient use of material is achieved by using upstanding brickwork as in fill wall till sill.
- Raised plinths protected with brickwork on its periphery against water logging.
- Space for toilets, wash areas, common courtyard & entrance enclosure has been provided for.
- In fill walls are light.

### Recommendations for Built Form

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<thead>
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<th>Plinth/Floor</th>
<th>Roof Profile</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rectangular linear plan flanked by a covered verandah or raised building structure to protect from wildlife.</td>
<td>Stilt structure or raised plinths.</td>
<td>Slopped roof pitched roof.</td>
</tr>
</tbody>
</table>

### Recommendations for construction systems

<table>
<thead>
<tr>
<th>Components</th>
<th>Recommended Specifications</th>
<th>Specific Comments</th>
</tr>
</thead>
</table>
| **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) | |
### Area Statement:

<table>
<thead>
<tr>
<th>Item</th>
<th>Area</th>
<th>Sq.m</th>
<th>Sq.ft</th>
</tr>
</thead>
<tbody>
<tr>
<td>Room</td>
<td>12.96</td>
<td>139.50</td>
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</tr>
<tr>
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<tr>
<td>Carpet Area</td>
<td>12.96</td>
<td>139.50</td>
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<tr>
<td>Built up Area</td>
<td>25.18</td>
<td>271.04</td>
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<tr>
<td>Built up Area</td>
<td>26.00</td>
<td>279.86</td>
<td></td>
</tr>
</tbody>
</table>

### Typical Section

- **Room**: 4800x2700
- **Verandah**: 1600 wide
- **250mm thick Brick masonry in cement mortar in rattrap bond or 200mm thick concrete block**
- **10mm dia steel bar at corners**
- **100mm dia bamboo or wooden post**
- **35x5 MS angle embedded in gable wall**
- **Embedded in gable wall**
- **Roof Band**
- **Mezzanine Floor**
- **RCC Plinth Band**
- **Foundation as per soil**
<table>
<thead>
<tr>
<th>SR. NO.</th>
<th>ITEM OF WORK</th>
<th>Quantity</th>
<th>Unit</th>
<th>Rate per unit (Rs)</th>
<th>Cost</th>
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<tr>
<td>1</td>
<td>FOUNDATION</td>
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<td></td>
<td></td>
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<tr>
<td></td>
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<td>per cum</td>
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<td></td>
<td>Labor</td>
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<td></td>
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<td>per cuft</td>
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<td>RCC for lintel band</td>
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<td>per cuft</td>
<td>500.00</td>
<td>127.50</td>
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<td>RCC for roof band</td>
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<td>per cuft</td>
<td>500.00</td>
<td>127.50</td>
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<td>per pc</td>
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<td>1800.00</td>
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<td></td>
<td>Windows</td>
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<td>per pc</td>
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<td></td>
<td>Labor</td>
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<td>ROOF</td>
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<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Bamboo members 10' long</td>
<td>12.00</td>
<td>pieces</td>
<td>320.00</td>
<td>3840.00</td>
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<tr>
<td></td>
<td>CGI sheet</td>
<td>350.00</td>
<td>per sqft</td>
<td>42.00</td>
<td>14700.00</td>
</tr>
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<td></td>
<td>Labor</td>
<td></td>
<td></td>
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<td>20000.00</td>
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<td></td>
<td>289.18</td>
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</tr>
</tbody>
</table>
WB-04C

This typology is applicable to Zone D

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Zone D comprises of the following districts
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2. The plains of Jalpaiguri & Alipurduar
3. Zone D has two typologies

Resources Available
- Timber
- Bamboo
- Jute

- 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.

<table>
<thead>
<tr>
<th>Recommendations for Built Form</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Plan Layout</strong></td>
</tr>
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</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Recommendations for construction systems</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Components</strong></td>
</tr>
</tbody>
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| Roof Cover | Thatch, terra-cotta flat & country tiles, corrugated GI sheets. | |
| Floor | Cement flooring  
Timber or Bamboo (for first floor) | |
TYPICAL PLAN

WEST BENGAL

AREA STATEMENT:

<table>
<thead>
<tr>
<th>Item</th>
<th>Area</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Sq.m</td>
</tr>
<tr>
<td>Room 1 (Ground Floor)</td>
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</tr>
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<td>Room 2 (Ground Floor)</td>
<td>8.10</td>
</tr>
<tr>
<td>Room 1 (First Floor)</td>
<td>8.10</td>
</tr>
<tr>
<td>Room 2 (First Floor)</td>
<td>8.10</td>
</tr>
<tr>
<td>Carpet Area</td>
<td>32.94</td>
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<tr>
<td>Built up Area</td>
<td>40.30</td>
</tr>
<tr>
<td>SR. NO.</td>
<td>ITEM OF WORK</td>
</tr>
<tr>
<td>--------</td>
<td>----------------------------------</td>
</tr>
<tr>
<td>1</td>
<td>FOUNDATION</td>
</tr>
<tr>
<td></td>
<td>Brickwork</td>
</tr>
<tr>
<td></td>
<td>Mudwork</td>
</tr>
<tr>
<td></td>
<td>RCC plinth beam</td>
</tr>
<tr>
<td></td>
<td>Labor</td>
</tr>
<tr>
<td></td>
<td><strong>TOTAL</strong></td>
</tr>
<tr>
<td>2</td>
<td>STILT LEVEL STRUCTURE &amp; WALLS</td>
</tr>
<tr>
<td></td>
<td>Concrete block wall</td>
</tr>
<tr>
<td></td>
<td>RCC sill band</td>
</tr>
<tr>
<td></td>
<td>RCC lintel band</td>
</tr>
<tr>
<td></td>
<td>Labor</td>
</tr>
<tr>
<td></td>
<td><strong>TOTAL</strong></td>
</tr>
<tr>
<td>3</td>
<td>FIRST FLOOR STAIRCASE</td>
</tr>
<tr>
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<td>Timber beams</td>
</tr>
<tr>
<td></td>
<td>Timber planks</td>
</tr>
<tr>
<td></td>
<td>Labor</td>
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<tr>
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</tr>
<tr>
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<td>FIRST FLOOR STRUCTURE</td>
</tr>
<tr>
<td></td>
<td>Timber frame columns (small)</td>
</tr>
<tr>
<td></td>
<td>Timber frame columns (big)</td>
</tr>
<tr>
<td></td>
<td>Wood for sill band</td>
</tr>
<tr>
<td></td>
<td>Wood for lintel band</td>
</tr>
<tr>
<td></td>
<td>Roof beam</td>
</tr>
<tr>
<td></td>
<td>Labor</td>
</tr>
<tr>
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<td><strong>TOTAL</strong></td>
</tr>
<tr>
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<td>FIRST FLOOR WALLS</td>
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<tr>
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<td>Timber plank walls</td>
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<td>Doors</td>
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<tr>
<td></td>
<td>Windows</td>
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<tr>
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<td>Labor</td>
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<tr>
<td></td>
<td><strong>TOTAL</strong></td>
</tr>
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<td>ROOF</td>
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<td></td>
<td>Bamboo members 10' long</td>
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<td>CGl sheet</td>
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<td>Labor</td>
</tr>
<tr>
<td></td>
<td><strong>TOTAL</strong></td>
</tr>
<tr>
<td></td>
<td><strong>GRAND TOTAL (A+B+C+D+E+F)</strong></td>
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<td>AREA (sqm)</td>
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<td>RATE OF CONSTRUCTION (per sqm)</td>
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<tr>
<td></td>
<td>AREA (sqft)</td>
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<td>RATE OF CONSTRUCTION (per sqft)</td>
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WEST BENGAL