
# Part 0. Introduction

Funding from the Belgian Red Cross Flanders following the earthquake of 2005 in north-east Pakistan has become part of the budget of a Health program of the German Red Cross in the affected Districts of Shangla and Kohistan, in NWF Province. This funding will particularly be used for the construction aspect of the program and targets a rehabilitation of 6 existing Basic Health Units. In the context of this funding, I was asked by the Belgian Red Cross Flanders to go on a short term mission to support the GRC/ PRCS team in the field in the planning and implementation of this rehabilitation.

During this mission of three weeks (4th to 25th of November), I have worked together most of all with the current construction team of GRC/ PRCS; senior diploma engineer Inayat Zeb and junior diploma engineer Irfan, out of the base of this team, Besham. Initially I concentrated on getting an understanding of the situation, by studying documents, visiting sites and talking to 'privileged witnesses'. In a second step, we formulated preliminary advices, which we discussed with other 'third parties' involved in similar experiences. In a last step I worked on tools and concrete recommendations for the further planning and implementation of the project, and getting all relevant actors involved around these. (day to day activities in annex 1)

Support on different levels could be offered. Although the current construction team is performing well under the circumstances, the way it is operating now can not be sustained for the challenges ahead. The total number of existing buildings is 36, spread over 6 sites, all in a different condition, none up to the standard. The budget for construction is limited and so is time, certainly considering that the focus of the program is on providing basic health services. A construction delegate for the rehabilitation of the BHU was not available full-time and this might continue in future.

In first instance, I noticed an urgent need to make final decisions regarding the actual construction that should/ could take place. To make this decision, a cost and time estimate was needed, as also a HR needs estimate. Secondly, the set-up of the office needed to be revised; in terms of roles and responsibilities, tools for planning and for monitoring. Thirdly, clarification needed to be given on the presumed result of the construction interventions.

This report is split in construction priorities and tools for construction management. The construction priorities are based on a limited damage assessment and take into account limitations in budget and time. The part on construction management offers tools for planning and monitoring of the project. They use the information that was available to date, and except for the way of working that speaks through it -and the tools itself-, have only a very contemporary relevance. Updating and continuing this work throughout the whole project is crucial.

# Part 1. Construction priorities

Coding used for each BHU:
BHU: Basic Health Unit, meaning the entire site
MB: main building, where the actual basic health services are provided
MOH: Medical Officer's House
Secondary residences: the other staff houses

The following recommendations are based on a series of field visits to the sites, review of previous studies and conversations with 'privileged witnesses' that have been or are involved in similar projects. They take into account that the GRC program is a health program, with construction as a secondary, supporting activity, which is reflected in the budget and time-planning of the program. A difficult exercise in balancing therefore is required, between needs and possibilities, immediate and future, minimal technical standards and program limitations. The conclusions of the field visits can be found in Annex 2. Assessment of existing BHU's.

The case of BHU Chichloo is pretty clear-cut. The quality of the buildings is that low and the damage incurred by the earthquake that extensive that rehabilitation is not advised. The BHU will need to be reconstructed from scratch.

Also the quality of construction of BHU Razika is quite substandard. In its location, a wooden structure would have been a more suitable choice. It is therefore advised not to invest more in the current constitution of the buildings but transform them, in one go or in phases, into technologically more suitable structures.

For BHU Damorai, the stability of the site needs to be improved. The soil consists of loose earth and boulders, huge and small, in steep slope, and the site is on two sides vulnerable to river erosion.

The cases of BHU's Doga, Seo, Damorai and Olander are a bit more complicated. The original construction techniques could have been better and the structural techniques are not up to the standard of current earthquake resistance. The damage done to the buildings by the earthquake of 2005 however is limited and can be repaired. For most buildings, retro-fitting would be too much effort and cost in comparison to the final expected quality of the buildings. Upon further investigation, this might be the same for repair works to some of the buildings.

For all sites, water and waste management are urgent issues, just as new electrification.

For BHU's Seo and Olander, new toilet blocks and a training room are proposed. The plans currently on the table are in large suitable, but need further detailing.

## BHU Chichloo, District Shangla

For the temporary mobile services, with some efficiency in use of space, the MOH and the MB could be used, but this has to remain limited in time as much as possible.

Best practice in earthquake resistance and in general should be the standard for new buildings:
- stiff boxes: bracing, tie, foundations, small central openings, regular volumes and structure
- trees at a distance, stable slopes/ retaining walls, water and waste management
- practical, clean, light, durable, comfortable buildings and site layout
- qualitative workmanship and construction techniques

This best practice is well known and does not require sophisticated engineering.

Drawings made with support of Designmen Consultants for a new BHU are available at GRC, but, upon study, some remarks are due. The proposed new main building is a composed volume of two rectangles and a curved entrance hall. Simple single volume rectangular designs prove to be more

resistant without requiring complex engineering. This design will cost more and there was no functional necessity to be found that requires this more complex design. It will be more difficult to ensure qualitative masonry work for the curved portion. Under these programmatic circumstances, it is strongly advised to look for more appropriate designs for the new BHU Chichloo.

Since various actors have been active in rehabilitation of BHU's in the last years, plenty previous experiences can be drawn from:

- GRC/ PRCS Engineer Inayat has a design (from the government) of a MB and a 2 room residence that follow best earthquake resistance construction practices, if the placing of the columns is rendered more regular. In the MB, the verandah could be cancelled and the central walk-through closed for a more functional use of space. The 2 room residence respects the guideline of a singular volume, but also here, the regularity of the columns can be improved. No drawing for MOH or 3 room residence are available.

- Also JICA has developed some designs for new BHU MB's which could be used and of which certainly the construction concepts are worth following. The JICA system is following a strict raster that avoids eccentricity to minimize torsional response during EQ.

It should be possible to find more designs, which are already finished, or form a good base to start from. The design work to be done is in any case very simple; an application of well known, almost standard construction practices.

Electrical fitting needs to be planned from scratch.

Water supply seems to be possible from a higher up well, which requires approx. 15.000 running feet of pipeline. To enable this, it is advised to work with the community, as they are probably most capable to make this pipeline efficiently, and, only through involvement and ownership of the community, the durability of such line can be ensured. The community could lay the pipeline, provided they get an incentive in terms of materials, extra tabs for community use or labor payments.

For black water management, three-chamber septic tanks (or similar principles in a two-chamber system) and soakage pits are advisable, separate for the BHU patient's toilets and the residence quarters. Also a grey water system should be provided, with grease traps and connection to the soakage pits.

Proper surface drainage will also be needed, together with a proper site organization.

## BHU Razika, District Kohistan

A construction in wood would have been more suitable for this site as it is costly and time consuming to bring up foreign materials to the site, whereas wood is readily available, cheaper and a suitable construction material for EQ prone areas. The area has a very interesting local practice in wooden construction and also the school was built in a wooden frame and wooden finishing.



The proposal is to transform the building into a wooden structure. As today, most of all the lower parts of the building are in a quite bad shape, it could be considered to start by transforming the structure bottom-up, by adding wooden columns on proper foundations and having braced wooden frames with stone infill beneath the window levels. For this, skilled labor under strict supervision needs to be put at work for underpinning of the existing structure, which is a quite time-consuming and complicated procedure. Preliminary drawings have been discussed with the GRC/ PRCS construction team.

Since however a wooden construction is much cheaper than masonry work, a better option would probably be to build completely new buildings in wood, which would be easier in construction, would perhaps not require stone infill but could be lighter, with wooden finishing, as the school (This BHU would in any case be only operational in summer time). Higher skilled carpenters could be hired together with local carpenters and labor.

Nespak (National Engineering Services: the body that approves earthquake recovery projects from the side of the government) needs to provide approval for a new construction in wood, to which they have advised against previously (reason seems to be fear of deforestation, but could just as well be the incorrect belief that constructions in concrete/ stone / masonry are more stable and durable). Several arguments can be used in pursuit of approval: in Kashmir, wooden BHU's seem to have been built recently; the school is built in wood; in this context, a wooden structure would be more durable; wood is the traditional construction practice and is available in the area; EQ resistance can be ensured in almost every building material, provided that the techniques are suitable; cost and time efficiency combined with difficult accessibility of the site.

To make a final decision, preliminary drawings and cost estimates should be made for the two options; a step by step transformation into a wooden structure of which perhaps only the first step is executed within the scope of this program and, secondly, a complete new wooden structure.

For the new construction, it needs to be checked with Nespak, and probably also with the Department of Health (or District Recovery Unit?), whether new wooden structures could be acceptable to them. The drawings need to be looked at by a qualified, preferably structural engineer for supplementary guarantee.

Probably this investigative work can only be finalized after more visits to the site, to gather more detailed information on available material and skills, cost and time implications of both options and a more detailed analysis of the existing structures for the first option.

## BHU Damorai retaining wall, District Shangla

The sides of the site near the river and the creek need to be stabilized. Various designs have been proposed and discussed with the geological assessment consultants Geoengineers.

What was concluded is that the MB would be surrounded by new retaining walls on two sides so that in a sense, it would be standing on a fully stable 'terrace' built into the slope. For reducing the cost of this intervention, it is best to build these retaining walls as close to the building as possible. Since the MB is not in a perfectly stable condition anymore, before building of this retaining wall, the building would have to be stabilized itself, by at least giving it new footings and repairing the tie. Still then, the construction of this retaining wall will need to take into account the stability of the MB during construction.

The retaining wall will need to be continued beyond the main building, following the slope around the corner to the side where the small creek passes along the site.

Also on a lower level of the slope, the retaining wall protecting the site from erosion needs to be repaired and perhaps shifted a bit more uphill. This lower retaining wall can be constructed in simple gabion with stones structures. This last intervention can perhaps be discussed with the government, as it is outside of the boundary walls of the BHU as it defined today.

Preliminary designs have been discussed with the GRC/ PRCS construction team. These need to be developed further, discussed once more with a qualified engineer, and the cost estimate needs to be updated accordingly.

## BHU Damorai, Seo, Olander and Doga

The buildings of these BHU's vary in condition. The general quality of construction is not what could be desired, but not clearly bad enough to decide to rebuild all. Some buildings are still worth repairing, though retro-fitting is in most cases not desirable due to high cost for the result.

Since the program is mainly focused on providing basic health services, the recommendations here present minimal acceptable interventions. The MOH's and the MB's are the most important to render the BHU's operational. Luckily, in most cases, these buildings are in the best condition. Also, the layout of these buildings is quite suitable for earthquake prone areas. It is thus expected that a detailed cost estimate of repair works will be able to compete with the cost of new constructions. The expected stability of the repaired buildings however will not be up to the standard of contemporary best practices in earthquake resistance.

The secondary residences are generally in a worse shape and the layout - often with gable instead of hipped roof, composed roofs and volumes, courtyards surrounded with boundary walls – is not suitable for earthquake prone areas. This report tackles most of all tools that can be used for future decision making concerning these secondary residences.

Also in the repair of the MOH's and MB's there is a variety from mostly beautification to rather extensive repair works:

- all buildings show cracks which need to be repaired with a mesh system (which has been discussed in detail with the GRC/ PRCS construction team). This mesh system should be over-sized (cover a greater area) where cracks were found in corners, to strengthen the minimally present (or absent) columns.
- all buildings need full or partial re-plastering and painting
- all buildings need complete new electrification, with 'earthing'
- all buildings need minor repair of carpentry of doors and windows (in BHU Doga, this repair will be more extensive)
- all buildings need repair of sanitary
- many buildings need new floors, mosaic was considered to be the most suitable option
- many buildings need a new tie at roof level; new finishing of walls with a concreted tie beam on which the roof structure is fixed properly
- many buildings need improvement of the roof structure, by bracing in horizontal, vertical and roof level planes, by adding metal plates to enforce the wood connections, by replacing members of the structure that have been affected by leaks in the roof
- many buildings need better water protection at plinth level
- many buildings need new CGI sheets on the roof

This list is not complete and varies from building to building. Probably minor additional repair works will only become clear during the repair of the buildings.

The mindset however must be clear:

- In first instance, the repairs that will be done to the buildings should be done in the best possible fashion, to say that saving on material quality or quantity will prove to be useless on the long run.
- Secondly, if this means that the cost of the repairs goes up too much, it should be considered to destroy the buildings and build new ones (see further cost estimate in Part 2).
- Thirdly, the GRC/ PRCS construction team is perfectly capable of defining the need for repairs per building, as well in the preparatory phase as while construction is ongoing.

What should be done thus, is to make a BoQ and drawing per MB and MOH of the needed repair works. If the cost of these repair works exceeds 30% of the cost of a new construction (which is roughly 3000 Rs./Sft external measurements), then it should be considered to destroy the building and build a new one, in consideration with whether and how this can be coordinated with the main scope of the program: providing basic health services.

For MOH Olander, the result of such exercise pointed out that repair works were a minimal cost and should certainly be pursued. For MB Seo, this exercise was repeated (full BoQ has been drawn up by Inayat and Irfan), with a result nearing the 30% cost of a new building. Since the BHU Seo has been identified as a priority for the health objective, repair remains a good option. The result for the other MOH's and MB's is still to be seen, but a negative outcome is for the moment only expected in MB Damorai and perhaps MB Olander.

For the secondary residences, a similar exercise can be done at a later stage, also using the results of the MOH's and the MB's. As it looks now, repair seems to be a viable option for BHU's Doga and Damorai, but not for BHU's Olander and Seo. Here the 30% rule should be respected even more strictly as the original designs of these buildings are not that suitable in EQ prone areas (also the living quality of these residences could be improved through better design).

## For all BHU's

In all BHU's, there is a need for proper water and waste management, repair of boundary walls and power supply.

In terms of **water management** the following is needed:

- Proper surface drainage:
  slopes leading away from buildings, small drainage canals and suitable discharge points, if necessary, foresee infiltration beds near outlet.
- Proper black water treatment:
  for staff toilets, three chamber septic tanks (or double chamber with similar principle/ existing tanks need to be opened to check actual condition and propose necessary repairs), manholes at outlet toilets and inlet septic tank, soakage pit for overflow. Different toilets connected to 1 septic tank. For patients, toilet (squatting pan) will have to be constructed above the first chamber of the septic tank (avoiding possible blockage of pipes).
- Consider proper grey water treatment:
  via inspection hole, through grease trap into soakage pit (same as for septic tank)
- Fresh water supply:
  should not require electricity, laying water pipes in hills could be realistic for local population (support in materials etc. can be provided to them: common water supply in return for labor?) + water tank to be built. Fresh water supply directly to examination rooms could be handy.
- Hot water supply through solar heating:
  To be studied further.
- Having toilets for patients outside of the volumes of the BHU's seems to be a good sanitary practice. It should be considered for all BHU's.

For each BHU, a 'water plan' should be drawn separately, connecting to the internal sanitation of each building. (see reference project OPD/ Dental Unit Habaraduwa, Galle, Sri Lanka in Annex 4)

In terms of **waste management**:
This needs to be studied further. A clean site is of course a basic necessity. At least a controlled burning point should be organized. The best option would be to have a full-fledged waste management unit (example can be found in same reference project Habaraduwa) and apparently this is being done in Kashmir, but this is probably outside the reach of this program.

Concerning the **boundary walls**:
Boundary walls are a substantial cost in the whole rehabilitation of BHU's. Also, in terms of EQ resistance, these are vulnerable as they are singular standing 'untied' elements. For these reasons, these boundary walls need to be planned properly; a suitable cost-efficient and safe design needs to be developed (several options have been discussed with the GRC/ PRCS construction team with a preliminary conclusion on half-high stone masonry with upper part in metal plate material or fence) and materials could be bought in bulk to further reduce the cost.

Concerning **power supply**:
This is a difficult issue that probably can not be solved completely. The use of generators has been decided upon, which is not very sustainable, but probably the best option at this moment.

## BHU Seo and Olander, toilet blocks and training halls

For BHU's Seo and Olander, the construction of new, outside **toilet blocks** for patients is proposed. The design that is available seems quite suitable, although it does not clarify the underground structure. A septic tank with a soakage pit underneath, built underneath the toilets is probably the best solution, since septic tanks are not emptied and pipes get clogged. This solution comes very close to the standard government design for the area, has been shortly discussed with the GRC/ PRCS construction team, but needs to be developed further.

Since the underground structure of the toilet blocks has not been defined in the drawings of Designmen, the indicated locations on the sites might finally be not the most suitable ones. Also this needs to be looked at again.

The drawings available for the new **training hall** are in general lines suitable. The dimensions of the hipped roof need to be adjusted, which has been discussed with the GRC/ PRCS construction team. The cost of this hall is not that high, but seen the limitations in budget, the necessity of these halls might be reconsidered, certainly considering the very minimal approach chosen for in terms of repair of existing buildings.

If some secondary residences would have to be rebuilt, this can be seen as a possibility to review the set-up of a BHU to introduce flexible use of space into the design, as now happens spontaneously. Also the training halls can be reviewed in this respect, after the more detailed study of the secondary residences is final (see further Part 2).

## General remarks

In ideal circumstances, all 36 buildings would be rebuilt or retro-fitted heavily. This proposal of construction priorities is a compromise that can be justified by the urgent need for basic health services in the area and the limitations in budget and time. Reducing these priorities even more is however not an option, and program decisions would be necessary if that need arises.

During the implementation of the construction, as large part of it is repair, these priorities might still shift for some buildings.

# Part 2. Management issues

The set-up of the construction project today is not sufficient to deal with the challenges ahead. Further planning in terms of detailing budget, timing and human resources following some of the preliminary work is still required. In the same time, already ongoing repair works need to be supported by putting better procedures and formats in place.

In this chapter an attempt is made to come to a coherent cost, time and human resources estimate for the activities of the coming nine to twelve months. This estimate is based on the information that could be gathered in a short time span. Further detailing and regular updating are necessary; these estimates should in first place be looked at as tools for planning.

Secondly, this chapter deals with the most common approaches to the construction itself and some simple monitoring mechanisms that are expected to be crucial. All these tools are well known in construction, but can be useful to point out in a project lacking a full-time construction delegate.

Cost, time, HR and approaches/ monitoring are subjects that can not be seen separate from each other. The proposal here is one way of combining these four in a workable manner, to which good alternatives can exist, as long as the total remains coherent.

## 2.1 Cost estimate

This estimate presents the best of an 'educated guess' at the end of my mission, focusing on the construction priorities as discussed in chapter 1. It is most of all important as a tool to be used in planning of the project, and needs a first update by the end of January 2009.

The following assumptions/ guidelines were used:

- A separation of issues to facilitate decision making on priorities:
    - site preparation, if relevant
    - the boundary wall
    - the buildings separately, including internal sanitation
    - electrification, excluding generator
    - external water management, including water supply to site, excluding solar panels

  (spending should be documented in a manner coherent to this, to facilitate budget follow-up, see further 2.2)
- The water management cost estimate is a lump sum, partially based on the experience in Olander: for the smaller sites 750.000 Rs., for the bigger ones 1.000.000 Rs.
- The electricity estimate is based on the experience of Olander, where electrification cost approximately 60 Rs./ Sft of rehabilitated building.
- (**: approximate Square feet, and in case of the boundary wall, Running feet)
- The estimate of the boundary wall is based on the experience and design of the MOH in Olander: 2000 Rs./ Square feet. This design needs to be reviewed to lower the cost.
- Talking to the Deputy Director of Works and Services of Batagram District, 30% of the cost of a new construction is in this region the maximum advised cost for repair works. If the value of repair works goes above this, it is better to build a new building, considering that the construction quality in these areas is particularly low.
- A new building costs about 3000 Rs. /Sft, so the 30% maximum for repair works comes up to 900 Rs. /Sft.

When full measurement plans, drawings and BoQ's for all works become available, this cost estimate can be updated with much more accuracy and render the decision on the future of some buildings more clear. One issue that needs to be cleared out urgently is the design and length of boundary wall per BHU, as this now weighs heavily on the budget. Secondly, a more detailed overview of the works on MOH's and MB's is necessary.

## BHU Chichloo, District Shangla

| Code | Works | Square feet** | Pak Rs. | Euro |
|---|---|---|---|---|
| CH_ DEM | demolition | NA | 0.00 | 0.00 |
| CH_SP | site preparation | NA | 1,000,000.00 | 10,000.00 |
| CH_BW | boundary wall (100%) | 500 | 1,000,000.00 | 10,000.00 |
| CH_MB | MB | 1,250 | 3,750,000.00 | 37,500.00 |
| CH_MOH | MOH | 2,000 | 6,000,000.00 | 60,000.00 |
| CH_2R1 | 2 bedroom staff house | 675 | 2,025,000.00 | 20,250.00 |
| CH_2R2 | 2 bedroom staff house | 675 | 2,025,000.00 | 20,250.00 |
| CH_2R3 | 2 bedroom staff house | 675 | 2,025,000.00 | 20,250.00 |
| CH_EL | electricity overall | NA | 323,700.00 | 3,237.00 |
| CH_WM | water management | NA | 750,000.00 | 7,500.00 |
| CH_TBM | toilet block men | 60 | 180,000.00 | 1,800.00 |
| CH_TBF | toilet block women | 60 | 180,000.00 | 1,800.00 |
| | **TOTAL** | **5,395** | **19,258,700.00** | **192,587.00** |

- The cost of demolition should be carried by the Government. This however does not mean that the site will be ready for construction immediately. Also, the retaining walls around the BHU should be checked further and possibly partially enforced.
- The calculation for the buildings is based on 3000Rs./ Sft approximate cost for new construction. The surface of a new design might of course differ from the existing surface.

Talking to IFRC/ PRCS about previous experiences, and taking into account the difficult accessibility of the site, it is wise to consider an extra 20% cost at this moment of the planning stage, which brings the estimated cost at **231,104.40 euro.**

## BHU Razika, District Kohistan

| Code | Works | Square feet** | Pak Rs. | euro |
|---|---|---|---|---|
| R_BW | boundary wall (100%) | 500 | 1,000,000.00 | 10,000.00 |
| R_MB | MB | 1,388 | 1,388,000.00 | 13,880.00 |
| R_MOH | MOH | 1,500 | 1,500,000.00 | 15,000.00 |
| R_2R1 | 2 bedroom staff house | 675 | 675,000.00 | 6,750.00 |
| R_2R2 | 2 bedroom staff house | 675 | 675,000.00 | 6,750.00 |
| R_2R3 | 2 bedroom staff house | 675 | 675,000.00 | 6,750.00 |
| R_EL | electricity overall | NA | 301,980.00 | 3,019.80 |
| R_WM | water management | NA | 750,000.00 | 7,500.00 |
| R_TBM | toilet block men | 60 | 60,000.00 | 600.00 |
| R_TBW | toilet block women | 60 | 60,000.00 | 600.00 |
| | **TOTAL** | **5,033** | **7,084,980.00** | **70,849.80** |

- It seems the local architecture in Razika (wooden structure with mud/clay finishing) costs about 400 Rs. /Sft. The cost for the buildings here is based on a 1000 Rs. /Sft estimate, taking into account more sophisticated techniques for foundations, carpentry work and finishing.
- This estimate is thus based on a total reconstruction of the BHU. A detailed calculation of the repair works (first phase transformation as discussed in chapter 1) should be produced as a reference for decision making.
- For estimation of cost in Razika, it will be necessary to spend some time on site, to ensure reliable information, as it is such a particular location and architecture.

## BHU Damorai, District Shangla

| Code | Works | Square feet** | Pak Rs. | euro |
|---|---|---|---|---|
| DM_SS1 | site stabilisation | NA | 5,000,000.00 | 50,000.00 |
| DM_BW | boundary wall (50%) | 260 | 520,000.00 | 5,200.00 |
| DM_MB | MB | 1,250 | 1,000,000.00 | 10,000.00 |
| DM_MOH | MOH | 2,000 | 500,000.00 | 5,000.00 |
| DM_2R1 | 2 bedroom staff house | 675 | 0.00 | 0.00 |
| DM_2R2 | 2 bedroom staff house | 675 | 0.00 | 0.00 |
| DM_2R3 | 2 bedroom staff house | 675 | 0.00 | 0.00 |
| DM_3R1 | 3 bedroom staff house | 910 | 0.00 | 0.00 |
| DM_3R2 | 3 bedroom staff house | 910 | 0.00 | 0.00 |
| DM_3R3 | 3 bedroom staff house | 910 | 0.00 | 0.00 |
| DM_EL | electricity overall | NA | 202,200.00 | 2,022.00 |
| DM_WM | water management | NA | 1,000,000.00 | 10,000.00 |
| DM_TBM | toilet block men | 60 | 180,000.00 | 1,800.00 |
| DM_TBF | toilet block women | 60 | 180,000.00 | 1,800.00 |
| | **TOTAL** | **8,125** | **8,582,200.00** | **85,822.00** |

- The design of the retaining wall is not final yet. Preliminary designs and cost estimates range from a positive 25.000 euro to a rather negative 75.000.
- The cost estimates for the MB and MOH are approximate and based on the detailed exercises conducted for the MOH of Olander and the MB of Seo.
- The cost for possible repair of secondary residences has been ignored here, due to limited total budget.

(As an exercise, if we consider that the MB will have to be rebuilt and the secondary residences only need minor repair, the cost estimate looks as follows:

| Code | Works | Square feet** | Pak Rs. | euro |
|---|---|---|---|---|
| DM_SS1 | site stabilisation | NA | 5,000,000.00 | 50,000.00 |
| DM_BW | boundary wall (50%) | 260 | 520,000.00 | 5,200.00 |
| DM_MB | MB | 1,250 | 3,750,000.00 | 37,500.00 |
| DM_MOH | MOH | 2,000 | 500,000.00 | 5,000.00 |
| DM_2R1 | 2 bedroom staff house | 675 | 250,000.00 | 2,500.00 |
| DM_2R2 | 2 bedroom staff house | 675 | 250,000.00 | 2,500.00 |
| DM_2R3 | 2 bedroom staff house | 675 | 250,000.00 | 2,500.00 |
| DM_3R1 | 3 bedroom staff house | 910 | 350,000.00 | 3,500.00 |
| DM_3R2 | 3 bedroom staff house | 910 | 350,000.00 | 3,500.00 |
| DM_3R3 | 3 bedroom staff house | 910 | 350,000.00 | 3,500.00 |
| DM_EL | electricity overall | NA | 202,200.00 | 2,022.00 |
| DM_WM | water management | NA | 1,000,000.00 | 10,000.00 |
| DM_TBM | toilet block men | 60 | 180,000.00 | 1,800.00 |
| DM_TBF | toilet block women | 60 | 180,000.00 | 1,800.00 |
| | **TOTAL** | **8,125** | **13,132,200.00** | **131,322.00** |

This shows quite clearly that any further evaluation of the buildings will have a quite big impact on the total budget and that it is urgent to get a clearer idea about this, at least already for the repair works for the MOH's and MB's. Also, program decisions concerning priorities clearly have a big impact on the budget.)

## BHU Doga, District Kohistan

| Code* | Works | Square feet** | Pak Rs. | euro |
|---|---|---|---|---|
| DG_BW | boundary wall (50%) | 480 | 960,000.00 | 9,600.00 |
| DG_MB | MB | 1,388 | 200,000.00 | 2,000.00 |
| DG_MOH | MOH | 2,000 | 200,000.00 | 2,000.00 |
| DG_2R1 | 2 bedroom staff house | 675 | 0.00 | 0.00 |
| DG_2R2 | 2 bedroom staff house | 675 | 0.00 | 0.00 |
| DG_2R3 | 2 bedroom staff house | 675 | 0.00 | 0.00 |
| DG_EL | electricity overall | NA | 210,480.00 | 2,104.80 |
| DG_WM | water management | NA | 750,000.00 | 7,500.00 |
| DG_TBM | toilet block men | 60 | 180,000.00 | 1,800.00 |
| DG_TBW | toilet block women | 60 | 180,000.00 | 1,800.00 |
| | **TOTAL** | **5,533** | **2,680,480.00** | **26,804.80** |

- BHU Doga MB and MOH are in a quite good condition, so the estimates for their repair are considered the same as for MOH Olander.
- The cost for possible repair of secondary residences has been ignored here, due to limited total budget.

## BHU Seo, District Kohistan

| Code* | Works | Square feet** | Pak Rs. | euro |
|---|---|---|---|---|
| S_BW | boundary wall (80%) | 670 | 1,340,000.00 | 13,400.00 |
| S_MB | MB | 1,358 | 1,334,815.00 | 13,348.15 |
| S_MOH | MOH | 2,000 | 1,000,000.00 | 10,000.00 |
| S_2R1 | 2 bedroom staff house | 675 | 0.00 | 0.00 |
| S_2R2 | 2 bedroom staff house | 675 | 0.00 | 0.00 |
| S_3R1 | 3 bedroom staff house | 910 | 0.00 | 0.00 |
| S_3R2 | 3 bedroom staff house | 910 | 0.00 | 0.00 |
| S_3R3 | 3 bedroom staff house | 910 | 0.00 | 0.00 |
| S_EL | electricity overall | NA | 220,680.00 | 2,206.80 |
| S_WM | water management | NA | 1,000,000.00 | 10,000.00 |
| S_TBM | toilet block men | 60 | 180,000.00 | 1,800.00 |
| S_TBW | toilet block women | 60 | 180,000.00 | 1,800.00 |
| S_TC | training hall | 200 | 600,000.00 | 6,000.00 |
| | **TOTAL** | **7,758** | **5,855,495.00** | **58,554.95** |

- The cost estimate of the MB of BHU Seo is based on a detailed engineering estimate prepared by the current GRC/ PRCS construction team, following the construction needs as discussed in chapter 1. This estimate is based on the government rates of 2008, taking into account 14% extra cost for the remoteness of Kohistan and including also the profit of the contractor. If these works are done by GRC as contractor, this cost could be slightly less. On the other hand, while construction is ongoing, new needs might pop up which will again increase the cost.
- This cost is only slightly lower than the 30% advised maximum cost of repairs. Still, the repair of the MB is a priority in the health program, so seems to be the feasible option at this moment.
- The cost estimate for the MOH has been estimated at 1.000.000 Rs., which is in comparison to the MB in a bit better state.
- The cost for possible repair of secondary residences has been ignored here, due to limited total budget. Also, it is expected that the repair costs of these buildings will exceed 30% of the cost of new constructions.

## BHU Olander, District Shangla

| Code* | Works | Square feet** | Pak Rs. | Progress 201108 | euro |
|---|---|---|---|---|---|
| OL_BW | boundary wall (100%) | 500 | 1,000,000.00 | 440,387.00 | 10,000.00 |
| OL_MB | MB | 1,250 | 1,000,000.00 | 0.00 | 10,000.00 |
| OL_MOH | MOH | 2,000 | 200,000.00 | 174,163.00 | 2,000.00 |
| OL_2R | 2 bedroom staff house | 675 | 0.00 | 0.00 | 0.00 |
| OL_3R1 | 3 bedroom staff house | 910 | 0.00 | 0.00 | 0.00 |
| OL_3R2 | 3 bedroom staff house | 910 | 0.00 | 0.00 | 0.00 |
| OL_3R3 | 3 bedroom staff house | 910 | 0.00 | 0.00 | 0.00 |
| OL_EL | electricity overall | NA | 214,200.00 | 113,130.00 | 2,142.00 |
| OL_WM | water management | NA | 1,000,000.00 | 279,573.00 | 10,000.00 |
| OL_TBM | toilet block men | 60 | 180,000.00 | 0.00 | 1,800.00 |
| OL_TBW | toilet block women | 60 | 180,000.00 | 0.00 | 1,800.00 |
| OL_TC | training hall | 200 | 600,000.00 | 0.00 | 6,000.00 |
| | **TOTAL** | **6,975** | **4,374,200.00** | **1,007,253.00** | **43,742.00** |

- The cost for possible repair of secondary residences has been ignored here, due to limited total budget. Also, it is expected that the repair costs of these buildings will exceed 30% of the cost of new constructions.

The repair of the MOH of Olander has started already, but the cracks have not been closed yet. This explains the cost estimate of 200.000 Rs., which is higher than the expenditure so far.

The part of the boundary wall of the MOH, 204 Rft out of 300 Rft, that is already reconstructed is a very big cost in the total. Use of stone masonry in stead of plastered brick work could reduce this cost. Also, a boundary wall around the MOH needs to be 6 feet high completely untransparent, whereas the boundary wall around the BHU could be lower, partially stone masonry, partially metal plates, or a simple fence even (this needs to be checked with the community and the Health Department).

## Total

The total cost estimate is thus approximately **520,000 euro** at this point. This does not include the repair (or new construction) of the secondary residences. By the end of January, a more accurate analysis of the works to be done on all MB's and MOH's and exact measurements and a best suitable design for the boundary walls should already give a good starting point for making programmatic decisions.

The total expenditure so far - for BHU Olander- is only 10.073 euro in value which is a very limited part of the whole. When one looks at the time in construction, administration and documentation that was spent on this, one can already get an understanding that the construction projects needs to be run differently in the future.

The original Excell file of 2.1 can be found in Annex 5.

## 2.2 How to + monitoring

Mainly two possibilities exist to get these construction works done, both with their particular implications for management/ monitoring. It is very important to keep a tight record of all construction activities from the beginning, as confusion can lead quite fast to delays, difficult relationships with contractors and sub-contractors and problematic financial records.

**OPTION1: GRC works as 'contractor' and hires subcontractors and suppliers**

The procedure that needs to be followed by the construction team is in general terms as follows:

**STEP1** The construction team prepares the following:

1. Drawing/ sketch of construction works necessary
2. BoQ of the construction works necessary
3. Engineering cost estimate (can be based on previous estimates, does not need to be broken down in complete engineering estimate every time: efficiency from experience)
4. Engineering time estimate

These four elements need to be sent for approval to the program manager.

**STEP2** Once approval is obtained, the following needs to be done:

5. Supply empty BoQ to minimum 3 selected material suppliers to quote.
6. Supply drawing/ sketch of construction works to minimum 3 selected subcontractors to quote for labor work, within the expected time frame.
7. If necessary, supply material list and time frame to minimum 3 transport companies to quote.
8. Do the CBA's as per format agreed (IFRC template). If major differences are there between the quotes and the original cost estimate (in point number 3), explain this also in annex to the CBA. Also make recommendation of preferred choice.

These four elements need to be sent for approval to the program manager.

**STEP3** Once approval is obtained, the following needs to be done:

9. Use the BoQ as an agreement with the suppliers, subcontractors and, if necessary, transport company.
10. Coordinate and supervise the works.
11. Keep record by means of a **daily logbook per site** (as discussed with CT) and a two-weekly progress report to the program manager.
12. Add every CBA, quotation, signed BoQ and miscellaneous bill to the **register per BHU** with the proper coding and coordinate this information with finance/ procurement.

Notify all serious problems immediately to the program manager and propose solutions.

**POS:**

- no risk of 'contractor failure': easy refusal of material and replacement of labor
- possibility to work phase by phase as necessary and possible
- good option for repair works, as new defects might come to light during repair
- works can start faster

**NEG:**

- requires GRC to act as contractor, which requires more HR and right profile of HR (daily supervision on site and good project documentation)

This option is advisable for the repair works in BHU's Doga, Damorai, Olander and Seo. It can be considered also for BHU Razika, also in case of complete reconstruction, as it might be difficult to find a suitable contractor to take on this project.

**MONITORING DURING CONSTRUCTION:**

The minor works in Olander so far have led to 49 payments in one month time, of which 24 after a CBA procedure and the rest in miscellaneous small costs, all of a total value of approximately 10.000 euro. Per BHU, per subject (as discussed in 1. cost estimate), a strict record needs to be kept otherwise proper monitoring –and planning- will soon become complicated. The CT (construction team) and I worked on putting a **register** in place for each BHU, to keep track of all costs and works in a strictly coded administration. In annex 6, one can find a possible 'register'.

The register is built in such a way that it can be easily linked to file used for 1.cost estimate, annex 5. Contributions to this register can be done by the Construction Officers of each BHU, but basically is the responsibility of the Construction Manager. It is also the tool that needs to be used to communicate with the Finance (-procurement) Officer and even general management.

On a daily basis, the CT should keep track of the activities going on per BHU in a **daily logbook**. This logbook should simply (per day during the peak of activities, otherwise might be less often) contain minimal information on the weather conditions, the materials present on site, the supplementary material needed or already bought, the skilled and un-skilled labor at work, the works done that day and possible remarks. This logbook is necessary to follow the progress on site and close the gap between the work on site and the office work of the construction manager of all BHU's. This daily logbook thus needs to be kept by the Construction Officer in charge for that particular BHU, in such a way that the information is easily accessible for others.

**PROCUREMENT:**

The experience of BHU Olander so far also pushes to look for some more efficiency in terms of procurement and related procedures.

- Winter time should be used to build BoQ's and cost estimates for all repair works to be done, at least of the MOH's and MB's of BHU's Doga, Olander, Seo and Damorai. These can be used to obtain approval from GRC HQ in one time for several costs.
- If the limit for 1000 euro maximum approvable in country could be increased, the number of CBA's that needs to be drafted up can be reduced a bit.
- Framework agreements with some suppliers could be drawn up for certain items (such as cement bags, steel rods etc.) that are necessary in every BHU. To make this possible, there needs to be some clarity on the approximate amount of that material that will be needed. Also, a limited tendering procedure will be necessary to select these material suppliers, including drafting up the appropriate documents.
- For some items, it can be considered to buy material in bulk. Also in this case, some more planning and coordination will be necessary than has been the practice until now. This could be efficient in case of construction of boundary walls for example, or replacing of CGI roofing sheets. Buying in bulk will cause problems of storage if the use of these materials is not coordinated in time (if good coordination in time remains difficult, a framework agreement might be more appropriate).

**OPTION2: GRC works as 'client' and hires a contractor**

This procedure is much more standard. The Construction team needs to prepare the following:

1. Drawings of the new constructions
2. BoQ
3. Detailed engineering cost estimate
4. Engineering time estimate
5. Tender documents
6. Draft agreement with the selected contractor

It would be good if an outsider/ a construction delegate could have a look at these documents before the tendering procedure is launched.

**POS:**

- All in one package, so bigger investment for planning for GRC in the beginning, but less afterwards.
- Responsibility of construction quality lies with the contractor, not GRC, and defect liability offers supplementary guarantee.

**NEG:**

- In case of contractor failure, extensive problems and delays are possible.

This option is suitable for all new constructions: BHU Chichloo, the toilet blocks, the training halls, the retaining wall of Damorai. Perhaps further down the line, more new constructions will be necessary.

**PROCUREMENT:**

Tender, if possible within GRC regulations, could be done with 4 or 5 pre-qualified contractors. This simplifies the procedures (technical evaluation is thus already done before the tendering) and reduces the risk of selecting a non performing contractor.

The agreement to be signed with the contractor needs at least the following elements:

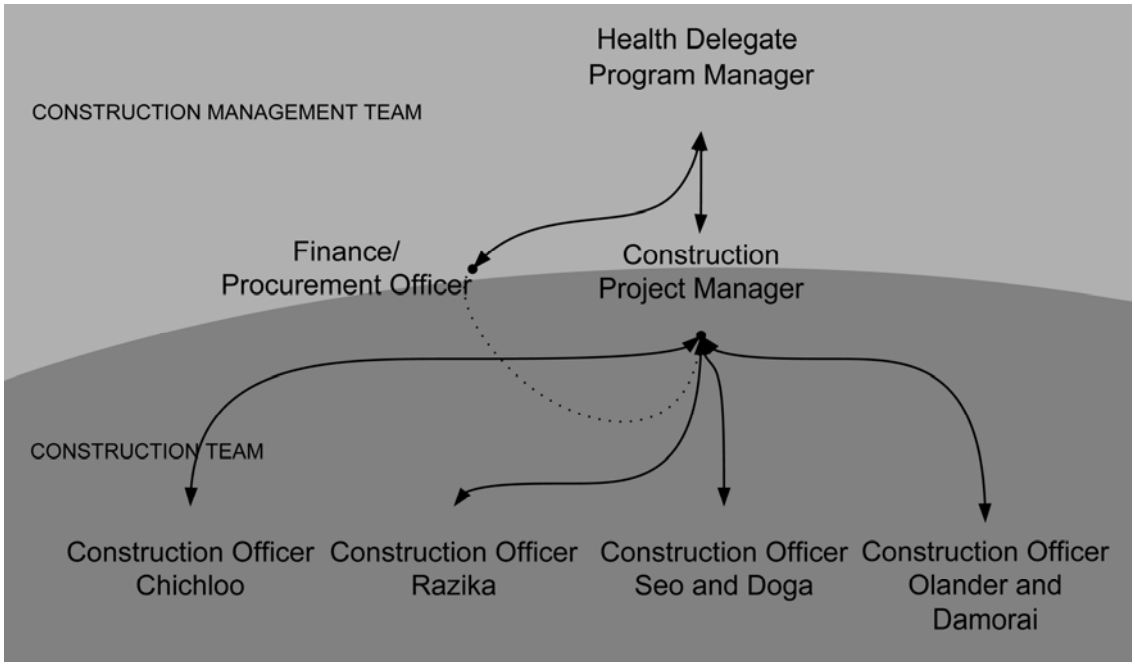
- A reasonable payment scheme (2% earnest money/ 8% retention fee/ monthly payments/ advance money or material disbursement/ 6 months liability period, following common practice in the region).
- Easy procedure to break the contract (in case of contract failure, need to be able to end contract easily: stipulations of reasons for termination contract, termination payment, hand-over of material already on site etc. already stipulated in contract).
- A clear time-line and clear procedures for the contractor to signal intermediate delays, the reason for these delays and for asking extension to the contracting period. A financial penalty for delays can be included to stimulate the contractor to finish in time (or the possibility of a bonus if the project is finished before the end of the contracting period could be investigated).
- Stipulations concerning subcontractors: need to be approved by GRC before they start and easy to stop collaboration when quality of work is not acceptable.

**MONITORING DURING CONSTRUCTION:**

- GRC site supervisor on site nearly every day, and certainly during structurally vulnerable moments as pouring of concrete, masonry work, septic tank + maintaining of **daily logbook** of activities on site (weather conditions, stock material and number and skills of labor on site, progress of the day, problems faced; same as in option1), reporting back to construction manager.
- One **weekly site meeting** with the site supervisor, construction manager and contractor discussing progress and delays, problems and solutions and plan for the coming week, written down in minutes. This should happen on site (or at least every two weeks on site).
- A **monthly progress report** needs to be compiled by the construction manager, by indicating the progress on each item of the BoQ, based on site visit, on the weekly site meetings and the daily logbook of the site supervisor. On the basis of this report, the amount of payment due to the contractor can be calculated.

## 2.3 Human resources estimate

A workable team structure could be as follows:




The central player in the construction project is the **Construction Project Manager**, who will be the leader of the Construction Team, will enable the link with higher up management (for issues of planning; budgeting, timing, priorities, HR) and will coordinate with the Finance/ Procurement Officer. (Engineer Inayat can play this role. If possible, if he can attend a short training -1, 2 weeks- in basic project management, during winter time perhaps, this would be beneficial.) (JD has been discussed with Dr. Sabine)

The **Construction Officers** are responsible for the work on the sites, doing the site supervision, keeping the daily logbook, taking measurements, preparing drawings, BoQ's, gather quotations under the guidance of the Construction Manager. They should all be assigned to a specific site, but should be able to replace each other also when necessary. (Engineer Irfan already works as Construction Officer, three more need to be hired, best soon as possible (see further 4. time etc.). (JD has been discussed with Dr. Sabine)

The support of a **Finance/ Procurement Officer** in the project is essential, to guarantee a good flow of payments to contractors/ sub-contractors, proper financial documentation and, as Procurement Officer, support in drafting up agreements, following through tendering procedures, pro-actively plan for more efficient procurement. (If Wasif can spend more time on this role in the future, that would be good, otherwise one might also consider to split these two tasks and hire one supplementary person (as another Construction Officer f.e.) with skills in procurement.

Since the project is in a preliminary stage, quite some planning still needs to be done. For this reason, the **Construction Management Team** will need to be heavily involved in the project in the coming months, to push forward a more detailed cost estimate –and following, take some decisions for the direction of the project- , a more rigid system of record keeping, pro-active planning of the works to be done, smooth functioning of the team.

The Construction Team needs a better **logistic support**, in terms of office set-up and movements management, this has been discussed already extensively on site.

## 2.4 Time estimate and tasks for coming months

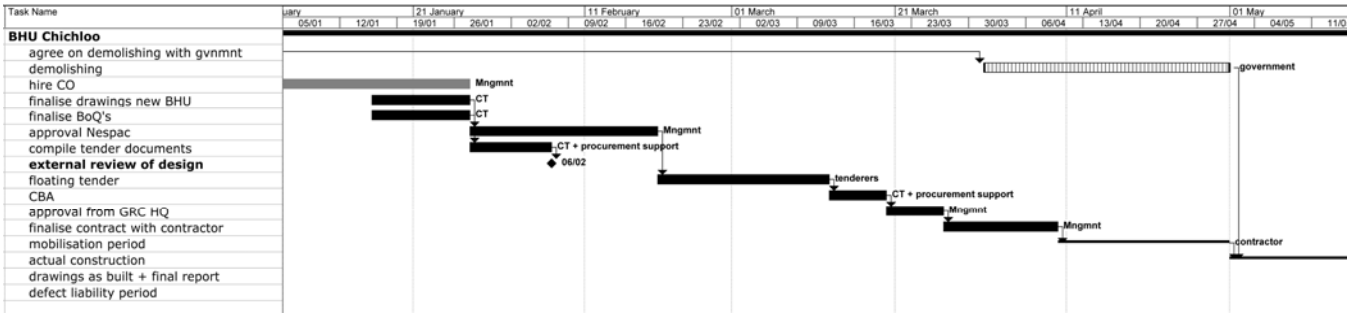
### BHU Chichloo, District Shangla

The preparation works for a project like the complete reconstruction of BHU Chichloo can be estimated to take at least two, probably three months. This is an investment in proper planning, tender documents, contract with contractor which is justified since it can later on save quite some complications, costs and time.

The existing buildings need to be destroyed, which needs to be discussed with the government. I have assumed here that it can only be done after winter, in April. The target for the preparation works should thus be to have them finalized by the end of March, so that the contractor can start mobilization of material and staff during demolition works.

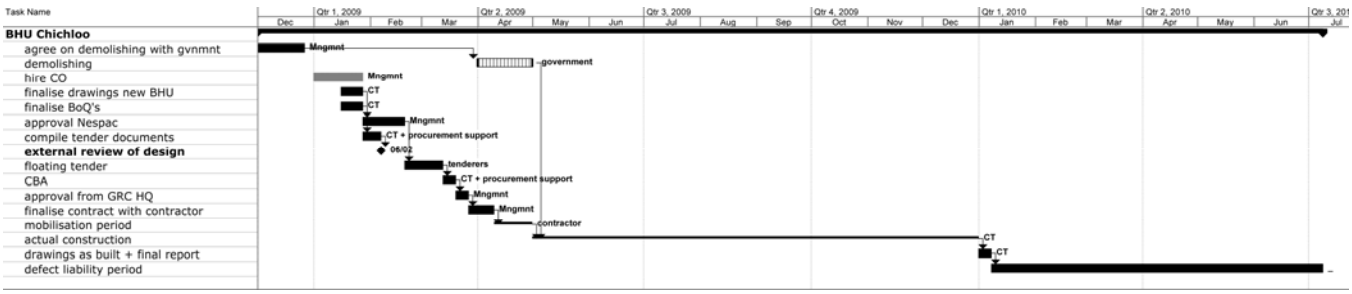
This leaves about eight months for the actual construction, which is not much, but should nevertheless be the aim, as otherwise the construction will continue through spring 2010. Strong incentives and restrictions can be included in the agreement with the contractor.

Here one can find an attempted timeline, indicating the different steps in the planning process and who should take the lead in which step:



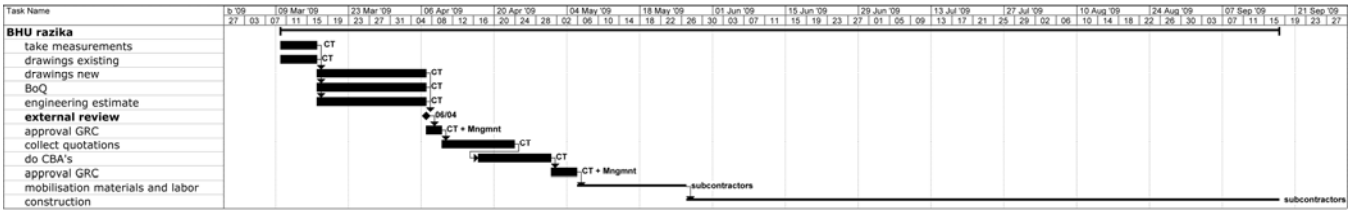

(CT: Construction Team GRC/ PRCS
Mngmnt: GRC/ PRCS CT + Management)

After the construction, a Defect Liability Period starts; this is the ‘guarantee’ phase, which we can fix at 6 months, during which the contractor is still liable for defects that may become clear. The project will thus only be completely finished by July 2010:




Seen these time-lines, it is strongly recommended to start the planning phase for BHU Chichloo as soon as possible. A Construction Officer dedicated to this project should be identified and hired immediately after New Year.

## BHU Razika, District Kohistan




For the rehabilitation of BHU Razika, a shorter period of only two months of preparation is necessary, in the assumption GRC will play the role of contractor. Mobilization to the site will probably be possible starting from May. The actual construction time here is fixed at about four months, which is very ambitious and needs to be reconsidered by the CT. In any case, as also in Chichloo, the preparatory works should not start later than March, to ensure the works can get done before the winter of 2009-2010.

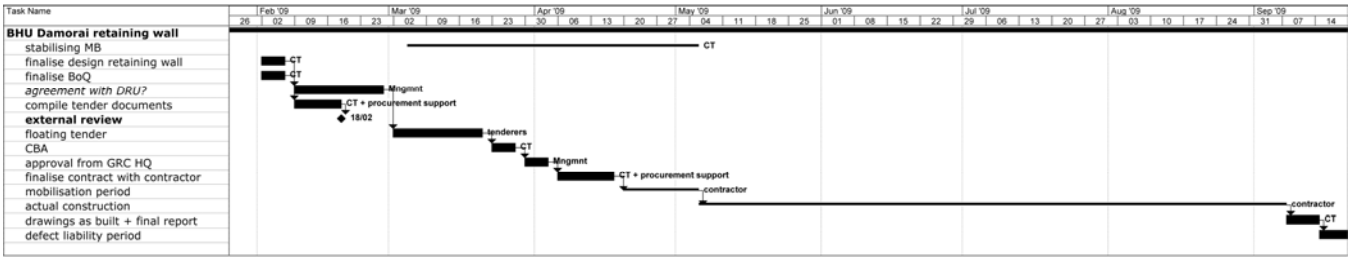
Also here, it would be good if an external person (construction delegate) would have a look at the drawings and BoQ before quotations are gathered.

## BHU Damorai retaining wall, District Shangla

The construction of the retaining wall can only start when the MB is stabilized. This requires approximately two months and can start from the beginning of March (see under).

The planning stage is very similar to the planning of BHU Chichloo, only that the design of the retaining wall can be finished faster. Also here, it is advisable that an external review of drawings and BoQ is done before the construction goes ahead.

The actual construction time is fixed at three months, but this needs to be reviewed by the Construction Team in the coming weeks/ months.




Planning for both Razika and Damorai retaining wall at the same time will be a bit much, certainly together with the repair works described here underneath. Even if one Officer is working full-time on one of these three BHU's for some time, the work load in management and procurement might be too much (depending also on which CO's can be found). It will be necessary to see how things go, but it should be considered to choose one (or Razika or Damorai) priority for the coming months.

## BHU's Doga, Damorai, Seo and Olander


BHU **Olander MOH** is already cleaned up. The cracks still need to be closed with a wire mesh system. This can be done in the coming weeks.

A full BoQ of repair works for BHU **MB Seo** was prepared by the CT during my mission. Since rendering BHU Seo operational is a priority, these works, upon approval, could be done starting from December. These works will require 10 to 12 weeks.

To improve the efficiency of the project, some preparation works would best be done before continuing the rest of the works on these BHU's. The **winter time** should be taken as a time for planning, to be able to restart construction by the beginning of spring in a more planned and coordinated manner.

A first necessity is to have accurate **measurement plans** of all sites.

In parallel, the team should start building up **drawings, BoQ's and cost estimates** of all repair works to be done to all **MOH's and MB's**. A first update of the cost estimate –as in point 2.1- should thus be available by the beginning of January. The results should be put together and discussed in the Construction Management Team.

The same exercise should then be repeated for the **secondary residences**, which can go faster as material from the MOH's and MB's can be used as a base. The overview of the results of this exercise should enable the Construction Management Team to take decisions on priorities.

Once these priorities are ready, there is still need for some time to draw up a planning of the different works through **time** and preparing for the most appropriate **procurement strategies** (framework agreement, bulk, contractors versus subcontractors etc.).

The actual construction time is very dependant of the result of these further planning exercises. For new constructions, it can be foreseen –in comparison to the BHU Chichloo time line- they will probably not be finished before the winter of 2009 -2010. Repair of all MB's and MOH's should be possible though, and even some of the secondary buildings.

## Toilet blocks and training halls

To have separate toilets for patients, outside the volume of the MB seems sensible sanitary practice. A program decision needs to be taken whether these blocks will be a fixed part of the water management works on all BHU's or whether they will by priority only be built in BHU Olander and Seo. If not, detailed drawings and BoQ need to be made and a small tendering launched. This should take about six weeks. The actual construction can best be coordinated with the other works that need to be done in BHU's Doga, Damorai, Seo and Olander, to find some efficiency in supervision.

## Total

It is thus advised to start the planning of BHU Chichloo immediately and or BHU Razika or BHU Damorai retaining wall slightly later. The other priority should go to the remaining preparation work for BHU's Doga, Damorai, Olander and Seo. By the end of spring, it can be evaluated how well the team is working, what the results are of the more detailed cost analysis and what needs to be tackled first to support best the health activities. A more detailed working plan needs to be developed from there on.

The overview of all time-lines can be found in annex 7. Again, this is as much a tool for continued planning as it is the best educated guess at this moment in the project.

# Part 3. Final remarks

This document hopes to have mapped out the biggest issues on a technical and managerial level. The complexity of this rehabilitation project should not be underestimated. After all, we are dealing with 36 different buildings on 6 remote sites, each with its own particularities, in program focused on providing health facilities, with limited budget and time.

Quite some drawings and BoQ's will need to be prepared. The current construction team is fluent in this, so for the repair works, there should not be a problem. For the new constructions, an external review of the drawings is advisable, together with a review of the tender documents and the agreements to be drafted with the contractors. New constructions also require more coordination with other outside partners, as the government.

One of the biggest challenges for the coming months will be to bring the project up to speed. Different tools for monitoring and management need to be acquired by the team and establish a fluent internal and external information flow, well linked up to the management of the program in its entirety.

A big leap was taken in this report, trying to get as much planning done based on little available material for proper planning. The timing of this mission was rather fortunate in the sense that the winter is starting which can be used for planning and team-building. More accurate time and cost estimates will be crucial to take further important decisions concerning BHU Razika, the secondary residences, the toilet blocks and training halls.

If no Construction Delegate becomes available to the mission, a good moment for another external push to the project will be somewhere near the beginning of Spring. At that moment, quite some preparatory work should be finished, and construction can start on a larger scale. More information will be available to continue the exercise of bringing cost, time, HR and scope into a coherent approach. This will have to be judged later on by the team in place.

## List of Annexes:

**Annex 1. Day to day activities**
**Annex 2. Assessment of existing**
**Annex 3. NSET damage grades**
**Annex 4. Water management reference**
**Annex 5. Overall cost estimate**
**Annex 6. BHU Olander cost estimate**
**Annex 7. Time estimate**

## Other relevant material:

Other material was produced and gathered - on top of all that was already available with Inayat- during this mission. On the one hand, the construction team and I worked on some preliminary (test) drawings for the retaining wall in Damorai, an alternative proposal for BHU Chichloo, a transformation of BHU Razika etc. On the other, reference material was gathered on earthquake resistant building techniques and some construction policy documents of other humanitarian organizations after earthquakes. These are available with the construction team in Besham.