BOOK B
How to manage an owner-driven construction project

In an **owner-driven construction project,** the program participants are at the center of the construction activities. The program participants are engaged in all stages of the construction project from site selection and quality/progress monitoring to final inspection of the completed structure.

Several variations of owner-driven construction are listed below. These are not exclusive of each other. In many (re)-construction projects, combinations have been designed to suit the particular post-disaster context:

In **self-built construction,** the program participants undertake the construction works themselves with technical assistance/ construction training/supervision by CRS/NGO. The construction materials are either sourced / distributed by CRS/NGO or, in a voucher/cash approach, the program participants are sourcing the construction materials themselves on the local market. The program participants and/ or CRS take on material delivery and material quality control responsibilities.

The program participants may opt to **employ skilled laborers and craftsmen** instead of undertaking the construction works themselves. In this case, the program participants take a managerial and monitoring role. The construction materials are either distributed by CRS/NGO or, in a voucher/cash, approach the program participants are sourcing the construction materials themselves on the local market. CRS/NGO responsibility is to provide technical assistance/supervision to monitor the quality, progress and compliance with the intended scope of the project.

CRS/NGO may **directly implement** the construction works themselves through employing craftsmen and skilled/unskilled laborers from the affected communities. In this case, CRS/NGO takes on overall responsibility for sourcing the construction materials, supervising the labor force and monitoring quality and progress. The affected communities are engaged in site selection, design solutions and monitoring, but not all program participants may be involved in the construction activities. (Also in this case, the program participants may source some locally available materials, such as river sand, thatch, etc.)

Book B cover photo: Comutee de ciblage monitoring owner driven construction in Madagascar 2012, Photo by Jeanne Ella Andrianambinina

Example 1: Piloting community-based disaster preparedness innovations in West Bengal and Orissa, India, 2008- ongoing

Flooding is a way of life in much of rural India, where annual monsoon rains swell the river systems that crisscross large areas of the nation's vast landscape. Years of deforestation, coupled with poor land planning and overcrowding, have left millions of India's rural poor facing recurrent disaster, as flood waters wash away their livelihoods, their material possessions and their homes, most of which are built of a simple mud construction without safe structural frame that is highly vulnerable to flooding. Many villagers have lost their homes several times in recent years, in some cases up to 10-15 times in their life, creating a cycle of poverty that becomes inescapable.

The flood-resistant shelter project was one of three components of a comprehensive disaster risk reduction program in these villages. CRS' emergency shelter expert worked with communities to identify their vulnerabilities to disasters and to determine priority actions to increase their resilience to future flooding.

A critical determinant of the ability to withstand floods is the presence or absence of a structural frame to support the roof. Without a solidly grounded structural frame, the mud walls collapse when they are saturated with water.

In response, a shelter design – "concrete pillar model" – was developed with the community to make houses more resistant to floodwaters. Normal construction practices were studied and community discussions were held to identify appropriate ways in which to modify and improve the homes of the poorest families. One-hundred and fifty-seven such shelters were built acrosstwo states of West Bengal and Orissa at a cost of $730/house.

Completed flood-resistant shelter.
Photo by CRS

The shelter design used affordable, locally available materials and promotes five disaster resilient construction techniques:

1. **Pillar fabrication:** Prefabricated reinforced concrete pillars anchored on stone footing at least 2 feet below ground level to provide greater resistance;
2. **Raised plinth:** Compacted raised earth plinth at the main occupied space of the shelter. The plinth has a chicken wire-concrete finish to make it more resistant to water immersion that accompanies extensive flooding;
3. **Cross-bracing** in perpendicular directions at two opposite corner pillars for lateral resistance;
4. **Roofs anchored** into the main pillar structure with "J" hooks, nails and washers;
5. **Hipped roof,** a four-sided roof that provides greater resistance to high winds.

The construction was partly done by skilled masons and partly by the participating households themselves. The concrete pillars were prefabricated by local vendors and the structural frame was erected by local masons and skilled labor. This included the fixing of the trusses and roof sheathing. The participating households gave labor contribution in form of transporting the mud to site, compacting the earth for the raised plinth, excavating for the concrete pillars, lattice fastening and daubing of the wall infill, and application of mud plaster finish to the walls. CRS and partner technical teams managed the procurement and distribution of construction material, and no cash or vouchers were distributed.

A neighbor helps CRS program participant Purna Chandra Dalai prepare a mud and straw mixture for his new home, built to be flood resistant using techniques and materials taught and provided by CRS. Photo by CRS

The communities were entrusted with the responsibility of safekeeping and storage of the construction materials – especially the prefabricated concrete pillars and bamboos – in the villages, as the affected area was not accessible during the rains.

To insure safe quality construction, CRS and partner technical teams took on the quality control of the prefabrication of the concrete pillars. Construction training was conducted in disaster resilient building techniques for the mason and skilled labor while constructing a first demo shelter for the most vulnerable households of the communities. The participating households were also trained on key construction techniques to be able to monitor their own construction quality. A detailed, step-by-step, illustrated construction guide – with photos and diagrams showing the five key flood-resistant elements – was used to communicate the important issues.

The construction guide is available from shelter advisor.

Reflections:

- The visible change in circumstances to program participant households, the poorest households in the four target villages, motivated and convinced others with greater resources to replicate the design (Orissa: 18 new homes, 44 retrofitted).
- As a result of this pilot project, CRS and partner staff increased their capacity to develop resilience- focused shelter responses.
- Constructing the model shelters in front of the government offices led to government acceptance of the design and buy-in. A result of strategically involving the government is that more vulnerable households will benefit via the government housing scheme.

Reinforced concrete pillar prefabrication site for the structural frame of flood resistant shelter.
Photo Credit: CRS

A neighborhood child looks on as CRS program participants Dukhiram Dalai and his wife, Sukanti, decorate the doorway of their new home in the village of Raipur in Orissa state.
Photo Credit: CRS

Owner creating the raised plinth around the concrete pillars.
Photo Credit: CRS

Example 2: Transitional Settlement program in Cagayan de Oro Philippines, 2011-2012

Tropical Storm Washi, locally known as Sendong, made landfall on December 16, 2011, in Surigao del Sur province on the north-eastern coast of Mindanao. The tropical storm unleashed heavy rains, which caused flash floods to a height of a two-story building and landslides across the region. CRS launched a transitional settlement program housing up to 2,000 households to bridge the gap between emergency and permanent settlement solutions.

For the physical design of the transitional shelters, it was essential that the shelters were moveable and made minimal impact on the land. Thus CRS worked with a local architect and engineer to design an adapted *amakan* house. This type of house is an icon of Philippine culture, as it represents the Filipino value of "Bayanihan", which refers to a spirit of communal unity or effort to achieve a particular objective. The Amakan House is inspired from the traditional Filipino house called the "Bahay Kubo" (Nipa hut). It is an indigenous house made from locally sourced materials, which is ideally suited to the rural traditions and cultures. This pre-Hispanic architecture was adapted to the tropical climate of the Philippines and can be easily repaired or rebuilt if damaged by typhoon, flood or earthquake, which frequent the country. The house is predominantly made up of amakan (bamboo or palm leaf weave; CRS used palm) for the walls, and coco lumber, which is durable and inexpensive, for the structural frames.

The following design parameters were important:

1. **Culturally appropriate:** Allowed families more privacy, used local materials, protected from rain and heat.
2. **Re-locatability:** A shelter can be carried from one place to another by 20 persons or can be easily dismantled and re-erected in another location.
3. **Speed of construction:** The shelter can be constructed in approximately 2-3 days
4. **Economical:** Total shelter cost, including all labor and materials, is approximately 17,000 PHP (410USD)
5. **Flexibility:** Versions of the model can be applied to relocated families and those returning to original sites.
6. **Upgradeable:** Shelter can be easily upgraded into permanent homes, or dismantled and moved if necessary.

The effectiveness of a transitional settlement program heavily relies upon the timeliness of response, cost efficiency, quality of outcomes and quantity of program participants assisted. Thus the logistics, procurement and financial systems are crucial to the outcome of the program. In this response, locally and regionally procured material were ordered at a massive scale, and systems had to be put in place. After a tropical storm in the rainy season, drying timber is an issue; also, limited road access affected the delivery time and costs.

Transitional shelter on site in Cagayan de Oro
Photo Credit: Seki Hirano for CRS

House destroyed by flash floods
Photo Credit: Charisse Mae Borja for CRS

Pilot construction of transitional shelter
Photo Credit: Andrew Schaefer for CRS

Children playing in front of transitional shelter on relocation site
Photo Credit: Seki Hirano for CRS

Example 3: Special Operations Appeal (SOA) for Tsunami affected communities, Sri Lanka, 2005

In response to the Indian Ocean tsunami in 2005, CRS implemented a re-construction program in Sri Lanka in Batticaloa, Ampara, Galle and Matara districts. The response included a transitional shelter phase where 12,616 T-shelters were built within the first year, and a three-year permanent shelter phase in which 10,713 permanent homes were constructed. Water and sanitation facilities, community halls and school rehabilitations were also provided.

CRS, with its Caritas partner, engaged in a participatory design process with the community and designed different model T-shelters, keeping in mind the local traditions and cultural practices. Households had the flexibility to move the doors/windows/select the roof type, etc., and a series of design variation were evolved in the process. Pilot constructions were built to test the different designs and materials performance. The designs were refined through community feedback, and considerations were given to local capacity, supply chains and feasibility of scaling-up.

The program participants received cash grants in installments and were in charge of the construction of their T-shelter, either by constructing it themselves or by employing local craftsmen. In a few cases, program participants invested additional resources and added extensions or finishes such as tiling or false ceilings, etc.

Initially, a contractor-built approach was used to construct the permanent homes. However, unsatisfactory quality of construction and lack of timeliness, as well as observations that local labor was exploited by the contractors, led to a shift towards an owner-driven approach.

Subsequently, the community led the identification of the required skilled workforce. They identified material supply chains and suggested improvements to the procedures. Homeowners and local skilled workers procured and stored the construction materials locally.

The site planning and design process was also led by the homeowners. CRS/partner technical staff used their technical expertise to review the design and specifications, as well as the timeframe and associated payment procedures. The building works were carried out by local skilled craftsmen for the reinforced concrete frame, brickworks walls and timber roof structure. The homeowner monitored the quality and timeliness of the construction, and together with CRS/partner technical staff, signed off each construction stage, which triggered the release of payments. To safeguard the quality of the construction, local craftsmen received training in good quality construction practices by CRS/partner.

Construction transitional shelter
Photo Credit: CRS

Completed transitional shelter
Photo Credit: CRSt

CRS and partners worked with community members to establish a system for release of payments, monitoring and quality control at agreed construction stages of foundation, sill, lintel and roof level, roofing, internal wiring/finishes and completion. To be able to do this effectively, homeowners received technical assistance in monitoring the quality of the construction.

To facilitate accountability and transparency of payments, program participants were encouraged to open bank accounts. Making payments through bank accounts had a number of advantages. It helped to set up an efficient management and accounting of payments. It created greater awareness among program participants regarding the overall cost of their houses and how project money was being spent. It also minimized opportunities for corruption.

CRS and partners experiences showed that the shift towards the owner-driven approach helped to revive the local economy and support local construction skills. It reduced exploitation of local labor experienced during the contractor-built approach. Challenges of material supplies and time delays were addressed through contingency plans developed by CRS/partners.

The main challenges experienced were in quality control of materials and construction, such as educating the homeowners on quality issues and rejecting substandard materials.

Reflections:

- Providing maximum flexibility and choice to participants of re-construction programs is beneficial to the success of the project.
- Supporting families who had experienced devastating loss to be active managers of their recovery. Educating homeowners, as the ultimate "end-user", on their responsibilities in monitoring the construction process was key. Homeowners were at first passive program participants, feeling they should accept whatever was given; project team encouraged their role in managing the process, which helped increase sense of ownership.
- CRS/partners can add value to reconstruction program by building upon available local skills and resources as opposed to contracting work to contractors.

Training carpentry skills
Photo Credit: Mehul Savla for CRS

Permanent shelter in construction
Photo Credit: Mehul Savla for CRS

B.1 STAFF COMPOSITION

Typically the shelter team is led by a CRS program manager and is composed of staff with distinct skill sets at the CRS level and implementing partner level. It is important to highlight that an owner-driven construction project will need a higher management and staff input for project management. For example:

A stronger processing team to process finance payments to program participant/more supervisors to guide and provide technical support, etc.

- **Technical/engineering/construction:** Architect, engineer, foreman, construction and material quality control supervisors (example: bamboo supervisors), etc.
- **Social mobilizer:** Community mobilizers (often at implementing partner level) explain the program, resolve disputes, encourage program participants and ensure that vulnerable groups are not being overlooked.
- **Operational support team:** This is often the most overlooked team, but these team members (logistics, procurement, finance, warehousing) are critical players to the success of the team.

Refer to B.15 for organizational structure diagram/job description

Diagram 2 gives an overview of all owner-driven work stages in sequential order.

DIAGRAM 2: OWNER-DRIVEN WORK STAGE DIAGRAM

Book A

THINGS TO CONSIDER WHEN (RE)-CONSTRUCTING IN POST DISASTER SITUATIONS

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Book B

OWNER-DRIVEN CONSTRUCTION

SUMMARY OF TASKS

B.3 CONCEPT DESIGN
Task 1: Make field visits

Task 2: Initial community mobilization- Conduct focus group discussions

Task 3: Reflect market assessments

Task 4: Draw up design solutions

Task 5: Develop detailed Bill of Quantities for pilot construction

Task 6: Develop draft construction manual for pilot structure

B.4 PILOT/DEMONSTRATION (DEMO) STRUCTURE
Task 1: Construct a pilot structure

Task 2: Conduct an “open house” and evaluate pilot structure

Task 3: Seek approval/agreement

B.5 SCALING-UP
Task 1: Community-led site planning and selection

Task 2: Obtain permission to build

B.6 TECHNICAL DESIGN – PRODUCTION INFORMATION AND BOQ
Task 1: Produce technical design drawings and specifications

Task 2: Produce Bill of Quantities (BoQ) /Unit Cost Analysis (UCA)

Task 3: Produce a construction brochure / finalize construction guide

Task 4: Review technical design – Local building codes

Task 5: Develop monitoring plan

B.8 COMMUNITY MOBILIZATION AND TRAINING
Task 1: Cluster program participants into neighborhood groups

Task 2: Agree on scope of participation with program participants

Task 3: Develop construction training and information/education material

B.9 PROCUREMENT – TENDER SELECTION AND PURCHASE ORDER
Task 1: Compile a tender package for materials/supplies

Task 2: Set up consistent tender templates

Task 3: Conduct a tendering selection process for procuring materials/supplies

B.11 SITE SUPERVISION
Task 1: Set up regular meetings

Task 2: Set up feedback system – Accountability

Task 3: Set up site safety measures

Task 4: Facilitate changes and improvements

Task 5: Equipment and Materials Management and Warehousing

B.12 PROJECT CONTROLS – TIME, COST AND QUALITY
Task 1: Set up a project schedule (progress tracking)

Task 2: Set up cost control (budget tracking)

Task 3: Set up quality control (assures construction quality)

Task 4: Set up document control (records management).

B.13 COMPLETION AND HAND OVER
Task 1: Conduct final inspection

Task 2: Re-verify the original target program participant group

Task 3: Hand over certificates

B.14 AFTER COMPLETION
Task 1: Introduce maintenance activities

Task 2: Introduce disaster risk reduction procedures

Task 3: Evaluation and program participant satisfaction

SUMMARY OF OUTPUTS

B.3 CONCEPT DESIGN

Outcome 1: Field assessments completed and documented

Outcome 2: Understanding of program participants capacity/ preferences to (re)-build

Outcome 3: Market survey for construction material and labor evaluated

Outcome 4: Design for pilot structure completed, including BoQ, cost, material specification, equipment, labor requirements, draft technical construction guide

B.4 PILOT/DEMONSTRATION (DEMO) STRUCTURE

Outcome 1: Appropriateness of proposed structure demonstrated and evaluated

Outcome 2: Improvements made and approved final design

B.5 SCALING-UP

Outcome 1: Reached site layout agreement with stakeholder and community

Outcome 2: Gain permission/agreement to construct project by local authority, government, community

B.6 TECHNICAL DESIGN – PRODUCTION INFORMATION AND BOQ

Outcome 1: Completed engineering package for tender action/material procurement

B.8 COMMUNITY MOBILIZATION AND TRAINING

Outcome 1: Program participants/community agree on their scope of participation

Outcome 2: Program participants have access to technical assistance

Outcome 3: Clear feedback system is set up and agreed upon with community

B.9 PROCUREMENT – TENDER SELECTION AND PURCHASE ORDER

Outcome 1: Quality supplier selected and purchase order awarded

Outcome 2: Cost and delivery time clarified

B.11 SITE SUPERVISION

Outcome 1: Good communication and feedback systems set up

Outcome 2: Site safety measures agreed upon and followed

Outcome 3: Procedures to control construction changes set up

Outcome 4: Material management/ warehousing is staffed and set up

B.12 PROJECT CONTROLS – TIME, COST AND QUALITY

Outcome 1: Project schedule set up

Outcome 2: Progress/cost reporting/ tracking procedures set up and agreed upon

Outcome 3: Quality control set up and agreed upon with program participants

Outcome 4: Filing system set up

B.13 COMPLETION AND HAND OVER

Outcome 1: Final inspection completed and accepted

Outcome 2: Ownership certificate handed over

B.14 AFTER COMPLETION

Outcome 1: Maintenance procedure agreed upon and established

Outcome 2: Disaster risk reduction training set up

Outcome 3: Evaluation conducted

B.2 WORK STAGE: PLANNING AND DESIGN

The initial design process of an owner-driven construction program is an iterative process and will have to go through several stages. The goal is to move from the concept design to a demonstration structure/pilot as soon as possible to be able to test design ideas within the specific post-disaster context.

"Who to target" program participant selection criteria: As explained in the introduction, this document does not include program participant selection processes/criteria. However, clear, participatory and transparent program participant selection is absolutely essential and should have been conducted during the feasibility stage or even prior to that. Past experiences have shown that absence of a clear program participant selection process can lead to serious conflicts between program participants and communities. This process should be as participatory as possible. PRA (participatory rural appraisal) tools like social mapping could be used to see that vulnerable HHs (households) are given priority.

Refer to Introduction

This stage includes the following sub-stages:

Sub-stage: Concept design	refer to B.3
Sub-stage: Pilot/demonstration structure	refer to B.4
Sub-stage: Scaling-up: Technical design matched with social mobilization	refer to B.5
Sub-stage: Technical design: Production information, details and BoQ	refer to B.6

B.3 CONCEPT DESIGN

At the start, a construction program needs a concept design to solicit input from key stakeholders (government, IASC cluster, program participants, etc.) and to be able to evaluate initial designs and assumptions formulated during the feasibility stage. The aim is to design **simple and achievable structures** without compromising the inhabitants' safety and dignity.

Also refer to initial design A.4

Refer to "Building Back Better", www.sheltercentre.org/library

SUMMARY OF TASKS

Task 1: Make field visits

Task 2: Initial community mobilization – Conduct focus group discussions

Task 3: Reflect market assessments

Task 4: Draw up design solutions

Task 5: Develop detailed Bill of Quantities for pilot construction

Task 6: Develop draft construction manual for pilot structure

TASK 1: MAKE FIELD VISITS

Identify basic structure types in the selected communities through site visits and/or transect walk. Field assessments are essential. If they have not been conducted in the feasibility stage, they must be conducted now (i.e., soil type/ testing, hazard mapping, land contamination, landmines, "no built zones", flood zones, topographic data, etc.).

Refer to A.3 technical assessments

Considerations:

- What do people build with locally and why?
- Visit temporary structures that may have already been constructed by owners or other actors.
- Investigate the type and value of materials purchased, and find out how they were procured.

- Understand plans and capacities the affected populations have in improving their temporary living conditions.

TASK 2: INITIAL COMMUNITY MOBILIZATION – CONDUCT FOCUS GROUP DISCUSSIONS

Engaging with the community and the program participants from the beginning is essential. Initial community mobilization should introduce the project to the community, collect feedback, and discuss and agree upon roles and responsibilities. This could be done through a household participation agreement.

Template of household agreement in Appendix 1

Template of household agreement, decline of participation in Appendix 2

Conducting focus group discussions with affected community members is a useful tool to gain important information on: what their previous structures looked like, material used to build them, and their cultural preferences. Find out how they live: Understand aspects such as women/men, different generations sleeping in different areas, household size and family structures, WASH facilities indoor or outdoor, cooking methods, climatic conditions, religious requirements, etc.

- Identify and talk to households that have not rebuilt temporary houses and find out why.
- Identify and talk to household who have rebuilt and find out how they started and why.
- Identify availability of skilled/unskilled labor (market survey should establish labor availability).
- Identify community organizations/NGOs familiar with the area and communities.
- Identify whether there is confidence in the local construction practices after a disaster. Are there changes required to make the new construction more hazard resistant? How can it be improved?

Example: Kyrgyzstan, 2010

In Kyrgyzstan, following ethnic violence and flooding resulting in damage to 2,000 homes in Osh and Jalalabad provinces, a winterized shelter project constructed 203 winterized transitional shelters that could be converted into permanent homes.

Some of the program participants were trying to build a 50 sqm house with the construction materials that were designed for a 28 sqm house. These families decided it was more important to them to recover their original house than to follow the 28 sqm transitional house instructions. This was a challenge, as the end result was not a safe and inhabitable house.

Reflection:
Make clear agreements with the program participants on the scope of their participation, their responsibilities and the scope of the project.

Winterized extensions to existing structures
Photo Credit: Andrew Schaefer for CRS

Example: Nicaragua, 2012

Community meeting to discuss site selection and design for a flood evacuation center in Kum, Nicaragua
Photo Credit: Seki Hirano for CRS

TASK 3: REFLECT ON MARKET ASSESSMENTS

Conduct market assessments on the availability of construction materials on the local markets. If a market survey has been conducted during the feasibility stage, use this information to select materials that are readily accessible in large quantities, acceptable quality, affordable, familiar to local craftspeople, environmentally safe and culturally accepted for construction. Identify multiple vendors and assess their willingness to participate. Having multiple vendors helps to ensure uninterrupted material supply and avoids monopoly. Regardless of the planned construction approach, a market assessment is essential; the more in-depth the better, but even a rapid assessment will suffice. In addition, look for ways to use salvageable materials in construction.

Timber market survey:

Sourcing large quantities of timber can be a challenge, especially when procuring responsibly.

- Are there any local, and then national, timber suppliers?
- Do they have in-stock supplies?
- Inspect the quality and request price for such quantity.
- Where was the timber sourced? Do sustainable reforestation programs exists in country?
- Do legal timber certification systems exist in country? (UNEP/UNDP may know.)
- If there is no certification system, an option is to procure internationally. This can incur additional costs for transport and import tax. Also, the time scale can be greatly extended.
- If sourcing timber becomes a major challenge, consider alternatives, such as steel, bamboo, etc.

Example: RCC (reinforced concrete) column production:

Market assessment should identify the existing vendors in the local area and their willingness to participate in the program.

Try to set up a prefabricated column production unit in the affected area so that monitoring and quality check can be done by the program participants.

Refer to example 1 in India for details

Also refer to A.3 assessments

Contact the emergency team for market assessment questionnaire templates

Refer to emergency market mapping analysis (EMMA), www.emma-toolkit.org

Refer to www.humanitariantimber.org

TASK 4: DRAW UP DESIGN SOLUTIONS

Technical sketch drawings of possible design solutions should have been made by the engineer/architect during feasibility. These need to be revised according to understanding gained from the community and site visits. At this stage, a “one size fits all” approach is not necessary; it is best to make multiple design solutions for different construction types, and it is important to retain some level of flexibility in terms of materials, size and layout to cater to different needs. (This can be done through design options.)

Design options should give consideration to people with disabilities (ramps/handrails), children, cultural practices and opportunities for housing improvements by the inhabitants (i.e., adding of internal partition to give more privacy/extensions, etc.).

Example: Haiti, 2010

Technical drawing for transitional shelter in Port-au-Prince, Haiti

It is essential to clearly define what disaster-resilient construction techniques are to be used. Design solutions must be safe structures that are resistant against future disasters as much as practically possible; consider flooding, earthquake, landslides, high winds. The principles of "build back better" and "safe, adequate, durable" are touchstones for (re)-construction.

Refer also to initial design-budget, timeframe A.4

Refer to Sphere Project, shelter and settlement section, www.sphereproject.org

Reference for shelter projects for case studies, www.sheltercasestudies.org

TASK 5: DEVELOP DETAILED BILL OF QUANTITIES FOR PILOT CONSTRUCTION

The engineer/architect needs to develop a detailed Bills of Quantities (BoQ) for the chosen pilot structure and share it with the procurement team to help them understand exactly what materials need to be bought. It is best to get the help of a local person/partner to get local rates of material and to establish a realistic cost estimation in order to prepare the BoQ. The BoQ is an exhaustive list of material specification, quantity and tools required to construct the design. It also gives an estimated cost per shelter. The BoQ is finalized/confirmed only after construction of a pilot structure.

Bill of Quantities (BoQ) template in Appendix 4

TASK 6: DEVELOP DRAFT CONSTRUCTION GUIDE FOR PILOT STRUCTURE

The engineer/architect and social staff should develop a draft technical assistance guide manual on how to construct the structure, which needs to be revised after the pilot has been tested. This should include step-by-step construction processes in pictorial format with examples of “dos and don’ts” in local language, highlighting critical junction details and contacts for advice and assistance.

Example: Bangladesh

Extract from construction guide for transitional shelter construction in Bangladesh

SUMMARY OF OUTCOMES

Outcome 1: Field assessments completed and documented

Outcome 2: Understanding of program participants capacity/preferences to (re)-build

Outcome 3: Market survey for construction material and labor evaluated

Outcome 4: Design for pilot structure completed, including BoQ, cost, material specification, equipment, labor requirements, draft technical construction guide

B.4 PILOT /DEMONSTRATION (DEMO) STRUCTURE

The purpose of the pilot construction is to:

- Show stakeholders a real, tangible sample of what is to come. It is a method to ensure buy-in from different stakeholders. In some contexts, it may be appropriate to have multiple variations of pilot models.
- Seek program participant and craftsmen feedback on the structure, ease and difficulties in making such structures, any modifications required, etc.
- Demonstrate the appropriateness of the structure in regards to meeting Sphere standards.
- Test the speed that these shelters can be built and the labor and skill requirements, as well as the technical assistance that is needed to scale-up quickly.
- Identify improvements that should be made after feedback/testing.
- Finalize exact BoQs.
- Reconfirm the level of skills required for construction.
- Use as a training opportunity for builders. DEMO shelters are frequently built by villages or groups of villages to train skilled labors on construction techniques and orient the community and program participants on key construction features (useful for community/ program participants monitoring).
- Evaluate the safety and storage issues when scaling-up (mapping of distribution schedules for material/cash).

When planning for a large scale project, it is always worth investing time and funds towards a pilot. If any improvements are identified, either in terms of design, BoQ or construction technique, the benefit of this finding will be multiplied by the number of repetitions, resulting in better quality construction, cost savings and increased program participant satisfaction with the structures.

Example: Madagascar, 2012

Pilot construction of shelter for training local community and craftsmen on cyclone resistant construction
Photo Credit: Rumana Kabir for CRS

"It is one thing to look at design drawings but it cannot compare with being able to look, touch and walk around in a real structure."

SUMMARY OF TASKS

Task 1: Construct a pilot structure

Task 2: Conduct an "open house" and evaluate pilot structure

Task 3: Seek approval/agreement

TASK 1: CONSTRUCT A PILOT STRUCTURE

The pilot construction should be built on the actual site (or a program participants land), if possible, by a group of skilled and unskilled laborers, under the same conditions and with the same equipment as planned for all following construction. This will achieve a more realistic assessment of the suitability of the structure, actual cost, construction time and labor requirements, and highlight what needs to be improved before scaling-up.

"Will program participants move into these kinds of shelters? It is the occupancy rate not the amount of completed structures that is the goal."

Example: Sri Lanka, 2006

Pilot construction of transitional shelter in progress for post-tsunami shelter response, Sri Lanka
Photo Credit: CRS

TASK 2: CONDUCT AN "OPEN HOUSE" AND EVALUATE PILOT STRUCTURE

- Once completed, it is important to get feedback from different groups, including:
- Government officials (politicians, zoning folks, city planning/construction department)
- Program participants: men, women (different age groups), vulnerable groups, etc.
- Shelter Cluster: To ensure understanding, coordination and harmonization of other construction projects (e.g., shelter) and the wider context, such as WASH and other sector intervention.
- Implementing partners
- CRS staff (social and technical)

Appropriate feedback mechanisms should be developed for each of these stakeholder groups. Smaller groups or different approaches at soliciting feedback in different forums may be necessary. It is not uncommon and should be accepted that there will not be a universal acceptance of the structure. In this respect, it is helpful to **evaluate the pilot on:**

- The acceptance of the structure by the program participants.
- The time it took to construct.
- The cost, including improvements, that may be necessary to make it suitable and safe.
- The construction skills required and the usability of the draft construction guidelines.
- The structure's compliance to Sphere standards. If there is a deviation, document the reason why. This can be shared with partners, the cluster and government agencies to ensure that there is a clear reason as to why Sphere is not achievable.

In urban settings where land is scarce, it may be difficult to achieve site area standards.

Contact shelter advisor for tools on feedback mechanisms

Refer to Sphere Project, shelter and settlement section, www.sphereproject.org

T-shelter: It is important to remember that the shelter is not intending to replace homes in their original state, but to provide a "bridge" to more durable solutions. Consider the reusability of material and/or possibility to extend the structure.

TASK 4: SEEK APPROVAL/AGREEMENT

Once verbal approval is given by any authority, follow up by getting written approval, especially from government authorities (local, municipal, federal, state, etc.). Written approval is advisable particularly for permanent construction, through in many situations it would be ideal. These document need to be retained and filed.

T-shelter construction: In many past experiences, in the absence of local authority approval mechanisms, the Shelter Cluster and affected community reviewed and endorsed the proposed design.

Seek written agreement from the land owners in the form of a signed Memorandum of Understanding. However, in some instances, verbal statements can be the most one can anticipate. If this is the case, be sure to record such verbal agreements in the form of meeting minutes.

Refer to B.5 for details

The evaluation/approval process can take time and planning; the scaling-up process should be done in parallel. Factors that need consideration are:

- In kind material distribution: In this case, tenders for construction materials should be prepared as soon as possible.

Refer to B.6 Production information, details and BoQ

- Vouchers distribution: Has a robust market assessment been done? Tender for construction materials/vendors should be prepared as soon as possible.
- Cash distribution: How will the cash be distributed? Consider security risks.

Contact emergency team for detail on in-kind material distribution, voucher or cash approach

Refer to B.7 for detail

SUMMARY OF OUTCOMES

Outcome 1: Appropriateness of proposed structure demonstrated and evaluated

Outcome 2: Improvements made and final design approved

B.5 SCALING-UP

Scaling-up owner-driven construction programs is not a precise science, rather it is a social process that will take time to refine to ensure high-quality programming and management quality systems are correctly integrated into the program. The social and technical units will need to work together to be able to scale up, addressing issues and helping troubleshoot problems as they come up. Effective teamwork between the social and technical teams is a key ingredient for a success.

Scaling-up needs:

- Adequate staff
- Clear role and responsibility between CRS and community
- Good assessment on capacity of the community and staff
- A clear mechanism to receive complaints and feedback from community

SUMMARY OF TASKS

Task 1: Community-led site planning and selection

Task 2: Obtain permission to build

TASK 1: COMMUNITY-LED SITE PLANNING AND SELECTION

Planning of the exact location of the structures on the site is very important. Past experience has shown that it is extremely important to invest effort into this stage. The program participants should lead this process with support from CRS/partner technical and social staff to include their knowledge and feedback into the proposed design. Key items to keep in mind when selecting a suitable location are:

- Geo-hazard vulnerability (Is this new site prone to landslides, flooding, etc.?)
- Does the new site have drainage (storm runoff, grey water, flooding)?

- Site leveling or clearance of debris required (e.g., destroyed structures, contamination, landmines).
- WASH considerations: Were WASH facilities destroyed/damaged during the disaster? If yes, to what extent can we rebuild or integrate construction program around these WASH services?
- Existing vegetation, prevailing wind directions and sun path.
- Current use of site by the community.
- Accessibility (roads, path, electricity, water, etc.).
- Ownership of land.

Example: Nicaragua, 2012

Transect walk with the community to select appropriate site for flood evacuation center project in Kum located in the estuary of Coco River, Nicaragua
Photo Credit: Seki Hirano for CRS

In an owner-driven construction project, it is essential to develop the site layout, plot sizes and other consideration mentioned in close partnership with the program participants, government officials and surrounding communities (host communities) to benefit from their local knowledge, get program participants' buy-in and mitigate future grievances and disagreements.

Tools to consider: transect walk

TASK 2: OBTAIN PERMISSION TO BUILD

To the extent possible (especially for permanent construction), written permission should be obtained from government, local authorities and communities (program participants/host communities) to build on the proposed site to the scope intended. In some cases, this formal process is not always possible, because:

- Not all local contexts have formalized building permission procedures and timeframes.
- In many cases, after a disaster the local administration is understaffed, government systems collapse or are not functioning, etc.

Therefore, it is important that CRS assists program participants with needed documentations of the project for submission according to the local laws. This could include: Site plans/survey plans with property boundaries/plot numbers and technical drawings of the construction (plans/sections/ technical specification).

T-shelter construction: In the case of transitional shelters/buildings, permission may take more informal formats as official processes are too lengthy and/or connected to formal landownership. In the past, this has been a strategic reason why CRS to opted for T-shelter construction. Furthermore, it is important to consider in the design the possibility to demount and rebuild the structures while leaving the building structurally safe.

Example: Philippines

In Philippines shelter response, the transitional shelter was designed to be re-locatable and demountable
Photo Credit: Charisse Mae Q. Borja for CRS

LAND USE AGREEMENT FOR TRANSITIONAL SETTLEMENT

Seek written agreement from the land owners in the form of a signed Memorandum of Understanding. However, in some instances, verbal statements can be the most one can anticipate. If this is the case, be sure to record such verbal agreements in the form of meeting minutes.

Important clauses to be included in agreements:

Project Documents. The land of the Land Owner shall be used exclusively for the purpose of building transitional shelters; inclusive of toilets, bathing cubicles, hand washing stations, clothes washing area, and cooking area; and according to the goal and objectives as set forth in the attached project design.

Period of Agreement. The project shall be implemented by CRS and the Church on behalf of the Archdiocese of Cagayan de Oro. The Land will be used for a period of six months, renewable in six month increments.

Safety. It is the responsibility of the Church to comply with all applicable laws, ordinances, rules, regulations and orders of any public authority having jurisdiction over the safety of persons or property or to protect them from damage, injury or loss.

Injury or Damage. It is understood that the personnel/workmen hired, engaged or contracted in connection with this project including employees of CRS or its donors shall not hold the Land Owner responsible for personal injury or damage caused or sustained by said personnel/workmen.

Sale, Transfer and Mortgage. The Land Owner agrees that the subject Land shall not be sold, transferred or mortgaged to parties outside of this agreement until such time as permanent housing is available for program participants residing in transitional shelters built on the Land.

Site Preparation. All site preparation, including construction of access road and necessary culverts and brush clearing shall be the responsibility of CRS. Large trees will not be removed from the land during site preparation.

Utility Connection. Provision of metered water and electrical connection will be the sole responsibility of CRS.

Drainage and WASH Facilities. Proper drainage and WASH facilities are the sole responsibility of CRS. Drainage will be designed and tested before construction to ensure suitable run-off of water. All latrines constructed will have properly sealed septic tanks.

Also refer to land ownership issues task 2 under point A.3

Land use agreement template (digital copy) available on share point

With squatters, sometimes “formalizing” an informal agreement can actually put the program participant at risk of losing access to that land. For example, in many situations, people have informal agreements such as “This land belonged to my wife’s uncle and I have been given verbal permission to use this land.” Formal interference into these relationships may cause more harm than good, violating these informal but recognized agreements. The program needs to take a clear position on this issue and communicate effectively to all stakeholders.

SUMMARY OF OUTCOMES

Outcome 1: Reached site layout agreement with stakeholder and community

Outcome 2: Gained permission/agreement to construct project by local authority, government, community

B.6 TECHNICAL DESIGN – PRODUCTION INFORMATION AND BOQ

SUMMARY OF TASKS

Task 1: Produce technical design drawings and specifications

Task 2: Produce Bill of Quantities (BoQ)/Unit Cost Analysis (UCA)

Task 3: Produce a construction brochure/finalize construction guide

Task 4: Review technical design – Local building codes

Task 5: Develop monitoring plan

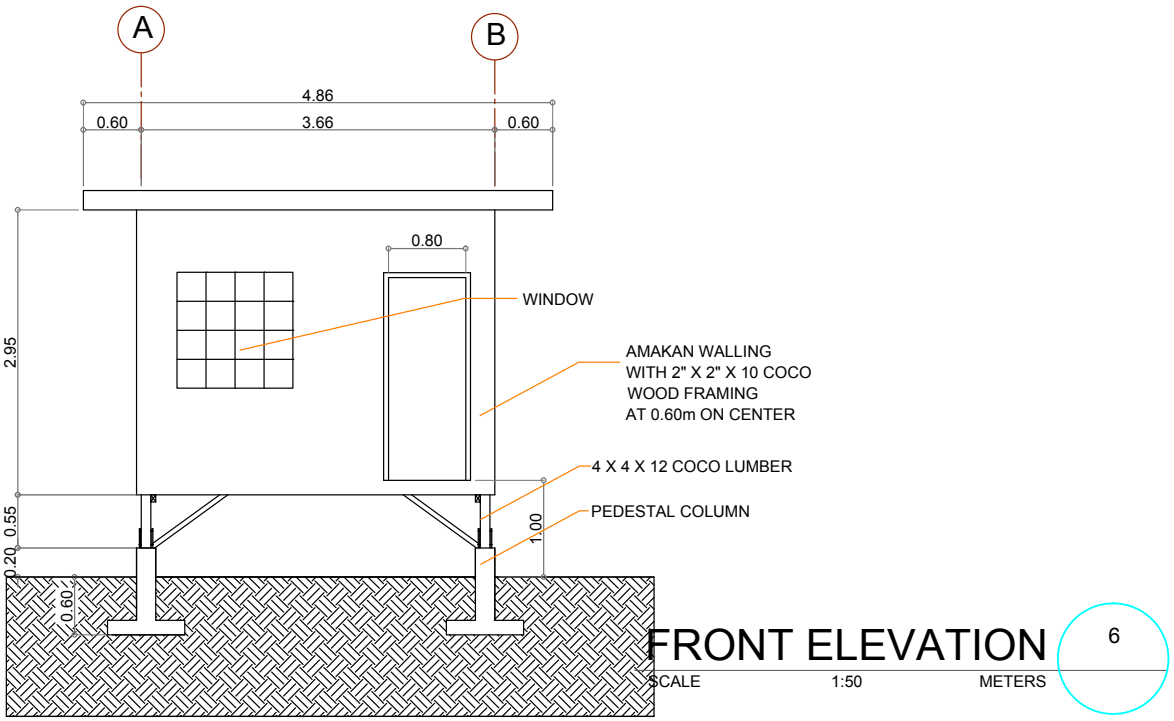
TASK 1: PRODUCE TECHNICAL DESIGN DRAWINGS AND SPECIFICATIONS

Defines what is going to be built. Produce the architectural and engineering drawings and structural requirements for the proposed structure following the improvements made to the pilot structure. Produce the engineering package (see below for explanation). The completed engineering package is the basis for the next work stage.

If the project is in a new settlement where new plots are created, then the site planning and infrastructural scope of work is essential (WASH, site drainage, access roads/paths, etc.).

In projects where the constructing is within the owner's plot of land, then an architectural and structural package may be sufficient.

Example: Philippines, 2012



Example of technical drawing, front elevation of transitional shelter in Philippines, 2012

What are technical design documents?

Design parameters

- List of design parameters (size, structural loading and resistance), list of drawings and assumptions

Site plans and infrastructure plans

- Civil drawings (roads, drainage, bridges, WASH, etc.)
- Site plan (showing site boundaries, location of structure on the site in plan, access, north direction, any water/drainage/electrical supplies, topographical information, vegetation, neighboring structures, etc.)

Architectural and structural package

- Architectural/structural drawings (plans, elevations, sections)
- Electrical, mechanical drawings (lighting circuits, ducting, ventilation)
- Material specification /equipment schedules
- Detail drawings (showing important junctions, i.e., foundations, wall/roof junction)
- Design Bill of Quantities (BoQ)
- Structural calculations

What is part of the specifications?

Specifications describe the **minimal** construction requirement to be achieved and describe the approved design in words and construction sequence. It must reflect the **design quality, material quality/characteristics** (i.e., concrete mixing strength, alignments tolerances) and the construction methodology (i.e., prefabrication versus on-site construction).

For example contact CRS Shelter advisor

What is part of the engineering package?

It collates all information relevant to the project and is the core documentation for overall construction project management, budget and timeframe control. It is essential to proceed to the next work stages. It includes:

- Technical assessment, field investigations, site planning and requirements
- Scopes of work, technical design drawings, material specifications, BoQ
- Construction modality – owner-driven or contractor-built or a combination of the two
- Monitoring plan

Note: The construction project manager/the engineering team should verify the accuracy and completeness of the engineering package to be able to manage the construction works effectively.

Purchasing of design software (i.e., STAAD, ETabs, EPANET, AutoCAD, etc.) may be required. A common problem associated with AutoCAD and other drawing software, especially in countries with limited professional education and regulating bodies, is the ease of "cutting and pasting" design drawings and details from one design to another without review. Design drawings should be signed and stamped by a licensed engineer/ architect, who will in turn assume the liability for any errors and/or omissions in the design.

What is a Bill of Quantities (BoQ)?

The final BoQ is based on the final approved design drawings and specifications. The BoQ lists out all the materials and quantities required to build the structure as drawn on the technical drawings. It determines unit costs. The BoQ is needed to calculate total project costs and monitor the budget.

What is a Unit Cost Analysis (UCA)?

UCA is part of the BoQ. It itemizes material cost, labor cost and equipment cost.

These estimated costs can be derived in several ways:

1) Use of a standard construction cost index (i.e., R.S Means Construction Cost Index, etc.) generally provides a lower accuracy estimate and is not always available.

2) Unit costs based on an up-to-date actual local area market price survey are more accurate, but will require more time and staff resources.

The total estimated construction cost = quantities x unit costs (materials, labor and equipment). In addition to the construction cost, make allowances for staffing /overheads/ contingencies.

The BoQ should be very specific so that the procurement teams can procure the right materials. Many procurement staff will never have purchased construction materials before, and they do not know the difference between different kinds of cement, rebar, GI sheeting, etc.

Example: Philippines, 2012

PROJECT TITLE: Construction of 18 sqm elevated T-Shelter
PREPARED BY:
SUBJECT: DETAILED ESTIMATE 3.66 x 4.88 m

ITEM	DESCRIPTION	QTY	UNIT	UNIT PRICE	AMOUNT
1	**Concreting of Pedestal Col.**				
	Materials				
	Portland Cement	5	bags	210	1050
	Mixed Gravel	1	mixed	800	800
	3/16" x 4' x 8' Ord Plywood	1	sht	220	220
	2 - 2" x 2" x 12' coco lumber	8	bdft	14	112
	10mm x 6.0 m Def. bar	12	lngth	140	1,680.00
	8mm x 6.0m Def bar	3	lngth	80	240.00
	# 18 Tie wire	2	kls	60	120.00
				Material cost	4,222.00
	Labor (1 day)				
	2 Carpenter	2	mds	300	600.00
	2 Helper	2	mds	250	500.00
				Labor cost	1,100.00
				Sub total	5,322.00
2	**Wooden Post /Girt**				
	Materials				
	4 - 4" x 4" x 12' Coco Lumber	64	bdft	14	896
	6 - 2" x 4" x 8' Coco lumber	32	bdft	14	448
# 4" Cwnails		1	kls	50	50.00
	# 2-1/2 cwnails	1	kls	56	56.00
				Material cost	1,450.00
	Labor (1 day)				
	2 Carpenter	2	mds	300	600.00
	2 Helper	2	mds	250	500.00
				Labor cost	1,100.00
				Sub total	2,550.00
3	**Fabrication and Installation of amakan Walling**				
	Materials				
	18 - 2" x 2" x 12' Coco Lumber Hor Stud	72	bdft	14	1008
	28 - 2" x 2" x 8 ' Coco Lumber Vert Stud	74.67	bdft	14	1,045.38
	Bamboo slats	2	bundles	80	160.00
	4' x 8' amakan	13	sht	160	2,080.00
	# 4" Cwnails	1	kls	50	50.00
	# 2-1/2 cwnails	1	kls	56	56.00
				Material cost	4,399.38
	Labor (1 day)				
	2 Carpenter	2	mds	300	600.00
	2 Helper	2	mds	250	500.00
				Labor cost	1,100.00
				Sub total	5,499.38

ITEM	DESCRIPTION	QTY	UNIT	UNIT PRICE	AMOUNT
4	**Installation of FloorJoist / Plywood Flooring**				
	Materials				
	14 - 2" x 3" x 12' Coco lumber Joist	84	bdft	14	1,176.00
	3/4" x 4" x 8" plyboard	6	sht	750	4,500.00
	# 4" Cwnails	2	kls	50	100.00
	# 2-1/2 cwnails	1	kls	56	56.00
	#1-1/2" cwnails	1	kl	55	55.00
				Material cost	5,887.00
	Labor (.5 days)				
	2 Carpenter	1	mds	300	300.00
	2 Helper	1		250	250.00
				Labor cost	550.00
				Sub total	6,437.00
5	**Roof framing / Roofing works**				
	Materials				
	8 - 2" x 3" x 12' coco lumber raffter	48	bdft	14	672.00
	10 - 2" x 2" x 12' coco lumber purlins	40	bdft	14	560.00
	Gage 26 x 10' corr g.i sht	14	shts	270	3,780.00
	Vulcaseal	1	pint	110	110.00
	# 4" Cwnails	2	kls	50	100.00
	# 2-1/2 cwnails	1	kls	56	56.00
	# 2 " umbrella nails	1	kls	75	75.00
				Material cost	5,353.00
	Labor (.5days)				
	2 Carpenter	1	mds	300	300.00
	2 Helper	1	mds	250	250.00
				Labor cost	550.00
				Sub total	5,903.00
6	**Windows/Door/Stair**				
	Materials				
	Bamboo Slat	1	bundle	80	80.00
	2 -2" x 2" x 12" coco lumber (doorframe)	8	bdft	14	112.00
	2" x 3" x 12 coco lumber (Stair	6	bdft	14	84.00
	3/16" x 4' x 8' ord. plywood	1	shts	220	220.00
	3" x 3" loosepin hinges ord.	1	pair	45	45.00
				Material cost	541.00
	Labor (.5 days)				
	2 Carpenter	1	mds	300	300.00
	2 helper	1	mds	250	250.00
				Labor cost	550.00
				Sub total	1,091.00
				Grand Total	26,802.38

BoQ with unit cost of 18 sqm transitional shelter in Cagayan de Oro, Philippines

TASK 2: PRODUCE BILL OF QUANTITIES (BOQ)/UNIT COST ANALYSIS (UCA)

Improve and finalize the pilot structure BoQ to be very detailed: Include a list of all materials, material quantities, equipment and labor required to build the structure. The labor requirements should include number of carpenters, masons, etc.; labor days are required for each phase.

UCA: Determine the unit cost for construction materials, equipment and labor.

The CRS in-house engineer/architect and procurement staff will revise the current market cost per item after the pilot construction. It is important that technical staff explain the BoQ in detail to the procurement staff.

Example: West Sumatra, 2009

Illustrated technical guide for transitional shelter construction in Padang, West Sumatra, Indonesia, 2009

Program participant with T-shelter technical guide poster
Photo Credit: CRS

TASK 3: FINALIZE TECHNICAL ASSISTANCE GUIDES

A construction brochure and/or manual should be finalized after feedback from the pilot project has been used to improve the design. This technical assistance is very important to illustrate in a very simple and clear way how to construct the shelter and how to monitor the quality. This could include photos of the pilot shelter with annotations, drawings, illustrations and diagrams. It should highlight key monitoring stages and give attention to key details, such as safe joining of materials. Contacts for help and assistance are a very important component of this document.

It is essential to use communication methods that program participants, who are building their own houses, understand. Many methods have been developed and tested. Contact shelter advisor for examples.

TASK 4: REVIEW TECHNICAL DESIGN – LOCAL BUILDING CODES

Permanent construction: Technical designs and specifications should be reviewed for compliance with local building codes and regulations or accepted international codes where local codes and regulations are not available or are below acceptable standards. This can include a combination of in-country local and international professional engineers and a wider review via email/internet utilizing the CRS network of construction professionals/shelter advisor.

Emergency/T-shelter construction: "Build Back Better" principles must be emphasized. Emergency/transitional structures must be designed so that if they do fail in a future disaster, they do not cause injury to the people. Evacuation procedures should be known and practised. An emergency shelter advisor should be consulted if there is not sufficient technical expertise available in-country.

This is particularly important in earthquake, high wind or flooding zones, where special construction techniques and detailing are essential to build safe and hazard-resistant structures.

Reference: Uniform Building Code (UBC), www.iccsafe.org

Reference: hazard resistant construction, www.sheltercentre.org/library

Contact shelter advisor for review of technical drawings/specification

TASK 5: DEVELOP MONITORING PLAN

This is a **tool** that defines the procedures to be used to **monitor the quality** of the construction works and the **progress.** Ideally, it is divided into the different construction stages (foundations [plinth], wall structure, roof, finishes and completion). It is developed on the basis of the technical design, material specifications and specific considerations for owner-driven construction (i.e., time for training in safe construction techniques, flexible timeframe, etc.).

What is part of a monitoring plan?

It sets the basic requirements and defines inspection standards of the construction works by the engineering team/program participants and community. It is a very important tool to monitor the quality of the construction.

- **States the responsible individual** for each of the inspection activities.
- **Includes verifying documents** for each inspection activity consisting of inspection forms/construction checklist (i.e., Daily Inspection reports that monitor day-to-day activities).
- **Includes breakdown of overall construction process** into different phases such as completion of ground works (drainage/sewers), foundations/plinth, wall structure (RCC columns/timer, etc.), roof structure (safe connection to wall structure) and finishes (internal/external).
- **Includes construction "Dos and Don'ts" poster** with pictures posted at the construction site to inform/educate the construction workforce on good and bad practices witnessed during construction. Past experience has proven that pictures help to communicate safe construction practices.

The monitoring plan defines:

- **"Hold points"**– critical stages of the construction work where construction is stopped until inspection and quality certification is provided from the engineering team and program participants. The hold points clearly describe what requires inspection. They are particularly important where on-going construction would otherwise conceal completed works (i.e., reinforcement and pouring of foundations, columns and support beams; installation of electrical, septic tanks, etc.).
- **"Monitor"** – random checks, by direct or indirect inspection, to verify conformance with specification and quality control.

Permanent construction:

- Owner-driven permanent construction should include a "defect liability period" of 6 months with a retention withheld (5%) to repair any minor issues that arise during this period.

A monitoring plan is a **communication tool** to use with the local community/program participants/skilled laborers to agree on the inspection procedures, assist them in achieving accountability and raise awareness for safe construction. An induction meeting with the community should explain the process carefully.

Reference to B.12 for more details on quality monitoring/program/budget controls

Contact shelter advisor for examples and template

SUMMARY OF OUTCOMES

Outcome 1: Completed engineering package for tender action/material procurement

It includes the scope of works, technical design drawings, specifications, BoQ/UCA, construction brochure building, code compliance note and monitoring plan.

B.7 WORK STAGE: PROCUREMENT AND WORKFORCE MOBILIZATION

This stage includes the following sub-stages:

Sub-stage: Community mobilization	refer to B.8
Sub-stage: Procurement –Tender selection and purchase order	refer to B.9

The procurement work stages are necessary steps to establish:

- The **appropriate labor** arrangement to construct (this could include combinations of the program participants themselves, skilled craftsmen and local labor).
- The tendering for **construction materials** to establish availability, cost and lead times.
- Placing **purchase orders** and developing consistent **contract templates** (Memorandums of understanding [MOU], service contracts).

In the past, CRS has used different options to source the materials and labor necessary:

A. CRS directly built, by procuring material and labor employed by CRS

In situations where land tenure is not certain, such as in formal/informal camps or temporary relocation sites, program participants may not be able to build their own shelters. In these instances, CRS/NGO/partners will need to directly hire skilled laborers/craftsmen to construct and to procure and store construction materials.

B. In-kind material distribution to program participants with labor contribution by the program participants and/or cash for work

In post-disaster situations where construction materials are not readily available on local markets or it is necessary to have a very prescriptive design and material selection, it may be necessary to procure materials and distribute items in-kind to program participants (refer to market assessment).

In this case, it is essential to asses if the community has the necessary skilled labor. If this is not the case, some form of cash grant can be considered for the program participants to manage the construction and payment of skilled laborers. The program participants often are in a position to negotiate better rates; however, technical advice on safe construction needs to be disseminated.

C. Material voucher distribution to program participants with labor contribution by the program participants and/or cash for work

This approach is most applicable in situations where there are several design solutions required (e.g., urban (re)-construction) and the local markets are functioning and will be able to cope with the increased demand of construction materials with consideration of inflation.

It is advisable to consider pre-selecting vendors or approaching vendors on how the process will work, especially in regard to cash flow and payment schedule to the vendors in order for them to have the materials available (i.e., payment every month or every 2 weeks).

D. Cash distribution to program participants with labor contribution by the program participants and/or cash for work

As explained under "material voucher", cash is most applicable where there are several design solutions required and the local markets are functioning and will be able to cope with the increased demand of construction materials. In addition, security situations and logistics allow for the distribution of cash to the program participants.

The cash-for-work approach is valuable as a mechanism for supporting disaster-affected households to rebuild their houses while also providing cash injections into the affected local economies. It provides waged labor opportunities to other laborers in the community in need of work.

Example: West Sumatra, 2009

Cash distribution to program participants by the post office in Padang, west Sumatra
Photo Credit: CRS

Each of these options requires variation in how construction materials are procured, necessary labor (skilled/unskilled) selected and construction supervised and quality monitored. **It is essential to tailor the shelter response to the specific post-disaster situation and shelter needs of the affected population.**

B.8 COMMUNITY MOBILIZATION AND TRAINING

Community mobilization is one of the most essential activities within any form of owner-driven construction modality. The engagement and participation of the program participants, community leaders and affected communities is vital, as they are either building the structures themselves, procuring the materials from local markets and/or employing local craftsmen or labor to build the structures.

Many shelter projects are assessed on their occupancy rate and not on the completion rate of the shelters. Consequently the participation of the affected communities is an essential component.

SUMMARY OF TASKS

Task 1: Cluster program participants into neighborhood groups

Task 2: Agree on scope of participation with program participants

Task 3: Develop construction training and information/education material

TASK 1: CLUSTER PROGRAM PARTICIPANTS INTO NEIGHBORHOOD GROUPS

Once the target group has been established, it is advisable to divide the program participants into smaller neighborhood groups or clusters. This assists in organizing the construction supervision and monitoring. The clusters can inform the program team about "special needs" within their cluster group, such as elderly households that require a hand rail to get in and out of the shelter or a wheel chair ramp, etc.

In the case of a voucher or cash process neighborhood members can take up organizational responsibilities such as, material sourcing, etc.

Example: Padang Earthquake, West Sumatra, Indonesia, 2009

Incentive approach: In some instances, it is may be prudent to offer a "solidarity" incentive bonus for the households. This helps ensure that community members support one another in the re-building of their communities. In the Padang earthquake response, 10% of the total cash grant was withheld until all households in the cluster safely completed the construction of their homes.

CRS team monitors the progress of T-shelter construction in Padang, west Sumatra, earthquake response
Photo Credit: CRS

Program participant list is posted on wall within the community
Photo Credit: CRS

TASK 2: AGREE ON SCOPE OF PARTICIPATION WITH PROGRAM PARTICIPANTS

At this stage, a clear agreement with the program participants/community on their scope of participation should be in place. In general, this is a form showing that the program participants have agreed to participate in the construction of their own houses. If they are disabled or do not have the ability, then they are responsible for "recruiting" other people to assist. In this respect, the clustering of neighborhood into work teams is beneficial to set up a community-based assistance model. When possible, the local community should be looking out for the "most vulnerable" group members, but the degree to which this happens is dependent upon community cohesion.

Template of household agreement in Appendix 1

Template of household agreement, decline of participation in Appendix 2

Shelter program participant card in Appendix 3

TASK 3: DEVELOP CONSTRUCTION TRAINING AND INFORMATION/EDUCATION MATERIAL

In addition to the construction brochure/guide (refer to B.6), a construction training and feedback process should be developed with the program participants. This is often done during the DEMO construction. This information should be inclusive of all groups of program participants, such as women, elderly, etc.

Refer to B.4 for pilot construction as training on safe construction techniques

References on gender in construction contact shelter advisor

Example: Niger, 2012

Construction training for host and affected communities and CRS staff of emergency shelter, Niger, 2012
Photo Credit: Seki Hirano for CRS

Example: Haiti, 2012

Prefabrication yard for T-shelters employed 50% women and 50% men. The manager reported that this created a balanced work environment and that women's productivity was equal to others, Haiti earthquake response, 2010
Photo Credit: Benjamin Depp for CRS

The pilot shelter is constructed to teach safe construction techniques and provide first available shelter to the most vulnerable. It also provides the opportunity to improve the design and material specification.

Risk: It is possible that the most vulnerable receive the least well-constructed shelter in these cases, as they are test constructions.

SUMMARY OF OUTCOMES

Outcome 1: Program participants/community agree on the scope of their participation

Outcome 2: Program participants have access to technical assistance

Outcome 3: Clear feedback system is set up and agreed upon with community

B.9 PROCUREMENT – TENDER SELECTION AND PURCHASE ORDER

There is a formal purchasing process for CRS to purchase construction materials directly for in-kind material distribution or CRS direct implementation of construction projects.

On the other hand, if program participants will be purchasing construction materials with CRS funds themselves on the local markets, a formal tender process is not required. However, it is essential that a market survey for construction materials has been conducted during the feasibility stage.

Refer to assessments point A.3

In general, it is the task of the tender process to establish material cost and delivery time clarity for this construction project. Consequently, it is important that the tender documents are as clear and detailed as possible and that the bidder understands the tender documents to be able to give realistic prices.

CRS note:

Please refer to agency CRS procurement policy and procedures and EFOM and Baltimore Purchasing Manuals

SUMMARY OF TASKS

Task 1: Compile a tender package for materials/ supplies

Task 2: Set up consistent tender templates

Task 3: Conduct a tendering selection process for procuring materials/supplies

TASK 1: COMPILE A TENDER PACKAGE FOR MATERIALS/SUPPLIES

The tender package should be consistently applied to all potential bidders and include:

- The BoQ with the UCA without the prices for bidders to complete for submission
- A clear description and specifications of the materials/equipment, their quality and quantity (part of BoQ)
- Clearly state delivery location, process, responsibilities and dates
- **Payment terms**
- **Tender condition/procedure and schedule –** outlining the specific conditions/procedures to follow for bid submission, submission dates, selection date
- Any performance bond or bank guarantee (if required)

TASK 2: SET UP CONSISTENT TENDER TEMPLATES

It is advisable to use standard CRS construction material supply tender templates and to keep them as simple as possible in bi-lingual format.

Tender form template material supply in Appendix 5

Tender supplier profile cover letter in Appendix 6

Tender cover letter in Appendix 7

In some instances, it may be necessary to seek advice from local host country legal advisor in regard to laws, tax, customs and other regulations.

TASK 3: CONDUCT A TENDERING SELECTION PROCESS FOR PROCURING MATERIALS/SUPPLIES

It is helpful to conduct an initial "pre-qualification process" that shortlists potential suppliers that have the capacity (financial/managerial, quality) to participate in the formal tendering process. This may have been done already during the market survey.

Refer to assessments point B.3

These background checks assist in mitigating time loss or supply problems during later stages in the project by filtering out suppliers who are not suitable or reliable.

Vendor Survey and Pre-Qualification checklist in Appendix 8

Example: Haiti, 2010

It is important to consider the specific post-disaster context. The local markets, the capacity of suppliers, their workforce, supply chain and transportation may be disrupted or even destroyed. It may be necessary to import a large amount of the construction materials from abroad. The time and extra cost implications need to be taken into consideration during the planning stages.

Imported plywood from USA
Photo Credit: Jean- Daniel Lafontant for CRS

A. Tender announcement:

It is a good practice to use local media resources (i.e., radio, TV, newspapers) to notify local suppliers of the planned construction work and where/when to participate in the tendering, or if feasible, to conduct an open information meeting for potential suppliers to promote openness and transparency

B. Tender submission:

The pre-qualified suppliers need to be informed of the tendering schedule and submission requirements (the completed tender package), including clarification period, submission date, evaluation period and tender announcement date to promote openness and emphasize that fair competition will be guaranteed between bidders.

Tendering schedule:

- 5-7 days to bidders to answer tender package
- 5-7 days to procurement/engineering staff to evaluate received bids and obtain required clarifications
- 5-7 days for final contract negotiation with the selected supplier
- 7 days to finalize contract and all necessary reviews and authorization

C. Tender evaluation/selection:

A Bid Selection Committee shall be formed within the Country Program to participate in the bid selection.

The **submitted tender returns** need to be analyzed and tabled (comparison worksheet) in regard to:

- completeness of information
- compliant with the tender package, as tabled in task 1 by engineering staff price

In general, the **best price/quality/reliability ratio should dictate selection.** Unless actual costs have already been determined by the UCA and market survey, then performance rather than price becomes a more relevant selection criteria.

The technical staff should review the returned BoQ with the procurement team during the tender return evaluation. This will assure that the right materials are purchased. The technical team typically knows if the prices that are being quoted are commensurate with market rates/in the correct price range for the quality of materials being requested.

Bid comparison worksheet template in Appendix 9

It is highly advisable to select multiple vendors and not to sole source your procurement purchases. One practice is to sign smaller contracts with multiple vendors, evaluate performance and then increase contracts with vendors that deliver high-quality materials on time at a reasonable price.

It is not uncommon to find the returned tender prices higher than the estimated material price established during the market survey and design phase. This can cause a substantial overall cost increase, especially in cases of a large number of repetitive designs. In this case, consider alternative material or material specifications (i.e., different grade of plywood, timber), individually sourcing (or excluding) nonstructural elements or building with salvaged materials.

D. Sole sourcing – In cases where the availability of good performing suppliers is limited or security is a concern, and CRS has identified and tested suppliers/contractors of higher performance, selection outside a formal bidding process may be appropriate. Documenting the justification for sole sourcing must be completed for audit purposes.

Contact shelter advisor for advice and templates.

CRS internal note:

POLICY STATEMENT CRS, Baltimore Purchasing Manual states:

CRS' headquarters, regional offices, and country program offices Purchasing departments or designated personnel will purchase all goods and services on the best terms consistent with the required quality and delivery, and at the lowest total cost. Acquisition will be without favoritism and on a competitive basis, whenever practical, to obtain maximum value for each dollar spent. All interested suppliers shall receive fair and impartial consideration.

The bid selection committee is formed from designated CRS Staff (i.e., Administrative, Finance managers, and senior managers). As per CRS purchasing policy, the engineering and procurement staff are to be excluded from the bid selection committee, but can provided a technical support role as required.

E. Placing orders/contract

Depending on the size and scope of required material/equipment or services, either a standard purchase order or service contract may be required. In general, singular purchases require only a purchase order as the administrative tool. However, if a more complex service or supply of materials is required, a service contract would be needed. This may include materials delivery in compliance with a specific schedule, multiple delivery sites, equipment rentals, etc.

Contact shelter advisor for service contract template and assistance

Purchase order should include:

- Tender information (BoQ with UCA, material specification), refer B.6
- Payment schedule (outlining when progress payments should be made after delivery)
- Suppliers prices, as submitted in the tender (including expiration date)
- Project/delivery schedules
- Advanced payment (to be avoided if possible, otherwise kept to minimum)
- Retention withheld (if required, such as tax requirements, material warranty)
- Performance Bond/Bank Guarantee Requirements[6] (if required)

Past experiences have shown that it is advisable to avoid advance payments to supplier if possible.

Example: Kyrgyzstan, 2010

Past experience has shown that the receiving department is not always familiar with the quality standards of construction materials. This is why the technical team needs to develop a specifications checklist for the receiving department or be present when material is delivered.

Construction vendors may well try to sell CRS their inferior products because we are not a traditional construction company/contractor. It is important for the receiving department to REJECT inferior quality products. In Kyrgyzstan, a material quality checklist was developed to assist the receiving staff for material delivery with assessing that the materials are to the specified quality.

Contact shelter advisor for complete material quality checklist

Extract of material quality checklist developed for winterized T- shelter response

SUMMARY OF OUTCOMES

Outcome 1: Quality supplier selected and purchase order awarded

Outcome 2: Cost and delivery time clarified

6 Performance Bond/Bank Guarantee Requirements: Performance Bonds and Bank Guarantees are issued by a bank or other financial institution and held in escrow pending confirmation from the client that contract terms have been met.

B.10 WORK STAGE: CONSTRUCTION SUPERVISION

Includes:

Sub-stage: Construction supervision — refer to B.11

Sub-stage: Project controls: time/cost and quality — refer to B.12

Sub-stage: Completion and hand over — refer to B.13

B.11 SITE SUPERVISION

In an owner-driven construction project, the owner or community is responsible for carrying out the works.

CRS is directly responsible for supervising the safety and quality of construction, as well as training and managing the required labor, in the form of program participants' own construction and skilled/unskilled laborers.

Advice: Keep it simple!

SUMMARY OF TASKS

Task 1: Set up regular meetings

Task 2: Set up feedback system – Accountability

Task 3: Set up site safety measures

Task 4: Facilitate changes and improvements

Task 5: Equipment and materials management/ warehousing

TASK 1: SET UP REGULAR MEETINGS

It is advisable to continue regular community meetings from the planning stage throughout construction to encourage transparency, develop good working relationships and provide a forum to address issues that may arise during construction. Specific discussion topics that may come up:

- Agreement on the specific responsibilities of all parties; refer B.3
- Ambiguity regarding roles and expectations; introduction of feedback system (hotline, help desk, etc.); refer to task 2 below
- Initial construction training and other technical advice; refer to B.4 for pilot construction and task 3 point B.8
- Agreement on site safety measures; refer to task 3 below
- Explanation of the intended project schedule; refer to B.12
- Explanation the site inspection process and progress reporting; refer to B.11

TASK 2: SET UP FEEDBACK SYSTEM – BEING ACCOUNTABLE TO PROGRAM PARTICIPANTS

It is good practice to set up a feedback mechanism to ensure that the right people are targeted (display program participant list at the start of the project) and that grievances or concerns can be address in a timely fashion. This could include:

- Setting up telephone hotlines or a help desk
- Posters, leaflets and notice boards

In some cultures it would be most appropriate to have feedback for men/women separately (i.e., individual conversations with women).

Refer to B.4 for pilot construction

Example: Haiti, 2012

Notice boards displaying the complaints and feedback process erected in all communities, Port-au-Prince, Haiti, 2010
Photo Credit: CRS

Example: West Sumatra, 2009

24-hour hotline service for feedback mechanism posted within the community, Padang, west Sumatra
Photo Credit: CRS

TASK 3: SET UP SITE SAFETY MEASURES

It is essential that safety measures protect laborers, building program participants and surrounding communities from harm during construction. Construction works are inherently dangerous activities and can lead to injury or loss of life if not taken seriously. Consequently, safety procedures need to be developed and monitored with the community.

Safety measures include:

- Develop site safety training and awareness campaigns for workforce and communities
- Consider barriers to enclose the construction site
- Consider climate and weather conditions or specific hazards related to the post-disaster situation (i.e., further landslides, aftershocks, etc.)
- Protection from falling; using barriers when excavating or working at higher levels
- Protective clothing for workforce: Shoes, helmets, vests, harness
- Safe storage of materials
- On-site safety – Do they have the proper tools to do the work?

CRS internal note:

Catholic Relief Services are fulfilling their legal and moral obligation to maximize awareness of safety in the workplace and to minimize the potential for accidents on their projects.

Example: Japan, 2012

Construction site safety in Japan for construction of a training center in Nasushiobara, 2012
Photo Credit: Seki hirano for CRS

TASK 4: FACILITATE CHANGES AND IMPROVEMENTS

Changes, alterations and improvements are part of almost all construction projects. Especially in post-disaster (re)-construction, it is essential to be able to respond to unforeseen events, market price fluctuations and challenges that may arise. These changes may be initiated by either the community or staff and should be discussed and mutually agreed upon before making any changes to materials, design or procedures, as changes may have an impact on cost and safety.

Any corrective action or design change identified by the field engineer should be reported clearly on the **construction monitoring form.** It is also possible to use **change order forms,** if an adequate amount of monitoring staff is available. After the changes/corrections have been made, they should be re-inspected and approved by the field engineer/community representative prior to proceeding with additional construction activities. This guards against unsafe construction being "covered up" and hidden from view.

Refer to point B.12 for details on quality control

Construction monitoring form in Appendix 10

Refer to B.12 for change order form explanation, in Appendix 11

TASK 5: EQUIPMENT AND MATERIALS MANAGEMENT/WAREHOUSING

In the case of CRS directly building or in-kind material distribution, it is necessary set up warehousing and stock management procedures to distribute materials and avoid delays that may occur in the supply chain. To do this, set up a warehouse management system with full-time, dedicated warehouse management staff.

The following steps will be required to provide adequate controls of and accountability for construction materials:

- Warehousing: Ideally the location of the materials and equipment warehouse should be within close proximity of the construction site, be easily accessible and have adequate security to reduce the threat of theft.
- Stock management system: Establish a warehouse management system that monitors equipment/material receipt/ inspection, storage, inventory and dispatch. This would include forms and documents (i.e., stock cards, good received notices [GRN], inventory database, etc.).
- Transport and logistics: Establish logistics documentation to track delivery and dispatch with CRS-owned or contracted transport (i.e., waybills).
- Financial accounting: Goods purchased for constructions should be in compliance with CRS financial accounting practices. This implies adequate financial tracking of pre-positioned purchased materials.
- Contracts administration: Establish procedures and contract templates for transport and logistics requirements.
- Safety/security: Establish safety/security protocols to reduce risk of fire, bodily injury and theft.

Contact emergency team for advice on setting up warehousing and logistics

Example: West Bengal in India, 2008

If social mobilization is strong and community organizations are functional, warehouse/storage could be done in the village itself. This minimizes cost of transport and chances of damage during transportation as well as encourages ownership of the project by the community.

This experience was made in the state of West Bengal as part of the flood-resistant shelter response. At the very beginning of the project, Village Development Committees (VDC) were promoted to ensure community participation in all key decisions, but mainly the program participant selection process. These committees were also entrusted the responsibility of safekeeping the shelter materials, especially the RCC pillars and bamboo. The decision to store materials locally was made firstly because the VDC were very active and engaged, and secondly because the affected areas were not accessible by road during the rainy season. By doing so, the community/VDC became accountable and took ownership of the project.

The vendors were asked to deliver to village points where program participants collected their materials. Any damage during transport to the village points was the responsibility of the vendor. Consequently, there were no costs incurred for local transport.

Reflections:
The CRS/partner should identify scope of storage/ warehousing during planning stages. This is particularly important where all-weather roads are not available.

Example: Kyrgyzsta, 2010

In Kyrgyzstan, in response to ethnic violence and flooding, transitional winterized shelter were constructed. A dissimilar warehousing approach was taken by CRS. The construction materials for the winterized t-shelter were procured and warehoused by CRS. Security guards were hired to monitor the site and warehouse during the day and especially during the night.

Reflections:
In some circumstances, it can be beneficial to have two security companies to do this to reduce risk of collusion and theft.

Winterized t-shelter with insulation layer under construction
Photo Credit: Andrew Schaefer for CRS

SUMMARY OF OUTCOMES

Outcome 1: Good communication and feedback systems set up

Outcome 2: Site safety measures agreed upon and followed

Outcome 3: Procedures to control construction changes set up

Outcome 4: Material management/warehousing staffed and set up

B.12 PROJECT CONTROLS – TIME, COST AND QUALITY

Project Controls are the monitoring and evaluation (M&E) processes, tools and protocols that facilitate the supervision of construction activities in respect to their safety, quality, cost and progress.

Specific attention should be given to **quality control.** In general, CRS will need to manage the workforce, which will be either skilled laborers or the program participants themselves, most of whom are not construction specialists. Community and program participants should participate in the inspection process as well as daily and weekly reporting to encourage ownership and responsibility for the project.

The tools and procedures listed below have been developed to assist in:

A. Constantly monitoring the safe and quality construction.

B. Tracking construction progress and cost expenditures, as progress may vary and expenditure is linked to progress made.

C. Monitoring material inventories and costs (if not procured by program participants themselves).

D. Pro-actively identifying problems and making improvements in projects design and budget expenditures.

These schedules need to be set up to be **project specific** using the information documented in the technical design phase as base information, refer to B.6:

- Technical assessment, field investigations, site planning and requirements
- Scopes of work, technical design drawings, material specifications, BoQ
- Market survey for labor and material availability and cost

SUMMARY OF TASKS

Task 1: Set up a project schedule (progress tracking)

Task 2: Set up project cost control (budget tracking)

Task 3: Set up quality control (assures construction quality)

Task 4: Set up document control (records management)

TASK 1: SET UP A PROJECT SCHEDULE – A TIMELINE

It lists the work activities and enables project managers to monitor construction progress against time. The Monitoring Plan is particularly important to the project schedule as it sets out the most important phases of construction and key inspection points.

Regular reporting from the site inspection teams is used to update the schedule. The project schedule is a working document. It is best updated on **a weekly base** with actual field measurements and observations of the construction works completed. This procedure is important to allow the project managers to foresee problems, such as cost increases, substandard construction, disagreements, etc., and be in a position to take action.

Note: The project schedule has to be project and emergency specific. It has to factor in many overlapping issues and also uncertainties, such as actual performance capabilities after disaster, availability of craftsmen, training of community, site conditions (debris, contamination, landmines) and climate, hazards, access, security situation and program participants' capacity to participate.

Project tracking and reporting
Weekly site inspections are recorded on the project schedule; cost is normally reported monthly by showing the current (Job to Date) cost of completed work and a current estimate of final cost at project completion (Estimate at Complete). A tracking curve diagram can be used to graphically represent the status of the project's actual progress/expenditure against planned progress/expenditure.

Project schedule/project tracking templates:
Templates can be developed using scheduling software such as MS Project, Primavera or MS Excel that organize information in a Gantt chart format.

Digital project schedule templates available on share point

Example: Orissa in India, 2008

As experiences during the low-cost flood-resistant shelter project in rural villages in Orissa have shown, in a case where construction works are stopped (due to various reasons), the workers tend to leave to outside places in search of work. The non-availability of workforce and high drop-out rate could become a challenge and cause delays in the progress of construction.

Reflection:

In absence of any formal binding or contract, these trained workers leave the construction site for personal or other reasons, affecting the project progress. Further, the project loses trained/skilled workers and must invest time and resources to train another group, which also hinders progress.

It is advisable to agree on a fixed-term contract/ formal contract from the beginning between partner/CRS and the workforce.

Example: unit cost analysis

Unit Price Analysis
Project title: **Date:**

title of construction activity

No	Description	Unit	qty	Unit Price	TOTAL			
					MATERIALS	LABOR	EQPT.	TOTALS
A	**Material**							
B	**Labour**							
	Skilled labour	day						
	Helper	day						
C	**Equipment**							
	Misc. Tools	lot						
	Sub -Total							
	Profit & OH 15 %							
	TOTALS							

Unit cost analysis example template itemizes materials, labor and equipment requirements

TASK 2: SET UP PROJECT COST CONTROL

Track the progress of the project by keeping an updated weekly project cost. Add a tracking line into the Bill of Quantities as materials are used. Use regular weekly reporting from the site inspection teams to assure the BoQ remains up-to-date.

The **Bill of Quantities (BoQ)/Unit Cost Analysis (UCA)** developed in the technical design stage are the documents needed to track budget expenditures over the life of the whole project.

Tip: Dividing the cost of completed work to date by the overall contract cost is an accurate and industry standard method of tracking and reporting overall project progress. Trends in actual cost expenditure versus planned expenditure can be analyzed to estimate budget over/under expenditures.

BOQ/UCA template in Appendix 4

CRS internal note:

Budget requests to allocate funds for the purchase of materials or to finance construction should comply with the standard CRS purchasing policy and procedures as well as any specific donor requirements. The construction project manager should track budget expenditures in close collaboration with the CRS country program finance department.

TASK 3: SET UP QUALITY CONTROL

Quality control is an inclusive process that involves the program participants, the technical staff and the social staff equally. The pilot construction, technical assistance brochure/ training, feedback system, regular community meetings and change procedures are all part of ensuring safe and quality construction.

In addition, the following inspection procedures are available, which need to be adapted to suit the specific emergency context (i.e., available timeframe).

A. Establish **key inspection points.** These mark the completion of key work stages where the field engineer assesses the safety and quality of construction before it can continue. Generally, these key inspection points are:

- Foundation/floor slap
- Foundation/wall structure junction
- Wall/roof structure junction
- Completion of roof

Cash advance for subsequent work should only be released if work has been completed to adequate standards.

B. Daily inspection by site foremen
In this model, one foreman will supervise a couple cluster of homes (depending on the geographic proximity). The site foreman will oversee site safety, keep the construction moving forward, report back any problems or observations to the field engineer, answer technical questions and make sure materials are present.

C. During **weekly inspections** by field engineer/architect, the social team records progress and defects on **quality construction monitoring form.** Ideally, the field engineer should take photos with the date and put them into the monitoring form.

Construction monitoring form in Appendix 10

Program participant identification card/ inspection points in Appendix 3

Adequate technical staff and social team staff is required to monitor and inspect effectively.

Example: Dafur, 2011

Sub-standard quality construction in a school made from stabilized earth blocks in Dafur, 2011
Photo Credit: CRS

TASK 4: SET UP DOCUMENT RECORDING PROCEDURE

This includes recording matrix and filing system. All documents relevant to the project should be recorded to reduce risk and confusion, especially in multiple sites and various revisions. This facilitates the retrieval and consolidation of information from regular progress reports for reporting to project management and donors.

Documents that should be included:

- Design plans and specifications
- Site inspections, surveys, soil and water testing results
- Land titles or other land ownership/ occupancy rights documents
- Building permits and certifications, other government approvals
- MOUs/agreements and contracts, including contract variations or amendments
- Progress report, quality control inspection reports
- Budget expenditure/liquidation tracking documents, progress billing/payments to contractors, invoices
- Relevant incoming and outgoing correspondence

Filing system includes:

- Labeling and indexing
- Filing by date of hardcopies
- Filing of all relevant soft copies of documents listed above
- Filing of superseded/revised documents

SUMMARY OF OUTCOMES

Outcome 1: Project schedule set up

Outcome 2: Progress/cost reporting/tracking procedures set up and agreed upon

Outcome 3: Quality control set up and agreed upon with program participants

Outcome 4: Filing system set up

B.13 COMPLETION AND HAND OVER

This includes completing the construction works and facilitating the safe occupation of the structure by the program participants.

SUMMARY OF TASKS

Task 1: Conduct final inspection

Task 2: Re-verify the original target program participant group

Task 3: Hand over certificates

TASK 1: CONDUCT FINAL INSPECTION

Once the construction works have been completed a final inspection of the structure is necessary to make sure that it is built according to the intended design and quality specified, and to verify that it is safe for the program participants to occupy. Ideally, any construction defects/mistakes should have been found during a previous inspection, and it is important to verify that all previous mistakes have been fixed.

If required a "mistake list" can be made to record all the outstanding mistakes that require attention.

The final inspection should be documented in a final inspection report (including the "mistake list" and accepted by the program participants).

TASK 2: RE-VERIFY THE ORIGINAL TARGET PROGRAM PARTICIPANT GROUP

It is not uncommon for program participant conditions to have changed during the construction period (i.e., moving away, change of family circumstances, etc.). Consequently, it is important to re-verify that the original target program participants are the occupants of the completed shelter. Ideally, the regular community meetings and close supervision procedures should have noted these changes and facilitated proper re-allocation of the shelter.

TASK 3: HAND OVER CERTIFICATES

Once shelters are complete, it is necessary to officially hand over shelters to program participants, inform local officials and report this accomplishment to cluster leaders. A simple form can be used, indicating that these materials (in the case where they don't have land ownership) belong to the program participants. Ensure clauses such as "All future repairs are the responsibility of the owners" are included in hand over certificates.

Attention and advocacy should be given to shared ownership between husband and wife and sole female ownership.

Example: Philippines, 2012

Program participants standing in front of their completed transitional shelter in Cagayan de Oro, Philippines, 2012
Photo Credit: Seki Hirano for CRS

SUMMARY OF OUTCOMES

Outcome 1: Final inspection completed and accepted

Outcome 2: Ownership certificate handed over

B.14 AFTER COMPLETION

The time after completion is often overlooked in a construction project, as the actual construction activities have been completed and the end-users are occupying the structure. Especially in areas that are prone to reoccurring hazard events, such as flooding, earthquake, fire, high winds, etc., it is important that the inhabitants know how to take care of their structure to remain safe.

SUMMARY OF TASKS

Task 1: Introduce maintenance activities

Task 2: Introduce disaster risk reduction procedures

Task 3: Evaluation and program participant satisfaction

TASK 1: INTRODUCE MAINTENANCE ACTIVITIES

Different construction materials require different ways to maintain them in a good condition. These should be explained to the end-user through meetings, maintenance leaflets, etc. Good maintenance has a significant impact on the safety and longevity of a structure. Maintenance procedures could include:

- Seasonal maintenance before rainy seasons, typhoon seasons, etc., such as checking for roof leaks, that drainage channels are not blocked, roof trusses are secured, roof sheeting has no missing nails, etc.
- General maintenance such as checking for termite infestation, root, corrosion

TASK 2: INTRODUCE DISASTER RISK REDUCTION PROCEDURES

Simultaneously with maintenance procedure, disaster risk reduction (DRR) must be addressed. This could include:

- Fire safety, especially for highly flammable materials such as bamboo, wood, etc.
- Evacuation meeting points, routes and procedures to be agreed upon
- Community-based risk mapping
- Setting up community evacuation drills

Refer to B.6 Technical design

Refer to hazard resistant construction, PASSA (Participatory Approach for Safe Shelter Awareness), www.sheltercentre.org/library

Giving consideration to DRR is critical during the site selection, site planning and technical design of the construction.

TASK 3: EVALUATION AND PROGRAM PARTICIPANT SATISFACTION

To be in a position to learn from past experiences and challenges, an evaluation is an important part of the overall project. In areas with extreme weather conditions, a midterm evaluation is good practice. An essential part of the evaluation is to include the program participants in the process through interviews, questionnaires or other feedback systems to evaluate the performance of the construction project.

SUMMARY OF OUTCOMES

Outcome 1: Maintenance procedures agreed upon and established

Outcome 2: Disaster risk reduction training set up

Outcome 3: Evaluation conducted

B.15 IDENTIFY APPROPRIATE STAFF

An important lesson-learned from CRS construction activities is that project success depends on the qualifications, skills and experience of the technical and management resources engaged to manage the project. Careful but expeditious vetting of potential candidates is critical in creating highly performing teams.

Within the engineering and construction industry, a four/six year engineering degree normally represents the foundation on which individuals will build different levels of experience and skills[7], especially in post-disaster situations. Beyond that, the years of experience and breadth of exposure to different construction designs of varying complexity develops the needed qualifications to manage different types of construction projects.

Senior staff will be required to have a balance of the technical skills and social skills to lead a program, and the ability to think creatively about resolving conflict and technical issues without losing sight of the overall project goals: rebuilding livelihoods and reducing vulnerability.

B.15.1 DETERMINING THE ORGANIZATIONAL STRUCTURE

Staff recruitment should follow Country Program protocols; however, there are a number of internal and external risks that CRS teams should consider when staffing up a construction program. Staffing plans and management structure should seek to mitigate these risks.

> Owner-driven and contractor-built projects will require different organizational structures.
>
> The diagram under B.15.2 gives a generic sample for owner-driven construction, which can be adapted according to the project scale, complexity and context.

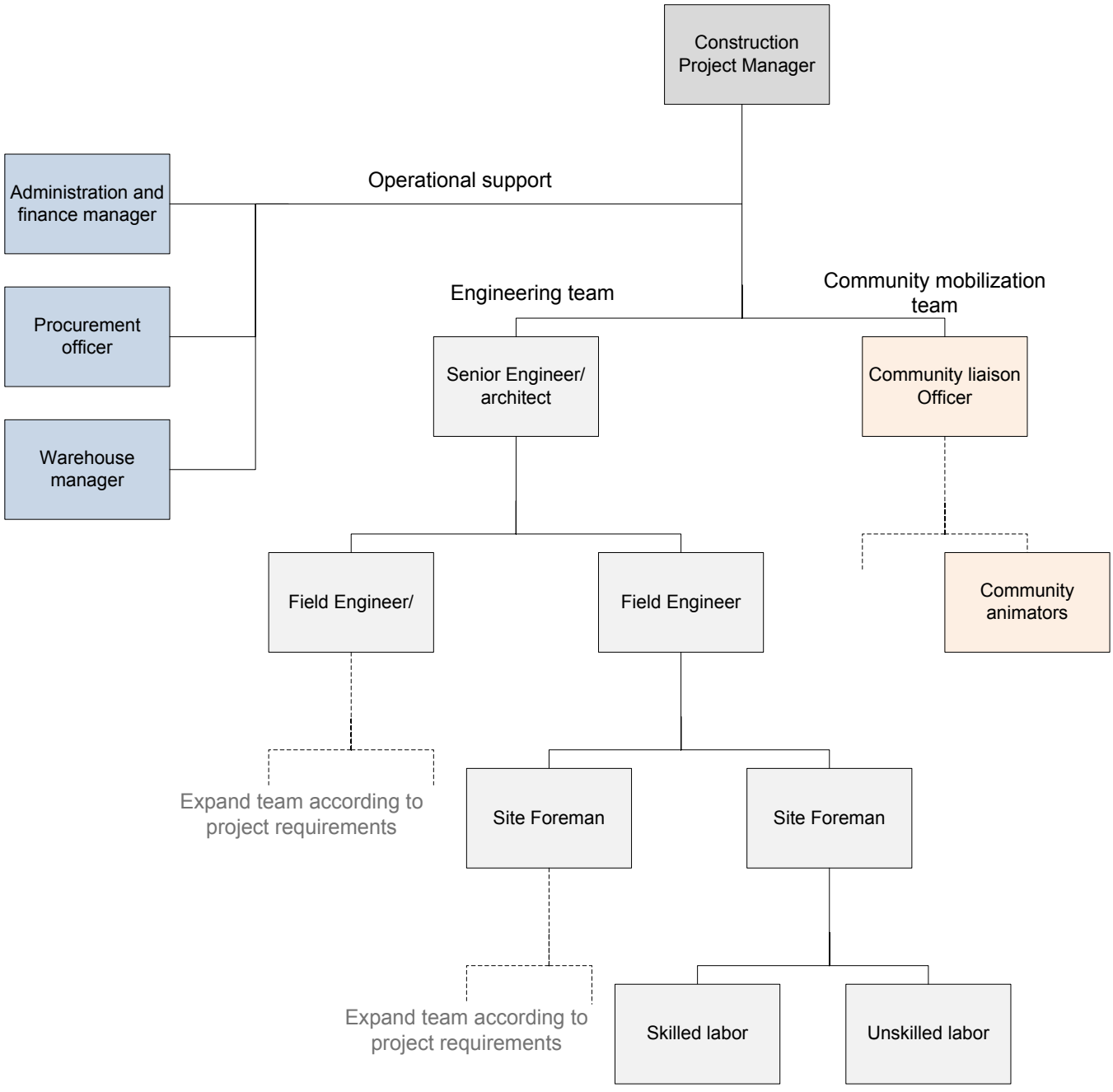
For sample job descriptions, refer to digital versions available on share point.

B.15.2 ORGANIZATIONAL STRUCTURE FOR OWNER DRIVEN PROJECT

The structure below offers an example for owner-driven projects where CRS is responsible for ensuring the project is carried out by the program participants themselves. There are three main functions to this structure, which is lead by the **construction project manager.** There is an **engineering team** (light grey color), **community mobilization team** (light pink color) and **operational support team** (dark grey color). all fulfill important roles in the project.

7 Engineers and architects generally specialize in design, construction management or contract management. Engineers often focus on one or more disciplines such as structural engineering, water and wastewater, geotechnical engineering, architectural design, among others.

DIAGRAM OF ORGANIZATIONAL STRUCTURE FOR OWNER DRIVEN PROJECT



RESPONSIBILITIES

Construction project manager
The project manager is responsible for the overall effective implementation of the construction project. This includes: budget control and program control (cost and time), purchase requests (materials, equipment, etc.), overall quality control (site audits), change control (changes to the design/ agreements while constructing), effective staff communications (technical, community mobilization and support staff), health and safety issues and document control.

Engineering staff:

Senior engineer
The senior engineer is responsible for supervising the field engineers, managing the engineering team and developing the design, specifications, Bill of Quantities (BoQ) and Monitoring Plan, and works with procurement team to source materials, equipment, etc. The senior engineer is responsible for the appropriate design decisions that have developed through the design process with the program participants/community mobilization team/ procurement team and senior management. The senior engineer oversees development of construction manuals/accountability processes and encourages good working relationship between technical and community mobilization staff.

The scope of work of this position will depend on the amount and complexity of engineering/ design required (i.e., this could be an architect or engineer with experience in (re)-construction in post-disaster, best with an owner-driven construction project).

Field engineer
Closely monitors day-to-day construction activities; reports deviations from design and/ or work plan; identifies corrective action; gives both verbal and written instructions to the site foreman; provides daily/weekly progress reporting; monitors quality and progress of construction. The field engineer gives construction training and safety instruction. This position is the day-to-day liaison with the site foreman, program participants and laborers.

Site foreman
This position works closely with the field engineer, organizing skilled and unskilled labor, and needs to be on site with the workforce. Site foreman is responsible for reporting on site activities and keeping records (photos/ drawings/reports).

Program support staff

If CRS is managing the construction activity directly, contract management, material and equipment supplies, logistics and warehousing are the responsibility of the CRS program support department. Adequate staffing and administrative systems are required to ensure accountability and control over material and equipment assets. Program support staff needs to communicate frequently and closely with the technical and community mobilization teams.

Procurement officer
The procurement officer is responsible for preparation of tender actions (tender packages for materials, suppliers, tender evaluations, etc.), purchase orders, and monitoring material and equipment cost, delivery and quality.

Administration and finance manager
The administration and finance manager is responsible for preparing contracts, bid selections, labor payments, contract and payment tracking.

Warehouse manager
The warehouse manager is responsible warehousing/logistics of materials and equipment that support construction activities.

Community liaison staff

Community liaison officer

The community liaison officer is responsible for managing relations with recipient communities, ensuring accurate and timely information sharing, and ensuring community expectations are aligned with project objectives. This position oversees complaints and feedback processes, helps resolve conflict with the communities and works closely with the technical team.

Community animators

Community animators are responsible for maintaining communications with the community and ensuring information is channeled to the correct place. They are important contact points for feedback from the program participants and ensure that people are targeted with the appropriate intervention. These staff can assist in identifying vulnerable pockets of the community and help tailor specific aspects of the program for those with spectial needs (elderly, disabled, women, single headed HHs, PLWHA, etc.).