Stockholm Evaluation Unit

EBOLA REVIEW

Ebola Treatment Centres: design and construction

PART II – Lessons learnt & specific recommendations for construction

[December 2015]

This publication was produced on request of OCA, coordinated within a broader review on OCBs response to the Ebola emergency. It was prepared independently by **Verónica Sánchez Carrera.**

CONTENTS

ACRONYMS 3
INTRODUCTION 4
SITE CHARACTERISTICS 4
General background 4
Location criteria 4
Ground characteristics 4
Meteorological characteristics 5
Resources in situ 5
FUNCTIONAL-SPATIAL ANALYSIS 5
HIGH RISK AREA 5
LOW RISK AREA 9
LIVING AND LOGISTICAL AREAS 13
PHYSICAL-TECHNICAL ANALYSIS 16
PHYSICAL INFRASTRUCTURE 16
TECHNICAL INFRASTRUCTURE 18
Water storage, treatment and control 18
Sanitation and hygiene 22
Electricity and lighting 26
Telecommunications 26
Fires 27
Adaptation to site design 28
ANALYSIS OF THE EXPERIENCE 32
HUMAN RESOURCES AND ORGANIGRAM 32

ACRONYMS

BO	Bo ETC
DirLog	Directors of Logistics Platform
DON	Donka ETC
ELW	Elwa 3 ETC
ETC	Ebola Treatment Centre
Fieldco	Field Coordinator
FOR	Forecaryah ETC
FOY	Foya ETC
GN	Guinea
GUE	Guéckédou ETC
HR	High Risk
KAI	Kailahun ETC
KAN	Kankan ETC
KIS	Kissy ETC
LA	Living Area
LB	Liberia
LR	Low Risk
MAC	Macenta ETC
MAG	Magburaka ETC
NON	Nongo ETC
RIOD	MSF Directors of Operations Platform
OC	Operational Centre
OCA	Operational Centre Amsterdam
OCB	Operational Centre Brussels
OCBA	Operational Centre Barcelona-Athens
OCG	Operational Centre Geneva
OCP	Operational Centre Paris
POW	Prince of Wales ETC
PPE	Personal Protective Equipment
PTP	Patient Transit Point
SL	Sierra Leone
UR	Unknown Risk
Watsan	Water, Hygiene and Sanitation
WHO	World Health Organisation
WFP	World Food Program

INTRODUCTION

This document does not attempt to be a final document or to give absolute truths, but to provide an ordered compendium of lessons learnt and practical recommendations with the purpose of guiding and facilitating the design and construction of future ETCs.

Information is drawn from research findings, interviews, informal talks, different OCs documents, field visits, workshops and previous personal experiences.

Many lessons learned and recommendations are from specific centres, situations, or moments and may not be appropriate for other situations. However, all the information is available here.

SITE CHARACTERISTICS

General background

It would be advisable to make a territorial and urban analysis of potential build sites for ETCs and gain governmental agreement for their use in case they will be needed for future responses.

Location criteria

- The existing health system will be taken into account, remembering that uninfected patients will have to be channelled to other centres.
- Good access, independent and separate from other roads and paths, if possible.
- Located at a prudent distance from rivers or other bodies of water.
- Sites should be chosen in areas where security can be guaranteed.
- Closeness to ``epicenter`` of outbreak/to (cluster of) cases
- Near existing health care system: be cautious if within an existing and still functioning HC Structure. It may pose problems, as fright of the ETC may limit access to normal services (patients may refuse to come to normal services because of the presence of the ETC).
- Culturally accepted place (e.g. no sacred place)

Ground characteristics

Within the complexity that presupposes it to be good land, it is recommended as much as possible that the ground is:

- Flat and level.
- Geologically stable and consolidated, preferably without organic or stony material.
- Easy to dig, without the danger of landslides and with the capacity for drainage.
- The groundwater level must not be less than three metres deep.
- The size of the plot of land must be sufficient to extend the centre if it becomes necessary.
- Use of GPS system for delimiting the land.

Meteorological characteristics

- It is essential to be very aware of the seasonal periods affecting the construction (times of rain, dry periods, etc.) and the adjustment of the design due to the climatological conditions during its use.
- The prevailing winds must be studied for the control of smoke and odors.
- Sun orientation must be taken into account for improved the shadows zones.

Resources in situ

- The water resources of the area must be evaluated, with special focus on the analysis of capacity, quality and availability.
- It is desirable to have the option to connect to local basic services of water, electricity and communications.
- Before the arrival of main supplies it is advisable to perform marking kit with GPS, to note reference points, distance measure and infra-red measure.

FUNCTIONAL-SPATIAL ANALYSIS

HIGH RISK AREA

- Avoid big extension areas without specific use in the high risk (HR) area, because they will have to be disinfected.
- The design has to procure a control place for resting patient areas/``terraces`` and be open and clear in HR, to keep visual contact with patients for staff, and between family members of patients and the patients.

The HR area should include the following elements and facilities:

Wards

- Wards should preferably be of a white colour for luminosity, cleaning and atmosphere for the patient.
- Include individual wards, showers, and latrines for suspected patients.
- Try to separate males, females and families.
- In case big tents are in use, creating smaller spaces within them is advisable.
- Avoid complicated systems of closing windows and doors. You need windows (but they can be just holes i guess, as long as rain is not directly coming in) already for ventilation (in our most ``closed`` centres we had issues with chlorine gas that couldn't escape), but indeed, you may not want glass windows that you can open/close.
- Doors is a point of discussion – better not too have them as they may become ``sources of contamination`` vs. if you don`t have them, patients (e.g. Children) may wander ``freely`` and pass zones (e.g. go from confirmed into suspect)

Patients' rest area

- Consider areas to wash and dry the patients' clothes.
- It is necessary to anticipate that the patients will sometimes prefer to sit or relax in this area, which is why it has to be wide so as not to obstruct workers' passage.
- It must be large and pleasant with a cleared area, have shade and be well ventilated.
- Preferably located at the entrance of the tents and visible from the low risk (LR) area.
- It is recommended that the views from this area are pleasant and diverse, so that there are distractions for patients.

Shower for discharged patients

(See PART I ANNEX II. Critical challenges and problems)

- The limit between the HR area and the exterior must be clearly signposted on the ground.
- It is recommended, after the shower, that the recovered patients go directly outside of the centre or to a convalescent area and not to the LR area.

Direct access of confirmed in ambulances (PTP)

(See PART I ANNEX II. Critical challenges and problems)

- Plan a direct entrance for access of confirmed patients.

Morgue

- Consider three areas: store, screening and handover areas.
- It should be out of the sight of workers and patients in the centre.
- The place should be large enough to store, handle and transport the bodies.
- It has to be protected and closed off to avoid bodies being stolen or animals entering, but always guaranteeing ventilation and natural lighting.
- The door must be opened and closed securely and easily at all times.
- The morgue must be visible for the community and visitors to avoid rumors regarding the management of the bodies.
- The morgue's waiting area should be equipped with shadow for family and handover.

Figure 1: Window in the wall for families (families can recognize their relatives through windows or Plexiglas screens).

Washing Slab

The washing slab is the place where the body is washed and prepared before its exit from the centre. It must have the following characteristics:

- Easy access is needed to all sides of its perimeter.
- After being used it must be disinfected. This is the reason why it is enclosed and not excessively large.
- It is recommended that it is kept under shade as the personnel will be working in PPE.
- Located near the perimeter fence to facilitate the view for families or photographic registration if needed.

Transfer of deceased patients

(See PART I ANNEX II. Critical challenges and problems)

The area where the deceased person is delivered to the team that is going to proceed with the burial.

Clean and dirty points

- Define points for dirty equipment waiting to be washed and for storing clean equipment and products for cleaning, as well areas as for drying equipment.

Log storage

- Storage of some tools or specific materials from the HR area.

Maternity

(See PART I ANNEX III. Innovations and adaptations)

On what concerns the maternity ward, it is recommended to have a place with better comfort and good drainage.

Undressing area

- Must be as open as possible and ventilated to remove any concentration of chlorine gas in the atmosphere. Do not locate in a windy location as critical incidents of clothing and material can easily fly around.
- The floor has to be easy to clean.
- Separate the different lines of exit with screens to avoid splashes.
- It is recommended to have a different point of undressing connected with each area of HR.
- The limit of the HR and LR areas will be clearly delineated on the ground.
- Provide shade for people who are waiting to enter the un-dressing area.

Figure 2: The undressing area has to be open and wide enough for ventilation and movement.

LOW RISK AREA

Personnel access

- It should be separated from the patients' access, with two differentiated flows at any given moment. If big crowds of visitors/family members are expected it is better to have a different access for them for crowd and infection control and avoid the danger of being in contact with high risk contacts.
- It should be of ample proportions because it is a place for meeting, waiting and possible overcrowding of people at certain hours.
- It is recommended to have only one access point to the LR area, because the existence of different access points can complicate the flow of people and infection control.

Access control point for LR area

- It must have good visibility so that the guard can control the whole area from his position.
- Access must be well protected and clear so that everyone with access is controlled and may not access the area without being disinfected.

Laundry

- Anticipate a large space for drying, both covered (anticipating rain) and uncovered.
- Recommended location is near the exit of the Undressing Area where gloves, goggles and aprons can be left by the changing rooms.

- Regarding the quantity of water used, special attention should be given to determine drainage dimensions.
- Appropriate drainage must be anticipated for individual wastewater and the use of washing machines and dryers, which need to intake water.
- A concrete sloped floor is recommended for fast water-drainage that avoids pools of water from gathering.
- It´s recommended to use industrial-sized washing and drying machines.
- Some problems can appear with the washing machines when they are in contact with chlorine.
- It is recommended to have a double system: using washing machines and traditional laundry methods.
- Clothes dryers are highly useful in the rainy season.

Figure 3: Image 1 - Traditional laundry, high washing platforms ensure minimal back pain.

Figure 4: Washing and drying machines

Figure 5: Some system for drying boots and gloves consume a lot of space and should be optimized.

Drink storage

- Place for storage and refrigeration of cold drinks for personnel and patients.
- Packs or bottles of water occupy a large space and are heavy.
- Consumption can be very high, and the replenishment of drinks must be made easy from outside of the LR area, as it is normally done daily.
- Should be situated near the exit of the Undressing Area and close to the personnel rest area.
- The use of taps at drinking water stands can be unsafe due to limited possibility of decontamination of tap between users.

Offices

- There are usually different work groups, each one needs its own space: medical personnel, psychosocial team, infection prevention and control team, etc. Although they are independent.
- It is recommended that the different offices be close together and connected.
- The design and relation between offices have a big impact on the relationship between teams.

Coordination point

- To prepare a place for meetings and organising the work of personnel.
- A place visually well situated to the other parts of the centre; a nerve centre for the meeting area.
- A place where the personal can spend periods of time; it should be comfortable and cool.
- Direct visual contact with the LR and HR areas, and Dressing and Undressing Areas is recommended.
- It should be a large area where it is possible to have large group meetings together.

Pharmacy

- This must be a well-ventilated and cool place (Max. 22ºC) to avoid deterioration of medicines.
- It´s recommended that it is located near the medicine store.
- Making a window through which drugs can be dispensed is recommended. It must be able to completely and securely close.

LR area latrine

- Latrines for use by personnel in the LR area.
- There could be a large number of people working.

LIVING AND LOGISTICAL AREAS

Personnel rest area

- It is recommended to have a place where personnel may rest and can meet together or find some privacy if needed.
- This place must be pleasant and should be an area secluded from the outside to accommodate different moods when privacy or disconnection is needed.
- Different places can be arranged, with different atmospheres or sizes so that different options exist. Sometimes it is sufficient to arrange a bench in a pleasant place.
- Showers in case the personnel need to wash up should be considered.

Lunch area

- A Lunch area is needed for staff, but the final decision depends on how lunch is organized on the mission; either way, it is recommended to keep some free space in the living area for lunch.

Authorised visitors

- A special place for visitors who need to approach to the LR and HR areas without having to physically access them (health personal, technicians, journalists, VIP visits, etc.).
- It must guarantee good visibility to the LR and HR areas. It has to be clearly marked.

Parking

- There can sometimes be many cars, which must not mix with the ambulances. It is necessary to anticipate the arrival of motorbikes and buses.
- Prepare the land to avoid the area becoming muddy.
- Separate cars with suspect cases and places for other cars.

Paediatric observation unit (POU)

- A place where the children without relatives, or whose parents are ill, are taken care of while another option is found.
- Its operation is governed by the protocols.
- Areas will be provided for sleeping and games.
- To be in a place easily controllable from the HR area.

Convalescent area

- Area of care for recovered Ebola patients, who need care before leaving the centre.
- Is very important to create a good place for them, most of them are alone and weak, and they lost many family members. A good proposal is to have a big table for conversing over lunch or games.

Stays and visits

- A place where relatives and visitors can come to see and speak with the patients.
- Sometimes, the relatives come from far away and they spend the whole day, which is why it is necessary to anticipate long stays.
- It is necessary to anticipate the visits of spiritual leaders who carry out rites or ceremonies.
- Arrangements will be made so that the visitors can have visual contact with all the areas where patients may be.
- A place with protection from sun and rain must be prepared so that relatives can be comfortable while near the patients.

Reception for companions

- It is recommended to consider a place where people who arrive with patients can rest and be taken care of while waiting for visual contact with the patients.
- Access to showers for companions who have had close contact with patients during the transportation phase should be considered as they have been subjected to the virus. New clothes should also be provided.

Psychosocial care and promotion of hygiene

- Workers carrying out activities in Psycho-social Care and the Promotion of Hygiene need spaces and rooms to undertake their activities; not only the more administrative parts, which can occur in office areas, but other activities, the location of which will depend on the requirements of the team.

Figure 6: Helipad in the ETC

PHYSICAL-TECHNICAL ANALYSIS

PHYSICAL INFRASTRUCTURE

Fencing

- The fence has to allow visual contact at all times, to guarantee security and good operation.
- It has to be double, having a minimum separation following the protocols.

Shade

- Areas of shade are necessary for solar protection and protection against rain, especially in the HR area, where the PPE suit is used and in the patient transfer points (PTP), as PPE is usually worn here for prolonged periods of time.
- All the rounds with PPE should be made under shelter.
- It is especially recommended to provide shade in the areas for patients and relatives.
- It is recommended that the shade structures are high (more than 3 metres) to avoid radiant heat on the head, and have a shape that improves ventilation.

Equipment

- As much as possible, the equipment has to be chosen considering its maintenance needs and the simplicity of which it can be cleaned, as well as its disinfection or elimination in the case of dismantling the centre.
- Elements with sharp edges or points that could damage or break the PPE must be avoided.

Figure 7: Different types of beds; sometimes the distance is not safe for staff to carry out their work

Figure 8: Different types of beds.

Decoration

- Decorating the ETC with murals, made by local artists, or decorating some of the areas could contribute to making the centre a more pleasant place.

TECHNICAL INFRASTRUCTURE

The installations must be easily inspected. As much as possible, passage to the installations through the HR area should be avoided.

Water storage, treatment and control

- It must be in a visible and secure place.
- Must be accessible for possible supply by trucks.
- It must have sufficient space for manoeuvring, and expansion if necessary.
- The materials have to be acquired as a whole; avoid using a mix of different suppliers that could generate problems regarding fit and measurements.
- Metallic pieces should be avoided, as contact with chlorine will produce corrosion problems.
- All the elements of the system should be colour coded with the criterion: 0.5%, 0.05%, Safe Water (0.3 – 0.4 mg/L) and Untreated Water.
- The installation can be made in PVC or POLYETHYLENE, both materials have advantages and disadvantages. Making the system in PVC is recommended, since the joints and the handling are simpler.
- It is fundamental to regulate the outflow, as badly determined sizing will result in water waste, which includes possible undesired puddling and chlorine waste.
- The use of ball valves is recommended as opposed to gate valves.
- It is recommended to leave the instructions necessary for the use and maintenance of the installation, as well as its diagrams.
- For small centres that remain open a short time (few transmission chains/small cluster of cases) big constructions are not necessary. Filling of water tanks by hand as opposed to the centralised pipe system is acceptable.

Figure 9: Providing a mix of buckets and taps is the best solution for water points

Supply point

- The supply point should be sought, and the water quality should be analysed, together with its flow and pressure.
- If the supply point is shared with other users, sustainable consumption must be kept in mind.
- Possible variations in the supply should be anticipated during the rainy and dry seasons.
- It should be reviewed periodically to ensure it is in a good state.

Reserves and chlorination area

- The storage should be set at an appropriate height to guarantee pressure in the system.
- The system should be arranged so that the filling, draining and chlorination processes can be easily controlled from the same point.
- Overflows and a draining system should be designed to enable cleaning the tanks if necessary.
- There should be a water reserve for at least 48/72 hours to guarantee the water supply for the hospital.
- The system should be designed to avoid mixing problems between flows with different degrees of chlorination.

- Supply by tankers should be anticipated as a security system. Pressure pumps should be planned, whenever sufficient gravity pressure is not guaranteed, to assure a minimum flow in all the distribution water points.

Distribution lines

- Three independent water lines are recommended, according to the different degrees of chlorination: 0.5%, 0.05%, SW. They have to be differentiated and indicated throughout their lines with the colour coding system.
- The ring design is recommended, facilitating cutting supply by sections, to make repairs.
- To facilitate the control and maintenance of the lines, they should not be buried. Where they have to be buried, do so at a minimum of 40 cm deep and make inspection boxes for valves and critical points. In case of the passage of vehicles, consider the use of conduit or stronger pass-tubes at the drive-over points.

Figure 10: Three types of taps with concrete, a poor design for maintenance.

Figure 11: Different supports for securing taps

Water points

- It is recommended to do a mixed system with taps and buckets.
- Opening and closing the taps must be simple and made without effort, taking into account their use by patients and children.
- Each water point must be well differentiated. The number and location will depend on protocols.
- It´s recommendable to use colour coding: 0.5% red colour - 0.05% yellow colour - SW green colour.

Water supply

- Prepare a criteria for the estimation of water and chlorine, by bed and by surface (m2).
- Designed to have the chlorine solution preparation centralized in one area on the LR, and distribute it to the HR.
- In emergencies, chlorine solutions can be prepared in situ for both LR and HR.
- It is recommended that, if possible, the pipelines and tanks for solutions are doubled (2 x 0,5% and 2 for 0,05%), to ensure its provision if maintenance on taps, lines and tanks must be done.
- Assume water network will be extended and build accordingly so that work is reduced in HR zone.

- For the calculation of flow at the points, it is necessary to consider that the 0.5% points are generally taps for filling of bottles or buckets, whereas the 0.05% and SW water points are generally for washing.
- The number of points will always depend on the protocols and the use of each area.
- Chlorination station could be composed by 6 tanks (the size could vary depending on the demand from 1m3 to 5m3) to do batch chlorination for the 3 lines (0.5%, 0.05% and safe water). If possible, use gravity systems, which are less vulnerable than pumping. Another option is the use of booster pumps, which was used in many of the MSF ETCs.

Chlorine storage

- Place for the storage of chlorine.
- It must be dry and ventilated. Follow the storage criteria according to specific protocols.
- Must be as close as possible to the chlorination point.

SANITATION AND HYGIENE

Latrines

- The latrines must be separated from the showers in both the HR and LR area.
- Men and women should have separate facilities.
- These should be spacious and of the spiral type to avoid doors.
- The finish of the walls and floors must guarantee their cleaning.
- Their design must avoid superfluous elements and cracks or discontinuities that make cleaning difficult.
- The VIP design is recommended.
- The slab will be prefabricated, plastic or of concrete poured in situ with a fine pore finish.
- The proportions should have sufficient depth so that they do not fill during the time that the centre is open.
- In case of problems with the water table, use buckets.
- Preferably do not use existing structures. Flushing toilets should be avoided also because they will eventually block, unblocking them is a risky operation.
- However, if there is no choice and flushing toilets have to be used in urban areas they may require regular flushing with 0,5% and emptying of septic tanks. Chlorine will interfere with the decomposition in the pits.
- Squatting is better than sitting to avoid cross contamination between suspect patients. Seating is preferable for weak patients, but very difficult to disinfect between uses. Therefore, for weaker patients, handles to provide hand-support can be advisable.

Figure 12: When water tables are high, elevated latrines are used which is more complicated for patients

Showers

- They must be spacious.
- Men and women should have separate facilities.
- Their design must avoid elements that are superfluous or that make cleaning difficult.
- The shower water should be SW and enter in direct contact with the bodies of the patients, which is why the water is considered contaminated after the shower. It should be held in a filtration pit in the same shower.
- These should be spacious and of the spiral type to avoid doors. The showers are anticipated to be spacious enough for fitting a stretcher in the interior.

Vomit pits

(See PART I ANNEX III. Innovations and adaptations)

Drainage

- Two networks should be differentiated: Network for the drainage of water from uncontaminated areas and rainwater, and Network for the drainage of water from contaminated areas: HR area, patient transfer areas, and decontamination areas such as the un-dressing Area. This second network must empty into filtration pits.

- Possible torrential rains must be taken into account when determining the proportions of drainage and pits.
- The slope of the land should be considered in its design. The execution should ensure that the challenging does not collapse. If the land can be easily washed away, the ditch should be consolidated by means of a bed of mortar or the construction of collectors.
- The conduits will preferably be open to facilitate execution and cleaning.
- A minimum gradient of 1% in all the run. The shortest possible route is recommended.
- The outlet of the drainage should end in a controlled area, to avoid water coming out from the ETC into the community.
- Closed systems for bio-safety and also for acceptance by neighbours/ community
- If time and conditions allow, foresee runoff direction and improve the area to drain correctly.
- Keep rainwater from flooding latrine and waste pits.
- Drains around them are important, and so is roofing to minimize the amount of water going in.
- Use criteria coloured bins for waste only and translucent bins for hand washing points.
- The plastic footpaths have to be well designed and not slippery on the surface.

Figure 13: The footpath needs to be big enough and not slippery, especially when staff use stretchers (morgue)

I

Figure 14: During the rainy season the draining channels can be full of water

Filtration pits

- To avoid the outlet of contaminated or very chlorinated water beyond the area of activity, various large sized filtration pits will be made, into which the contaminated water drains will discharge.
- The drainage capacity of the pits depends on the type of soil, which is why a test should be made to determine the absorption capacity of the pit.
- They should be filled with different sized stones and gravel to prevent their collapse. They should be well-marked or covered to avoid slipping or accidents.

Waste management area

(See PART I ANNEX II. Critical challenges and problems)

Vector control

- In general, mosquito nets are avoided due to medical and bio-safety reasons. Confused patients might get strangled with them. However, in specific circumstances, mosquito nets on beds may be allowed.

Electricity and lighting

- The supply is generally made with generators. In case of the possibility of supply by means of the local network, the generators should be installed as an auxiliary system.
- The generators and electrical boards should be centralised to facilitate their control.
- The different circuits should be independent, especially those specific to the HR area that will have independent power and lighting circuits.
- The exterior perimeter fence must be lit.
- The HR area should be lit from the LR area whenever possible, and its switches should always be controlled from low-risk areas.
- The generators can produce noise that can interfere with the patients' rest and the centre's communication.
- A quiet generator model should be chosen, or if not, a location should be chosen to avoid possible annoyance, and the area could be soundproofed if necessary with simple systems such as the piling up of sacks of earth.
- The electricity network should be laid out in such a way that it does not interfere with the water network, and that it can be manipulated, or have elements replaced, easily in case of breakdown.
- The use of LED lamps for the exterior is recommended.
- The electrical system should be aerial; in case it goes underground, it should be protected with pass-tube to a minimum depth of 20 cm, and to 40 cm at drive-over points.
- Lighting in the patient area should be adapted so that it is sufficient during the night, but also guarantees an atmosphere suitable for rest and privacy.
- Many electrical points (fuses and lights) are spoiled after disinfection processes; it´s recommended to make protected points for the water.

Telecommunications

- Data, TV and radio systems should be anticipated.
- Radios are needed for communication between senior personnel and security personnel, as well as for communication of the technical team.
- One Walkie Talkie per work area is recommended, plus extra equipment for the different people in charge. With centralized battery recharging in the office areas.
- A system of communication for the ambulances is necessary, and communications with other locations of the mission and with the nearby health centres should be considered.
- The possibility of having television or projection cinema for the patients is recommended.
- Communications should be ensured between the LR and HR areas.
- The installation of a loudspeaker system for notifications and piped music or radio is recommended.
- It is also highly recommendable for the technical team to have radio communication during the construction phase.

Use GPS location points before the construction

(See PART I ANNEX II. Critical challenges and problems)

Fires

- Fire training should be provided to the personnel, especially to the security and maintenance personnel.
- The waste burning area should be sited far from any other structure and especially that used for diesel storage.
- The evacuation route should be sign-posted.
- ABC Powder extinguishers should be housed in tents, stores and offices.
- CO2 extinguishers should be housed in the area of the generators and electrical boards.
- In terms of fire safety, fire extinguishers should be part of the kit as well as smoke alarms.

Figure 15: Fire extinguisher has to be secure properly in visible places

Adaptation to site design

- Each time there is a need/suggestion to change the prerequisites, discuss this suggestion within the whole emergency team (incl. fieldco/medics), informing everybody about the impact on the deadline.
- Changes in the plan should be discussed with all team members because changes have consequences on following construction activities.

Material and tools resources

- Cyclone fencing is recommended for greater durability and some security even though it may be less acceptable in its perception (Bo ETC being called “Guantanamo”)
- Raffia can be used to create shade, making a double cover or making cool closures.
- Wooden structures and materials should be covered with plastic material so that it can be washed and be disinfected.

Machinery

- For good quality concrete, a petrol cement mixer.
- Optional and depending on the soil, a small excavator.
- Good, high quality power tools (grinder, circular saw, staple gun) are essential.

Figure 16: Big areas need specific machinery and tools to mark the place in blue print

Structures

- **Modularization** is recommended for construction in the case of structures, with the purpose of standardizing the construction process with the accomplishment of trusses and porches in situ.
- The structure has to be strongly secured to protect against the **strong winds**. In different situations, 'party tents' to cover the footpaths were destroyed.

Figure 17: To avoid weak solutions, mix different metals and try welding. Assemble the structure properly, carefully combining the metals.

Phases (open centre, maintenance, hibernation, decommission, dismantlement)

- The protocols and methods of action in the management of the closure, disinfection, reuse and dismantling of the facilities should be defined.
- A description and analysis of the facilities to be disinfected, reused or dismantled should be defined.
- Special attention should be given to the treatment and management of the technical elements, such as the water installation (tanks, pipes, valves, etc.), or that of electricity (generators, light bulbs, wiring, etc.), since their recovery is possible to a high degree, whenever undertaken by specialized personnel and following the security protocols to avoid contamination.
- Security and control during the dismantling are fundamental, since acts of looting or theft could occur that can represent a high risk of contagion.
- The environmental impact on the area should be addressed, proposing regeneration measures if possible.
- The stigmatization of the site will always be a possibility, which is why activities must be defined to minimize it.
- Leave protocols and plan for dismantling when the ETC is handed over to another organization or MOH. Ensure knowledge and capacities of the actor for the dismantling.

Planning / time

- Aspects that have impact on the planning: Lack of HR in key positions / the extremely low level of skills of the national workers / mechanical breakdowns (concrete mixer, grader…) / full rainy season / time needed -once construction was ready- for cleaning buildings, site, and spraying inside the structures.
- Very important to do a realistic chronogram and communicate the chronogram to the whole team and clarify the lack of HR and its effect on the chronogram.

ANALYSIS OF THE EXPERIENCE

- A proposal was to organise a kind of "guided tour" in and around the ETC with important local stakeholders (like members of the council, important suppliers and contractors (who helped with the construction), local chief (s), pastor, imam, women's/youth representative of the village, etc.).
- A 'guided tour' inside the ETC (low risk zone, visitors' area, etc.) would certainly help to:
    - Make the ETC more open and visible.
    - Win the confidence of (important stakeholders within) the community. They in turn can help to improve public confidence in the ETCs (and convince them to come to the ETC or holding centre as soon as they show symptoms, instead of hiding)

      Lessen the stigmatization of the ETC-staff and of the patients and the discharged (who need to go back to their community).

HUMAN RESOURCES AND ORGANIGRAM

- Add a night shift to work faster.
- The design has to be as simple as possible, due to the local workers' very low level of skills.
- Put in place a 'hierarchical' structure for construction supervision.
- Distribute a set of minimum equipment (gloves, boots and protective glasses for some people) from the start of the project and not after some days have gone by.
- On average, local staff were used during peak periods, in some situations more than 400 hundred at a time.
- Sometimes the amount of staff was too large to manage effectively. This put too much pressure on the few skilled staff and supervisors.
- Employ or borrow staff from other projects, such as experienced national staff to manage such a large workforce.
- Keep workers from the construction team to work in maintenance (plumbers, electricians, carpenters, masons and labours), once the centre is open. They can be part of the technical maintenance team or any other position as their knowledge of the setup is valuable.
- The way the construction work is managed (recruitment process, relations with leaders and contractors, institutional relations, etc.) is crucial and can positively or negatively affect the rest of the operation.
- A major security issue came from lots of people on-site asking for a job. Fencing the compound and hiring some respected community leaders as 'crowd control' increased the security. It is recommended to do that again.

Figure 18: It is fundamental to guarantee good lighting at the construction site, for security and for possible night work.

Figure 18: Security and safety conditions can be improved with equipment and control in the workplace.

Stockholm Evaluation Unit
Médecins Sans Frontières
http://evaluation.msf.org