MANUAL ON ALTERNATIVE TEMPORARY SHELTERS

2020 Edition

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MOVE UP | MOVING URBAN POOR COMMUNITIES TOWARD RESILIENCE

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Manual on
Alternative Temporary Shelters

2020 EDITION

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Acknowledgment

The 2020 ATS Manual draws heavily from the experiences and success of the MOVE UP Project since its inception in 2016. Special recognition is given to those who helped complete this document: the United Architects of the Philippines-Emergency Architects (UAP-EA), Local Government Units and partner communities in the cities of Malabon, Cotabato, Cagayan de Oro, among others, and the European Civil Protection and Humanitarian Aid Operations (ECHO).

About the manual

The 2020 Alternative Temporary Shelter (ATS) Manual is an initiative of the Moving Urban Poor Communities in the Philippines toward Resilience (MOVE UP) Project. This manual is intended for new and experienced users with zero to advanced ATS System and shelter response knowledge. This manual aims to describe the importance and practical applications of ATS and offer step-by-step guidance on properly adopting and implementing select ATS solutions as a form of shelter response and early action during emergencies. This manual provides guidance to local government units, civil society organizations, community members, and other stakeholders on addressing the immediate shelter needs of internally displaced populations (IDPs) within a 24-hour to 36-hour period after a disaster and even for long-term displacements while conforming with universally accepted humanitarian principles and standards. This manual is a working document and shall be updated from time to time.

Target users

This manual is principally intended for local government units (LGUs) and communities to augment their shelter response and early action capacities during emergencies. The manual also targets the private sector, civil society organizations (CSOs), humanitarian organizations, and other actors working closely with communities to build their resilience.

How is the book organized?

The manual is divided into three interrelated sections organized sequentially from context building up to the stages of designing, fabricating, and deploying the ATS System. Chapter 1 (Introduction) begins with an overview of the problem and the urban context that the ATS System addresses. This chapter also presents the MOVE UP Project and the urban resilience framework that directs it. The second chapter, ATS System Strategy, defines the processes and strategies that make up the ATS System. Chapter 3 (Menu of Options) compiles and presents indoor and outdoor ATS models with information on their application, construction and budgetary requirements, and more. The narratives are supplemented with visual elements (e.g., photos, drawings, plans) to help users grasp and understand the concepts faster and better.

Frequently Asked Questions (FAQs)

1. What is the ATS System?
The Alternative Temporary Shelter System (ATS) is a range of substitute solutions that immediately address the shelter needs of affected populations in the initial stages of disasters to guarantee human dignity and sustain family and community life.

2. Are ATS structures expensive?
No. The ATS structures are cost-efficient and made from inexpensive yet reliable construction materials that are readily available.

3. How can LGUs select the most appropriate ATS for their communities?
Reviewing plans and previous evacuation experiences, consulting people who have or are likely to evacuate, and conducting a participatory community-based vulnerability and capacity assessment may help LGUs determine the right ATS solution.

4. How do LGUs choose the most suitable location for the deployment of the ATS?
LGUs can identify the most suitable deployment by checking on existing risk maps and conducting a community-based vulnerability risk and capacity assessment. The process involves multi-sectoral participation from experts,

government units, and the community to identify ideal spaces for the structures' deployment.

5. How long does it take to construct ATS structures?
The construction period for ATS structures varies depending on the models and variants. Some models may take only a day, while some require a longer time. If materials are accessible and readily available, set up could be shorter. Prior training of community volunteers and LGU staff will also speed up the setting-up.

6. Do users need technical knowledge on construction to be able to build an ATS structure?
Having technical knowledge of construction is advantageous in building ATS structures. However, ATS structures have been designed to be user-friendly and easy to fabricate. This Manual and its technical content may greatly help those who wish to build one.

7. Can other materials be used if the prescribed one is not available?
No. Only the recommended materials shall be used to achieve ATS's maximum effectiveness. However, slight modifications can be made upon consultation with the UAP-EA or testing done by LGU together with technical staff.

8. Access to the materials and supplies can be challenging during emergencies; how can we prepare for this?
You may acquire, store, and distribute materials by purchasing and stockpiling in advance, arranging rental or retainer agreements with suppliers, and combining these two. You may also tap the business sector's CSR to source funds for the acquisition and storing of building materials.

9. Are ATS structures easy to set-up?
Yes. You can set up ATS structures in less than 7-10 minutes, depending on the model [e.g., Barrel Vault Tent]. Other community members can also be trained to set-up, deploy, and dismantle the ATS structures. However, keep in mind that models that can be set-up quickly entail fabrication time prior to actual use.

10. Can the ATS System solve our problems during emergencies?
Yes. If deployed and maintained correctly, the ATS System may help lessen and solve issues and concerns on privacy, safety, security, and many others. Proper guidelines and services on camp coordination and camp management (CCCM) shall always accompany ATS's deployment to ensure its effectiveness.

11. Can we reuse ATS structures for another emergency?
The ATS designs were designed to be durable and reusable for other emergencies. Some models may last up to five years before materials should be replaced.

12. Does the ATS System support longer-term shelter needs?
The ATS System is originally intended to address short and medium-term emergency shelter needs. Some models can cater to longer-term displacement needs. Depending on the situation, the community might need more long-term solutions on shelter or housing, which need additional assessment and planning steps. In this case, the ATS System may be utilized to provide shelter while more permanent housing solutions are drawn up.

Disclaimer

The MOVE UP Project has consulted with key partners and communities over the years to improve the ATS System further. The project ensures that these improvements in the past will be presented in this manual. The authors of this manual would appreciate any feedback. Send comments and suggestions via email to info@accord.org.ph.

The MOVE UP Project strongly recommends strict compliance with the instruction, caution, and prescribed construction materials and building processes stated in this manual. A careful and thorough assessment of the texts and references in this manual is needed to achieve the desired outcomes. Changing or altering the specified construction materials and building processes in any way may compromise the safety, security, and strength of the structures. All inquiries should only be directed to the proponents of the project.

The MOVE UP Project, its project proponents, including Action Against Hunger Philippines, Plan International Philippines, CARE Philippines, and Assistance and Cooperation for Community Resilience and Development (ACCORD); its partners, including the United Architects of the Philippines-Emergency Architects (UAP-EA) and various LGUs that tried and tested the ATS System; and funder, the European Civil Protection and Humanitarian Aid Operations (ECHO), shall not be liable for any loss or damage of whatever nature (direct, indirect, consequential, or other) which may arise as a result of the user's negligence and inability to follow and abide by the content of this manual.

This manual and the information in it are free to use with proper attribution. For further questions/clarifications, please contact ACCORD through the following:

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CHAPTER 1: INTRODUCTION

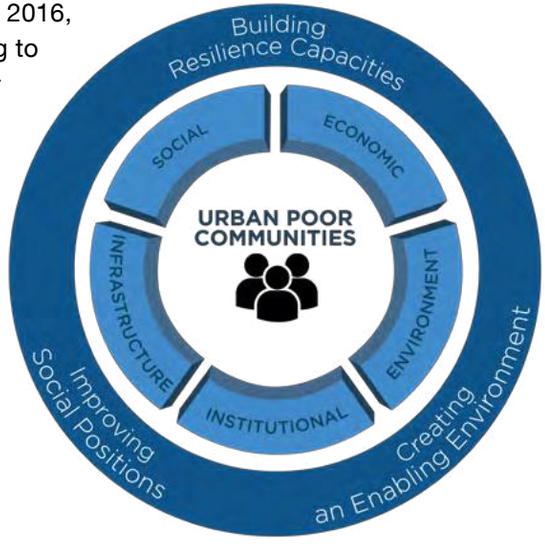
Context

Urban poor communities, especially in hazard-exposed countries such as the Philippines, face the greatest risk from two converging trends. First is that disasters are increasing in frequency and intensity due to climate change, ecosystem degradation, and even conflict. Second, urbanization is occurring at a fast pace. The nexus of these two trends underscore the urgency not only for effective urban risk reduction and resilience strategies, but also for approaches that put the urban poor at the core of programming.

MOVE UP Project and Urban Resilience Framework

With the aim of contributing to resilience and disaster risk reduction mechanisms of urban poor in the Philippines, the European Commission Civil Protection and Humanitarian Aid funded the Moving Urban Poor Communities Toward Resilience (MOVE UP Project) being implemented by a Consortium of NGOs composed of Plan, Action Against Hunger, CARE and local partner ACCORD (Assistance and Cooperation for Community Resilience and Development).

The MOVE UP Project started in 2016, with the objective of contributing to building resilience of urban poor populations in highly urbanized cities in the Philippines. Specifically, MOVE UP works with communities, local government units, and other agencies to increase preparedness and risk reduction capacities of communities, through Alternative Temporary Shelter Systems, Resilient Livelihoods, and Social Protection.



MOVE UP believes that resilience can be achieved only by placing urban poor communities at the core, and that initiatives should contribute to:

1. Building resilience capacities — increasing urban poor communities' capacities to anticipate, respond to, adapt to, and transform risks. Aside from bolstering these resilience capacities, livelihoods and livelihood assets may also be made more resilient by strengthening, diversifying, and protecting them

2. Improving social positions — advancing social inclusion relating to gender, ethnicity, age, and disability; increasing organizational capacity; and pushing for the equitable distribution of capital and assets

3. Creating an enabling environment — promoting good governance, or governance that is "participatory, consensus-oriented, accountable, transparent, responsive, effective and efficient, equitable and inclusive and follows the rule of law" (UN-ESCAP, 2009)

It recognizes, however, that resilience building is a long and complex process involving many different components and stakeholders. It is a significant undertaking that cannot be accomplished within the timeframe of a single project. As such, the project focused on two strategies at the onset that will serve as both entry-point and catalyst for strengthening urban resilience: the Alternative Temporary Shelter (ATS) System and Resilient Livelihoods.

By centering on improving shelter conditions during emergencies and making livelihoods more resilient to shocks and stresses, MOVE UP hopes to strengthen the resilience capacities of urban poor communities and their respective local governments.

Moreover, through the participatory and inclusive manner in which the activities under these components are designed and implemented, the project also hopes to contribute to improving people's social positions and creating an enabling environment. In this way, the three strategies are implemented simultaneously and become mutually reinforcing.

Alternative Temporary Shelter

According to the Internal Displacement Monitoring Centre, there are four million people displaced in the Philippines for 2019. That does not account for small, chronic, but low intensity, under the radar disasters such as small but frequent urban fires that cause protracted displacements and forced displacements of indigenous people due to conflict and violence.

Passage of the Philippine Disaster Risk Reduction Law (R.A 10121 of 2010) which mandates local governments to lead risk reduction and resilience building of communities, facilitated efforts of LGUs to reduce casualties and enable preparedness and response actions. However, disaster events in recent years reveal major gaps in these preparedness and response mechanisms. While we have come a long way in DRR efforts, much more can be done in terms of upholding the dignity of the displaced population and catering to their needs inside the evacuation centers, especially in urban areas where space is limited. Beyond merely survival, shelter is necessary to maintain human dignity and provide protection. Internally displaced persons (IDPs) might have been saved from the hazard itself, but some of them experience secondary disasters and death because of the difficulties and dire conditions inside the evacuation centers arising from exposure to other risks such as health, security, protection, and gender-based violence. These issues, including safeguarding livelihoods and assets, are the leading reasons why at-risk households refuse to evacuate preemptively, placing them and their rescuers in grave danger during disasters.

Alternative Temporary Shelter or ATS, as one of the main components of MOVE UP, seeks to contribute to addressing these gaps. Alternative Temporary Shelter is a range of substitute solutions that immediately addresses the shelter needs of affected populations in the initial stages of disasters, including security and safety, protection from the elements, and resistance to ill health and disease. It aims to improve existing temporary shelters and utilizes alternative spaces to address the lack of adequate temporary shelter. By doing so, it hopes to contribute to upholding human dignity and sustaining family and community life.

MOVE UP partnered with the United Architects of the Philippines – Emergency Architects to design ATS structures that cater to different evacuation scenarios and augment temporary shelter capacities of local governments. Designs range from tents made of bamboo or steel and tarpaulins, or partition systems made of pipes, or wooden panels, or container vans. From these “ATS Menu of Options”, communities and local governments may select or tailor-fit ATS depending on their available spaces and facilities for sheltering IDPs. The ATS improves existing shelter capacities of local governments in order to provide adequate space, privacy, and protection from health, psychosocial, and other risks. Improved evacuation facilities through ATS, including putting up safe spaces for livelihood assets also help in encouraging IDPs to evacuate preemptively.

For MOVE UP, ATS is more than the shelter structures. Many local governments fall into the trap of procuring ATS such as foldable tents without undergoing the process of assessment, selection and designing, and planning. ATS structures alone is not the solution but it can be used as an effective entry-point in improving disaster preparedness plans of local governments. ATS should be adopted and planned for as a system and integrated in disaster preparedness mechanisms of LGUs such as CCCM, DRRM plans, and contingency plans. The following ATS system strategy/process is developed and honed by MOVE UP and partners’ experiences on planning for and actual deployment of Alternative Temporary Shelters.

1. Identifying ATS needs

The first and critical step of deploying temporary shelter and evacuation conditions of communities is identifying the ATS needs. This ensures that the solutions are context-appropriate and effectively address any identified gaps. It also helps ensure that resources are maximized.

Deploying ATS requires planning and therefore understanding of what type and how many units of ATS should be deployed, who will it cater to, when and where to deploy them, and how they will be prepositioned and set up in advance of a disaster. Identification of ATS needs through secondary and primary data collection should be carried out as part of risk assessment activities of communities and local governments, and should be done in advance of a disaster.

Various participatory tools and methodologies are available to gather key information that are crucial in providing appropriate ATS solutions. Below are examples of these tools that may be used to produce relevant information for ATS planning:

TOOL/ ACTIVITY	WHAT DATA CAN BE GATHERED FROM THE TOOL?	WHAT INFORMATION CAN BE PRODUCED AND HOW IS IT RELEVANT FOR ATS PLANNING?
ATS Household survey and FGD	Shelter conditions of urban poor communities	Identify population that will sustain significant damage to their houses or whose location would put them in harm's way and therefore would require safe temporary shelter assistance
	Profile of potentially displaced population	This information is helpful in identifying who are the potential users of AT and, their capacities and vulnerabilities, in order to inform design considerations. For instance, households headed by persons with disability and other vulnerable sectors should have accessible and easily deployable ATS.
	Duration of displacements and reason for going back to place of origin	This information will help determine appropriate type of ATS to be deployed
	Evacuation center conditions from experiences of IDPs	This will help identify gaps on ATS and services in evacuation centers
Inventory of existing evacuation center and available spaces	Inspect and assess available and alternative spaces, superstructure, and facilities that can accommodate and service displaced population	Identify the most suitable settlement option in accordance with available capacities and spaces in the communities and LGUs Identify gaps in terms of space and facilities which will require alternative spaces and provision of facilities. This is done through comparing space required by the number of potentially displaced persons and the facilities available to cater to them.
Hazard assessment tools	Hazard history and timeline, nature and behavior of hazards, determine high risk areas and safe locations	Determine worst case scenario(s) to determine appropriate type of ATS and identify suitable location (including open spaces) for deployment; Develop early warning system to which ATS system is integrated to

2. Designing ATS

Each community and LGU have different risks, resources, and capacities. As such, ATS solutions need to be designed based on context-specific requirements. To enable this, LGUs and communities must agree on design criteria considering the result of needs assessment, i.e. profile of the potentially displaced population, displacement pattern, and existing evacuation practices among urban poor.

For the Metro Manila experience of MOVE UP, the result of needs assessments in selected urban poor communities in Metro Manila cities revealed that potentially displaced populations in these areas have a high incidence of female-headed households, children per family, and persons with disability. As such, evacuation centers and Alternative Temporary Shelters should consider at least the following factors: accessibility, ease of deployment, and privacy. Furthermore, durability also has a significant weight in designing ATS, considering the duration of displacement of more than a month and the frequency of displacement occurrences.

From the design criteria (see Table 1 on page 18), the MOVE UP Consortium and the United Architects of the Philippines – Emergency Architects developed an ATS Menu of Options consisting of a range of ATS solutions which can be selected according to parameters and categorization such as varying time frames of occupancy, availability and configuration of space, capacities of the local government units investing on ATS, as well as deployment conditions.

Communities and local governments may opt to either adopt designs from the ATS Menu of Options and tailor-fit these designs in their context such as adjusting dimensions and using locally available materials, or if necessary, design a more applicable ATS. This step highlights the need for multi-stakeholder partnerships, as well as the importance of combining local capacities with technical expertise.

Table 1. ATS Design Criteria

Design Criteria	Weight	Points
ROBUSTNESS	*22%*	
Design should be robust enough to be re-used many times instead of "disposable" solutions. This reduces wastage and allows for buildup of assets for the community		10
Design should consider means to sanitize and clean the unit after each use to ensure hygiene		5
As much as possible, materials used should prevent or deter the spread of fire		7
AFFORDABILITY	*21%*	
Design should be fabricated using locally available materials and, as much as possible, incorporate reused/ recycle materials / and/ or utilize rented/ leased/ sub-contracted materials to lower production cost		9
Design should consider possibility of using local labor or sweat equity to lower production cost		5
Design should also consider the cost of transporting and setup/ dismantling of ATS		7
SCALABILITY	*21%*	
Design should be modular to facilitate ease of deployment		8
Design should be versatile in terms of application and configuration		5
Design should be gender-sensitive as well as provide access to persons with disabilities		8
RANGE OF APPLICATION	*15%*	
Outdoor open space (parking lots, parks, open lots)		5
Covered court/ multipurpose halls, ware house, multi-level parking buildings		5
Classrooms and chapels		5
SPEED OF CONSTRUCTION	*21%*	
Should be easy to construct or fabricate		7
Connections are easy to understand and can be made using simple tools		7
Design can be easily assembled and dismantled		7
TOTAL	***100%***	**100**

3. Integration to plans and budgets of local government units

ATS are most effective when integrated with and implemented through appropriate LGU plans and mechanisms such as Camp Coordination and Camp Management and Contingency Plans, and budgeted through local DRRM and annual investment plans – which should all link with each other.

ATS in Camp Coordination and Camp Management (CCCM) Plan

CCCM is about how an evacuation center is organized to meet the basic needs of evacuees or internally displaced population for assistance and protection. How the evacuation site is set up largely affects IDPs' dignity and capacity for recovery. The ATS offers solutions to improve evacuation centers or camps to provide safety, security, and privacy for IDPs.

In line with DSWD-DILG-DOH-DepEd Joint Memorandum Circular (JMC) No. 1 Series of 2013 or Guidelines on Evacuation Centre Coordination and Management, local governments are mandated to provide adequate shelter and other relevant facilities to evacuees. The JMC requires the Evacuation Center Management Committee under the LDRRMC to develop CCCM/ ECM plans. Selected or designed ATS should be integrated into these plans as part of the basic facilities under shelter and accommodation that should be stockpiled or prepositioned to be readily available in the event of a displacement.

The CCCM plan should include a site plan of the evacuation center that provides details on what type of ATS is selected to be deployed, how many units can fit in the designated space, and how is the ATS positioned in relation to other facilities based on standards, including:

- Shelters, including ATS, should be accessible and have at least 1.5 m2 per person for safe preservation of life and at least 3.5 m2 per person for emergency and temporary shelters, or as agreed;
- Latrines should be less than 50 meters away from temporary shelter/settlements;
- Latrines should have a ratio of 1 latrine per person;
- Evacuation center should have space for livestocks and other assets of evacuees;

- Evacuation center should have facilities such as lactation rooms, child-friendly spaces, temporary learning spaces, etc.

Moreover, the CCCM plan should include protocols for ATS deployment and decampment in connection with Early Warning Systems of the community and local governments. This will define who, when, and where the ATS will be deployed, and on what cue. In the same manner, decampment or uninstallation of ATS should also have clear criteria based on guidance from the Joint Memorandum Circular.

ATS in Contingency Planning

Contingency Planning aims to address the impacts of hazards to people, properties, and environment and prevent the occurrence of emerging threats through arrangement of timely, effective, appropriate, and well-coordinated response as well as efficient management of resources.[1] Integration of ATS should be done both in the contingency planning process and actual contingency plan, especially in the most ATS-relevant clusters such as CCCM and IDP protection. It is also important to align barangay level contingency plans with city or municipal level plans to understand and fill in gaps on temporary shelters.

CP Guide Chapter and Forms	ATS-relevant information to include
Chapter 1: Background	• Characteristics of urban poor population (population density, poverty incidence, location, livelihoods, etc.) • Information on location, shelter materials, livelihood • Risks and hazards faced by urban poor communities • Vulnerabilities and existing capacities of all sectors, including urban poor, persons with disability, women, youth, older persons, etc.
• CP Form 1: Hazard Analysis	• In the impact column, indicate the damages to shelters and evacuation centers and temporary shelter facilities • Include the potential scale of displacement
• CP Form 3A: Scenario Generation for Natural Hazard	From the ATS needs assessment findings: • Indicate the potentially displaced population, with details on profile, numbers, location, etc. • Indicate actual/potential impact on shelter (and livelihood) • Include how women, men, boys, girls, and persons with special needs (older persons, persons with disability) will be differently affected/ impacted by hazard • Include SADD
• CP Form 4A: Affected Population	From ATS needs assessment findings: • Shelter gaps (Number of individuals catered by available shelter capacities vs Number of IDPS) • Shelter inventory and matrix From ATS needs assessment findings: • SADD from survey/actual data • Data on vulnerability • Including data on persons with disability, pregnant and lactating women, and older persons
• CP Form 4B: Breakdown of Affected Population	From ATS needs assessment findings: • SADD from survey/actual data • Data on vulnerability • Including data on persons with disability, pregnant and lactating women, and older persons
Chapter 2: Goals and Objectives	• Objectives defined in this chapter should highlight upholding right to life with dignity during disasters and displacements, prioritizing the most vulnerable sectors
Chapter 3: Response Arrangements	For CCCM and IDP Protection Clusters Implementation Plans: • Include protocols/roles/responsibilities on management, setting up/fabrication, deployment, dismantling, and storage of ATS • Protocols and activities should have gender, age, disability considerations • This should include or be consistent with the required CCCM/ECM plan as stated in the JMC No.1 series of 2013. • Protocols for ATS deployment and decampment in connection with Early Warning Systems of the community and local government
• CP Form 6: Response Activities	For CCCM and IDP Protection Clusters: • Integrate ATS System as discussed and agreed upon with LGU/community • Mechanisms such as procurement, storage, deployment, and decampment • Include how livelihood assets will be protected

1 Office of Civil Defense (2020). CP Guidebook as of January 2020.

• CP Form 7: Resource Inventory	For CCCM and IDP Protection Clusters: • If ATS is already procured and prepositioned, include in resource inventory • Include CCCM capacities, including available capacities and facilities on WASH, protection, information management, etc.
• CP Form 8: Resource Projection	For CCCM and IDP Protection Clusters: • Include appropriate / selected ATS for procurement to address shelter gap • WASH and other facilities for camp management • Make sure this will be included in DRRMP and AIP of local government to secure funding for ATS

DRRM Plan and Annual Investment Plans

From the tactical and operational plans such as CCCM Implementation Plan and Contingency Plans, ATS should also be integrated in local DRRM plans and in Annual or Long-term Development Investment Plans of local governments to ensure budget allocation and mainstreaming in longer term planning. In the DRRM planning, ATS as part of CCCM plan should be part of the preparedness and response pillars. Budget allocation of ATS in the annual investment plans of LGUs will enable the DRRMO/CCCM Cluster/IDP Protection Cluster/ Evacuation Center Management team to make necessary arrangements, procurement, and pre-fabrication.

4. Facilitate implementation of ATS plans

Roll out and implementation of ATS plans is done in two phases: the pre-disaster and post-disaster phases. For the pre-disaster phase, implementation of ATS plans integrated in the CCCM, contingency, DRRM, and Investment Plans will be carried out through processes such as procurement of ATS materials and /or supplier arrangements, fabrication of ATS through local builders or community mobilization, capacity building for setting up, and prepositioning and storage.

The post-disaster phase of implementing ATS plans is the deployment of ATS in an actual emergency. Using the experience of Malabon City LGU as example, the prepositioned ATS materials are located in a mobile van storage which can be immediately deployed once an emergency is declared. DRRMO staff and volunteers who are trained to set up the ATS proceed to the designated evacuation center to start deployment. IDPs also help in setting up of ATS and are part of the evacuation center committee. Once decampment criteria is met, DRRMO staff uninstall the ATS and return them to the storage unit for future displacements.

5. Monitoring and evaluation, public awareness, and advocacy

Monitoring and evaluation activities are also important in deploying ATS. This helps determine critical information such as user feedback on appropriateness of ATS structure, materials, and size, accountability and participation of IDPs in design process and implementation, availability of other CCCM services in the evacuation center, and impact of ATS in IDP living conditions. In all ATS deployment monitoring activities done by MOVE UP, users report they have improved privacy and rest, safety and security, and protection from heat and rain, among others, as compared to their previous displacement experiences without ATS. These information help improve the CCCM services of communities, barangays, and local governments which in effect facilitates better turn out for pre-emptive evacuation.

Public awareness activities play an important part in disseminating ATS services. Simulation exercises such as table top exercises and quarterly drills should be done to test and disseminate CCCM and contingency plans that include ATS. Communities living in high risk areas should be informed on readily available ATS units that can be deployed and protocols for deployment. This can be done through IEC activities such as assemblies. Moreover, capacity building activities should be conducted for local builders and potential users on ATS fabrication and setting up.

ATS FEEDBACK

BEFORE ATS INSTALLATION

Challenges experienced

- **No privacy**
- **Noisy**
- **No protection from extreme heat**
- **No protection from rain**
- **Difficulty resting/sleeping**
- **Lack of security of belongings**

AFTER ATS INSTALLATION

Changes/improvement experienced

- **100% have improved privacy**
- **100% have rested/slept better**
- **97% felt safer**
- **82% felt their belongings are secure**
- **97% felt it is safer for women (reduced GBV risks)**

Others:

- **Protected from heat and rain**

CHAPTER 3: ATS MENU OF OPTIONS

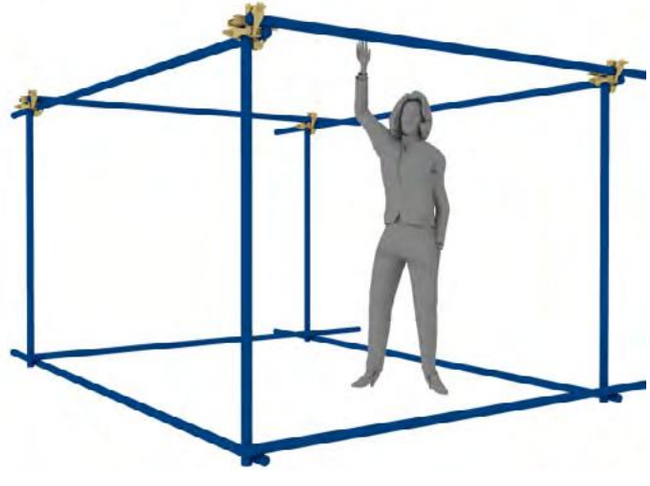
The ATS Menu of Options is a range of possible alternative temporary shelter solutions that were designed for varying displacement scenarios and may be selected by local governments to address gaps on evacuation center management.

I. Temporary Covered Court Partition System

The Temporary Covered Court Partition system (TCCP) is a flexible solution for organized sheltering of evacuees in indoor venues, such as multi-purpose halls or covered courts. It was designed to be an affordable 'easy-to-understand-and-build' shelter using materials easily sourced from neighborhood hardware stores. The organization of limited space to allow equitable distribution of natural light and ventilation is also an important consideration for the assembly of the TCCP.

The model ensures fast and simple assembly/disassembly of the units, and it allows flexibility in unit sizes to accommodate different needs of the evacuees (i.e. healthcare, nutrition).

The partition system is composed of 38mm diameter PVC pipes joined together at bottom using tek screws and at top using scaffolding clamps to form individual cubic cells, and combined to other cells to ultimately form a modular system. A cell may have a 2.4m x 1.8m footprint, with a height of 1.5 meters. The unit can accommodate a single family with up to five people inside. Fabric or canvas materials such as tarpaulin or blankets can be used as partitions and siding to add privacy and security.



After emergency situations, the partition system can be dismantled in a relatively easy manner. Parts must be kept together and stored properly for future reuse and deployment. Additionally, the TCCP can also be used as kiosks during social events increasing its range of uses and value of investment.

The model is economical, robust, flexible, simple and efficient Alternative Temporary Shelter that provides dignified sheltering needs to evacuees by maximizing and organizing covered spaces.

1.1. Basic Materials

Note: For 100 families

Item no.	Material Description	Qty.	Unit
1	1 1/2” Ø PVC blue pipe	240	lths
2	1 1/2” Ø diameter PVC coupling	80	pcs
3	Duct tape for joinery / sealing	80	pcs
4	96” wide heavy gauge Maruyama tarpaulin	40	meters
5	400 cc PVC solvent cement	10	cans
6	4mm nylon twine	300	meters
7	Swivel / fixed clamps	240	pcs
8	1 1/2" metal type Tek screws (or self-drilling screws)	1	lot
9	add nylon fisherman's net insect proofing (optional)		

1.2. Procedure of Production

i. Prepare materials as per Bill of Quantities and Cutting List.

ii. Assemble per block of 8 family-unit starting with the base members, with short cross members over the longitudinal members using metal type tex screw fasteners. Normally, 1 fastener to each joint is sufficient, driving the bolt to refusal (full depth of thread,) in medium torque. An electric drill-driver with torque adjustment is ideal for this work application.

iii. Verticals or posts are next assembled into the common base joints. It is ideal that the post is connected to both base members with tex screws. There shall then be three fastener connections to each common base joint. This joinery serves as the key to the structure’s rigidity.

iv. The top members are last to join the assembly, with the longitudinal members at the topmost level, carried by the shorter cross members in contact just underneath, so that the highest possible clearance is attained at the entry side. The use of fixed scaffolding clamps, (two to each common top joint) completes the rigidity of the assembly.

    Note: Do not use scaffolding clamps on base connections for risk of accident due to protruding hardware.

v. Finally, optional partitions or curtains using a variety of readily available materials or linen can be hanged or attached to the frames for privacy.

1.3. Cutting List

Cat no.	Part Description	Material Description	Cut Dimension	Qty.	Unit
TCCP.01	Bottom frame	1 1/2” Ø PVC blue pipe	2.4m long	2	pcs
TCCP.02	Bottom frame	1 1/2” Ø PVC blue pipe	1.8m long	2	pcs
TCCP.03	PVC coupler	1 1/2” Ø PVC coupling	N.A.	varies	pcs
TCCP.04	Vertical frame	1 1/2” Ø PVC blue pipe	1.5m long	4	pcs
TCCP.05	Top frame	1 1/2” Ø PVC blue pipe	2.4m long	2	pcs
TCCP.06	Top frame	1 1/2” Ø PVC blue pipe	1.8m long	2	pcs
TCCP.07	Pipe jointing clamp / Top joints	Fixed clamp	40mm x 40mm	4	pcs

1.4. Speed of Assembly

One TCCP shelter module can be assembled in less than ten minutes and can be disassembled in less than 5 minutes, making it very easy to put up during disasters and easy to keep after.

1.5. Required Manpower and Skill

At least two people should be able to put up a TCCP. The ability to manually use a hand saw to cut the PVC pipes is needed. Manual force is also needed to secure and tightly lock the PVC pipes into the fittings.

1.6. Required Tools and Equipment

Basic carpentry hand tools such as claw hammer, pliers, square, bubble level, measuring tape, utility knife, and the like. For cutting - hand saw is needed.

Personal protective equipment (PPE) such as hard hat, shoes, gloves, vest, eye protection, face mask, and appropriate clothing should be used and worn to protect labor personnel from risk of injury.

TCCP Applications in Actual Emergencies

I. Urban fire incidents in Malabon and Cagayan de Oro cities

1. Fire Incident in Barangay Catmon, Malabon City

Disaster Event:	**Fire**
Location:	**Barangay Catmon, Malabon City**
Date and Time of Incident:	**May 24, 2018, 12:58 PM**
Alarm Level:	Task Force Bravo
Affected Communities:	Sitio 6
Number of Structures Burned:	500 houses (light and mixed materials)
Estimated Amount of Damages:	PHP 4.5 Million
Casualties:	6 (injured)
Number of Affected:	1,200 families/5,000 individuals

Evacuation Sites:
Barangay Covered Basketball Court, Tennis Court, Badminton Court, Multi-purpose Hall, Manapat Compound

Evacuation Center Conditions:

- lacking in privacy
- congested and lacking in dignified space
- lacking in protection from elements
- sanitary and health concerns
- lacking in camp management systems especially on information management, relief distribution, and use of facilities

LGU and other CSOs' Response:

- deployment of mobile shower, mobile kitchen, stand-by ambulance, and command van vehicle
- provision of hot meals, food packs, and NFIs
- water supply
- portalets
- cash assistance
- shelter repair kits / construction materials

ATS Deployment

Selected Sites:
Barangay Covered Basketball Court and Multi-purpose Hall

Shelter Materials:
PVC pipes for framing, scaffolding clamps as connectors, blue sack for perimeter walling, and various textiles for partition walling

Number of Shelter Units Deployed:	100
Space Allocation:	1.2 sqm/person
Cost:	PHP570 per capita / PHP30 per day
Beneficiary Profile:	41% female-headed households
	50% with minors
	23% with pregnant/breastfeeding
	18% with older person
	3% with person with disability
Duration of Displacement:	31 days
Duration of Displacement with ATS:	18 days

Activities Conducted:

- DNCA and temporary shelter needs assessment
- ATS TWG (Malabon DRRMO, City Engineering, CSWDD, ACCORD, UAP-EA) meetings, camp site planning, and formulation of recommendations for intervention
- ATS Presentation to City LCE and BLGU
- Social Preparation:
  - IDPs and barangay volunteers were consulted, organised, and participated in awareness-raising activities on ATS prior to actual deployment of structures
  - 2 weeks of validation of IDP list to ensure that all shall benefit from the intervention and no one will be excluded (Do No Harm)
- Social Mobilisation: Organising of block leaders (mostly women and female heads of households) for camp site tasks such as space allocation and designation of families, validation of IDPs inside EC, conflict management and resolution, implementation of protocols, and maintenance of organized EC

Feedback and PDM Results:

- It's a first for most to sleep properly and feel privacy since having experienced displacement.
- Night shift workers were able to sleep in the morning.
- 92% of ATS beneficiaries felt more secure, 94% expressed having

a sense of privacy, 88% felt their belongings are more secure, 97% cited having slept or rested better, and 80% deemed the sleeping space provided as appropriate.

Post-deployment Activities and Sustainability:

- Disassembled ATS materials were warehoused for reuse.
- The LGU of Malabon City through the DRRMO bought its own TCCP model for prepositioning. The DRRM Office also tailor-fitted the specifications of the model for wider walkways in camps and innovated a mobile ATS storage solution (mini trailer truck) for easier access and faster deployment in the future.
- Implementing team forwarded recommendations to the BLGU after deployment. This included a reiteration of the local government's mandate and responsibility to lead in overall CCCM, reminders in terms of camp safety and security, and suggestions on monitoring and further establishment of camp policies.

Lessons:

- Application of participatory approach and engaging all relevant stakeholders (City LGU, Barangay LGU, IDPs and community volunteers, CSOs) in the entire process facilitated implementation, ensured inclusion, and bore a collaboration with fruitful results.
- ATS needs to be prepositioned/constructed/deployed before IDPs troop to the evacuation site.
- ATS must be integrated and harmonised in written protocols in evacuation and contingency plans to ensure that shelter structures are married with systems in CCCM.

2. Fire Incident in Barangay Ibaba, Malabon City

Disaster Event:	**Fire**
Location:	**Barangay Ibaba, Malabon City**
Date and Time of Incident:	**May 1, 2019, 03:24 AM**
Alarm Level:	4th Alarm
Affected Communities:	Dulong Camus, Dulong Herrera
Number of Structures Burned:	100 houses (light materials)
Estimated Amount of Damages:	PHP525,000.00
Casualties:	1 (injured)
Number of Affected:	271 families/1087 individuals (170 families/725 individuals inside ECs)

Evacuation Sites:

Santiago Syjuco Memorial School, Concepcion Main Child Development Center

Evacuation Center Conditions:

- uneven space allocation amongst displaced families
- classroom chairs used as temporary partitions
- problem in waste management inside the camp
- no proper coordination/camp management
- no visible camp managers/barangay/school personnel

ATS Deployment

Selected Site:
Santiago Syjuco Memorial School Covered Court

Shelter Materials:
PVC pipes for framing, scaffolding clamps as connectors, katsa cloth for walling

Number of Shelter Units Deployed: 120
Duration of Displacement: 24 days
Duration of Displacement with ATS: 22 days

3. Fire Incident in Barangay Tonsuya, Malabon City

Disaster Event: **Fire**
Location: **Barangay Tonsuya, Malabon City**
Date and Time of Incident: **March 5, 2020, 03:00 AM**
Alarm Level: 4th Alarm
Affected Communities: Letre Damata
Number of Structures Burned: 150 houses (light materials)
Number of Affected: 250 families (30 families inside EC)

ATS Deployment

Selected Sites:
Barangay Tonsuya Covered Court

Shelter Materials:
PVC pipes for framing, scaffolding clamps as connectors, katsa cloth and blue sack for walling

Number of Shelter Units Deployed: 40
Duration of Displacement: 11 days
Duration of Displacement with ATS: 11 days

4. Fire Incident in Barangay Tugatog, Malabon City

Disaster Event: **Fire**
Location: **Barangay Tugatog, Malabon City**
Date and Time of Incident: **September 5, 2020, 06:18 PM**
Alarm Level: 2nd Alarm
Affected Communities: Bronze St.
Number of Structures Burned: 35 houses
Estimated Amount of Damages: PHP430,000.00
Number of Affected: 100 families (23 families inside EC)

ATS Deployment

Selected Sites:
Barangay Tugatog Covered Court

Shelter Materials:
PVC pipes for framing, scaffolding clamps as connectors, katsa cloth, Maruyama tarpaulin, and blue sack for partition and perimeter wallings, tarpaulin and various textiles for makeshift roofing

Number of Shelter Units Deployed: 30
Duration of Displacement: 45 days
Duration of Displacement with ATS: 45 days

5. Fire Incident in Barangay Carmen, Cagayan de Oro City

Disaster Event: **Fire**
Location: **Barangay Carmen, Cagayan de Oro City**
Date and Time of Incident: **June 22, 2020, 12:00 AM**
Number of Affected: 83 households/292 individuals

Evacuation Site:
Carmen National High School Roof Deck

Evacuation Center Conditions:

- IDPs sleeping on concrete flooring, exposed to heat and rain
- EC prone to flooding
- No privacy
- Noisy
- No protection from extreme heat
- No protection from rain
- IDPs having difficulty resting/sleeping
- Lack of security of belongings
- Limited access to WASH

LGU and other CSOs' Response:

- Food packs distribution and pre-cooked meals provision

ATS Deployment

Shelter Materials:
PVC pipes for framing, scaffolding clamps as connectors, Maruyama tarpaulin sheets for partition walling

Number of Shelter Units Deployed: 48
Beneficiary Profile:
30% of families have member who is an older person
17% with pregnant or lactating women household member
12% with person with disability household member
71% families with children below five
Duration of Displacement: More than 30 days
Duration of Displacement with ATS: 22 days

Activities Conducted:

- Rapid needs assessment
- Consultation with stakeholders/actors and joint discussions (City LGU, Barangay LGU, CSOs, IDPs)
- Participatory designing and building processes throughout the deployment
- Organizing of IDPs
- Crafting of execution plan on setting up ATS
- Formulation of house rules with IDPs

Feedback from PDM:

- 100% of ATS beneficiaries experienced improved privacy, 100% have rested/slept better, 97% felt safer, 82% felt their belongings are secure, and 97% felt it is safer for women (reduced GBV risks).
- Evacuees are protected from heat and rain.
- IDPs were able to continue with their livelihoods and other economic activities since their children and belongings are safe within the ATS.
- IDPs were able to immediately restart livelihood activities as soon as ATS was set up

Lessons:

- A tailor-fitted ATS design is a product of various participatory activities conducted with the partner LGU and IDPs themselves.

II. Setting up Community Quarantine Facilities (CQFs)

ATS in COVID-19 Response

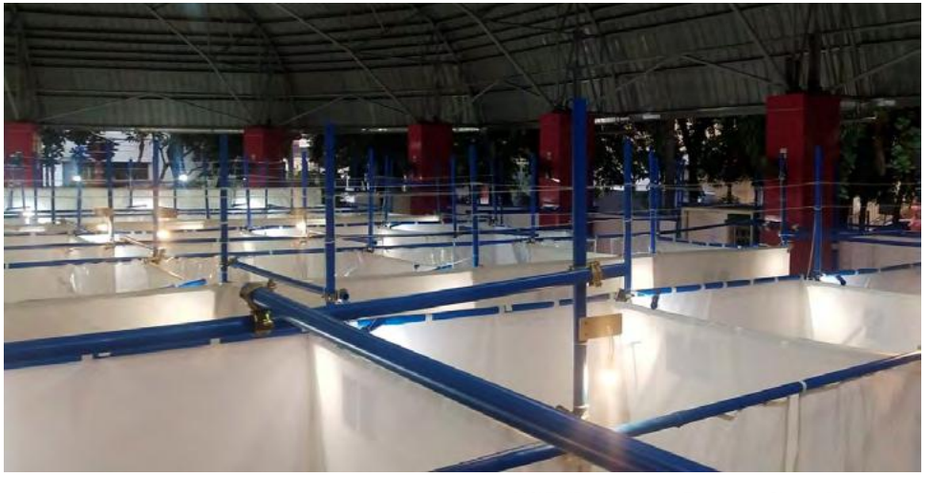
- Translation of ATS into CQF
- Intervention based on assessed needs to augment surge capacity of medical facilities for COVID-19, especially in urban settings where observing (infection prevention and control) IPC measures, such as physical distancing, is a challenge, and LGUs have limited capacities on facility structures
- Applies the same implementation strategy for ATS

Selected Location:
Malabon City Amphitheater (behind Malabon City Hall and beside Ospital ng Malabon)

The Malabon City CQF will be functioning as a temporary treatment and monitoring facility for COVID-19, being an extension of the local hospital, so that the Ospital ng Malabon can continue its regular work and accommodate non-COVID cases.

Malabon City CQF Site Features:

- 26-bed capacity temporary confinement space
- TCCP materials (PVC 1.5” diameter pipes and scaffolding clamps and\ tek screws as connectors) make up for basic installation of framing
- Partition walling material is Maruyama tarpaulin and frontal cubicle curtains are polyethylene plastic sheets for easier sanitation and IPC
- shared WASH facilities (site has existing toilets)
- temporary shower areas installed, platforms inclined for IPC
- zoning (sterile, buffer, contaminated) adhering to IPC followed
- 1 block for confirmed cases composed of 11 units and 1 code blue room erected
- designated blocks for male and female suspect and probable cases
- stage area assigned for female suspect cases who are pregnant
- temporary ramps installed for access and inclusion
- separate doors installed for confirmed COVID patients, probable and suspect cases, healthcare workers, and patients for discharge
- 2.01m distance observed between confirmed cases’ block and suspect probable cases’ block



- 2.4m partition walling height for confirmed cases cubicles
- 1.8m partition walling height for probable and suspect cases cubicles
- Rest cubicles for healthcare workers, donning and doffing areas, laundry in and out cubicles, testing booth and nurse stations fabricated
- Temporary lavatories and portable handwashing stations deployed in required areas
- Cubicle lightings, power outlets, and nurse call buttons also installed (aerial setup of electrical). Switchboard panel positioned inside Nurses' Station.
- IEC materials such as idiolocators, facility reminders/protocols, and other signages installed
- Buffer wall erected to isolate facility from the Oreta Sports Complex (walling reinforced with wood black screw, instead of duct tape, to sustain strong winds)

CQF Implementation Strategy and Process

A. Needs Assessment
- consultation and coordination activities with ATS/CQF TWG, and local and national IATF-EID
- site analysis and selection

B. Planning
- continuous monitoring and application of pandemic guidelines being released from official sources
- extra precaution on safety (conduct of IPC training, COVID testing, and deployment of small teams)
- engagement with local health office as a design consultant and a TWG member
- collaboration with UAP-EA as lead designer
- revisions and refinement of the site and WASH plans

C. Actual Deployment

D. Post-deployment
- Furnishings such as hospital beds, tables and chairs, and trash bins deployed by the LGU
- CQF officially turned over to the local government on June 18, 2020, with the deed of donation signed and received by LCE Antolin Oreta III.
- Ospital ng Malabon staff oriented with facility design and function also on June 18. A meeting later was held to formulate operation protocols.

- The accreditation team from DOH-NCR inspected the facility on June 19. There were minimal comments on the facility (missing partition curtain to isolate staff area from the testing booth, the need for additional viewing window at the nurse station, need for additional handwashing station at donning area). The CQF Ground Team worked immediately on the aforementioned necessary requirements to pass accreditation.
- On June 22, the CQF at the Malabon City Amphitheater was already operational, with 9 cases transferred on that day.

Gaps, Challenges, and Opportunities

- challenges on procurement (availability of construction materials in terms of volume; the team had to adjust and explore alternative materials)
- developing studies on COVID affected planning phasing
- COVID testing for CQF workers and field team resulted in a few days delay in construction, and laborers and staff with reactive results had to be removed from the implementing roster.
- The intervention proved the scalability, flexibility, and replicability of the ATS, that can be adopted, rolled out, and improved by LGUs and communities.
- Settling with a 'good enough' facility standard to prioritise urgency of the response initiative, while still being available for additional improvements and modifications.
- The good working relationship and close coordination with the LGU and partners facilitated the smooth and efficient implementation of the intervention.

CQF Replication in Cagayan de Oro City in Mindanao:

- implemented in coordination with project working group members DRRM, Planning, and Health offices
- fabricated prototypes of CQF modules with modification on framing materials (utilised stainless steel instead of PVC pipes)
- conducted presentation and feedbacking session with the city and provincial governments
- turned over two CQF modules with a total of 6 units last December 4, 2020 to the LGU of CDO City

II. Lightweight tents for outdoor settlements

These ATS solutions were developed for displacement scenarios or contexts where usual evacuation centers such as covered courts of multi-purpose halls and other indoor facilities are not available or not an option. For instances such as strong and massive earthquakes, use of open spaces is highly recommended. These designs can also be used to augment spaces for evacuation if indoor facilities are fully occupied especially during large-scale displacements.

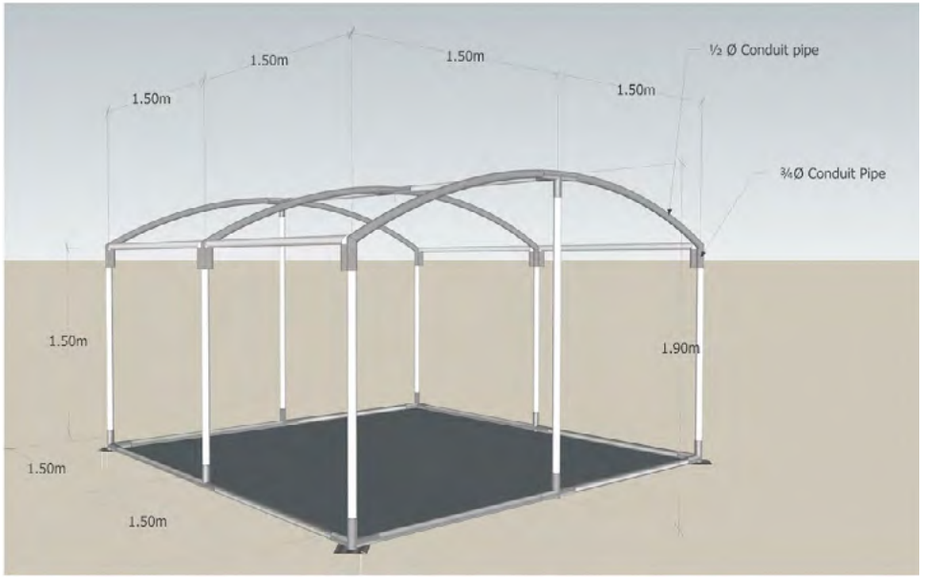
1. Barrel Vault Tent

The Barrel Vault Tent (BVT) is a very straightforward prefabricated ATS solution for immediate short-term deployment with materials readily available in most urban areas in the Philippines. Its name taken from the arched roof character, it has the advantage of good space utilization owing to its square footprint, its cubic form and proportion, making it a sturdy stand alone structure.

Openings for doors and windows can be cut-out from its tarp sheet wall and the flaps can be manually rolled up and down. Flooring material can be tarpaulin sheet, or wood or plastic palettes. At 3.0x3.0M footprint and a minimum height of 1.5M, a family with about 5-7 members can be accommodated inside the BVT comfortably.

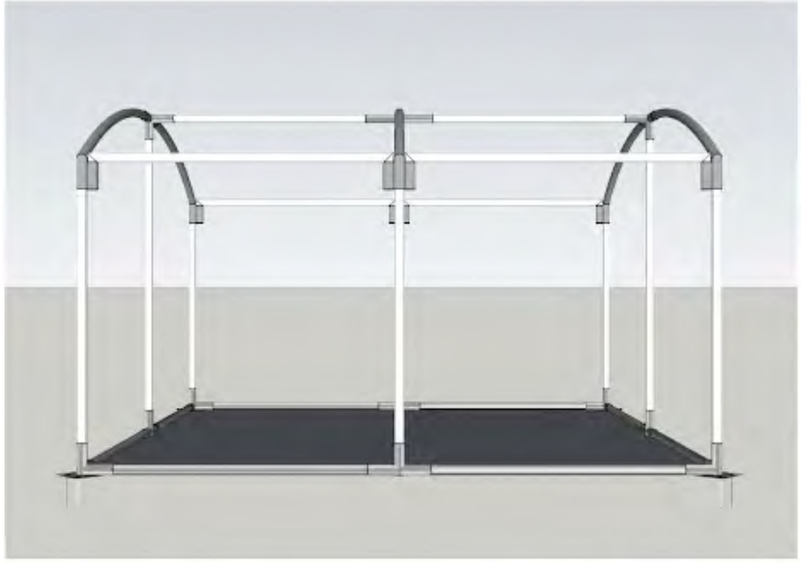
From feedback and suggestions of the different stakeholders (LGUs, technical partners, community members and local fabricators), improvements to the original design were introduced. Currently, six (6) variants of the BVT were developed and prototyped using different materials for the framing system, with slight variations on the tarp sheet walls and roofing. Except for one type that uses bamboo as the primary framing material, five of the current designs use steel pipes, which are readily available from local construction supplies and hardware stores. These five variants also require prefabrication of components, specifically welding of corner and other connections joints.

PERSPECTIVE OF BARREL VAULT ATS FRAMING



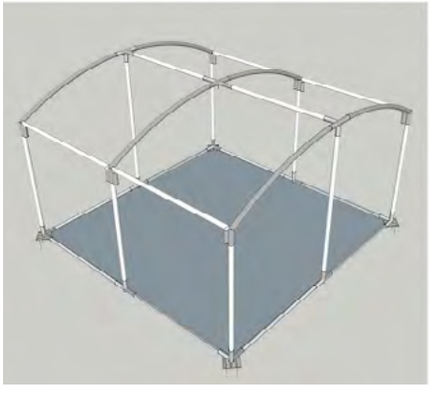
PERSPECTIVE VIEW OF FACADE OF BARREL VAULT ATS

FRAMING SYSTEM

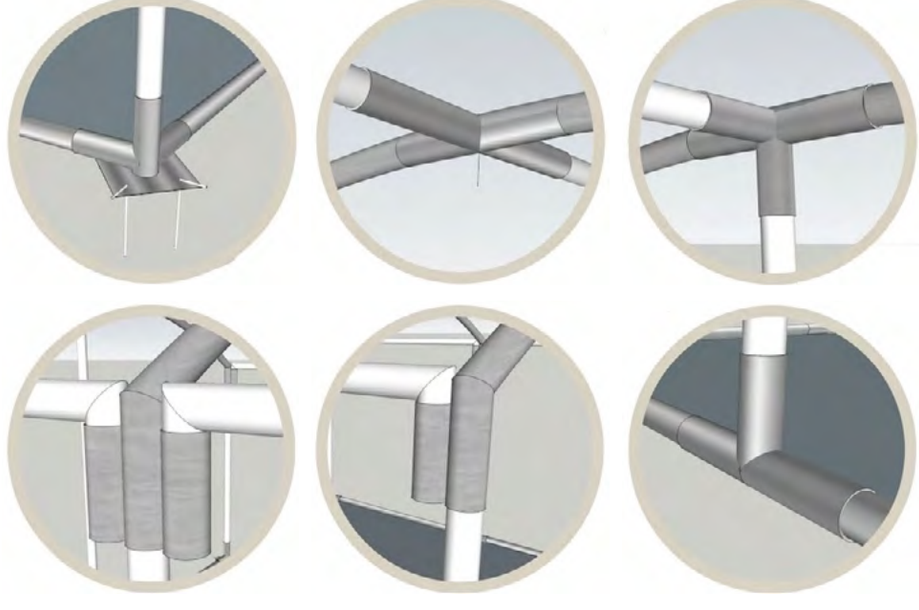


TOP VIEW

BARREL VAULT ATS FRAMING



BLOW-UP OF SPOT CONNECTIONS



Variant	Framing Material	Tarpaulin Wall/ Roofing	Identifying Feature/s
BVT 1 (Base Model)	Rigid Steel conduit Pipe	Taffeta fabric	
BVT 2 (Gray)	GI Pipe	Maruyama tarpaulin sheets	Heavy-duty zipper mechanism for door and window opening
BVT 3 (White)	GI Pipe	Maruyama tarpaulin sheets	Color coded- GI pipe/ Velcro mechanism for doors and window With optional tensor rods for added bracing
BVT 4 (Stainless Steel - Manila)	Stainless Tubular Pipe	Maruyama tarpaulin sheets	No-screw mechanism for connecting frames
BVT 5 (Stainless Steel - Mindanao)	Stainless Tubular Pipe	Maruyama tarpaulin sheets	With overhang roofing and large windows/ used as Community Isolation Facility for Covid-19 Response
BVT 6 (Kawayan)	Bamboo	Maruyama tarpaulin sheets	Raised floor and slatted bamboo as flooring materials

Production of this model shall require specific skills of:

- A welder who can work on thin metal thicknesses with some pipe fitting skills.
- An upholsterer or tailor able to work on thin upholstery materials.
- For the bamboo type, familiarity with bamboo construction, especially on the correct jointing/connections.

1.1. Materials and Cutting List per BVT Variant

BVT-1 (Base Model)

Materials

Item no.	Material Description	Qty.	Unit
1	RSC Conduit Pipe 1/2” Ø (for posts, beams, and arches)	15	Lengths
2	RSC Conduit Pipe 3/4” Ø (connectors)	1	lth
3	Welding Rod (for welded connections)	1	kg
4	4” Disk Cutting Blade – Metal (for cutting)	1	pc
5	4” Grinder Blade – Metal (for grinding)	1	pc
6	#100 Waterproof Sanding Paper (for sanding)	3	pcs
7	Silver Paint (retouch paint)	1	pc
8	2” Paint Brush (painting tool)	1	pc
9	Silver-Blue Tafetta (main skin)	32	yrd
10	Strap	1	roll
11	Velcro (strap fix)	1	roll
12	4mm Nylon Cord – Blue (for tie/guy wire)	15	mtrs
13	Zipper (fastener)	4	yrds
14	Zipper Head (fastener)	4	pcs
15	Cord Lock	5	pcs
16	Maruyama White Tarpaulin (flooring, flashing)	9	yrds
17	Nylon Sewing Thread	2	yrds

Cutting List

Frame - refer to supplied BVT tent frame set sample for actual basis of cutting preparation.

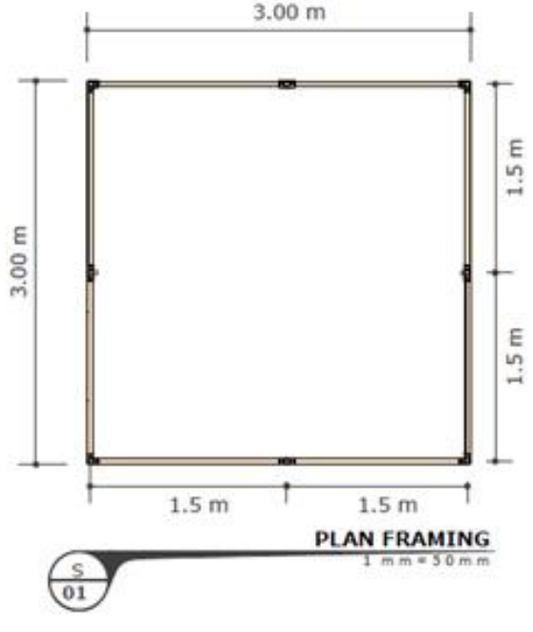
Skin - refer to supplied tent skin sample as cutting and assembly template.

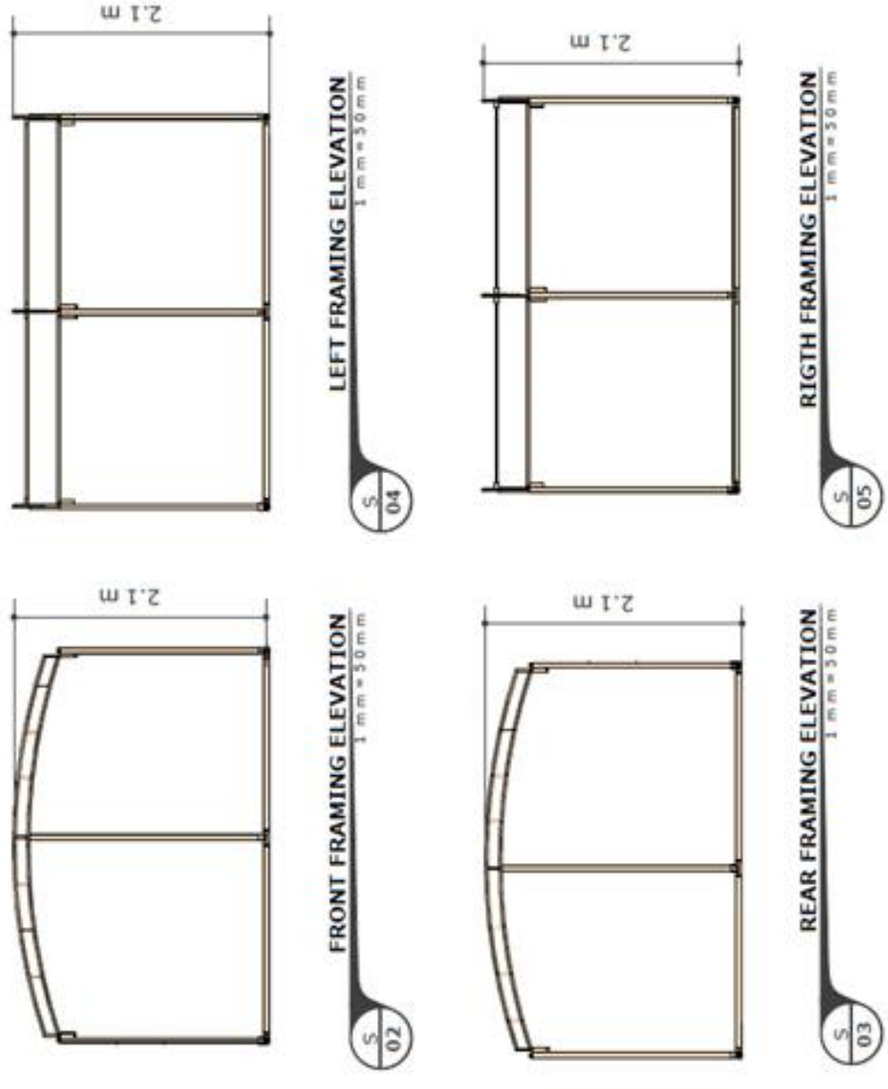
Cat no.	Part Description	Material Description	Cut Dimension	Qty.	Unit
BVT1.01	Fabricated Tee with bottom plate	3/4" Ø RSC Conduit Pipe	Use 1.4 mm GI plate	4	lot
BVT1.02	Fabricated Bottom 3-way corner connector w/ plate for the anchor rod	3/4" Ø RSC Conduit Pipe	Use 1.4 mm GI plate	4	pcs
BVT1.03	Horizontal Frame Member	1/2” Ø RSC Conduit Pipe	1500 mm long	6	pcs
BVT1.04	Anchorage	10mm Ø Anchor Rod	400 mm long	8	pcs
BV1T.05	Vertical Frame Member	1/2” Ø RSC Conduit Pipe	1500 mm long	6	pcs
BVT1.06	Center post Members	1/2” Ø RSC Conduit Pipe	2100 mm long	2	pcs
BVT1.07	Curved Roof Frame Member	1/2” Ø RSC Conduit Pipe	1500 mm long	6	pcs
BVT1.08	Fabricated top tee	3/4" Ø RSC Conduit Pipe	200 mm long &	2	pcs
			150 mm long	4	pcs
BVT1.09	Top angle and tee connection	3/4" Ø RSC Conduit Pipe	400 mm long &	2	pcs
			200 mm long	4	pcs
BVT1.10	Top cross tee connection	3/4" Ø RSC Conduit Pipe	400 mm long	2	pcs

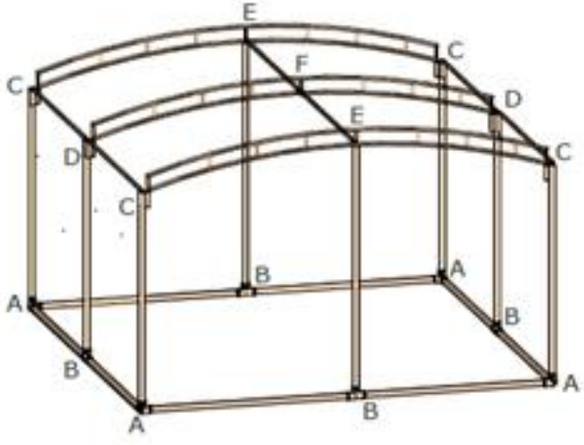
BVT-2 (Gray)

Materials

Item no.	Material Description	Qty.	Unit
1	Galvanized Iron (GI) Pipe 1/2" Ø (for posts, beams, and arches)	17	Lengths
2	Galvanized Iron (GI) Pipe 3/4" Ø (connectors)	1	lth
3	Welding Rod (for welded connections)	1	kg
4	4" Disk Cutting Blade – Metal (for cutting)	1	pc
5	4" Grinder Blade – Metal (for grinding)	1	pc
6	#100 Waterproof Sanding Paper (for sanding)	3	pcs
7	Assorted Paint (White, Yellow, Green, Blue)	1	quarts
8	2" Paint Brush (painting tool)	1	pc
9	White Maruyama Tarpaulin	35	Sq. meters
10	4mm Nylon Cord – Blue (for tie/guy wire)	15	mtrs
11	Zipper (fastener)	4	yrds
12	Zipper Head (fastener)	4	pcs
13	Cord Lock	5	pcs
14	Nylon Sewing Thread	2	yrds
15	Velcro Tapes	15	meters







FRAMING ELEVATION

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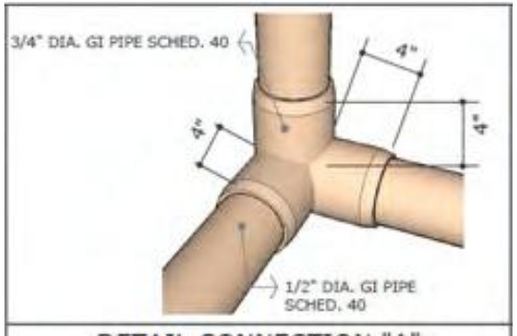
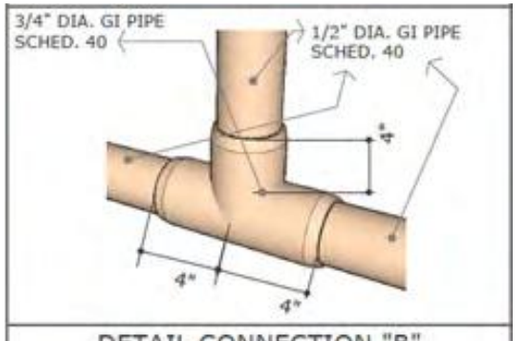
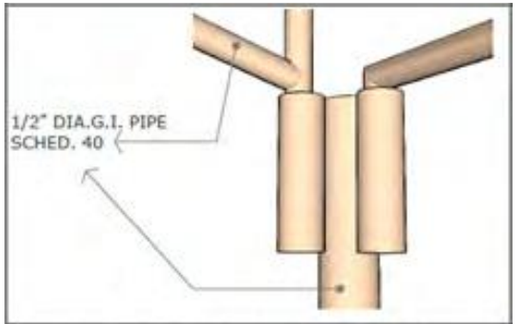
1 mm = 50 mm



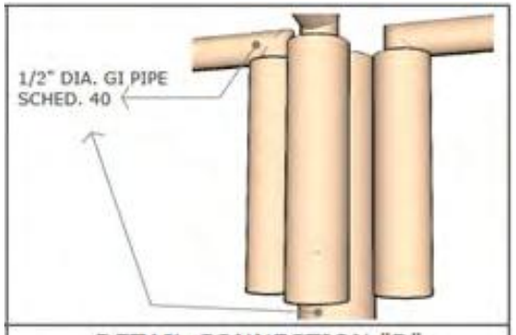
DETAIL CONNECTION "A"



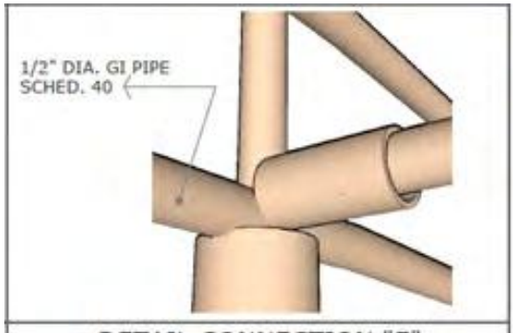
DETAIL CONNECTION "B"



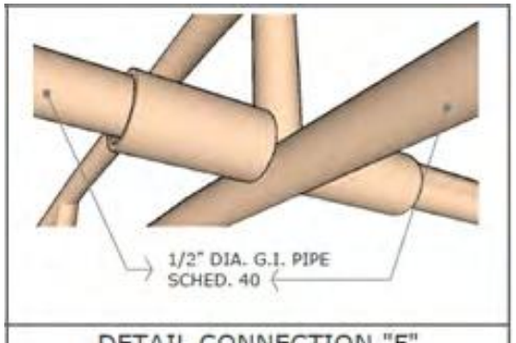
DETAIL CONNECTION "C"



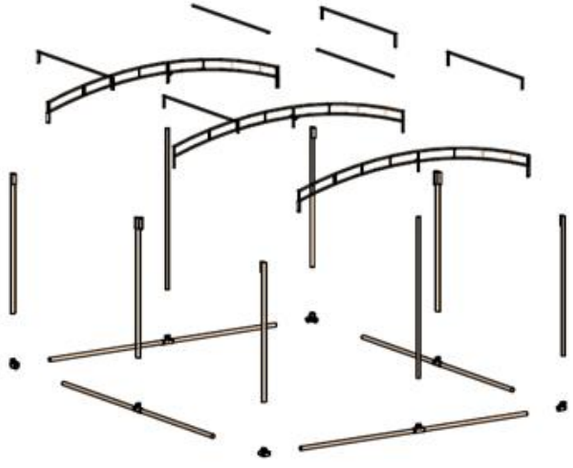
DETAIL CONNECTION "D"



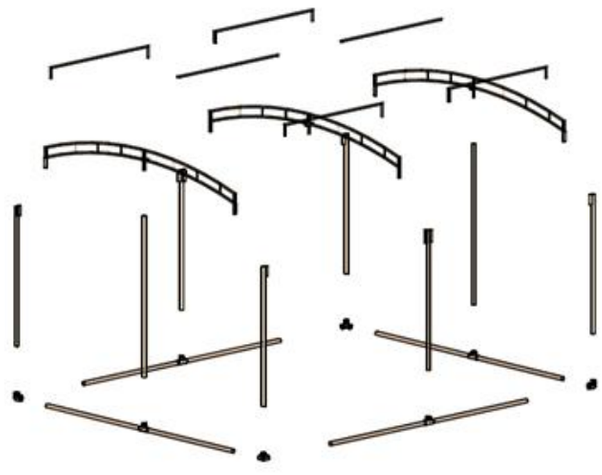
DETAIL CONNECTION "E"



DETAIL CONNECTION "F"



EXPLODED FRAMING LEFT ISOMETRIC VIEW
1 mm = 30 mm
S 07



EXPLODED FRAMING RIGHT ISOMETRIC VIEW
1 mm = 30 mm
S 08

Cutting List

Frame - refer to supplied BVT tent frame set sample for actual basis of cutting preparation.

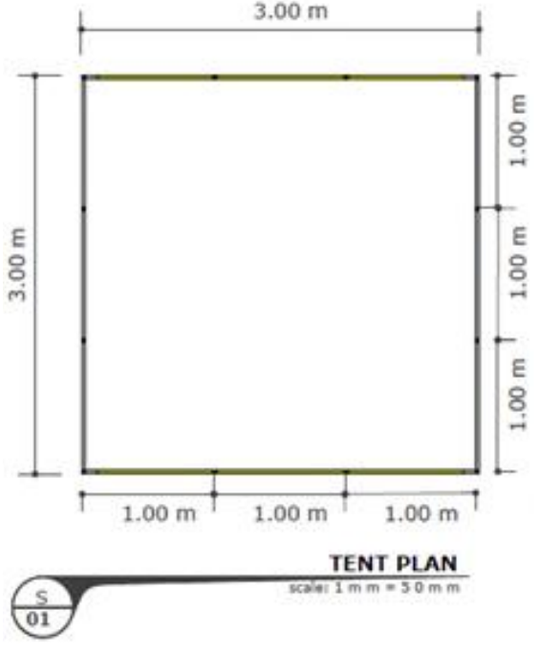
Skin - refer to supplied tent skin sample as cutting and assembly template.

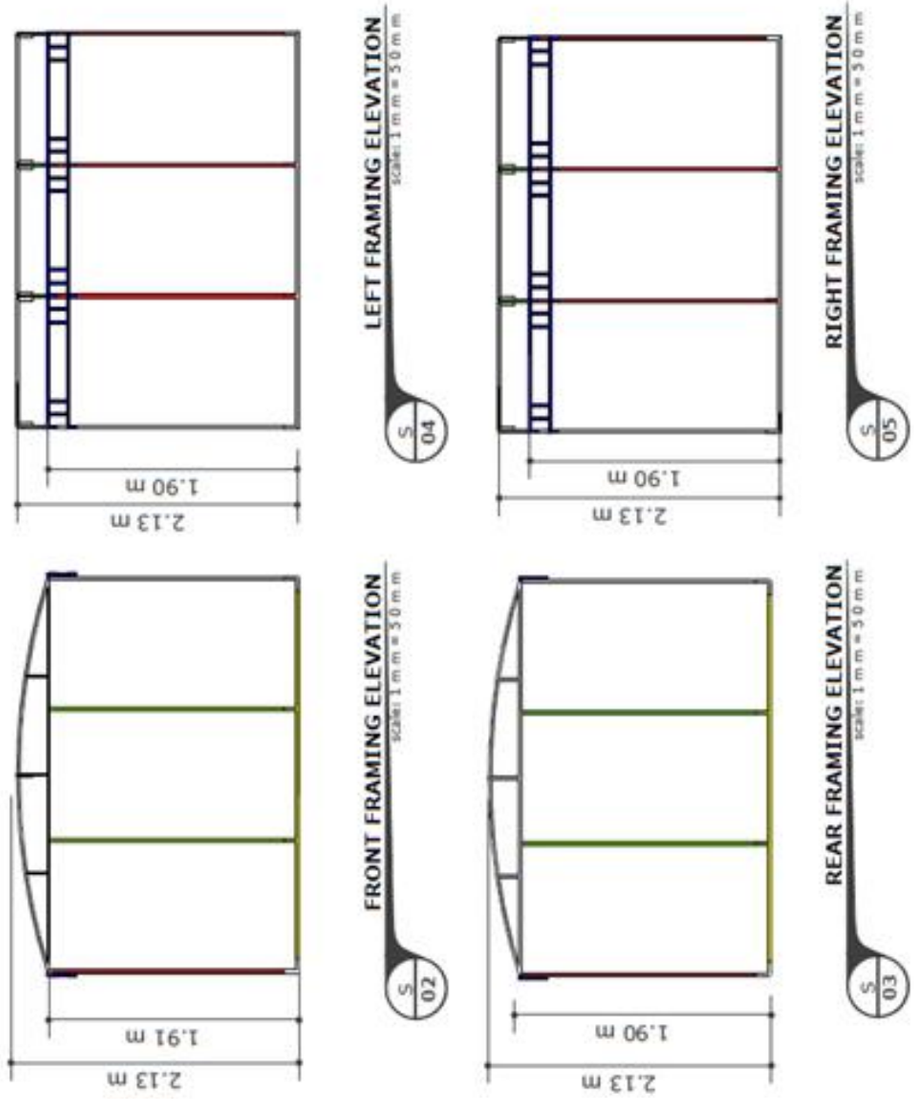
Cat no.	Part Description	Material Description	Cut Dimension	Qty.	Unit
BVT2.01	Fabricated Lower Horizontal Member	1" Ø GI Pipe	3000mm long	2	pcs
		1" Ø GI Pipe	250mm long	2	pcs
BVT2.02	Fabricated Lower Horizontal Member(with corner)	1" Ø GI Pipe	3000mm long	2	pcs
		1" Ø GI Pipe	250mm long	6	Pcs
BVT2.03	Vertical Frame Member	1" Ø GI Pipe	1900 mm long	4	pcs
		3/4" Ø GI Pipe	50mm long	4	pcs
BVT2.04	Fabricated Vertical Frame Member	1" Ø GI Pipe	1900mm long	8	pcs
		1" Ø GI Pipe	25mm long	16	pcs
		3/4" Ø GI Pipe	50mm long	8	pcs
BVT2.05	Fabricated Truss(Exterior)	1" Ø GI Pipe	3000 mm long	2	pcs
		1" Ø GI Pipe	3500mm long	4	pcs
		1" Ø GI Pipe	150mm long	2	pcs
		1" Ø GI Pipe	200mm long	1	pc
		3/4" GI Pipe	75mm long	4	pcs
BVT2.06	Fabricated Truss(Interior)	1" Ø GI Pipe	3000 mm long	2	pcs
		1" Ø GI Pipe	3500mm long	4	pcs
		1" Ø GI Pipe	150mm long	2	pcs
		1" Ø GI Pipe	200mm long	1	pc
		3/4" GI Pipe	75mm long	12	pcs
BVT2.07	Fabricated Upper Horizontal	1" Ø GI Pipe	3000mm long	4	pcs
		1" Ø GI Pipe	125mm long	24	pcs
		3/4" GI Pipe	75mm long	16	pcs
BVT2.08	Fabricated Truss Connection	1" Ø GI Pipe	1500mm long	2	pcs
		3/4" GI Pipe	75mm long	4	pcs

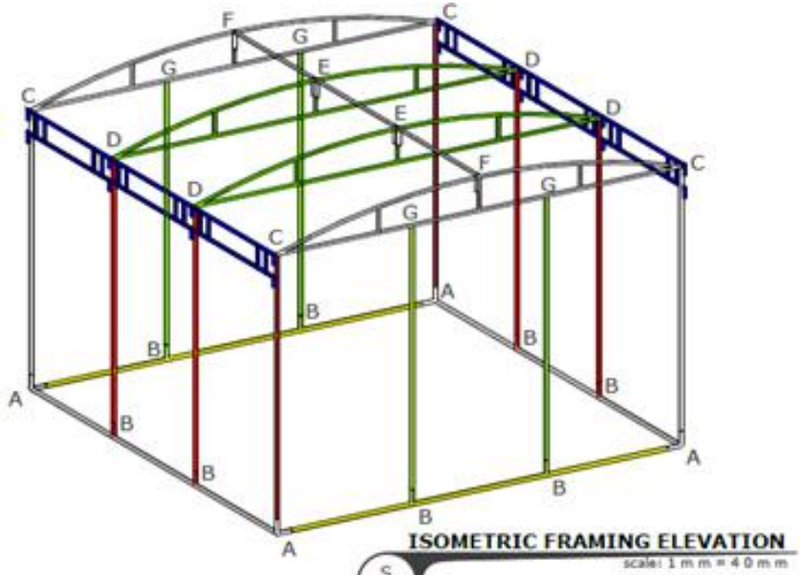
BVT-3 (White)

Materials

Item no.	Material Description	Qty.	Unit
1	Galvanized Iron (GI) Pipe 1/2" Ø (for posts, beams, and arches)	14	Lengths
2	Galvanized Iron (GI) Pipe 3/4" Ø (connectors)	1	lth
3	Welding Rod (for welded connections)	1	kg
4	4" Disk Cutting Blade – Metal (for cutting)	1	pc
5	4" Grinder Blade – Metal (for grinding)	1	pc
6	#100 Waterproof Sanding Paper (for sanding)	3	pcs
7	Silver Paint (retouch paint)	1	pc
8	2" Paint Brush (painting tool)	1	pc
9	Gray Maruyama Tarpaulin	35	Sq. meters
10	4mm Nylon Cord – Blue (for tie/guy wire)	15	mtrs
11	Zipper (fastener)	4	yrds
12	Zipper Head (fastener)	4	pcs
13	Cord Lock	5	pcs
14	Nylon Thread	2	yrds



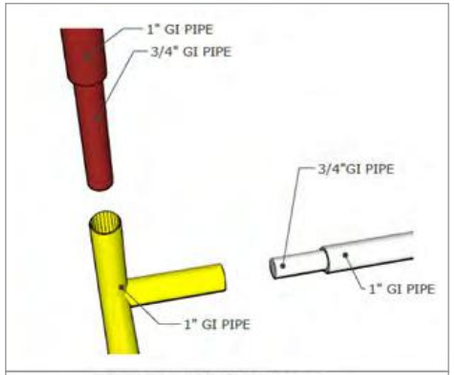




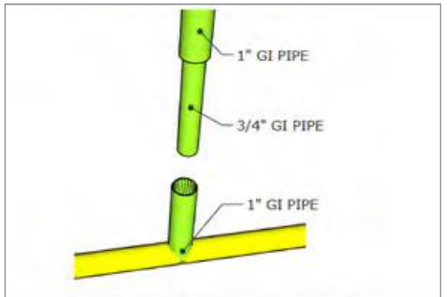
ISOMETRIC FRAMING ELEVATION

scale: 1 m m = 4 0 m m

S 06



DETAIL CONNECTION A



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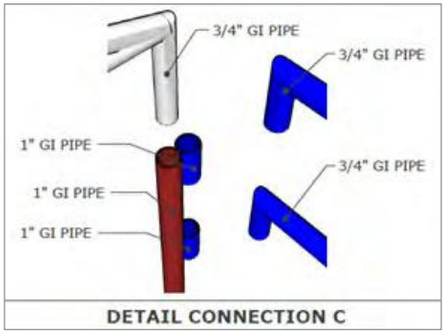
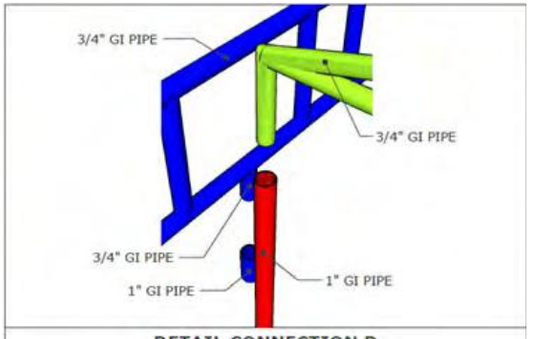
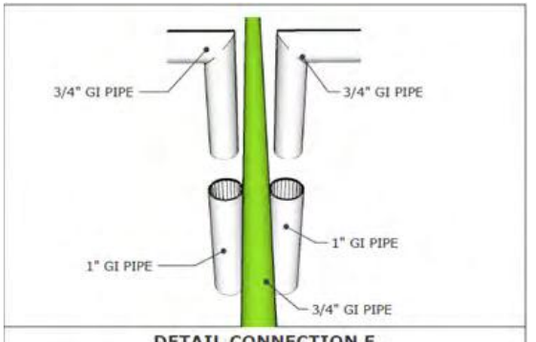


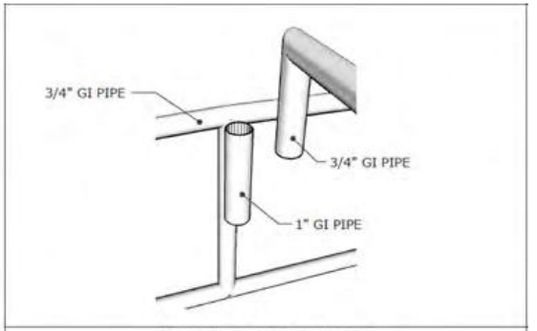
DETAIL CONNECTION C



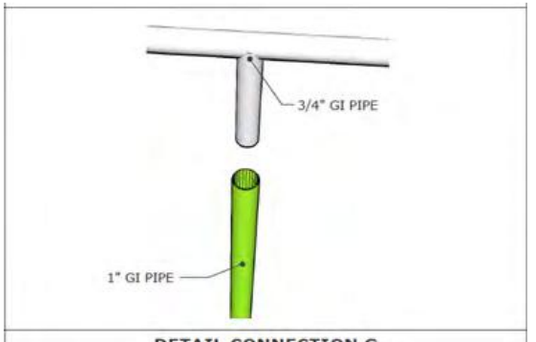
DETAIL CONNECTION D



DETAIL CONNECTION E



DETAIL CONNECTION F



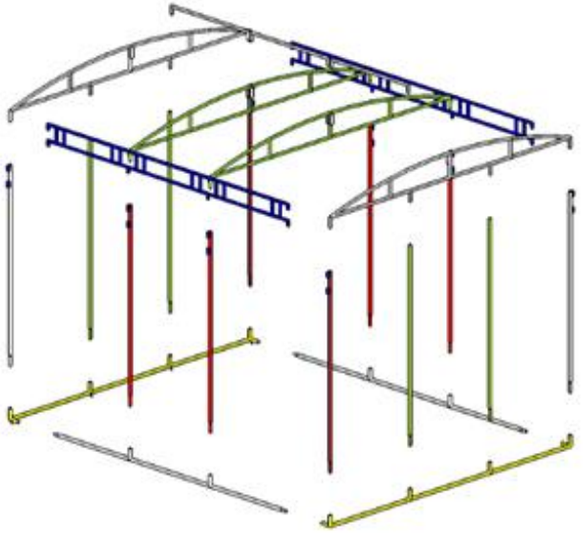
DETAIL CONNECTION G

Cutting List

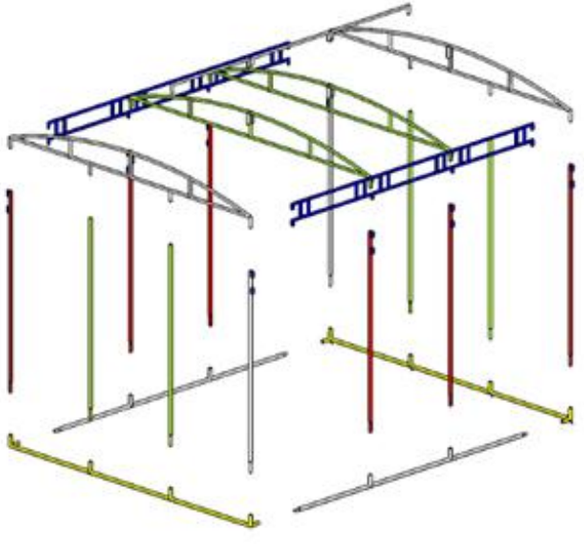
Frame - refer to supplied BVT tent frame set sample for actual basis of cutting preparation.

Skin - refer to supplied tent skin sample as cutting and assembly template.

Cat no.	Part Description	Material Description	Cut Dimension	Qty.	Unit
BVT3.01	Fabricated Lower Horizontal Member	1/2" Ø GI Pipe	3000mm long	2	pcs
		3/4" Ø GI Pipe	125mm long	6	pcs
BVT3.02	Fabricated Lower Horizontal Member(with corner)	1/2" Ø GI Pipe	3000mm long	2	pcs
		1/2" Ø GI Pipe	125mm long	18	pcs
BVT3.03	Vertical Frame Member	1/2" Ø GI Pipe	1900 mm long	4	pcs
		3/4" Ø GI Pipe	100mm long	12	pcs
BVT3.04	Fabricated Vertical Frame Member(Center)	1/2" Ø GI Pipe	2100mm long	8	pcs
		3/4" Ø GI Pipe	75mm long	4	pcs
BVT3.05	Fabricated Truss(Exterior)	1" Ø GI Pipe	3500mm long	6	pcs
		3/4" GI Pipe	200mm long	21	pcs
BVT3.06	Fabricated Upper Horizontal	1" Ø GI Pipe	3000mm long	4	pcs
		3/4" GI Pipe	75mm long	12	pcs
BVT3.07	Fabricated Truss Connection(Top)	1" Ø GI Pipe	1500mm long	2	pcs
		3/4" GI Pipe	75mm long	4	pcs



EXPLODED FRAME RIGHT ISOMETRIC VIEW
scale: 1 m m = 5 0 m m
S 07

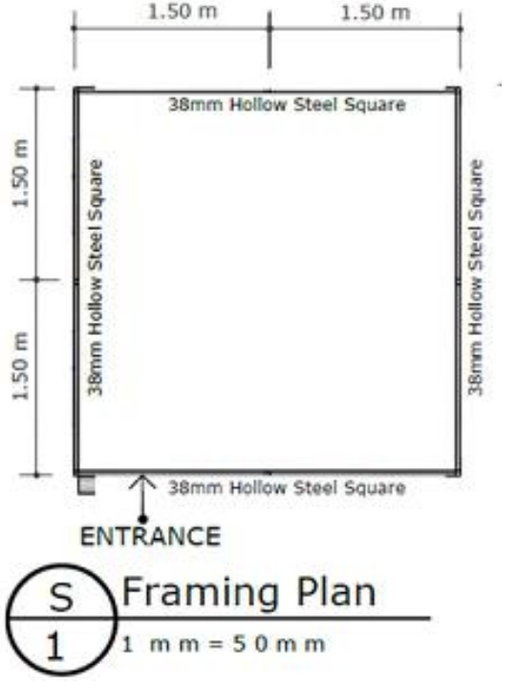


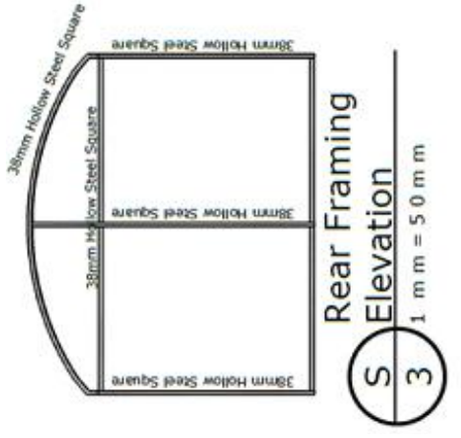
EXPLODED FRAME LEFT ISOMETRIC VIEW
scale: 1 m m = 5 0 m m
S 08

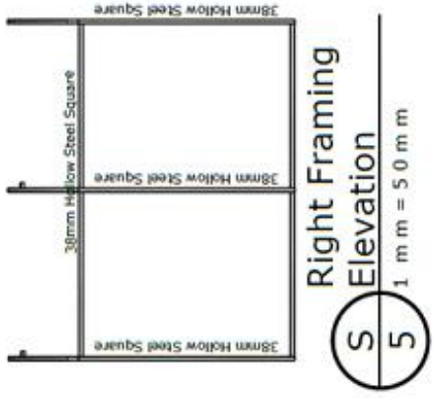
BVT-4 (Stainless Steel - Manila)

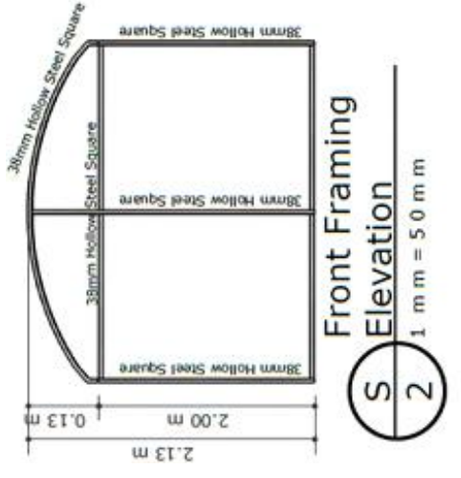
Materials

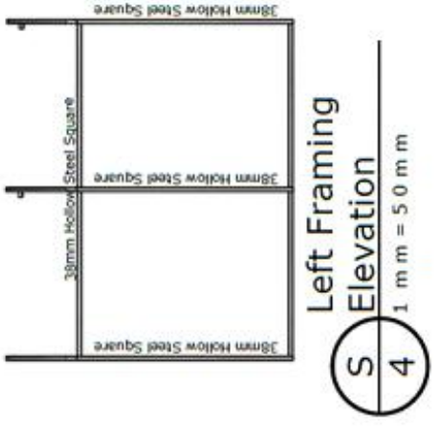
Item no.	Material Description	Qty.	Unit
1	Stainless tubular square Pipe 1.5” Ø (for posts, beams, and arches)	15	Lengths
2	Stainless tubular square Pipe 1” Ø	1	lth
3	Welding Rod (for welded connections)	1	kg
4	4” Disk Cutting Blade – Metal (for cutting)	1	pc
5	4” Grinder Blade – Metal (for grinding)	1	pc
6	#100 Waterproof Sanding Paper (for sanding)	3	pcs
7	2” Paint Brush (painting tool)	1	pc
8	White Maruyama Tarpaulin	35	Sq. meters
9	4mm Nylon Cord – Blue (for tie/guy wire)	15	mtrs
10	Zipper (fastener)	4	yrds
11	Zipper Head (fastener)	4	pcs
12	Cord Lock	5	pcs
13	Nylon Sewing Thread	2	yrds
14	Velcro Tapes	15	meters

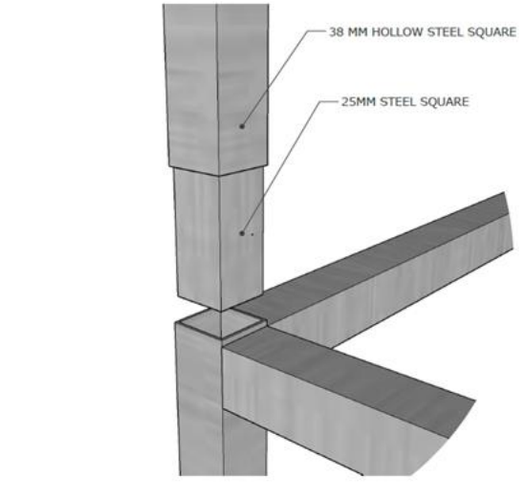


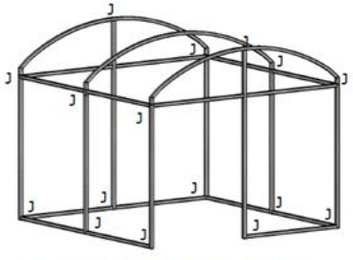










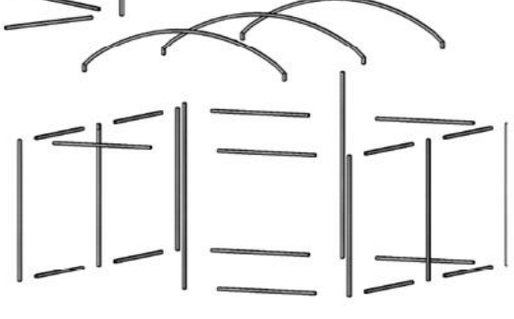


* TENT FRAMING WITH INDICATED LOCATION OF JOINTS

* CONNECTION DETAIL AT EVERY JOINTS IN THE FRAME.

S 6 DETAIL CONNECTION NTS

S 7 FRAMING LEFT ISOMETRIC EXPLODED VIEW 1 m m = 5 0 m m



S 8 FRAMING RIGHT ISOMETRIC EXPLODED VIEW 1 m m = 5 0 m m

Cutting List

Frame - refer to supplied BVT tent frame set sample for actual basis of cutting preparation.

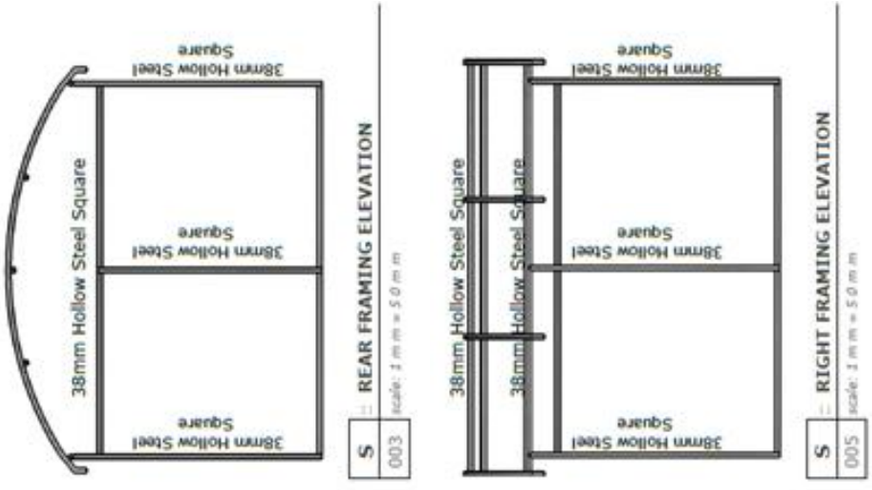
Skin - refer to supplied tent skin sample as cutting and assembly template.

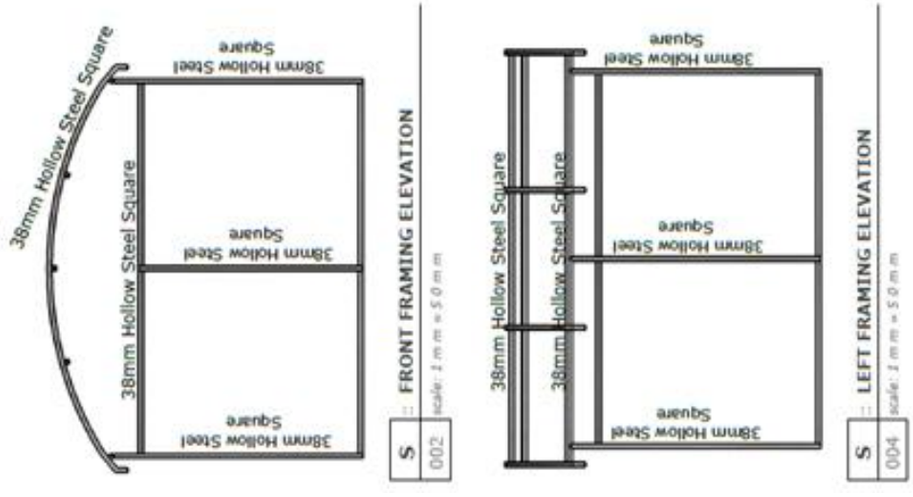
Cat no.	Part Description	Material Description	Cut Dimension	Qty.	Unit
BVT4.01	Fabricated Lower Horizontal Member	1 1/2" Ø Hollow Square Pipe(Tubular) Pipe	3000mm long	2	pcs
		1" Ø Hollow Square Pipe(Tubular) Pipe	150mm long	6	pcs
BVT4.02	Fabricated Lower Horizontal Member(with corner)	1 1/2" Ø Hollow Square Pipe(Tubular) Pipe	3000mm long	2	pcs
		1 1/2" Ø Hollow Square Pipe(Tubular) Pipe	150mm long	18	pcs
BVT4.03	Vertical Frame Member	1 1/2" Ø Hollow Square Pipe(Tubular) Pipe	2000 mm long	4	pcs
		1" Ø Hollow Square Pipe(Tubular) Pipe	100mm long	12	pcs
BVT4.04	Fabricated Vertical Frame Member(Center)	1 1/2" Ø Hollow Square Pipe(Tubular) Pipe	2100mm long	8	pcs
		1" Ø Hollow Square Pipe(Tubular) Pipe	75mm long	4	pcs
BVT4.05	Fabricated Truss(Exterior)	1” Ø Hollow Square Pipe(Tubular) Pipe	3500mm long	6	pcs
		1" Hollow Square Pipe(Tubular) Pipe	200mm long	21	pcs
BVT4.06	Fabricated Upper Horizontal	1” Ø Hollow Square Pipe(Tubular) Pipe	3000mm long	4	pcs
		1" Hollow Square Pipe(Tubular) Pipe	75mm long	12	pcs
BVT4.07	Fabricated Truss Connection(Top)	1” Ø Hollow Square Pipe(Tubular) Pipe	1500mm long	2	pcs
		1" Hollow Square Pipe(Tubular) Pipe	75mm long	4	pcs

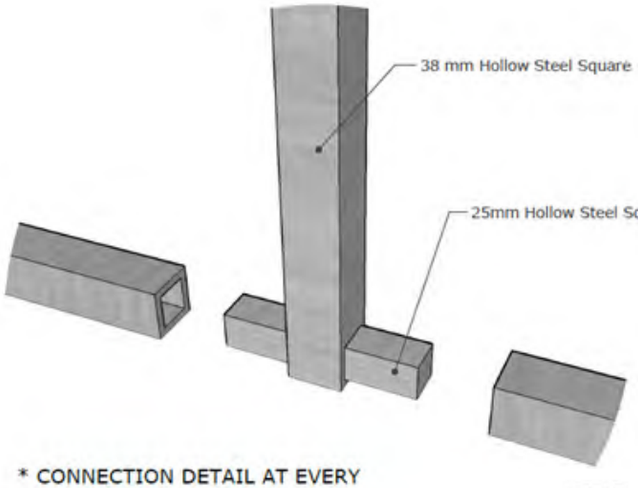
BVT-5 (Stainless Steel - Mindanao)

Materials

Item no.	Material Description	Qty.	Unit
1	Stainless tubular square Pipe 1.5” Ø (for posts, beams, and arches)	15	Lengths
2	Stainless tubular square Pipe 1” Ø	1	lth
3	Welding Rod (for welded connections)	1	kg
4	4” Disk Cutting Blade – Metal (for cutting)	1	pc
5	4” Grinder Blade – Metal (for grinding)	1	pc
6	#100 Waterproof Sanding Paper (for sanding)	3	pcs
7	2” Paint Brush (painting tool)	1	pc
8	White Maruyama Tarpaulin	35	Sq. meters
9	4mm Nylon Cord – Blue (for tie/guy wire)	15	mtrs
10	Zipper (fastener)	4	yrds
11	Zipper Head (fastener)	4	pcs
12	Cord Lock	5	pcs
13	Nylon Sewing Thread	2	yrds
14	Velcro Tapes	15	meters

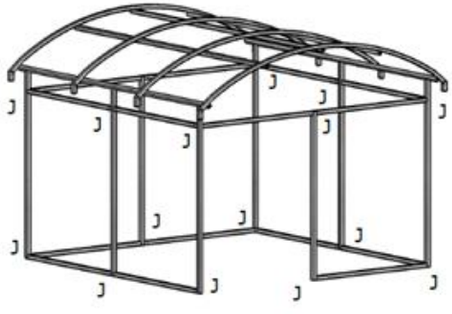






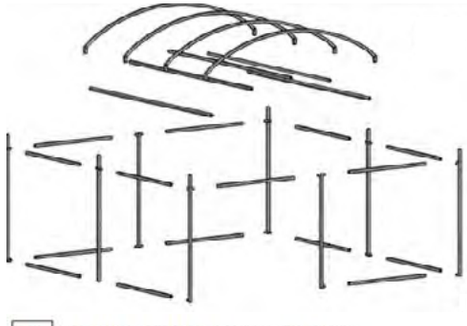
* CONNECTION DETAIL AT EVERY JOINTS IN THE FRAME.

S :: DETAIL CONNECTION
006 scale: N T S



* TENT FRAMING WITH INDICATED LOCATION OF JOINTS.

* CONNECTION OF PURLINS ANF TRUSS ARE THROUGH BOLTS.



S :: FRAMING LEFT EXPLODED ISOMETRIC VIEW
007 scale: 1 m m = 5 0 m m

S :: FRAMING RIGHT EXPLODED ISOMETRIC VIEW
008 scale: 1 m m = 5 0 m m

Cutting List

Frame - refer to supplied BVT tent frame set sample for actual basis of cutting preparation.

Skin - refer to supplied tent skin sample as cutting and assembly template.

Cat no.	Part Description	Material Description	Cut Dimension	Qty.	Unit
BVT5.01	Fabricated Lower Horizontal Member	1 1/2" Ø Hollow Square Pipe(Tubular) Pipe	3000mm long	2	pcs
		1" Ø Hollow Square Pipe(Tubular) Pipe	150mm long	6	pcs
BVT5.02	Fabricated Lower Horizontal Member(with corner)	1 1/2" Ø Hollow Square Pipe(Tubular) Pipe	3000mm long	2	pcs
		1 1/2" Ø Hollow Square Pipe(Tubular) Pipe	150mm long	18	pcs
BVT5.03	Vertical Frame Member	1 1/2" Ø Hollow Square Pipe(Tubular) Pipe	2000 mm long	4	pcs
		1" Ø Hollow Square Pipe(Tubular) Pipe	100mm long	12	pcs
BVT5.04	Fabricated Vertical Frame Member(Center)	1 1/2" Ø Hollow Square Pipe(Tubular) Pipe	2100mm long	8	pcs
		1" Ø Hollow Square Pipe(Tubular) Pipe	75mm long	4	pcs
BVT5.05	Fabricated Truss	1" Ø Hollow Square Pipe(Tubular) Pipe	3600mm long	6	pcs
		1" Hollow Square Pipe(Tubular) Pipe	200mm long	21	pcs
BVT5.06	Fabricated Upper Horizontal	1" Ø Hollow Square Pipe(Tubular) Pipe	3000mm long	4	pcs
		1" Hollow Square Pipe(Tubular) Pipe	75mm long	12	pcs
BVT5.07	Fabricated Truss Connection(Top)	1" Ø Hollow Square Pipe(Tubular) Pipe	1500mm long	2	pcs
		1" Hollow Square Pipe(Tubular) Pipe	75mm long	4	pcs

BVT-6 (Kawayan)

Materials

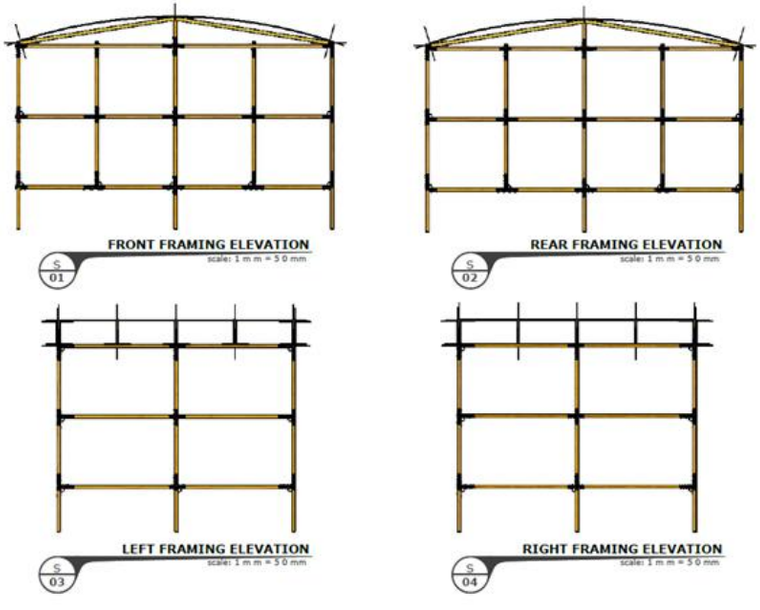
Item no.	Material Description	Qty.	Unit
1	Bamboo, minimum of 100mm Ø (for posts, beams)	85	m
2	Bamboo, minimum of 75mm Ø (arch roofing)	10	m
3	Bamboo, minimum of 50mm Ø (arch roofing)	25	m
4	Common Wire Nails(5”)	1	kg
5	Hand Saw (for cutting)	1	pc
6	Jungle bolo (for bamboo splitting)	1	pc
7	Crowbars (for excavation)	1	pc
8	Common Wire Nails (0.5” to 1.0”)	1	kg
9	White Maruyama Tarpaulin	35	Sq. meters
10	4mm Nylon Cord – Blue (for tie/guy wire)	15	mtrs
11	Tie Wire	1	kg

Cutting List

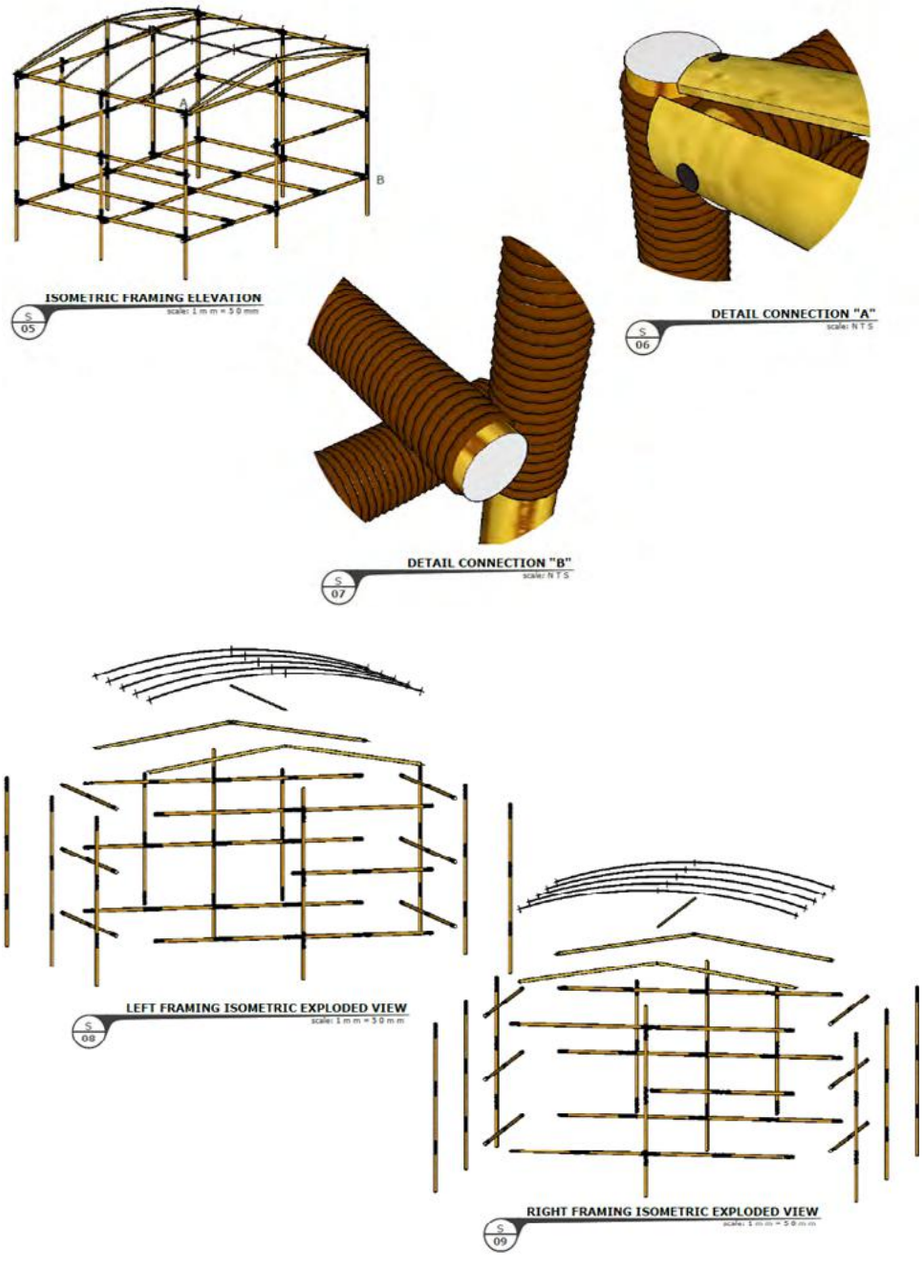
Frame - refer to supplied BVT tent frame set sample for actual basis of cutting preparation.

Skin - refer to supplied tent skin sample as cutting and assembly template.

Cat no.	Part Description	Material Description	Cut Dimension	Qty.	Unit
BVT6.01	Long Post	100mm-dia bamboo	3300mm	8	pcs
BVT6.02	Vertical Member	100mm-dia bamboo	2000mm	4	pcs
BVT6.03	Horizontal Frame Member (Long side)	100mm-dia bamboo	4000mm	5	pcs
BVT6.04	Horizontal Frame Member (Short side)	100mm-dia bamboo	3000mm	9	pcs
BVT6.05	Horizontal Frame Member (Door side)	100mm-dia bamboo	1500mm	1	pcs
BVT6.06	Truss	75mm-dia bamboo	1000mm	4	pcs
BVT6.07	Curved Roof Frame Member	50mm-dia bamboo	4500mm	5	pcs
BVT6.08	Stairs (Vertical)	75mm-dia bamboo	1000mm	2	pcs
BVT6.09	Stairs (Horizontal)	75mm-dia bamboo	500mm	4	pcs



* MATERIALS FOR FRAME ARE SUBJECTED TO BAMBOO.



1.2. Procedure of Production

FABRICATION and PRODUCTION WORK consists of replicating supplied component samples as per model, for Tent Frame and Skin patterns.

Frame :

- Prepare material lengths for components as described and quantified in the cutting list and verified from the sampe model.
- Weld component connectors per samples, testing each finished item for fit and removing burrs with file or sandpaper. For connectors requiring fitting bolt, make sure holes on the connectors are larger (5/16” dia.) than fitted nuts so that fitting bolts can freely tighten on the joint. Fitting bolts must be tested thoroughly on each nut to loosen the (bolt & nut) fitting for easy assembly.

Skin :

- Production of the tent skin shall be based on supplied actual sample as mother pattern, where all cutting and joining shall be duplicated from.
- The bamboo variant does not require pre-production of tarpaulin sheets. Walling and roofing can be directly wrapped around the bamboo framing using nylon chords

1.3. Speed of Production / Assembly

The BVT owes much of its practicality in deployment to its speed in assembly and dismantling. The BVT can be assembled in less than ten minutes and can be disassembled in less than 5 minutes, making it very easy to put up and easy to keep after each use.

The key to all these is prefabrication. A fairly fast piecework welder can fabricate 2 frame sets a day while the tailor / upholsterer can work very much in the same pace. Prefabricated components allow for most practicality and speed in deployment making the system very much feasible for adoption to contingency plans and pre-positioning by LGUs and NGOs including the stocking of a significant number of this model of temporary shelters ready for deployment in the eventuality of applicable disaster event.

1.4. Required Manpower and Skill in assembly and deployment

Assembly of prefabricated tent components do not require special skill. Any regular family member aged 12 and above can be adept in assembly and use of wrenches in tightening joints after a single trial assembly.

1.5. Required Tools and Equipment

For fabrication:

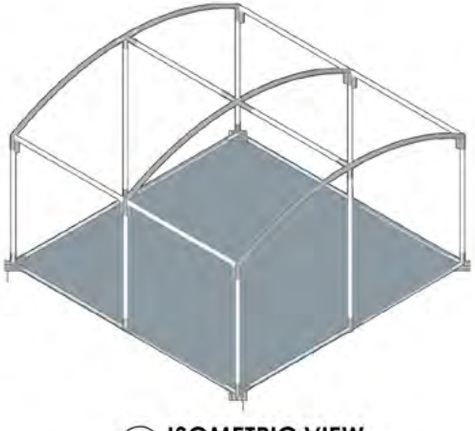
- Heavy duty sewing machine
- Basic tailoring tools, scissors, cutter,
- Measuring implements

For assembly:

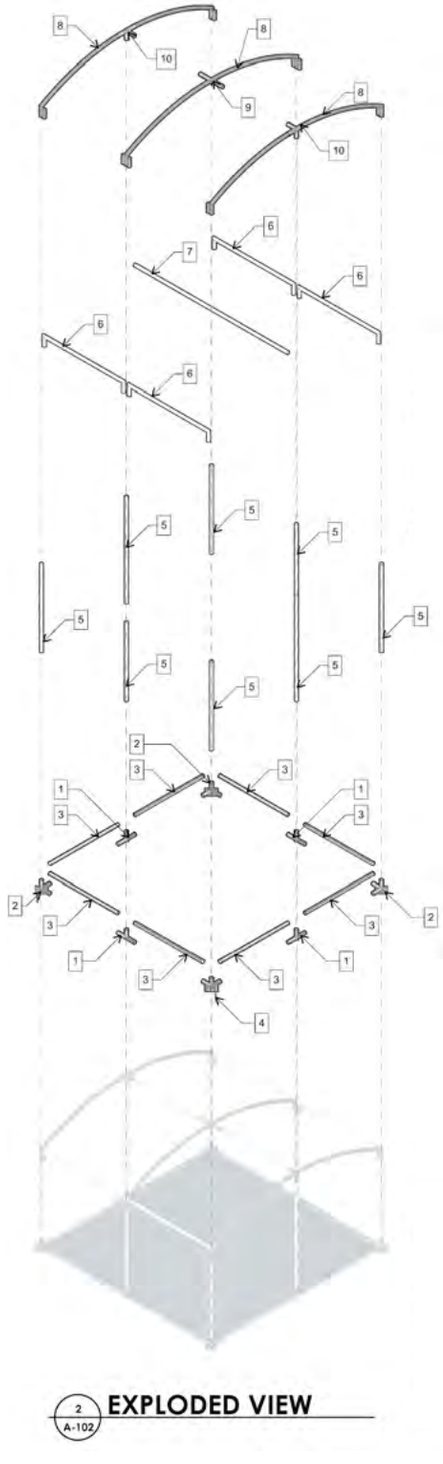
- 2 pcs 10 mm open or box wrenches to each assembler / installer.
- Working gloves
- 2.3 Mechanical pliers
- Hard hat and safety working attire.

For bamboo construction

- Handsaw
- Chisel
- Hand drills
- Jungle Bolo and hammer for preparation of bamboo slats
- Crowbar, shovel



1 A-102 ISOMETRIC VIEW
NOT TO SCALE



2 A-102 EXPLODED VIEW

BARREL VAULT TENT FRAME PARTS/LEGEND:

1) 3/4" Ø RSC FABRICATED TEE
2) 3/4" Ø RSC FABRICATED 3-WAY CORNER CONNECTOR WITH PLATE FOR THE ANCHOR ROD
3) 1/2" Ø RSC HORIZONTAL FRAME MEMBER
4) 10MM Ø ANCHOR ROD
5) 1/2" Ø RSC VERTICAL FRAME MEMBER
6) 1/2" Ø RSC ROOF FRAME MEMBER (BOTTOM)
7) 1/2" Ø RSC ROOF FRAME MEMBER (TOP)
8) 1/2" Ø RSC ROOF FRAME MEMBER (BENDED)
9) 3/4" Ø RSC FABRICATED CROSS TEE
10) 3/4" Ø RSC FABRICATED CORNER CROSS TEE

BVT Applications and Trial Setups

I. Deployments in Actual Emergencies

1. Lumad displacement in Bukidnon due to conflict

Disaster Event: **Armed Conflict**
Location: **San Fernando, Bukidnon**
Date of Incident: **January 15, 2019**
Affected Communities: Barangays Magkalungay and Kawayan
Number of Affected: 119 families

Evacuation Site:
Barangay Magkalungay, San Fernando

Evacuation Center Conditions:

- IDPs sleeping only on cement flooring, some have carton boxes as sleeping mats
- Domestic animals loitering around the camp
- No privacy
- No protection from cold weather
- No WASH facilities
- Children get sick

LGU and other CSOs' Response:

- Construction of semi-permanent latrines
- Water facility
- Food packs
- Health missions

ATS Deployment

Selected Site:
Barangay Magkalungay

Shelter Materials:
Bamboo poles for framing, banana twines as connectors, laminated sack and tarpaulin for walling and roofing

Number of Shelter Units Deployed: 119
Beneficiary Profile: Lumad families displaced by conflict
Duration of Displacement: 9 months
Duration of Displacement with ATS: 5 months

Activities Conducted:

- Assessment and designing of ATS
- Site selection and assessment
- Organizing and capacity building for builders / IDP
- Bayanihan for construction of ATS

Feedback and PDM Results:

- IDPs are protected from elements such as cold, heat, and rain
- ATS is not much different from their original dwellings which made them feel a sense of home

Post-deployment Activities and Sustainability:

- Other interventions were conducted on site such as birth certificate registration and civil documentation, food assistance, WASH support, and health missions.

2. COVID-19 Response in Navotas and Malabon cities

Disaster Event: **Pandemic**
Location: **Metro Manila**

ATS Deployment

Selected Sites:
Barangay North Bay Boulevard South Covered Court, Navotas City
Ospital ng Malabon, Malabon City
Barangay Panghulo, Malabon City

Shelter Materials:
Galvanised iron pipes for framing and connectors, taffeta for tent skin, tarpaulin for flooring

Number of Shelter Units Deployed: 20
Space Allocation: 9sqm/tent unit
Beneficiary Profile: homeless families, probable and suspect COVID patients, frontliners
Duration of Displacement: ongoing since March 2020 (ECQ)

3. Typhoon Response in Metro Manila

Disaster Event: **Typhoon**
Location: **Metro Manila**

ATS Deployment

Selected Sites:
Panghulo National High School, Barangay Panghulo, Malabon City

Shelter Materials:
Galvanised iron pipes for framing and connectors, tarpaulin for walling and roofing

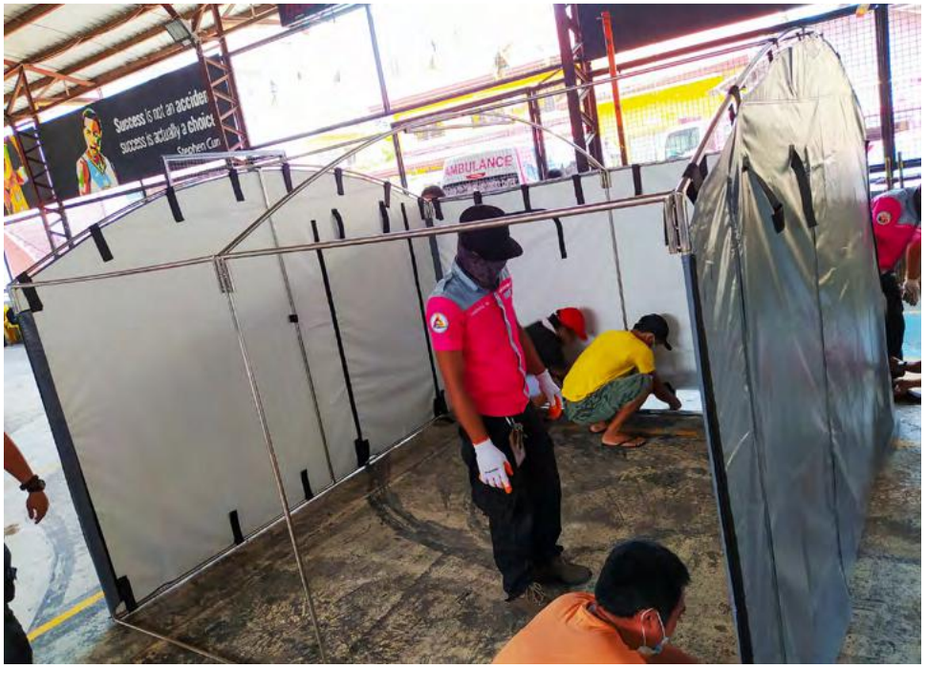
Number of Shelter Units Deployed: 5 (prepositioned for pre-emptive evacuation)

Space Allocation: 9sqm/tent unit

II. Trial Setups

Earthquake Drill (Barangay Panghulo, Malabon City, November 15, 2019)
Number of Units Deployed: 6

Exhibit and Feedbacking Session (Malabon City, September 30, 2020)
Number of Units Deployed: 6



Prototype Presentation (Cotabato City, November 18, 2020)
Number of Units Deployed: 4

Demo Set-up on Standard Basketball Court (Malabon City, November 18, 2020)
Number of Units Deployed: 24

Setting-up of Units for Turn-over (Cagayan de Oro City, December 4, 2020)
Number of Units Deployed: 10

2. Tarp Tent 1

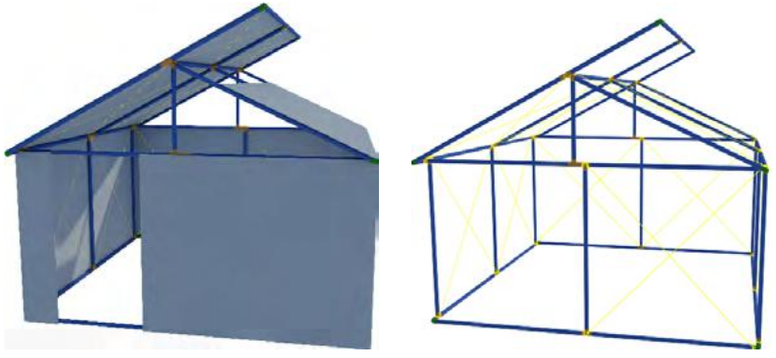


Fig. Tarp Tent 1 perspective and its framing system

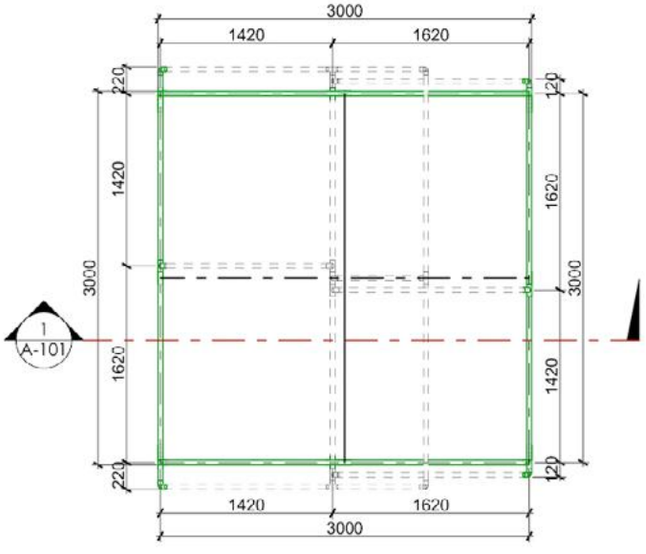
The PVC-Tarp Tent 1 is a straightforward ATS solution that takes a boxy form and asymmetrical gable roof with one panel extending over the other to accommodate a roof vent to allow warm air exhaust.

It makes use of the typical tarpaulin and PVC pipe components, making use of standard PVC fittings to join the pipes into a rigid frame, thus allowing it to be covered by tarpaulin skin using duct tape. A ground mat of tarpaulin sheet should be provided as a flooring material as this will insulate occupants from the earth, and keep away moisture and water penetration. As with similar tent models, windows and doors can be cut out of the tarp skin.

Indicative cost of this model run to about P24,000.00, a direct cost for labor and materials.

2.1. Materials

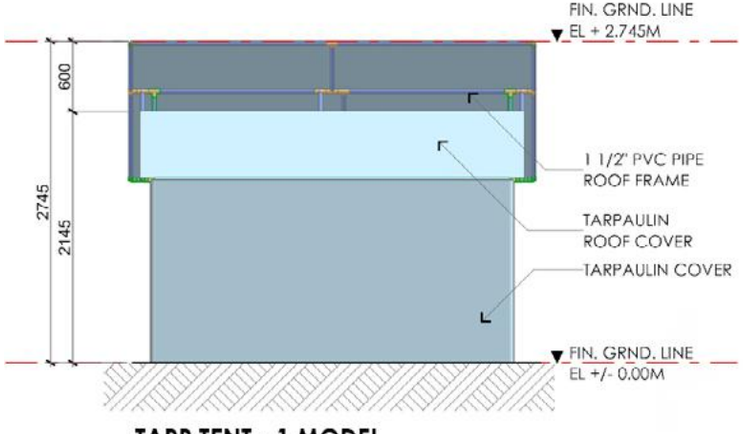
Item no.	Material Description	Qty.	Unit
1	1 1/2” PVC pipe	18	bds
2	PVC pipe elbow 90°	10	pcs
3	PVC pipe tee	34	pcs
4	Duct tape	1	Pcs.
5	Tarpaulin (11.00 m x 6.00 m)	1	lot
6	20 m Nylon rope	1	roll
7	1 1/2" metal type Tek screws (or self-drilling screws)	88	pcs



TARP TENT - 1 MODEL

1 / A-101 FLOOR PLAN

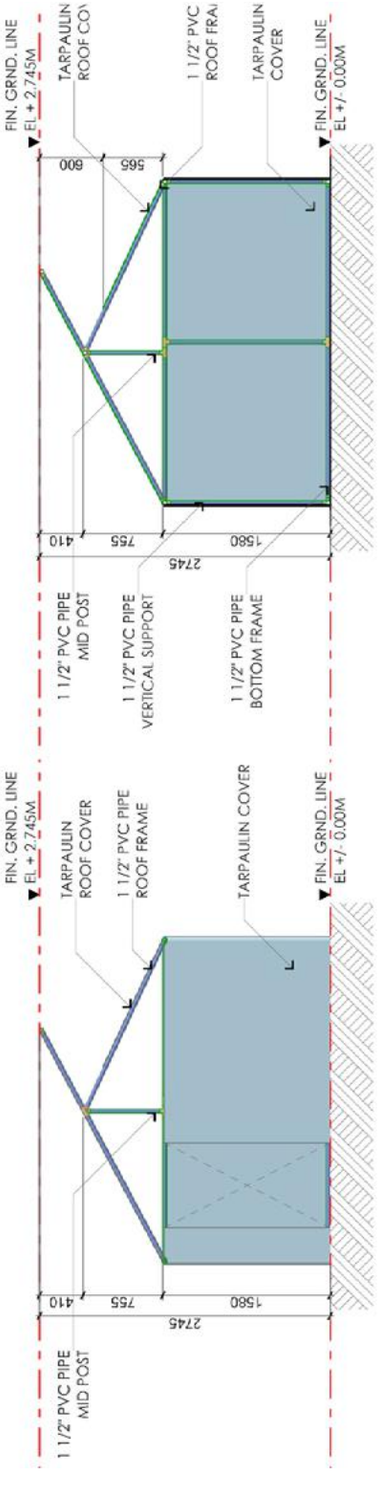
SCALE 1:50



TARP TENT - 1 MODEL

1 / A-101 LEFT SIDE ELEVATION

SCALE 1:50



TARP TENT - 1 MODEL

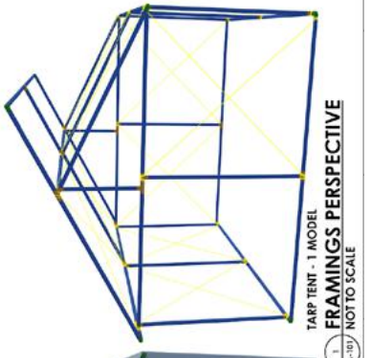
3 / A-101 CROSS SECTION

SCALE 1:50

TARP TENT - 1 MODEL

2 / A-101 FRONT ELEVATION

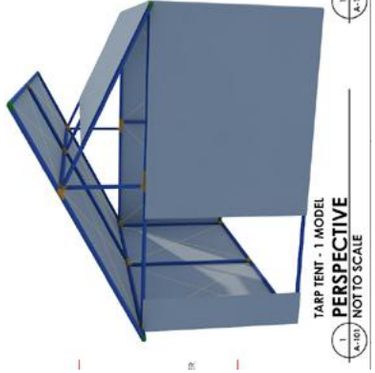
SCALE 1:50



TARP TENT - 1 MODEL

1 / A-101 FRAMINGS PERSPECTIVE

NOT TO SCALE



TARP TENT - 1 MODEL

1 / A-101 PERSPECTIVE

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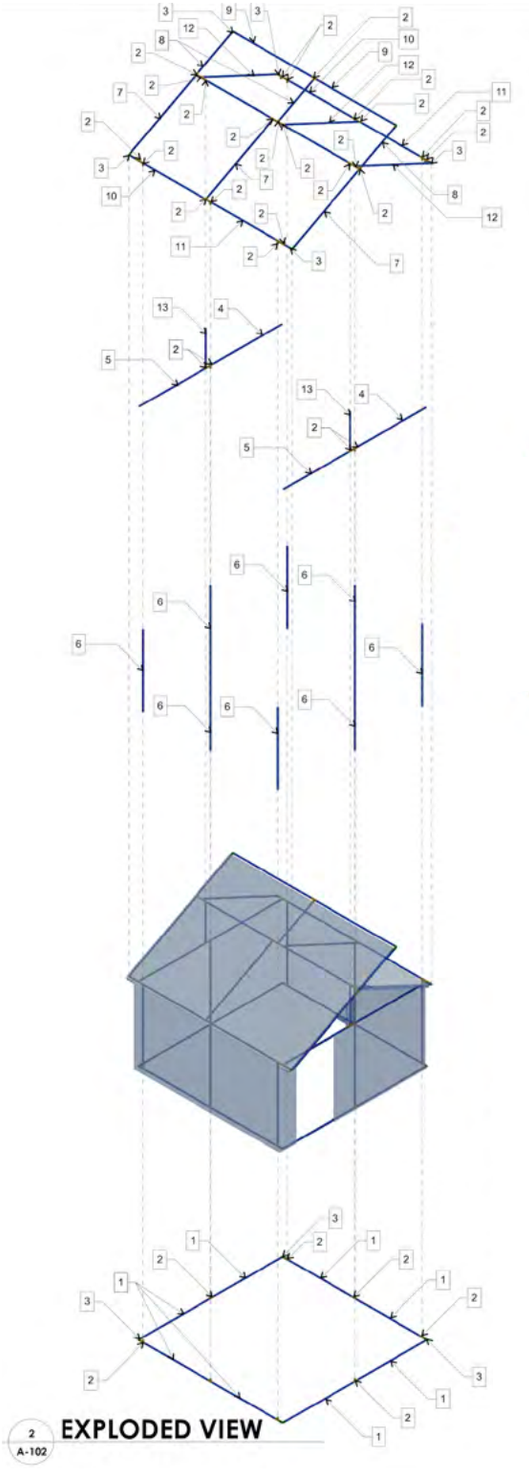
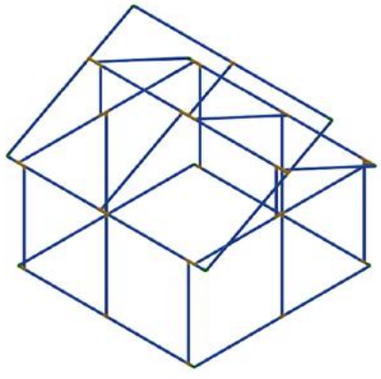




TARP TENT-1
PARTS/LEGEND:

1) 1 1/2” PVC PIPE HORIZONTAL FRAMING AT THE BASE, 1.5M LONG
2) PVC PIPE TEE
3) PVC PIPE ELBOW 90°
4) 1 1/2” PVC PIPE HORIZONTAL FRAMING, 1.48M LONG
5) 1 1/2” PVC PIPE HORIZONTAL FRAMING, 1.38M LONG
6) 1 1/2” PVC PIPE VERTICAL FRAMING, 1.5M LONG
7) 1 1/2” PVC PIPE ROOF FRAMING, 1.56M LONG
8) 1 1/2” PVC PIPE ROOF FRAMING, 0.83M LONG
9) 1 1/2” PVC PIPE ROOF FRAMING, 1.68M LONG
10) 1 1/2” PVC PIPE HORIZONTAL FRAMING, 1.38M LONG
11) 1 1/2” PVC PIPE HORIZONTAL FRAMING, 1.28M LONG
12) 1 1/2” PVC PIPE ROOF FRAMING, 1.745M LONG
13) 1 1/2” PVC PIPE KING POST ROOF FRAMING, 0.17M LONG

2.2. Procedure of Production

i. Cut the PVC pipes accordingly. (Refer to the cutting list)
ii. Cut the Tarpaulin cover for the body and roof. (Refer to the cutting list)

Refer to the drawings and cutting list for the proceeding steps

iii. Assemble the horizontal framing member at the bottom by joining pipes horizontally with tee joints and elbows.
iv. Assemble the roof framing.
v. Assemble the vertical framing member that serves as posts by joining it to the tees and elbows that also connects the horizontal framing member at the bottom.
vi. Connect another horizontal framing member that will serve as lintel at the other upper end of vertical member (posts). Provide additional elbows and tees for the roof framing.
vii. Lift the roof framing and connect it to the tees and elbows from the top horizontal framing that serves as lintel.
viii. Add guy wires or nylon wires to the framing that will serve as diagonal members to make the frame sturdier.
ix. Put the tarpaulin cover for the body and roof.
x. Secure the connection of PVC pipes and tarpaulin cover by using duct tape.

2.3. Cutting List

Cat no.	Part Description	Material Description	Cut Dimension	Qty.	Unit
PVCTT1.01	Horizontal framing at the base	1 1/2” PVC pipe	1500 mm long	8	pcs
PVCTT1.02	Fittings	PVC tee	N.A.	34	pcs
PVCTT1.03	Fittings	90° PVC elbow	N.A.	10	pcs
PVCTT1.04	Horizontal framing	1 1/2” PVC pipe	1480 mm long	2	pcs
PVCTT1.05	Horizontal framing	1 1/2” PVC pipe	1380 mm long	2	pcs
PVCTT1.06	Vertical framing	1 1/2” PVC pipe	1500 mm long	8	pcs
PVCTT1.07	Roof framing	1 1/2” PVC pipe	1560 mm long	3	pcs
PVCTT1.08	Roof framing	1 1/2” PVC pipe	830 mm long	3	pcs
PVCTT1.09	Roof framing	1 1/2” PVC pipe	1680 mm long	2	Pcs
PVCTT1.10	Horizontal framing	1 1/2” PVC pipe	1380 mm long	2	pcs

PVCTT1.11	Horizontal framing	1 1/2” PVC pipe	1280 mm long	2	pcs
PVCTT1.12	Roof framing	1 1/2” PVC pipe	1745 mm long	3	pcs
PVCTT1.13	Roof framing	1 1/2” PVC pipe	170 mm long	2	pcs

2.4. Speed of Construction

Provided that all materials are available and have been cut, with 2 workers, the assembly time can be done in 3-4 hours.

2.5. Required Manpower Skills

- At least two skilled workers are needed.
- Must know how to use tools to assemble components.
- Must have good precision skills.
- Assembling of PVC Tarp Tent 1 requires hand and arm strength.
- Skills for installing or connecting pipe systems using PVC.

2.6. Required Tools and Equipment

- Basic carpentry hand tools such as claw hammer, pliers, square, bubble level, measuring tape, utility knife, and the like.
- Personal protective equipment (PPE) such as a hard hat, shoes, gloves, a vest, eye protection, a face mask, and appropriate clothing should be used and worn to protect labor personnel from the risk of injury.

3. PVC Tarp Tent 2

The PCV-Tarp Tent 2 is actually a variant of the barrel vault tent using PVC pipe frames instead of steel. Pipe framework are joined together by fittings without adhesive to allow reusability of the materials. Instead, tek screws are used to secure rigid joints.

The footprint is slightly smaller at 297x297cm but can still accommodate 3-7 family members.

A ground mat made of tarpaulin sheet should be provided as flooring material, this will insulate occupants from the earth, and keep away moisture and water penetration. As with similar tent models, windows and doors can be cut out of the tarp skin.

Indicative cost of this model run to about P24,000.00, direct cost for labor and materials.

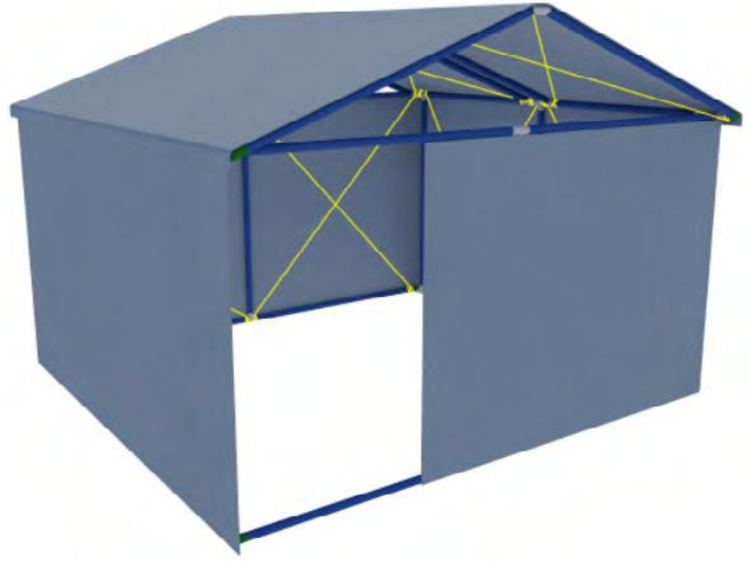


Fig. Tarp Tent 2 perspective

3.1. Materials

Item no.	Material Description	Qty.	Unit
1	1 1/2” PVC pipe	18	bds
2	PVC pipe elbow 90°	8	pcs
3	PVC pipe tee	28	pcs
4	Duct tape	1	pcs
5	Tarpaulin (11.00 m x 6.00 m)	1	lot
6	20 m Nylon rope	1	roll

3.2 Procedure of Production

i. Cut the PVC pipes accordingly. (Refer to the cutting list)
ii. Cut the Tarpaulin cover for the body and roof. (Refer to the cutting list)

Refer to the drawings and cutting list for the succeeding steps

iii. Assemble the horizontal framing member at the bottom by joining pipes horizontally with tee joints and elbows.
iv. Assemble the roof framing in accordance with the dimensions given.
v. Assemble the vertical framing member that serves as posts by joining it to the tees and elbows that also connects the horizontal framing member at the bottom.
vi. Connect another horizontal framing member that will serve as lintel at the other upper end of vertical member (posts). Provide additional elbows and tees for the roof framing.
vii. Lift the roof framing and connect it to the tees and elbows from the top horizontal framing that serves as lintel.
viii. Add guy wires or nylon wires to the framing that will serve as diagonal members to make the frame sturdier.
ix. Put the tarpaulin cover for the body and roof.
x. Secure the connection of PVC pipes and tarpaulin cover by using duct tape.

3.3. Cutting List

Cat no.	Part Description	Material Description	Cut Dimension	Qty.	Unit
PVCTT2.01	Cover (wall)	Tarpaulin cover	10880 mm (long) x 1580 mm	1	lot
PVCTT2.02	Horizontal framing (1)	1 1/2” PVC pipe	1485 mm	8	pcs
	Horizontal framing (2)	1 1/2” PVC pipe	1200 mm	8	pcs
PVCTT2.03	Vertical framing	1 1/2” PVC pipe	1580 mm long	8	pcs
PVCTT2.04	Fittings	90° PVC elbow	N.A.	8	pcs
PVCTT2.05	Fittings	PVC tee	N.A.	28	pcs
PVCTT2.06	Roof framing	1 1/2” PVC pipes	1580 mm long	8	pcs
PVCTT2.07	Cover (roof)	Tarpaulin cover	3000 mm x 3000mm	1	lot

Note: Precision cutting are better attained as dimensions are verified during construction / fabrication and test assembly. Measurements shown in the cutting list are indicative. Dimensions are best referred to in working drawings.

3.4. Speed of Construction

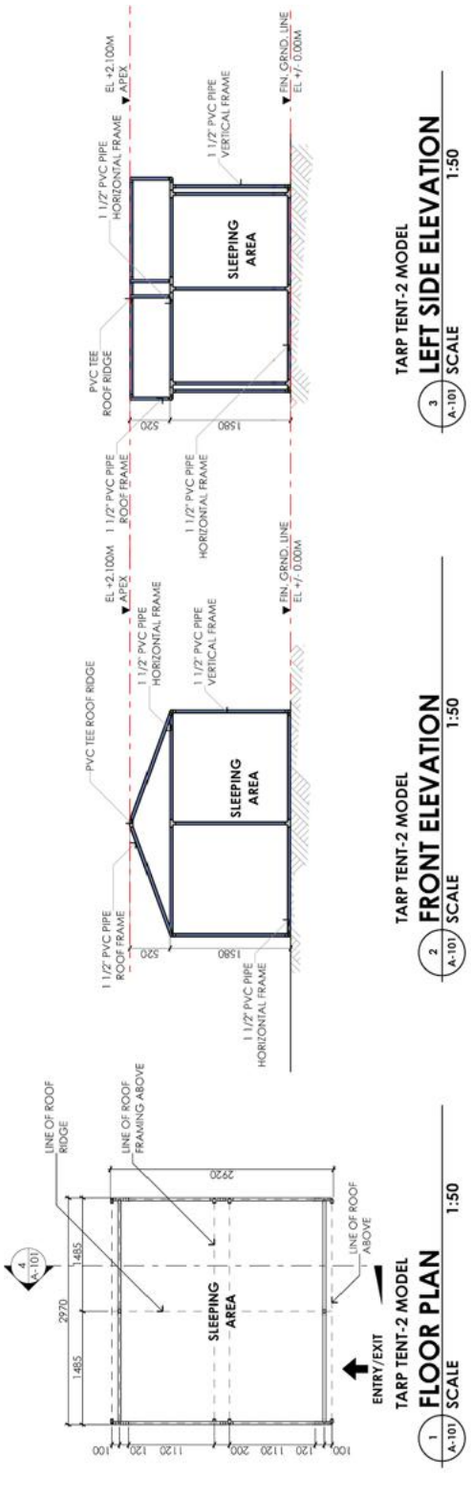
Provided that all materials are available and has been cut, with 2 workers, the assembly time can be done in 3-4 hours.

3.5. Required Manpower Skills

- At least 1 skilled worker paired with a helper are sufficient to satisfactorily complete the assembly.
- Some hand and arm strength are required for twisting pvc pipework.

3.6. Required Tools and Equipment

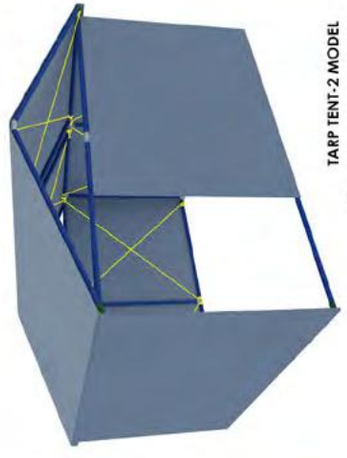
- Basic carpentry hand tools such as claw hammer, pliers, square, bubble level, measuring tape, utility knife, and the like.
- Personal protective equipment (PPE) such as hard hat, shoes, gloves, vest, eye protection, face mask, and appropriate clothing should be used and worn to protect labor personnel from risk of injury.



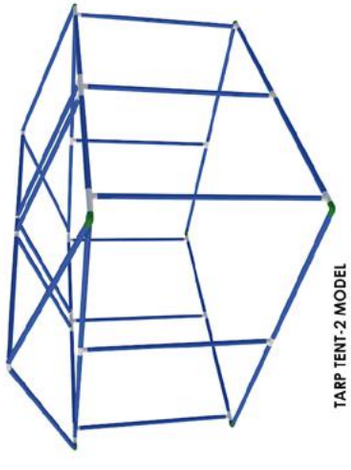
TARP TENT-2 MODEL
1 FLOOR PLAN 1:50
1 A-101 SCALE

TARP TENT-2 MODEL
3 LEFT SIDE ELEVATION 1:50
3 A-101 SCALE

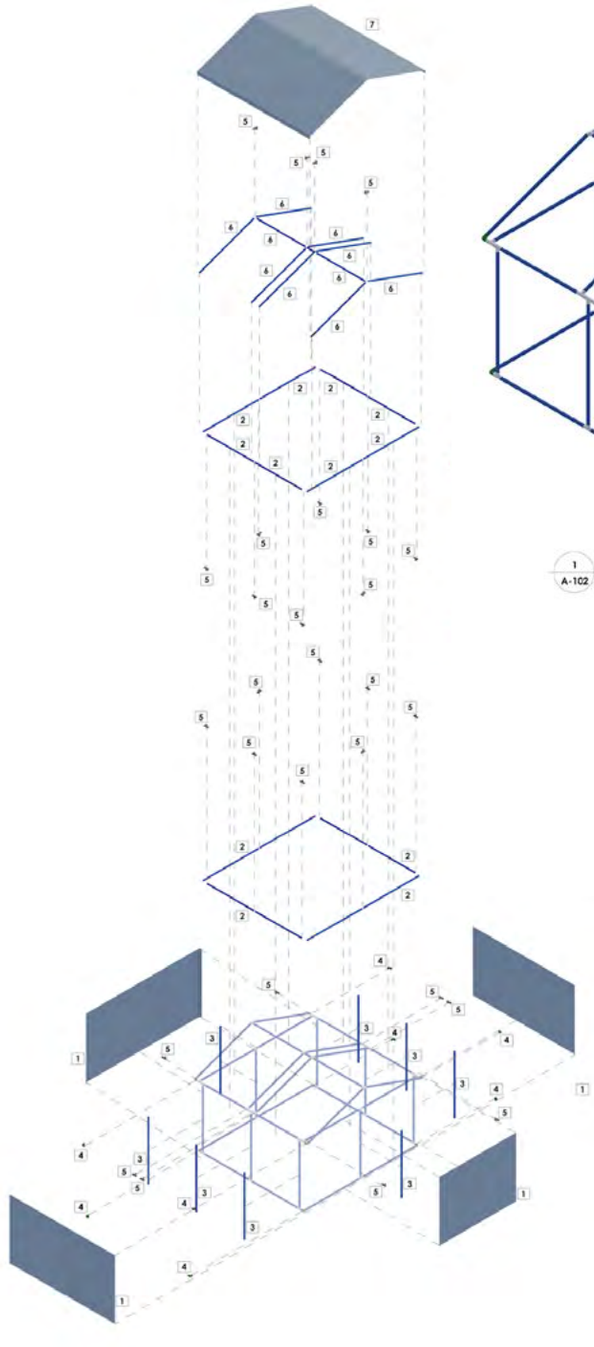
TARP TENT-2 MODEL
2 FRONT ELEVATION 1:50
2 A-101 SCALE



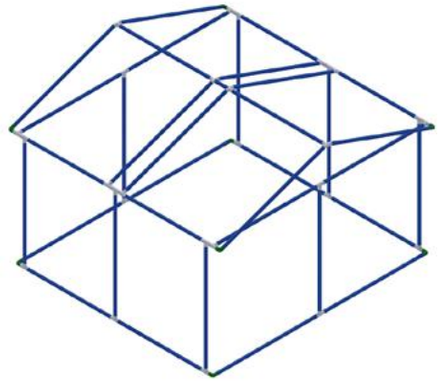
TARP TENT-2 MODEL
5 PERSPECTIVE NOT TO SCALE
5 A-101



TARP TENT-2 MODEL
4 FRAMING PERSPECTIVE NOT TO SCALE
4 A-101



2 EXPLODED VIEW
2 A-102



1 ISOMETRIC VIEW NOT TO SCALE
1 A-102

TARP TENT-2
PARTS/LEGEND:

1) TARPAULIN COVER
2) 1 1/2" PVC PIPE HORIZONTAL FRAMING AT THE BASE
3) 1 1/2" PVC PIPE VERTICAL FRAMING
4) PVC ELBOW 90°
5) PVC TEE
6) 1 1/2" PVC PIPES ROOF FRAMING
7) TARPAULIN ROOF COVER

4. Multi-family Outdoor Shelter System (MOSS)

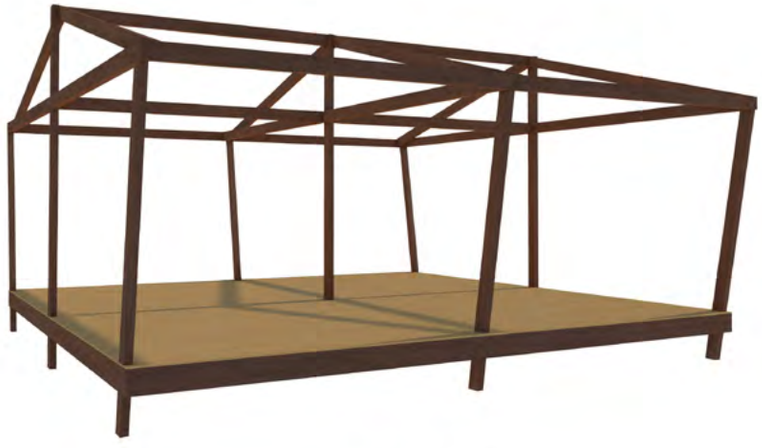
This shelter model features the lowly coco lumber for the main structural frame. When properly selected, the material exhibits the same performance as most Philippine hardwood.

The frame is constructed employing common carpentry skills in building simple timber houses. The s ingle level framework is effectively resilient to lateral force. The base floor can be elevated up to 14 inches from the ground. 9 units of posts can be well anchored to the ground to offer more movement and wind resistance.

One module measures 480 x 480 cm at the base which when partitioned equates to 4-family shelter unit with maximum of 6 members each. The flooring is made of 1/2 inch phenolic board and partitions and skins of tarpaulin.

4.1. Materials

Parts	Material Description	Qty.	Unit
Stilt	2 x 4 x 6' coco lumber	9	pcs
Side post	2 x 4 x 8' coco lumber	6	pcs
Mid post	2 x 4 x 10' coco lumber	3	pcs
Girder	2 x 5 x 8' coco lumber	6	pcs
Joist	2 x 4 x 8' coco lumber	24	pcs
Girt	2 x 4 x 8' coco lumber	6	pcs
Brace	2 x 3 x 10' coco lumber	6	pcs
Bdwalk	2 x 4 x 8' coco lumber	10	pcs
Bdwalk	2 x 5 x 10' coco lumber	2	pcs
Fastener	4" common wire nails	1	kg
Fastener	3" common wire nails	3	kg
Floor	12 mm thk phenolic board	8	pcs
Fastener	2" common wire nails	2	kg
Rood cover	540 x 480 cm prefab tarp cover w/ rope edge	1	kg
Wall skin	180 cm wd white tarp light gauge	20	set
Pvc conn.	1/8" pvc connector gusset plates (fabricated)	6	M
Guywire	3/16” nylon wire	100	M
Duct tape	Duct tape	2	rolls
	Maruyama	9	



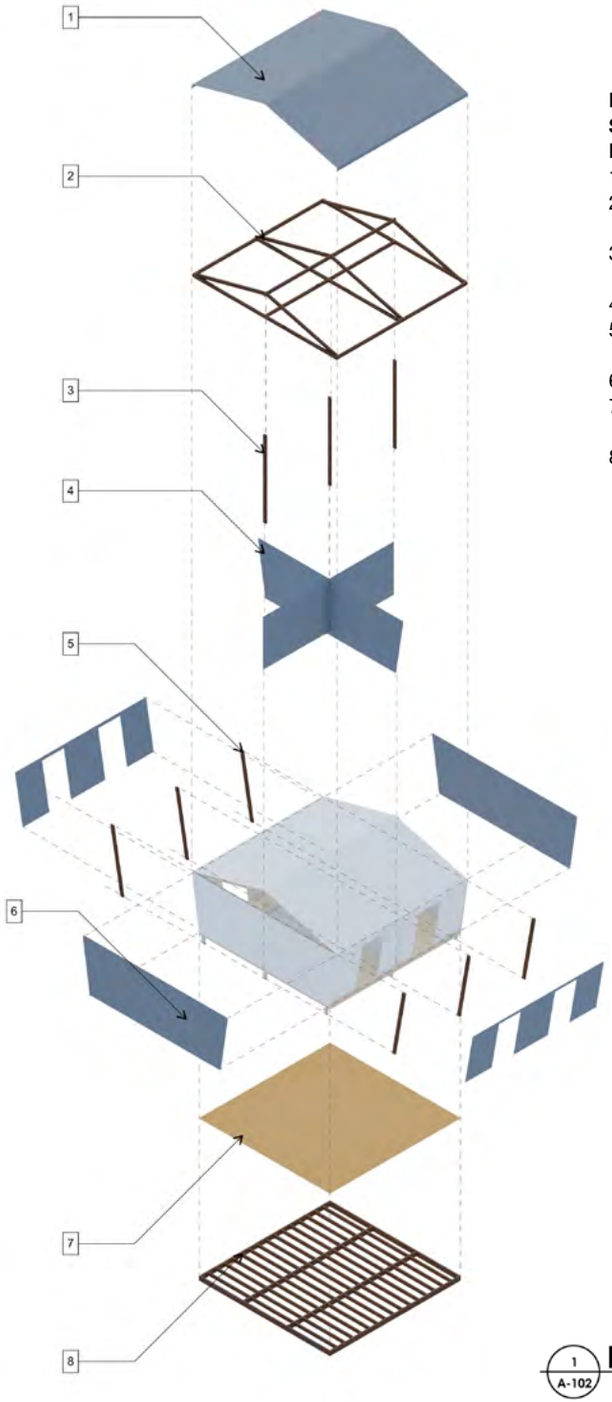
WITHOUT COVER

WITH COVER

MULTI-FAMILY OUTDOOR SHELTER MODEL

1 A-103 PERSPECTIVES

NOT TO SCALE



MULTI-FAMILY OUTDOOR SHELTER MODEL PARTS/LEGEND:

1) TARPAULIN ROOF COVER
2) COCO LUMBER ROOF FRAMING
3) COCO LUMBER VERTICAL FRAMING
4) TARPAULIN PARTITION
5) COCO LUMBER INCLINED SUPPORT
6) TARPAULIN WALL COVER
7) 1/2" PHENOLIC BOARD FLOORING
8) COCO LUMBER FRAMING

1 A-102 **EXPLODED VIEW**

4.2. Procedure of Production

i. Layout 2 phenolic boards side by side to form a 2400mm x 2400mm floor space. Prepare 4 sets of these modules arrayed in a 4800mm x 4800mm grid. This will serve as the guide for the layout of the posts. Stake them out on the ground as necessary.

ii. Raise these boards by constructing a board walk or platform using 2"x4" coco lumber framing spaced at 600mm both ways at a height of 300mm or less.

iii. Fasten the phenolic boards on to the platform securely. Provide steps as necessary using scrap wood or concrete hollow blocks.

iv. In between the 2400mm x 2400mm grids, place the 3000mm long middle posts one at each end then one in the middle.

v. At the edges, place 1800mm long side posts at each end as well as in between the units.

vi. On top of the middle post, fasten the girder.

vii. On top of the side posts, fasten the girt.

viii. Secure the roof framing assembly securely along its edges and joints in order to form a rigid frame. Take note that the side post had to tilt slightly outwards in order to accommodate the full length of the girt. This slight angle will also prevent water infiltration during rains.

ix. Provide additional support for the roof assembly through cross bracing or by stretching a rope across the frames.

x. Stretch the 540 x 480 cm prefab tarp cover w/ rope edge onto the roof frame assembly. Secure the assembly onto the ground using a guy wires for wind resistance.

xi. Provide cross bracing in between the frames that will serve as partition

walls between the units in order to provide lateral support and improve wind resistance.

xii. Stretch a tarpaulin running through the middle posts to divide the units into two equal halves of 4800 x 2400mm. Fasten securely with duct tape on each end. Anchor the tarpaulin on to the middle post with ample tape.

xiii. Stretch another set of tarpaulin from the side post to the middle post and secure with duct tape on both sides. These will serve as partition in between the units.

xiv. Fabric privacy panels may be provided by the occupants. Wires may be fastened end to end in between posts to serve as hanging rods for these panels.

4.3. Cutting List

Precise cutting are better attained through on site assembly, by taking actual measurements for cutting of parts and components during layout and construction.

4.4. Speed of Production

A crew of 2 skilled carpenters and 2 helpers can erect the MOSS in 1 or 2 days.

4.5. Required Manpower and Skills

Basic carpentry knowledge, know-how in measurements, plumb leveling and squaring assures satisfactory fabrication and assembly of the MOSS.

4.6. Required Tools and Equipment

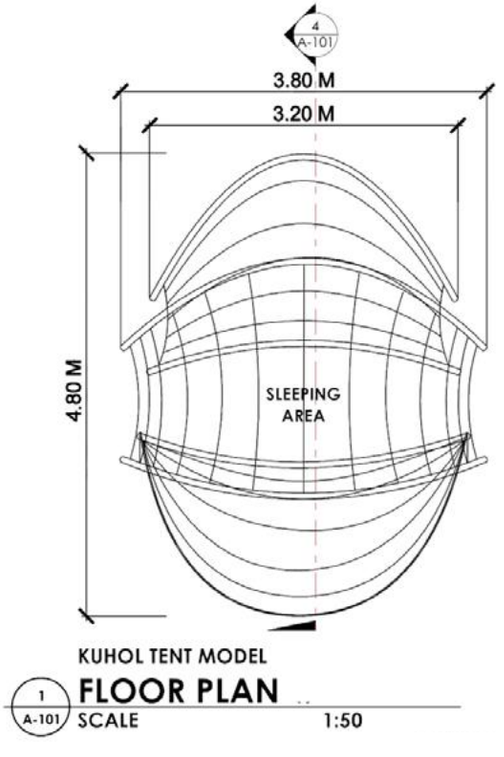
- Basic carpentry hand tools such as claw hammer, pliers, square, bubble level, measuring tape, utility knife, and the like.
- Personal protective equipment (PPE) such as hard hat, shoes, gloves, vest, eye protection, face mask, and appropriate clothing should be used and worn to protect labor personnel from risk of injury.

5. Kuhol Tent

The Kuhol Tent takes inspiration from the popular, edible farm snail with a hard, protective shell. It is developed primarily as a solution to short-span sheltering needs for emergency response. The construction of the Kuhol Tent makes use of readily available and easily sourced construction materials, assembled and shaped in a manner that allows natural cooling of the interior of the shelter. The plan has two basic spaces, an anteroom that opens to the exterior, and an interior part for sleeping and resting. The space can provide temporary resting space for seven persons at most. A blanket sheet or ground mat provides insulation from the earth, and at the same time, extended seams of the ground mat acts as flashing to deter rain water from getting inside.

It is contended that the model has the viability of being constructed on site with simple process of fabrication and assembly. The Kuhol Tent has a 350cm x 500cm footprint, with a height of 160cm - 190cm thereby allowing a standing room inside.

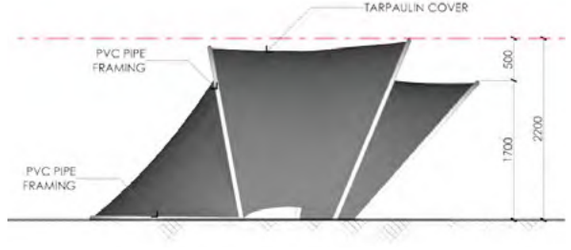
Its basic assembly consists of cutting the tarpaulin sheet according to specified dimensions, and fastening the edges onto the bent PVC pipes.



KUHOL TENT MODEL

2 / A-101 FRONT ELEVATION

SCALE 1:50



KUHOL TENT MODEL

3 / A-101 LEFT SIDE ELEVATION

SCALE 1:50

KUHOL TENT MODEL

4 / A-101 CROSS SECTION

SCALE 1:50

5.1. Materials

Item no.	Material Description	Qty.	Unit
1	3/4” Ø PVC conduit	15	lths
2	1” Ø PVC conduit	3	lths
3	Duct tape	5	rolls
4	96” wide heavy gauge Maruyama tarpaulin	7	mtrs
5	400 cc PVC solvent cement	1	can
6	4mm nylon twine (guy wires)	1	lot
7	1” Ø PVC tee	4	pcs

5.2. Procedure of Production

i. Assemble the arched PVC framework as per dimensions.

ii. Assemblies:

ii.a. On Tarmac Assemblies

a. Assemble the arched PVC framework as per dimensions.
b. Base joints shall utilize 90-degree elbow fittings size 3/4”, fitted with a short bushing connector and connected with a 6” long coupler glued together to form a composite long stem elbow fitting. This special fitting is key to the reusability of the model on paved surface applications.
c. The framework can be anchored to the tarmac using PVC pipe clamps fitted with concrete nails, or with the use of 1/4” dynabolts on rigid steel conduit clamps.

ii.b. On Ground Assemblies

a. Assemble the arched PVC framework as per dimensions.
b. For on-ground assemblies, earth anchorage shall utilize 1” diameter x 12” PVC pegs hammered to the ground following the specified angles and strictly conforming to layout dimensions.
c. 3/4” diameter PVC framing shall be simply inserted into the oversized pegs anchored on the ground. The anchorage system ensures the reusability of the model.
d. As the framework stands anchored with some footing, additional wind resilience can be attained by installing additional peg anchorages about 2 feet from the footprint and tying the framework from the top members to the foothold by using guy cords (3/16” diameter nylon twine).

Note: Straight connections shall make use of 1” diameter by 6” long PVC couplers, unglued. For applications utilizing tarpaulin skin templates, it will be very necessary to follow exact layout dimensions.

iii. Tent skin - Using a light density tarpaulin sheet, cut the tent skins using the furnished template pattern. Use the white duct tape to fix in place the skins to the PVC pipe frame by adhering the tape to the pipe making sure the tape is hidden from view.

NOTE: for assemblies where layout dimensions may not have been exactly followed, tarpaulin cutting must be made by using the assembled frame itself as the pattern, making sure that the cutting of the skin as much as possible follows the contour of the assembled framework, along the pipelines while providing for allowances for properly adhering the tape to both pipe frame and tarp skin.

iv. Floor cover (for the sleeping space) using heavy gauge tarpaulin sheet is finally cut using the footprint as a pattern, providing for a 6- inch flashing (vertical overlap), including the front portion where a cord may be tied at ends of the pipe frame on which the floor cover may be hanged. This part of the tent may be taped to the interior tent skin and the front cord, effectively keeping any groundwater from seeping into the sleeping space.

5.3. Cutting List

Cat no.	Part Description	Material Description	Cut Dimension	Qty.	Unit
KUHOL.01	PVC pipe framing	3/4" Ø PVC conduit	Varies	Varies	lths
KUHOL.02	Tarpaulin / skin	96" wide heavy gauge Maruyama tarpaulin	Varies	Varies	mtrs

5.4. Speed of Construction

Provided that all materials are available and have been cut, with 2 workers, the assembly time can be done in 3-4 hours.

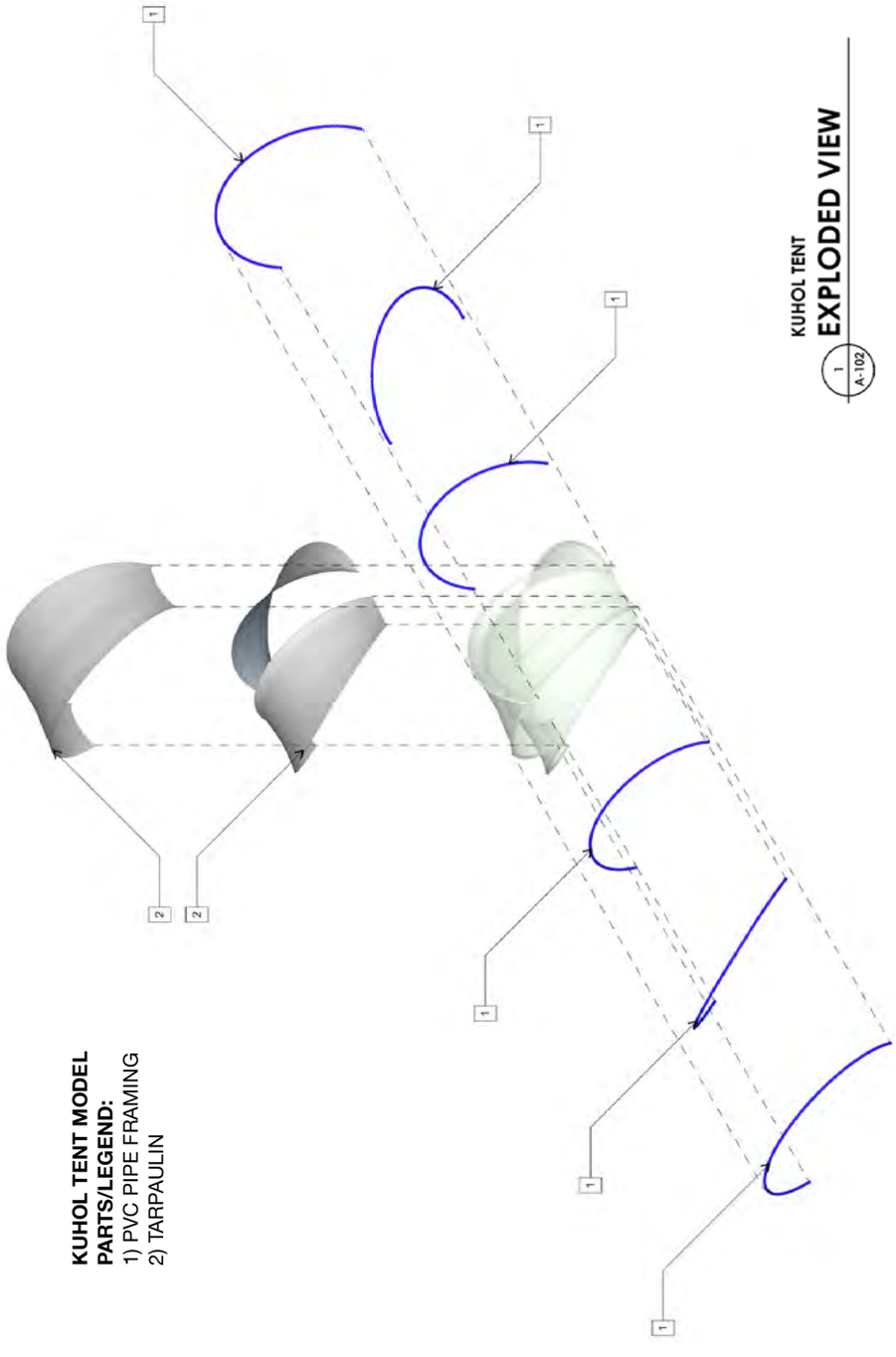
5.5. Required Manpower Skills

- At least two skilled workers are needed.
- Must know how to use tools to assemble components.
- Must have good precision skills.
- Assembling of PVC Tarp Tent 1 requires hand and arm strength.
- Skills for installing or connecting pipe systems using PVC.

5.6. Required Tools and Equipment

Basic carpentry hand tools such as claw hammer, pliers, square, bubble level, measuring tape, utility knife, and the like.

Personal protective equipment (PPE) such as a hard hat, shoes, gloves, a vest, eye protection, a face mask, and appropriate clothing should be used and worn to protect labor personnel from the risk of injury.



1. Steel Angle Module 1

Designed by:
Ar. Adrian R. Toisa and
Ar. Jose Miranda

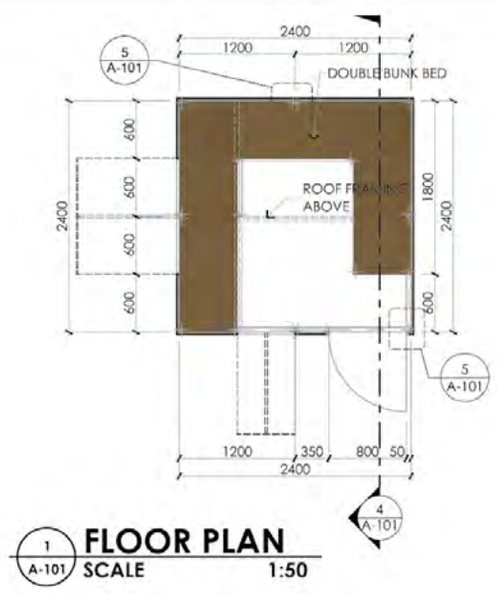
Using materials that are easy to find and readily available in the market is one of the best strategies in times of emergency. The Steel Angle Model 1 (SAM 1) is composed of materials that are readily available in local hardware stores. The assembled unit can fit up to 6 people inside.

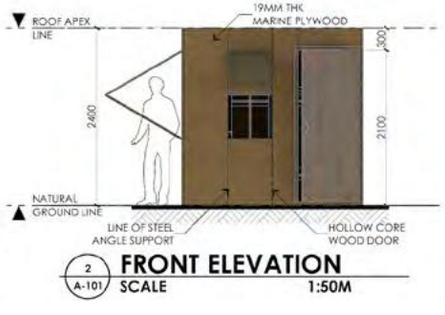
The module is 2.4 m x 2.4 m in dimensions, a footprint of 5.76 sq. m. SAM 1 is designed with a single ingress/egress door and two awning windows for cross ventilation. The steel angle is used as the main material for the model's framing system, as it is versatile and cost-effective. For the wall panels, a variety of materials can be used; such as marine plywood, phenolic board or fiber cement board. All of these options are durable and will apply for outdoor deployment, even with the siding material used as roofing in place of framed sheet metal roof.

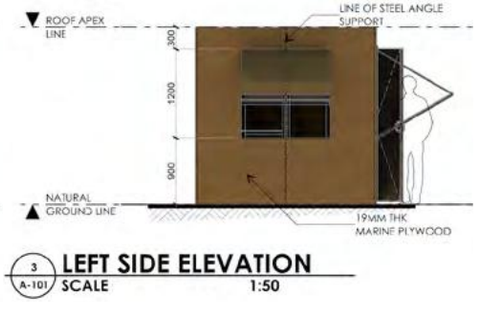
The joined frame and panel make up a strong composite component that is easy to fabricate employing common carpentry skills in building. For deployment in covered courts, the roofing may altogether be omitted without compromising the rigidity of the free-standing structure.

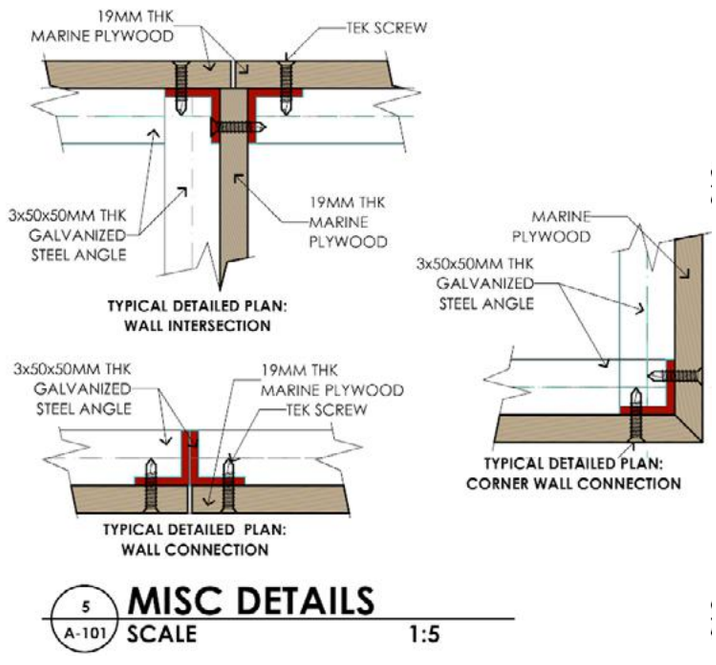
The model adapts to evacuation camps with managed common wash and cook facilities.

The indicative cost per family unit is P40,000.00, direct cost for labor and materials.









6 A-101 SECTIONAL PERSPECTIVE
NOT TO SCALE

7 A-101 EXT. PERSPECTIVE
NOT TO SCALE

1.1. Materials

Item no.	Material Description	Qty.	Unit
1	¾” thk Marine Plywood	14	bds
2	2mm x 50mm x 50mm Steel Angle	56	pcs
3	1 1/2" metal type Tek screws	200	pcs
4	2x3” butt hinges	6	pairs

1.2. Procedure of Production

i. Prepare the ¾” marine plywood for the base, walls, and roof cover.

ii. 2 sides of the module have an opening for doors and windows, prepare to cut the opening. The cut-outs will be used as the awning window and door panel.

iii. Prepare the angular steel, for framing.

iv. Cut the angular steel that will serve as horizontal and vertical framing to indicated lengths, as well as the parts that will serve as the framing of bed and ladder.

v. Connect the angular steel base frame to the marine plywood that will serve as the base or floor of the unit.

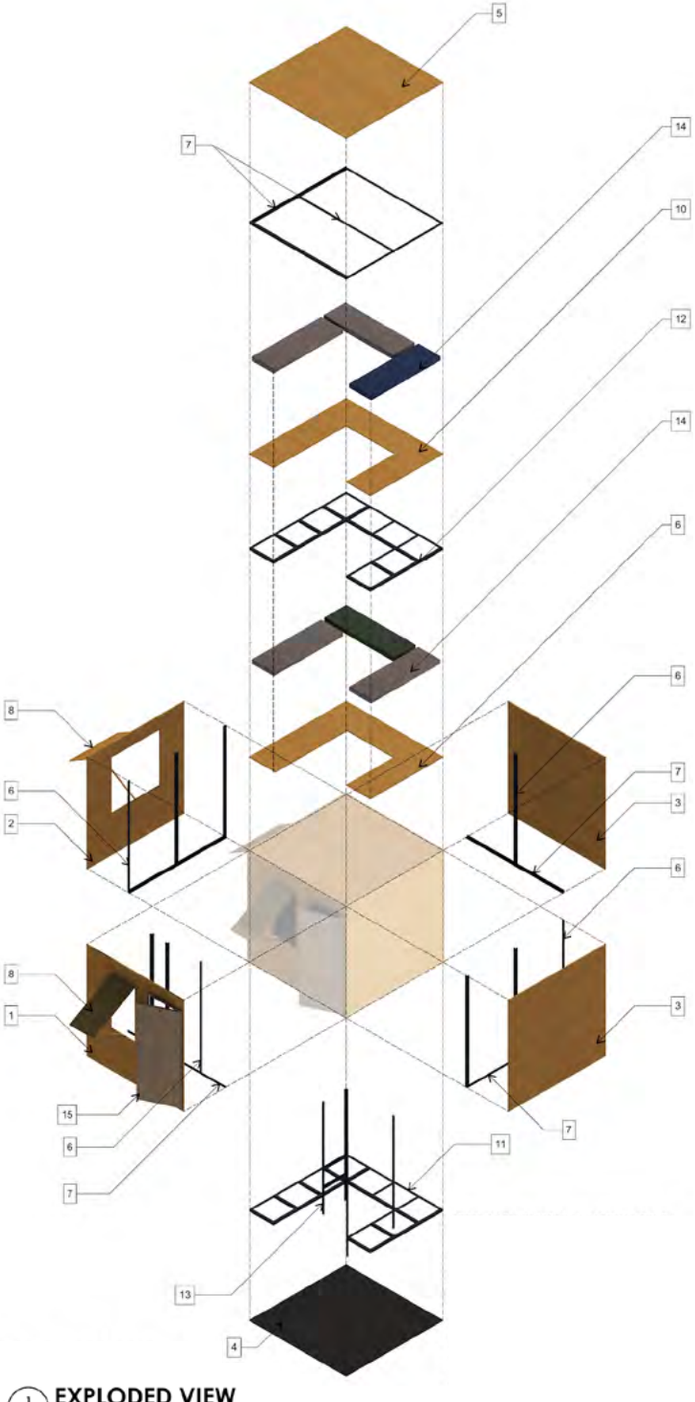
vi. Connect the angular steel vertical frames to the base frame by using tek screws, following the spacing and details indicated in the plans.

vii. Secure the marine plywood walls and roof to the angular steel frames by using tek screw.

viii. Prepare the angular steel that will serve as the framing of bed and ladder.

ix. Connect the angular steel frames for the bed by using tek screw. Follow the height of the bottom bed and upper bed indicated in the plans.

x. Secure the ¾” marine plywood bed to the angular frames using tek screw.



1 A-102 EXPLODED VIEW
NOT TO SCALE

STEEL ANGLE MODULE-1 PARTS/LEGEND:

1) 3/4" MARINE PLYWOOD WALL COVER WITH DOOR & WINDOW OPENING
2) 3/4" MARINE PLYWOOD WALL COVER WITH WINDOW OPENING
3) 3/4" MARINE PLYWOOD WALL COVER
4) 3/4" MARINE PLYWOOD BASE/ FLOORING
5) 3/4" MARINE PLYWOOD OVERHEAD COVER/ROOFING
6) L 2.0MM x 38MM VERTICAL FRAMES
7) L 2.0MM x 38MM HORIZONTAL FRAMES
8) 3/4' MARINE PLYWOOD SWING UP WINDOW WITH 2x2" TUKOD
9) 3/4" MARINE PLYWOOD LOWER LEVEL SLEEPING AREA
10) 3/4" MARINE PLYWOOD UPPER LEVEL SLEEPING AREA
11) L 2.0MM x 38MM LOWER LEVEL BED FRAMING
12) L 2.0MM x 38MM UPPER LEVEL BED FRAMING
13) L 2.0MM x 38MM STAIR/LADDER
14) MATTRESS (OPTIONAL)
15) 3/4" MARINE PLYWOOD SWING DOOR

1.3. Cutting List

Cat no.	Part Description	Material Description	Cut Dimension	Qty.	Unit
SAM1.01	Wall panel with door opening	3/4" thk marine plywd	1.22m x 2.44m (Stock size)	1	bds
SAM1.02	Wall panel with window opening	3/4" thk marine plywd	1.22m x 2.44m (Stock size)	3	bds
SAM1.03	Wall panel without opening	3/4" thk marine plywd	1.22m x 2.44m (Stock size)	4	bds
SAM1.04	Base / Flooring	3/4" thk marine plywd	1.22m x 2.44m (Stock size)	2	bds
SAM1.05	Overhead cover / Roofing	3/4" thk marine plywd	1.22m x 2.44m (Stock size)	2	bds
SAM1.06	Vertical frame	L50 x 50 x 2mm (steel angle)	2.44m long	15	pcs
SAM1.07	Horizontal frame	L50 x 50 x 2 mm (steel angle)	2.44m long	12	pcs
SAM1.08	Awning panel	3/4" thk marine plywd	0.6m x 1.2m	3	bds
	Tukod	3/4" thk marine plywd	50mm x 1.0m long	3	pole
SAM1.09	Lower level sleeping bunk	3/4" thk marine plywd	0.6m x 0.8m	3	bds
SAM1.10	Upper level sleeping bunk	3/4" thk marine plywd	0.6m x 0.8m	3	bds
SAM1.11	Lower level bed framing	L50 x 50 x 2mm (steel angle)	0.6m long	7	pcs
			1.8m long	6	pcs
SAM1.12	Upper level bed framing	L50 x 50 x 2mm (steel angle)	0.6m long	7	pcs
			1.8m long	6	pcs
SAM1.13	A. Ladder - steps	L50 x 50 x 2mm (steel angle)	0.6 m long	3	pcs
	B. Ladder - rail		1.8 m long	1	pcs
	C. Ladder - rail		1.2 m long	2	pcs
	D. Ladder – frame		1.6 m long	2	pcs
SAM1.14	Mattress (optional)	varies	0.6m x 0.8m	6	bds
SAM1.15	Swing door	3/4" thk marine plywd	0.8m x 2.1m	1	bds

Note: Materials may need to be further trimmed to fit and conform to required joint clearances.

1.4. Work Span

Provided that all materials are available and have been cut accordingly, with 3 workers, the assembly time for Steel Angle Module can be done 4-6 hours.

1.5. Required Manpower and Skill

- Knowledge in measurements and basic geometry such as squaring angles.
- Some familiarity with lumber and other materials.
- Some familiarity with wood framing work and the use of power tools as in boring through wood and metal and driving fastener.

1.6. Required Tools and Equipment

- Basic carpentry hand tools such as claw hammer, pliers, square, bubble level, measuring tape, utility knife, and the like.
- Variable speed drill/driver.
- Personal protective equipment (PPE) such as a hard hat, shoes, gloves, a vest, eye protection, a face mask, and appropriate clothing should be used and worn to protect labor personnel from the risk of injury.

2. Steel Angle Module 2

Capitalizing on the strength derived from the composite component of angular steel and marine plywood panel, the two level SAM2 was developed, taking off from the SAM1 model.

The construction basically consists of two SAM 1 modules joined together to make a 240cm x 480cm footprint and contain a living/dining space and a sleeping room, now good for 8-9 family members. 4 of such family units can be joined together while another set can be constructed on top to form a second level, provided with middle stairs, thus forming a sturdy 8-family building cluster.

The model was erected and tested in two exhibitions where it gained support from LGUs and national agencies. The indicative cost per family unit is P80,000.00, direct cost for labor and materials for this long-term temporary shelter. The alternative phenolic board paneling and bed bunk material form a suitable variant.

2.1. Materials for an 8-unit cluster

Item no.	Material Description	Qty.	Unit
1	¾” thk marine plywood	172	bds
2	L3 x 50 mm angular steel	320	pcs
3	1 1/2" metal type Tekscrews	3500	pcs
4	2 x 3 in butt hinges	48	pairs

2.2. Procedure of Production

i. Prepare the ¾” marine plywood for the base, walls, and roof cover.

ii. Prepare to cut the marine plywood for the openings of every unit like doors and windows. Some units have 3 windows and 1 access door, some have 2 windows only with 1 access door. The cut-out will be used as the window awning and door panel.

iii. Construct the whole cluster one unit at a time.

iv. Prepare the angular steel for framing.

v. Cut the angular steel that will serve as horizontal and vertical framing, as well as the parts that will serve as the framing of bed and ladder.

vi. Connect the angular steel base frame to the marine plywood that will serve as the base or floor of the unit.

vii. Connect the angular steel vertical frames to the base frame by using tekscrews. Follow the spacing and details indicated in the plans.

viii. Secure the marine plywood walls and roof to the angular steel frames by using tek screw.

ix. Prepare the angular steel that will serve as the framing of bed and ladder.

x. Connect the angular steel frames for the bed by using tekscrews. Follow the height of the bottom bed and upper bed indicated in the plans.

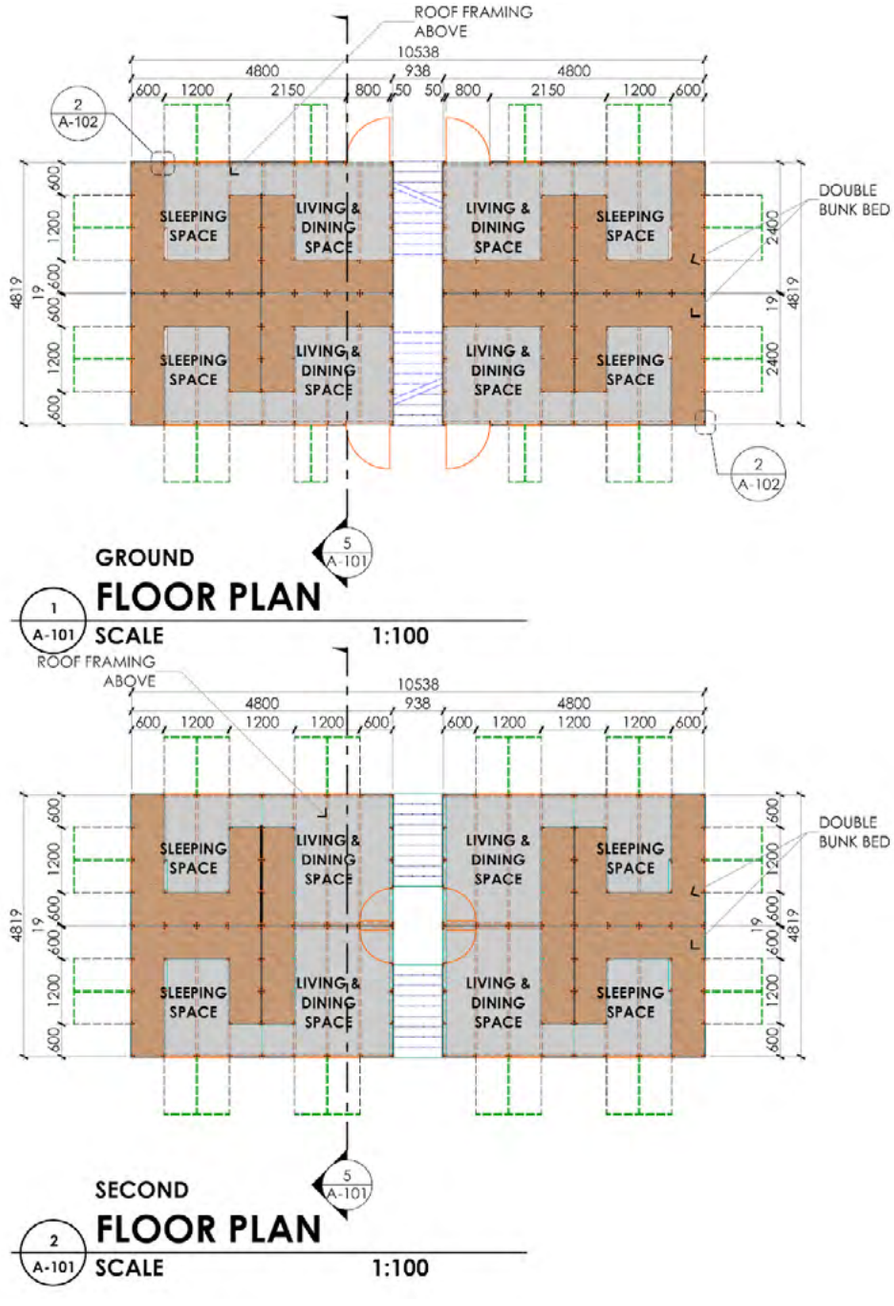
xi. Secure the ¾” marine plywood bed to the angular frames using tek screw.

xii. Follow the steps iv - xi to construct other units, to complete one 8 unit cluster.

2.3. Cutting List

Cat no.	Part Description	Material Description	Cut Dimension	Qty.	Unit
SAM 2.01	Wall panel with door opening	3/4” thk marine plywd	1.22 m x 2.44 m (Stock size)	8	bds
SAM 2.02	Wall cover with window opening	3/4” thk marine plywd	1.22 m x 2.44 m (Stock size)	40	bds
SAM 2.03	Wall cover without opening	3/4” thk marine plywd	1.22 m x 2.44 m (Stock size)	16	bds
SAM 2.04	Base / Flooring	3/4” thk marine plywd	1.22 m x 2.44 m (Stock size)	32	bds
SAM 2.05	Overhead cover / Roofing	3/4” thk marine plywd	1.22 m x 2.44 m (Stock size)	18	bds
SAM 2.06	Vertical frame @ First Floor	L50 x 50 x 3 mm (steel angle)	2.44 m long	192	pcs
	Vertical frame @ Second Floor	L50 x 50 x 3 mm (steel angle)	2.44 m long	180	pcs
SAM 2.07	Horizontal frame @ First Floor	L50 x 50 x 3 mm (steel angle)	2.44 m long	104	pcs
	Horizontal frame @ Second Floor	L50 x 50 x 3 mm (steel angle)	2.44 m long	104	pcs
SAM 2.08	Awning panel	3/4” thk marine plywd	0.6m x 1.2m	42	bds
	Tukod	3/4” thk marine plywd	50 mm x 1.0 m long	5	pole
SAM 2.09	Lower level sleeping area	3/4” thk Marine Plywood	0.6m x 0.8m	24	bds
SAM 2.10	Upper level sleeping area	3/4” thk Marine Plywood	0.6m x 0.8m	24	bds
SAM 2.11	Lower level bed framing	L50 x 50 x 3 mm (steel angle)	0.6m long	56	pcs
			1.8m long	48	pcs
SAM 2.12	Upper level bed framing	L50 x 50 x 3 mm (steel angle)	0.6m long	56	pcs
			1.8m long	48	pcs
SAM 2.13	Ladder - steps	L50 x 50 x 3 mm (steel angle)	0.6m long	24	pcs
	Ladder - rail		1.8m long	8	pcs
	Ladder - rail		1.2m long	16	pcs
	Ladder – frame		1.6m long	16	pcs
SAM 2.14	Mattress (optional)	Mattress	0.6m x 0.8m	48	pcs
SAM 2.15	Swing door	3/4” thk Marine Plywood	0.8m x 2.1m	8	bds
SAM 2.16	Seating	3/4” thk Marine Plywood	0.6m x 1.8m	8	bds

SAM 2.17	Framing of Seating	L50 x 50 x 3 mm (steel angle)	0.6m long	44	pcs
			1.8m long	12	pcs
			1.2m long	4	pcs
			2.4m long	8	pcs
SAM 2.18	Interior wall	3/4" thk Marine Plywood	1.2m x 2.4m	8	bds
			0.6m x 2.4m	8	bds
	SAM-2 Stair riser		0.267m x 0.9	18	bds
	SAM-2 Stair run		0.2m x 0.9	9	bds
	SAM-2 Stair landing		0.95x1.45	1	bds
SAM 2.19	SAM-2 Stair Framing - run	L50 x 50 x 3 mm (steel angle)	0.2m long	36	pcs
	SAM-2 Stair Framing - riser		0.267m long	36	pcs
	SAM-2 Horizontal framing		0.9m long	38	pcs
	SAM-2 Stair Framing – inclined member		2.9 m long	4	pcs
	SAM-2 Stair landing frame		1.45 m long	2	pcs
			0.95m long	2	pcs



3 A-101 **FRONT ELEVATION**
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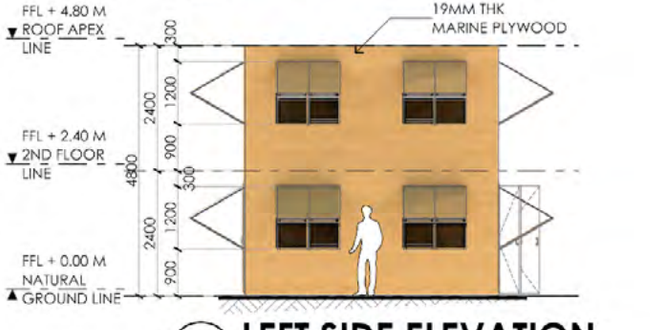

4 A-101 **LEFT SIDE ELEVATION**
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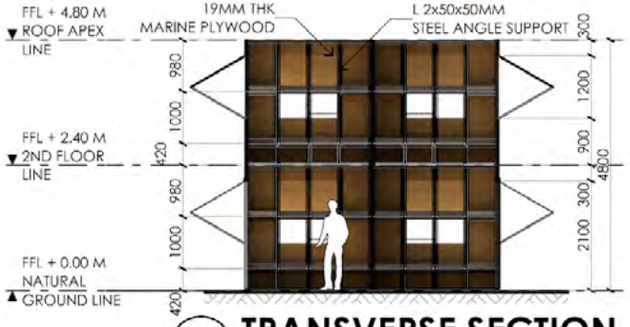

5 A-101 **TRANSVERSE SECTION**
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2.4. Work Span

Provided that all materials are available and have been cut accordingly, with 3 workers, the assembly time for Steel Angle Module can be done 8-12 hours per family unit.

2.5. Required Manpower and Skill

- Knowledge in measurements and basic geometry such as squaring angles.
- Some familiarity with lumber and other materials.
- Some familiarity with wood framing work and the use of power tools as in boring through wood and metal and driving fastener.

2.6. Required Tools and Equipment

- Basic carpentry hand tools such as claw hammer, pliers, square, bubble level, measuring tape, utility knife, and the like.
- Variable speed drill/driver.
- Personal protective equipment (PPE) such as a hard hat, shoes, gloves, a vest, eye protection, a face mask, and appropriate clothing should be used and worn to protect labor personnel from risk of injury.