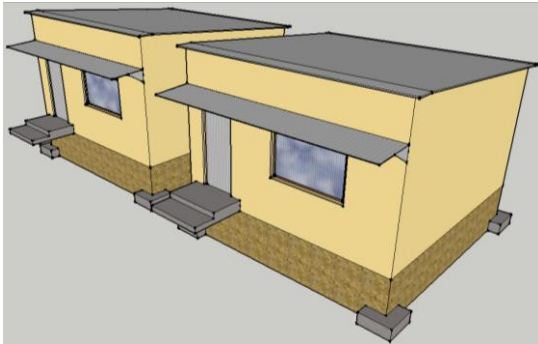


Introduction



In 2010 Pakistan was hit by extreme rainfall, devastating flooding killed more than 2,000 people and affected over 20 million. Areas most affected by overflow from the Indus River coincided with districts with the highest population density. Some of the major factors which increase vulnerability to urban flooding, especially in developing countries are; poverty, poor housing and living conditions, lack of preparedness and management of flood defences, increasing population, squatter settlements in hazard prone regions, poor maintenance of drainage structures, lack of awareness among the general population and limitations in early warning systems.

Our design will target these areas and provide an effective solution that can be used in all contexts and countries to eliminate localised flooding resulting in a better quality of life for local communities.

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In Pakistan and many countries throughout the world there are isolated communities regularly affected by localised flooding.

Heavy rainfall can result in floods and cause substantial damage. This is due to both poor flood control systems and inadequate housing. The net effect is that lives are ruined. Many people are dispossessed and at risk of water born diseases. Many communities are caught in a vicious cycle of flood and repair, with current defences proving futile, this is unsustainable. Our solution is one of prevention rather than cure, a simple yet effective modular tank system that can be adopted to suit any terrain or country.



Context - Occurrences of Isolated Flooding in Pakistan



We will engage with the community to ensure their needs are met and provide a sustainable long term solution. This project could be used as a model to prevent localised flooding in both developed and developing countries.

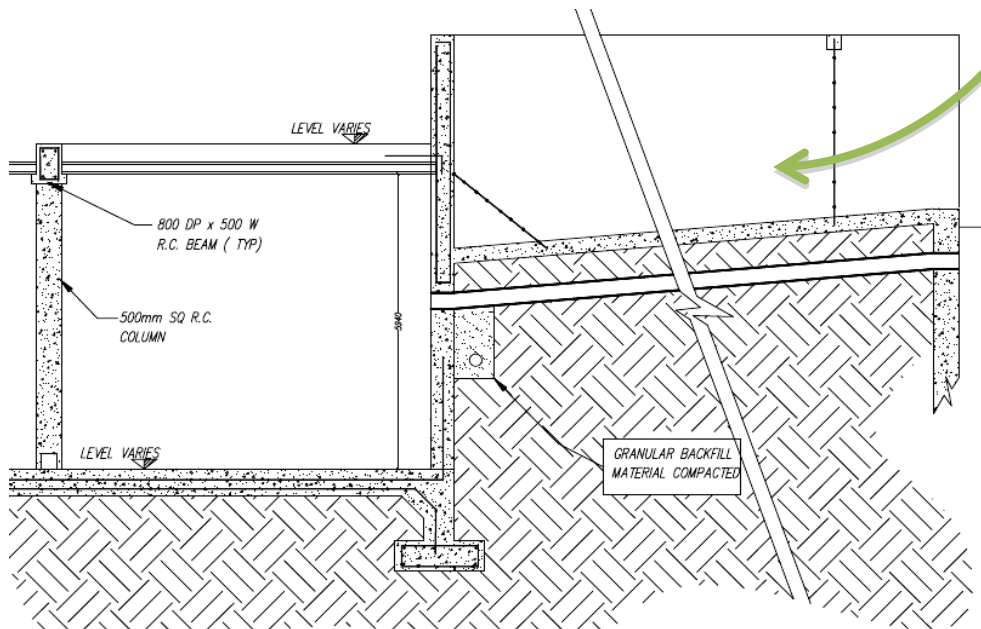
Although there are massive logistical issues with this type of project, they can be overcome with effective planning and control. Serious issues working in Pakistan are the political situation and the potential influence of the Taliban in border regions, thus support and engagement of the wider community is essential.

Concrete plants

An integral element in our project is the construction of a concrete plant that will produce all the materials necessary to complete the project and offer a long term financial benefit to the people. We have decided to set up the plant for 3 reasons;

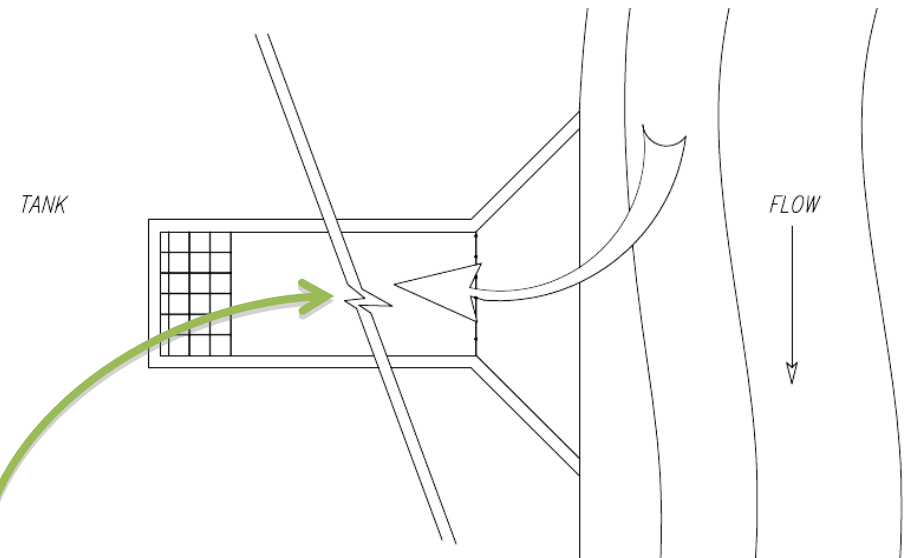
1. There is a large mining industry in Pakistan and we plan to use the spoil from these mines as aggregate.
2. We don't want to import all materials and prefer to use local labour and suppliers.
3. The concrete plant will be a source of revenue for the community.

The plant will be our main production hub, producing the modular tank components and housing units.



Section through proposed culvert.

Technology - Tanks



Plan view of proposed culvert for inflow from river at flood flow level

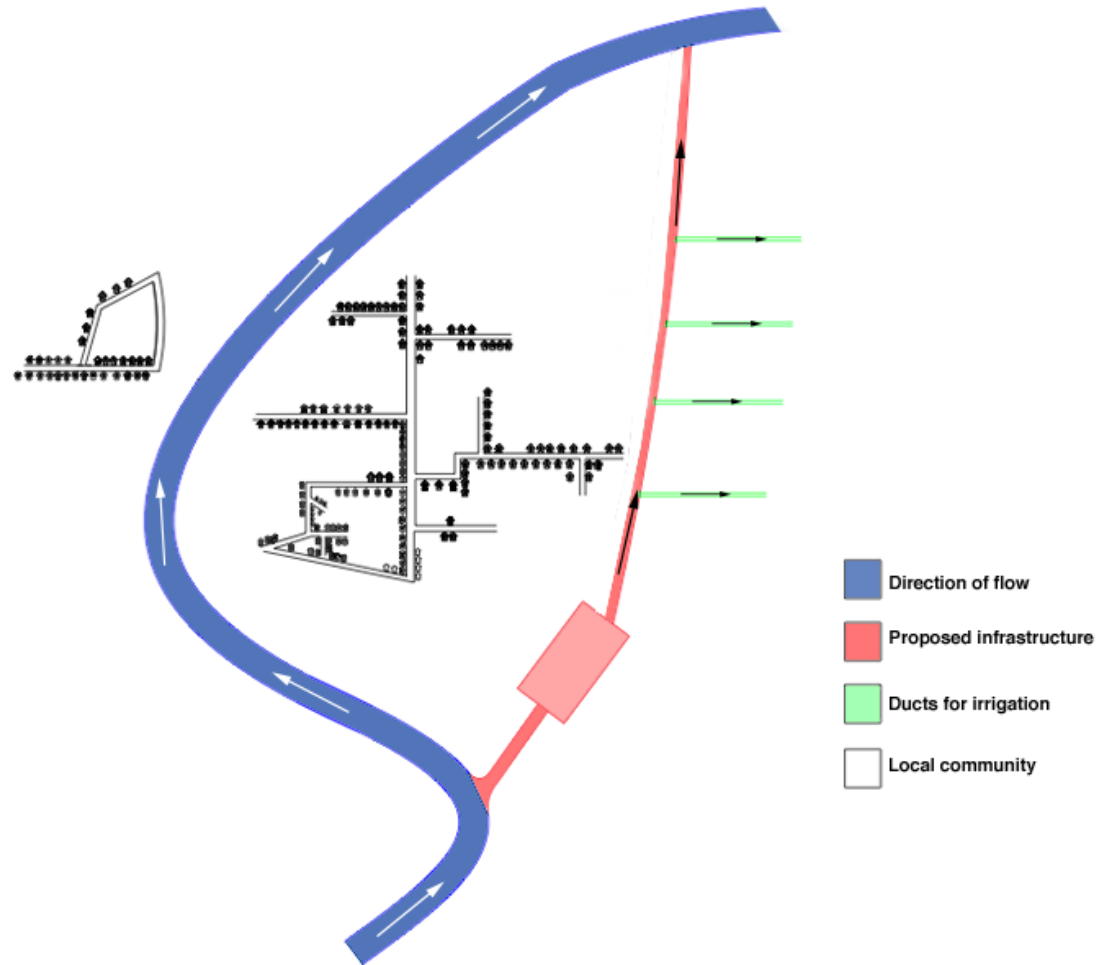
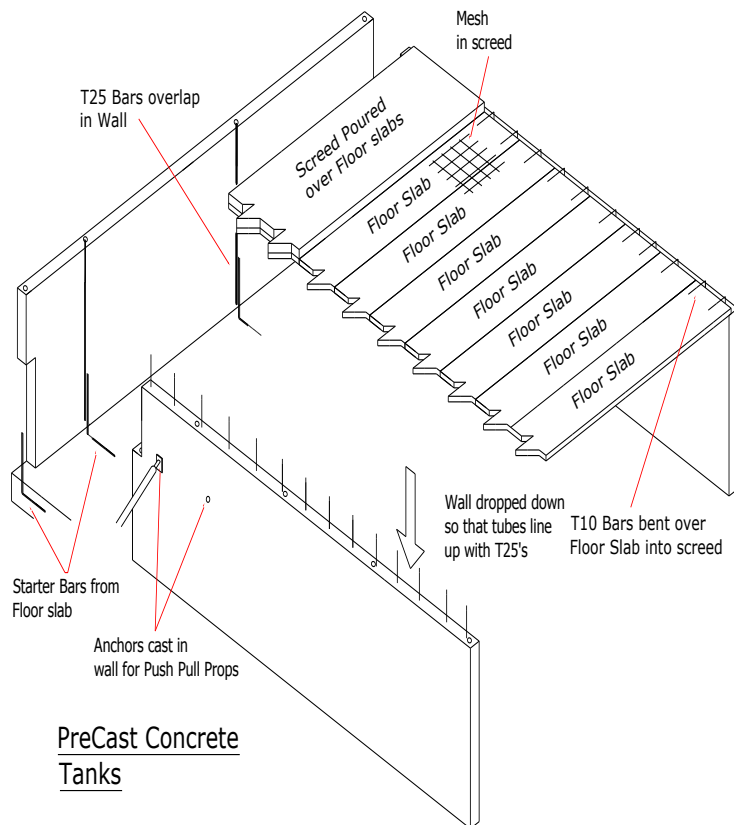
Our proposed solution is to construct tanks from prefabricated concrete elements. These will take the initial storm surge and divert excess water to the tanks, where it can be stored, diverted around the village to join the river or released to lower lying areas. The spoil from excavating will be used to raise and reinforce river embankments. As elements are modular tanks can be built to any size and number to accommodate projected flow rates.

The tanks can be designed to hold millions of litres and thus have the benefit of storing water for the winter months when rainfall is approximately 3% of summer rainfall. The pipe below main culvert can be used to top up tank prior to dry season. This water can be used for households (non potable) or irrigation.

Technology – Proposed infrastructure

The tanks are assembled as follows.

1. Preparation of Floor.
2. Erection of Pre-Cast Walls.
3. The joints.
4. Sealing of Tank
5. Erection of Floors.
6. Pouring of Screed.



Simplified Infrastructure Drawing

The diagram shows a basic layout of a typical village and proposed infrastructure. The flood water is diverted to the tanks when the river rises above a pre-determined level.

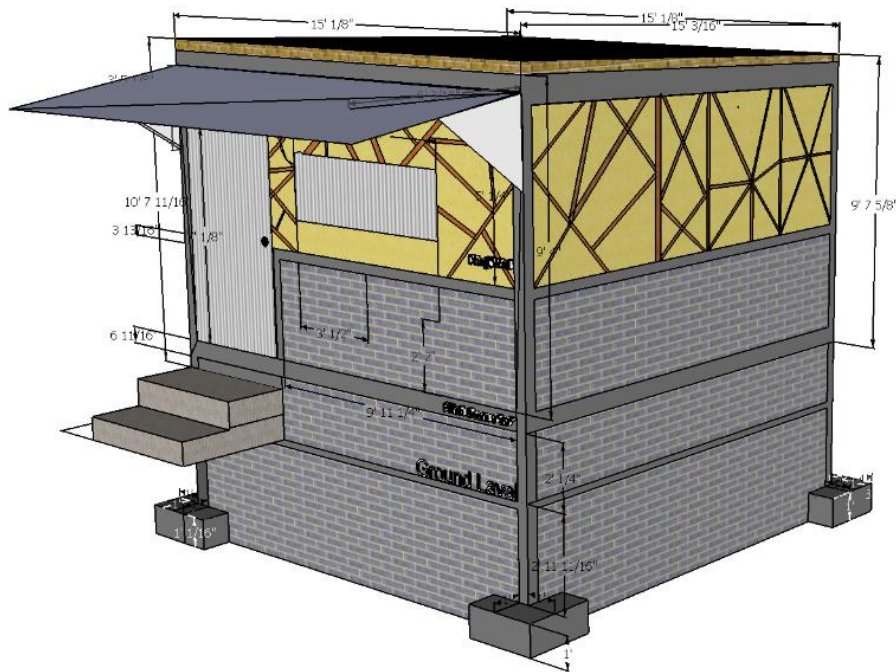
The tank incorporates an overflow valve, so once full excess water is diverted through a network of channels to irrigation points or a point further downstream.

Technology – Housing solution

Houses

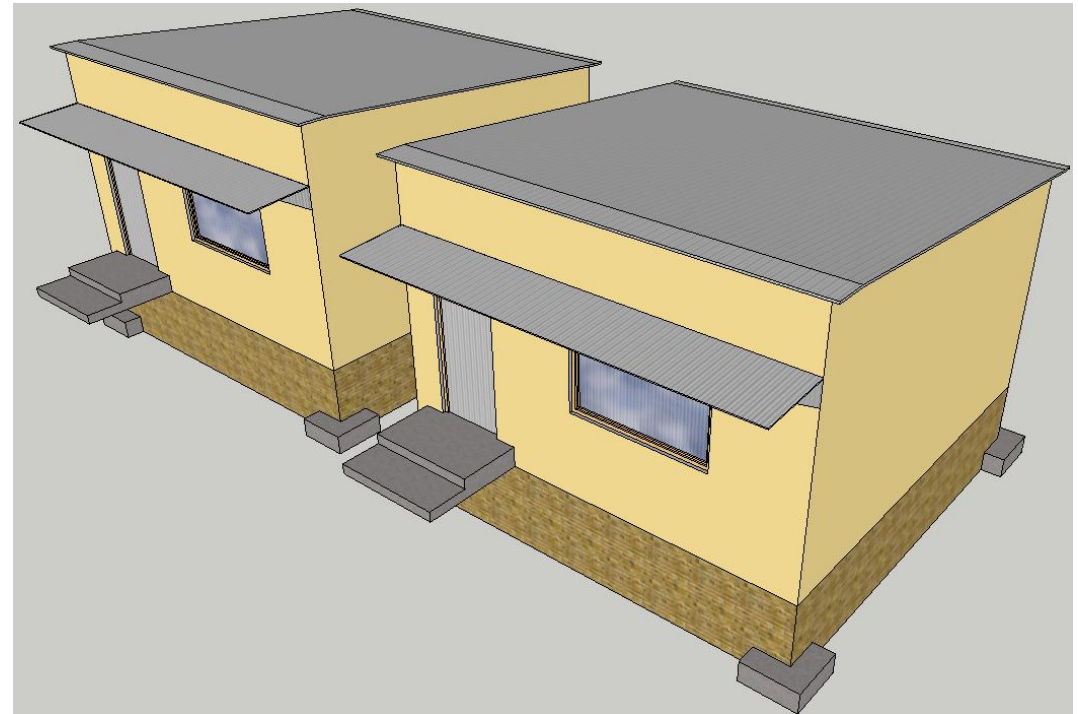
To establish the correct style of housing for the area we consulted Moustafa Osman, an expert in humanitarian work who has worked extensively in Pakistan. He said that following consultation with villagers in affected areas their preferred design of a shelter will have following criteria:

1. Provide protection from the heat in the summer and cold in the winter.
2. Consist of one room, with a toilet (for cost reasons).
3. Flood proof and earthquake resistant.
4. Can be adapted for disabled access



The traditional house proposed by Moustafa Osman, post flood event Lundi.

Our Proposed House



We aim to provide housing that will meet the requests and requirements of the affected people. These will be in the form of modular units that will be manufactured in the concrete plant alongside the tanks. To ensure the houses still look appropriate for the area an exterior brick cladding can be added. The foundations for the building will depend on ground conditions; deep enough that the house will remain standing if there is heavy rain and surface water. The foundations will be built to a tried and tested local method, made from bricks and mortar and rebar to tie the wall panels. Residents will aid in the excavation and construction process.

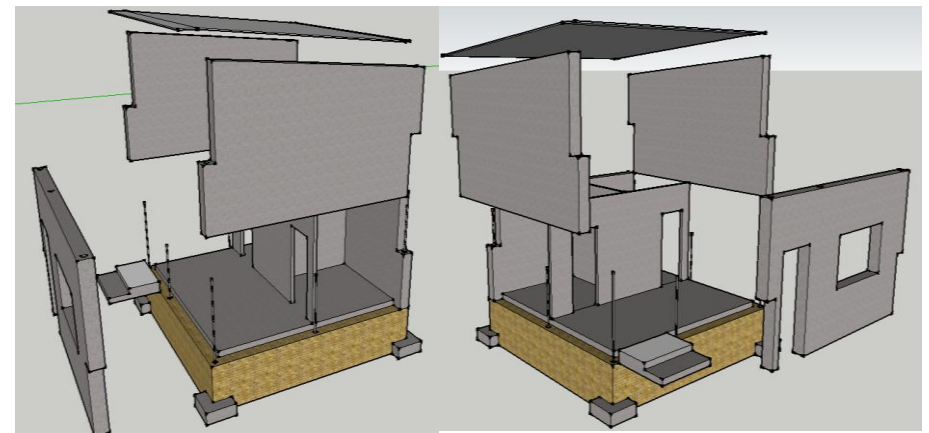
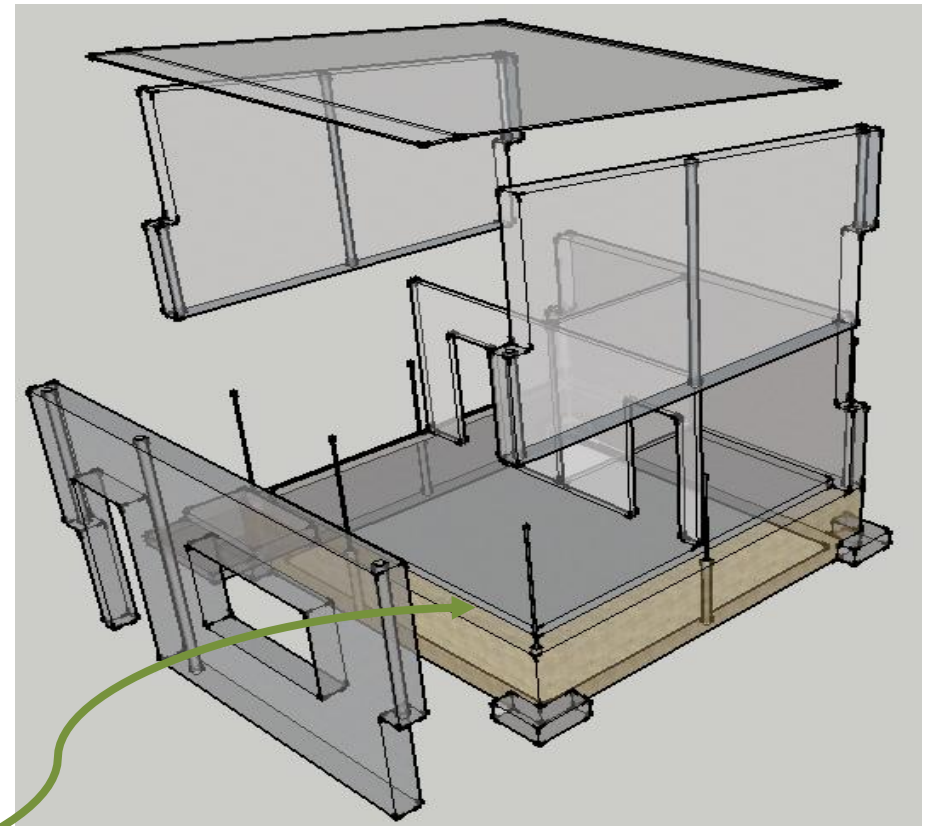
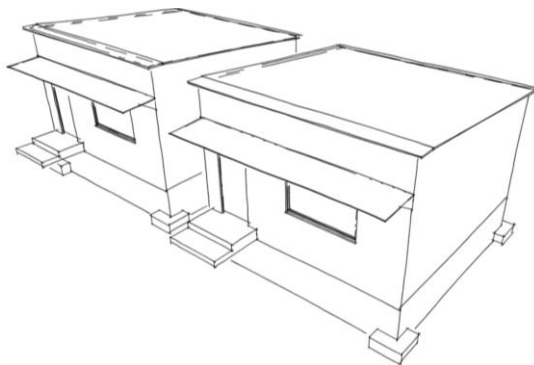
Technology – Assembly drawings

Clockwise from bottom left

Traditional foundation, buried approximately 900mm below ground.

Foundation continued, ready for precast modules to be placed. Entrance is raised above street level as further protection during rainy season.

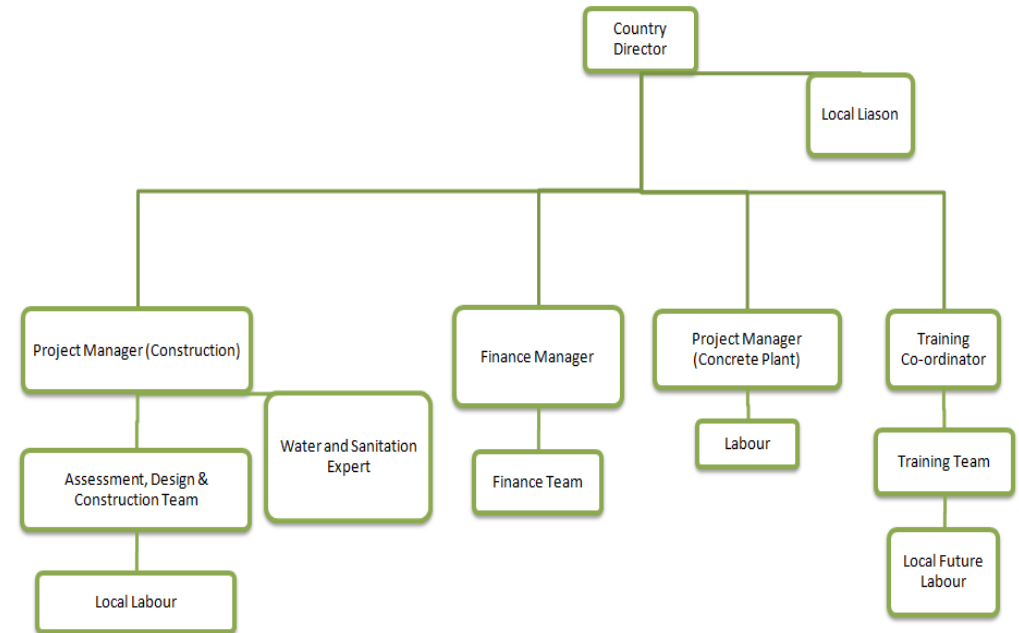
Exploded views showing how panels are fitted over fitted and tied using the rebar. The joints are filled using a non shrink grout.



Organizational Approach and Logistics

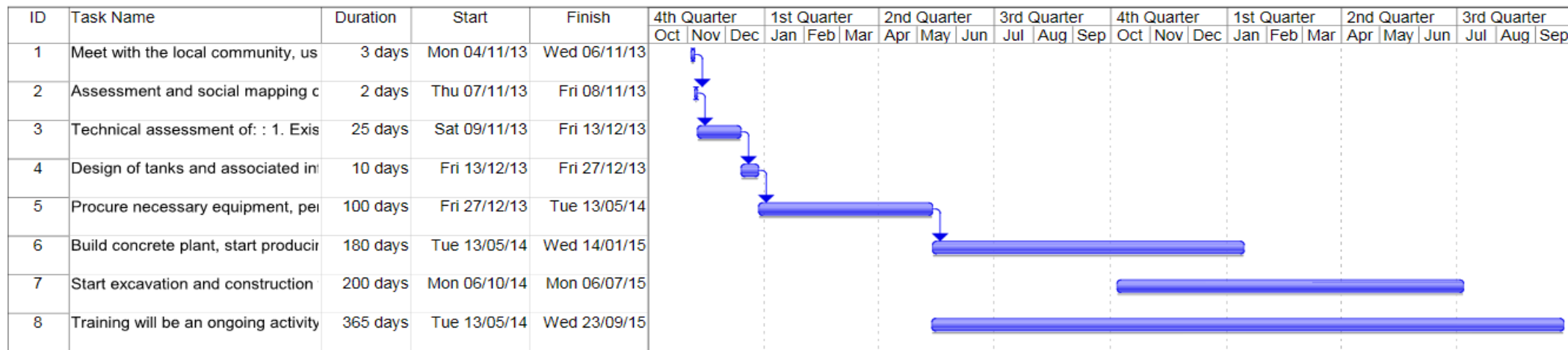
When carrying out humanitarian work it is important that we don't impose our views, practices and customs on the local people therefore we will use an integrated approach.

Meetings with the local community will be held at all stages, establishing the community's needs and capabilities and how best to fulfill these.



The structure of the organisation is shown above. The Country Director is the head of the project, responsible for coordinating the entire team and will be constantly advised by a Local Liaison to ensure we respect local customs. We will source both skilled and unskilled labour locally as much as possible. The various teams will consist of a mix of locals and foreign nationals.

Timetable for implementation.



The project will be sustainable and provide long term prospects for the community. We will train the local people to operate and maintain the systems, so they can provide for themselves in the future. The precast factory will provide a source of revenue for the area, however once we have finished the construction we will monitor and manage the factory to avoid possible corruption and ensure other communities are benefiting.

No.	Activities	Who
1	Meet with the local community, use tools of engagement to establish the needs of the community	Country Director Local Liason Section Managers
2	Assessment and social mapping of the village	Field Based Managers, aided by the community
3	Technical assessment of: 1. Existing infrastructure network 2. Existing street layout and housing standards 3. Potential locations for tanks and associated infrastructure (including assessment of ground conditions)	Construction Project Manager and assessment team
4	Design of Tanks and associated infrastructure	Design Team
5	Procure necessary equipment, permission, labour etc to start	Whole Organisation
6	Build concrete plant, start producing materials and store until next weather window	Concrete plant Project Manager
7	Start excavation and construction for: • Tanks and channels • Houses	Construction project manager and team
8	Training will be an ongoing activity throughout the work schedule	Training Coordinator