International Committee of the Red Cross,
ICRC

Architectural notice

Pre-qualification questionnaire for the construction
of a Physical Rehabilitation Centre
in Lashkar Gah (Helmand province, Afghanistan)

November 2020
Contents
1. BACKGROUND ................................................................................................................................. 3
2. DESIGN CONCEPT .......................................................................................................................... 4
3. CIVIL ENGINEERING ASPECTS ....................................................................................................... 10
4. STRUCTURAL ENGINEERING .......................................................................................................... 11
5. MECHANICAL ENGINEERING ......................................................................................................... 11
6. PLUMBING ..................................................................................................................................... 14
1. BACKGROUND

1.1. Project component

The International Committee of the Red Cross is an independent, neutral organization ensuring humanitarian protection and assistance for victims of war and other situations of violence.

In 2019, the ICRC has signed a Memorandum of Understanding with the Ministry of Public Health of the Government of the Islamic Republic of Afghanistan (MoPH) allowing the ICRC the use of a piece of land located in Lashkar Gah to build, equip and manage a Physical Rehabilitation Centre (PRC).

The area of the plot is 6,045 sqm and is adjacent to the PRT road continuing north to the D1 area. This plot will host a new PRC, replacing an existing centre which does not fulfill the current needs of ICRC activities. According to the Design studies, the Total Floor Area will be approximately 3,387 sqm, capable of hosting 90 staff members, 60 beds for in-patients and approximately 255 out-patients and caretakers a day.

The central point of the plot of land is geographically defined by (coordinates in decimal degrees): Latitude (X): 31.6020610 and Longitude (Y): 64.3695340. The coordinates in grades: 31°36'07.4"N 64°22'10.3"E. The altitude is ±787 m.

The PRC plot is located within a greater masterplan of the LAK municipality, which will cover a surface of 38,872 m2. Indeed, east of the future PRC plot, several medical facilities and institutions are implemented or will be built in the future.

West of the PRC plot is located one of the three main access roads into LAK city connected to the general “Afghan ring road”. It is the only road continuing up north to the D1 area, to the Mukthar area/IDP camp and to the Helmand river, located approximately 1.5km from the plot.

On this 40 meters-wide paved road, a roundabout is planned by LAK municipality but not built yet. North of the plot, a main access road is planned and is currently under construction. East of the plot, a secondary road is existing. It is a dead-end and only leads to the future PRC and institutional buildings.

In conclusion, during the implementation period, the construction works might need to deal with adjacent ongoing constructions.
2. DESIGN CONCEPT

According to ICRC guidelines, the Lashkar Gah PRC is in a “moderate” seismic hazard zone. Therefore, all buildings need to consider all possible loads regarding earthquake resistance; in addition to wind loads coming from South-West.

The centre is designed to be a standalone facility regarding electricity and water needs. In case Lashar Gah municipality provides the site with constant electrical power and drinking water, the design will need to allow the junction with municipality services in a near future.

All buildings will need to be accessible to a disabled population. All design options are compiling with the following code: “ISO 21542:2011 – Building construction – Accessibility and usability of the built environment”.

2.1. Architectural program

The facility is composed of ten (10) buildings: Administrative department, Physiotherapy departments (woman and man), Prosthetic and Orthotic department, Dormitories (women and men), toilet blocks, main store, basketball court and a service area with electrical, water and solid waste installations. Each sector corresponds to one specific use.

All buildings are designed as ground floor construction; except the basketball court which is a higher type of building for sports reasons.

<table>
<thead>
<tr>
<th>Department</th>
<th>Area (NFA in sqm)*</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Administration</td>
<td>550,5 m²</td>
<td>Security airlocks, administration offices, guard room, changing room for staff, toilets, kitchen.</td>
</tr>
<tr>
<td>Clinic area</td>
<td>153 m²</td>
<td>Waiting room, archive room, pharmacy.</td>
</tr>
<tr>
<td>Prosthetic and Orthotic</td>
<td>354 m²</td>
<td>Plaster room, casting room, thermoforming room, machine room.</td>
</tr>
<tr>
<td>Physiotherapy Woman</td>
<td>185,3 m²</td>
<td>Physiotherapy exercise room, dressing room, cerebral palsy.</td>
</tr>
<tr>
<td>Physiotherapy Man</td>
<td>211,9 m²</td>
<td>Physiotherapy exercise room, dressing room.</td>
</tr>
<tr>
<td>Kindergarten</td>
<td>13,6 m²</td>
<td>Kindergarten room</td>
</tr>
<tr>
<td>Dormitory Woman</td>
<td>124,7 m²</td>
<td>Paraplegic dormitory, non-paraplegic dormitory, bathrooms, dining room woman.</td>
</tr>
<tr>
<td>Dormitory Man</td>
<td>240,9 m²</td>
<td>Paraplegic dormitory, non-paraplegic dormitory, bathrooms, dining room man.</td>
</tr>
<tr>
<td>Service area</td>
<td>362,3 m²</td>
<td>Generators shelter, fuel tanks, water tower, water treatment room, main store, laundry.</td>
</tr>
<tr>
<td>Sports court</td>
<td>770,6 m²</td>
<td>Basketball court, storage room, changing room, toilet, crowd stands.</td>
</tr>
<tr>
<td>TOTAL NET FLOOR AREA</td>
<td>2966,7 m²</td>
<td>-</td>
</tr>
</tbody>
</table>

*The following Net Floor Area (NFA) can vary according to future modifications. The above table gives indications.
The center has 2 different access. The main entrance dedicated to patients, caretakers and staff is located on the 40 meters wide road (west of the plot). It is composed of a vehicle security airlock and two pedestrian security airlocks (women and men). The secondary access (service entrance) is located on the 12 meters wide road (east of the plot). It is composed of a vehicle security airlock. This entrance is dedicated to the technical support and deliveries.

2.2. Architectural organization

The plot is composed of 3 main sections:

- North and North-West = Administration, Medical departments, Kitchen/dining rooms, Dormitories, Kindergarten and Toilet block;

The PRC design considers the local architecture patterns by designing low-rise buildings made of concrete and brick outdoor finishing. The structural option selected is RCC columns/beams for all buildings; except the basketball court designed as a metallic structure which allows greater structural flexibility.

Buildings are fragmented into independent units without physical connections to create outdoor spaces for patients to practice during their recovery period and caretakers to enjoy a friendly environment. To create shade and a clear path from the main entrance to the main medical building of the center, a metallic structure/ pergola is designed to cover a part of the pedestrian walkways.

A second larger pergola structure is designed between the Physiotherapy Man Department and the Dormitory Man department allowing paraplegic patients’ beds to be moved outside during the day so they enjoy outdoor spaces.

- North-East = Sports court and its services;

This sports center, built in a steel structure and with a horizontal pergola at its entrance, will dialogue with the rest of the PRC by creating a uniformed architectural bias.

- South = Technical support (water treatment, generator, fuel tanks, solid waste management).

This PRC is designed as a standalone center regarding water and electricity supplies.

A borehole will be drilled, a reduced water treatment room and a water tower capable of storing 2 days of water will be implemented on site. Drinking water (hot and/or cold) will supplied in every building of the PRC.

Generators, fuel tanks and all electrical services will be implemented in the Technical section to supply 24 hours/7 days a week the PRC. The generators’ building is designed to reduce noise disturbance for the PRC neighbors and with proper ventilation to avoid overheating. A Transformer room is planned and dedicated to a future transformer once the PRC can be connected to the LAK municipality power. No date planned yet.

Internal corridors of buildings need to be designed to facilitate natural cooling, ventilation and allowing daylight to enter. For this purpose, different roof heights with opening for natural ventilation and natural light have been studied in the Concept Design and need to be developed by the Consultant to find the best combination.
Please find below a few pictures of the PRC land, taken on July 17th, 2019:

Main entrance, boundary wall and existing borehole

Existing Hescos and mound of soil to be removed

Existing arch and brick wall to be dismantled

View of the institutional office, south of the plot

### 2.3. Passive cooling and ventilation

The insulation of the building envelope is part of the total concept of passive cooling, by preventing heat from entering the building. The passive concept also includes removing heat out of the building, which can be done by natural ventilation. When possible, the rooms provide cross ventilation by installing windows on two opposite room facades.

A section of the roof is elevated to create a chimney air suction effect and a wind catcher effect. Indeed, active cooling to cool down the inside air temperature, done by air-conditioning, is also recommended given the large temperature ranges. Not all the different rooms will have to be air-conditioned, but only the necessary functions will be provided with air-conditioning.
2.4. Building envelope

Regarding thermal comfort, the main concern is the large difference of the outside air temperature. The building envelope will have to be able to respond to this and in such should be insulated, to reduce the heat transfer between inside and outside environment.

The local Helmand/LAK building style is a mud house with 100cm thick wall to address the thermal mass of the building. Due to the function of the PRC building and the safety features needed inherent this function, the local style cannot be considered.

On the other hand, the outside walls of the building can be constructed with the use of thermal insulation, as followed, from outside to inside:

- Lower part of finishing layer = cladding bricks up to 90cm height;
- Upper part of the finishing layer = plaster and light colour paint to reflect sunlight in summer time,
- External brick wall: 100mm burnt clay hollow brick
- Thermal insulation/foam: 70mm thickness;
- Internal brick wall: 200mm clay burnt brick
- Inside finishing with plaster/paint and tiles. Possibility to use marble inside the rooms finishing (lower part of the wall) since marble is produced in Helmand province.

Brick cladding will be used in the lower part of the outside façade, as well as in the angles of the buildings, to protect from deterioration since certain patients will use wheelchairs. It will also avoid having mud stains on plaster/paint when it rains.

The outside floor of the building can be constructed as followed, downwards:

- Finishing,
- Screed,
- Waterproof layer,
- Pressure resistant thermal insulation, approx. 10cm,
- PE sheet,
- Screed,
- Reinforced / non-reinforced (depending on the function of the room) concrete slab,
- Ground, because there is no risk of flooding the building does not need to be elevated.

The roof or false ceiling will have to be thermally insulated as well. It is important that the insulation is continuous throughout the different building elements, because interruptions will create thermal bridges. In LAK, expanded polystyrene (EPS) insulation has been used at external party’s construction sites.

Since the brick wall standing on the plot will be demolished to build the PRC buildings, the crushed bricks can be used as a natural insulation on the roof. The bricks of the existing boundary wall to be demolished can also be used to this natural insulation purpose.

Examples of white Helmand marble for inside finishing (lower part of the wall).

Examples of designed lintels below windows’ facades.
Examples of cladding brick samples for the lower part of building’s facades.

Examples of cladding brick samples for the kindergarten (colours or Helmand architectural pattern).

Examples of pergola / shaded structure in walkways.

2.5. Accessibility provisions

The PRC is a centre for People with Disabilities (PwD) and obviously accessibility provisions shall be strongly enforced. A national standard regarding “accessibility” does not exist in Afghanistan, although a small but limited chapter 11 “accessibility” can be found in the Afghan Architectural Code, but this does refer repeatedly to the ICC Building Code. This code does indeed elaborate on the accessibility subject, but ICRC gives preference to the ISO standard 21542 “Building construction – accessibility and usability of the built environment” that will have to be applied.

This international standard is comprehensive and considers benefitting all people, including people with hearing, vision, mobility, cognitive and hidden impairments and people with diversities in age and stature. In the PRC only the provisions in regards of mobility, cognitive and hidden impairments and people with diversities must be applied, nevertheless a building can be optimised to be according the total norm and benefit everyone.
2.6. Passive security installations

The security situation in Helmand Province and Lashkar Gah municipality can be volatile. In addition, some neighbor buildings are sensitive and can be targeted. Therefore, specific passive security measures need to be designed.

The main objective is to secure the patients, family members, visitors and staff members of the PRC and avoiding having people injured because of actions taken on the adjacent road or future roundabout. Therefore, the following installations are planned (non-exhaustive list): boundary wall, vehicle and pedestrian security airlocks at entrances, Hesco walls at specific locations, guard rooms, safe areas, security alarm system, CCTV system, emergency evacuation route.

All around the plot, a perimeter wall needs to be build and the current one to be demolished. The objective of a perimeter wall is to isolate the PRC from its environment threats. A newly implement CCTV system and security alarm system will need to be implemented.

The corridor created between the perimeter wall and the buildings (west, north and east) offers a pathway for the guards’ round and as an escape route in case of intrusion in the PRC. It will also be used for fire protection system, the water distribution system and a part of the power distribution plan.

2.7. Standards and codes

The buildings structure and details must comply with International Building Code (IBC) at best and Afghanistan Building Code at minimum.

3. CIVIL ENGINEERING ASPECTS

It is recommended that the PRC should work as a standalone facility without consuming municipality services; water, sewage, power, etc. In the next chapters it is assumed the PRC is not connected to any municipality services.

3.1. Road design

Within the PRC compound, a road should be constructed by ICRC. The road area should be finished with an asphalt finishing or with concrete tiling, according to availability and cost of materials. The presence of loose gravel must be avoided in order not to having spattering projectiles. The round gravel is not recommended.

The pedestrian path shall be constructed in concrete to welcome patients in wheelchairs. Landscaped areas should be finished in natural compacted soil and adequate trees/greens.

3.2. Storm water collection and disposal

It is advised that storm water is collected from the roofs through vertical drainage pipes draining immediately on the ground, streets, garden and footpath. Because the average monthly rainfall in LAK is low, an open drain along the perimeter of the buildings is not necessary.
3.3. Solid waste management

The aim is to design a standalone facility. Indeed, the solid waste management should be completed on site in the dedicated area of the PRC. At this stage, all wastes will need to be sorted in medical/non medical departments before behind delivered to the dedicated waste management booth. Medical/sharp items, metallic and other type of solid waste will be stored in dedicated booths. Food waste will be stored in a locked booth outside the PRC compound (to be discussed with LAK municipality). A dedicated platform will be installed to clean tools used to deliver wastes (wheelbarrows in particular).

4. STRUCTURAL ENGINEERING

4.1. Geotechnical consideration

LAK environment is considered as a “moderate” earthquake risk zone. Structural design must be in application of this earthquake risk conclusion. Therefore, a column/beam concrete structure was selected with a specific envelope design or the LAK PRC buildings. The basketball court is made of steel structure to allow longer spans.

4.2. Surveys completed

A geotechnical survey, percolation test and a topographical survey were completed.

4.3. Building structure

The PRC land in LAK is in an earthquake “moderate” risk zone. All PRC departments are independent and accessible by outdoor pathways.

To creating shade and a clear pathway orienting people from the main entrance towards the waiting areas, a metallic structure/pergola was designed to cover the pedestrian walkways. A second metallic structure/pergola is foreseen next to the basketball court so paraplegic patients can stay outside. This structure’s pillars can’t have the same foundations as the buildings. It needs to be independent.

East of the plot, the sports court' structure will be built in a steel structure filled with sandwich insulated panels and a steel roof. This structure is light and behaves properly in an earthquake.

5. MECHANICAL ENGINEERING

5.1. Heating system

The main maximum daily temperature in the coldest month, January, in LAK is still 15°C. The heat produced by the sun in wintertime should not be lost and is recommend to be used by accumulation in the thermal mass of the construction to heat up the internal rooms. In contrary the main daily minimum temperature is 0°C, and the coldest night is even -7°C.

All rooms welcoming patients and family members during the night (mainly dormitories) will be equipped with electrical radiators. Offices and small surface rooms will be equipped with split ACs.
All buildings and rooms only used during the daytime (medical rooms) have higher temperature. There is physical activity and a large presence of people in these facilities, which creates an accumulation of heat. Thus, central heating will not be required.

For the sports court, one industrial blower is foreseen. In summer, water coolers will be used to refresh the sports court. These devices will be located on the West façade (main door entrance) or located in the "storage room" of the basketball facility.

In the technical sector of the PRC, no central heating system must be foreseen in the main store. For the guard booths and changing rooms, reverse cycling A-Cs can be foreseen.

5.2. Ventilation

The different rooms occupied by people are organized in a way that almost each room has at least one wall as an outside façade wall. By creating a natural airflow, the inside air temperature and air quality will be improved. In corridor and some specific rooms, the openings on the elevated roof will allow air renewal and ventilation. Wall or ceiling fans can also be used in specific rooms (guard rooms).

Window mounted exhaust fans must be installed in the different bathrooms, the kitchen, the laundry and the stock. In conclusion, in all rooms where the dirt air must be discharged.

The technical sector (generator rooms, fuel tank shelter) are also designed to allow ventilation and avoid overheating.

5.3. Air-conditioning

Given the high temperatures in summer, with very hot days in July (45°C), ideally almost all areas of the centre should be air-conditioned. Nevertheless, having the whole PRC mechanically air-cooled would greatly impact on the power requirements and on the running cost. Therefore, the natural ventilation flow is planned and using the building mass to reduce the inside air temperature is an asset.

Because LAK has a hot and dry climate, a water cooling air system is preferred. The water cooling air system brings in outside air and moisturizes the air, which improves the air quality, has a lower initial investment cost, a lower running cost, a minimal maintenance requirement and lower CO2 emission.

It is advised the rooms which will have a large amount of people hosted during the day and/or a large presence of staff during the day should be equipped with A-C or water cooling air systems. The larger rooms which will host a large amount of people, where an exact room temperature is not required and difficult to measure anyway, should be foreseen of water cooling air system.

The rooms which will host individuals are recommended to be foreseen of a split-unit A-C which can have the exact room temperature required: all the offices and the dormitories. The rooms which should not be foreseen of any mechanical cooling are the sports court, the different stores and the kitchen.

In the sports court, water cooler and cross ventilation by opening the doors will be allowed. The material chosen (insulated sandwich panels) will also be an asset to keep heat away from the inside spaces.

5.4. Compressed Air

Some machinery devices need compressed air. Therefore, an air-compressor should be provided with a network with compressed air fittings for one specific building.
5.5. Electricity supply and distribution

As a reminder, the PRC will be designed as a standalone facility. Since LAK municipality can’t provide reliable electricity, the centre will rely on diesel generators.

To anticipate a future connection to the LAK city power in case the supply becomes continuous and can guaranty its daily delivery, a distribution transformer room needs is planned.

The main power source of the centre is diesel generators. In case, photovoltaic panels are planned in the future, the power distribution grid will need to be easily adapted to this technology.

On weekdays, all departments are welcoming patients, caretakers, staff members and visitors. Meaning, the capacity of the generators needs to cover all departments being active. On week-ends, only a few departments (dormitories, kitchen, basketball court, radio room, guard rooms) are welcoming patients or staff members. Meaning, the capacity of the generators are based on these departments being active, and not all departments.

5.6. Lighting

Each room must be illuminated with satisfactory daylight. Emergency lights will have to be foreseen on exit routes, which are the corridors, and will indicate the exit in the different buildings. The roads, the boundary wall, the gardens and others outside areas around the centre must be illuminated by light fixtures as well.

Passive security measures will need to be considered in coordination with the ICRC.

5.7. Lightning, earthing and bonding

Earth protection and lightning protection will have to be installed. It is advised that the lighting arrester are located on the water tower, because this is the highest point, and is near the water tanks. It is important to foresee correct earthing for the sports court, composed of steel, and for the stock, which host a large amount of electrical equipment. Lightning protection and earthing should be provided in each building.

In addition, surge arresters must be foreseen to protect electrical equipment in power transmission and distribution systems from over-voltage transients caused by external (lightning) or internal (switching) events.

5.8. Communication systems and information technology (IT)

The communication system and information technology will be defined in coordination with the ICRC. Nevertheless, landline and internet access should be provided in the office workstations. Due to the scale of the PRC and to facilitate the internal communication, interphone can be recommended to foresee in every office workstation as well. The location of the server room must be discussed with the ICRC.

5.9. Fire alarm system

It is advised to provide a centralized fire alarm system and fire detection with different sectors. The number of fire alarm bells must be overestimated to have an adapted response for the users with mobility impairments.

Standalone smoke detectors with 10 year-battery should be provided in every room. Fire extinguishers should be provided. Break glass devices should be foreseen on the main corridors in the different buildings.
By providing a control panel located in the guard’s rooms there can be an indication in which sector the alarm has been activated.

A pressurized water firefighting network is designed with a dedicated water reservoir. Fire hose reels are located to cover the entire centre. The firefighting pumps will automatically start when a fire hose valve is open.

The different equipment of the fire alarm system must comply with ICRC standards and the afghan regulation.

6. PLUMBING

6.1. Water demand

The centre water needs is based on ICRC experience and regulations for patients in a PRC.

The gardening of the outdoor areas will be created in a way consumption of water stays very low. LAK is a cold arid desert climate considered as dry and hence has almost no supply of rainwater. The maximum monthly rainfall is 28mm like mentioned earlier in this study.

6.2. Site water supply system and storage

Water supply network in LAK is practically inexistent. Since the public water facilities are not functioning and unreliable, the PRC is designed as a standalone facility in regards of water supply.

A newly drilled borehole is foreseen to provide water to the centre. Once pumped from the borehole, the water is chlorinated and stored in an underground tank and an elevated tower. The technology selected is adapted to the local context, in terms of complexity and the sustainability. Low technology devices is selected in priority.

Only specific rooms will need hot water. Water will be heated thanks to solar heater devices on the roof.

6.3. Waste water collection, treatment and disposal

Regarding waste water collection, the centre is designed as a standalone facility. The site being small and foreseen departments having a large footprint, the wastewater management was a real challenge and special precaution will need to be addressed during phasing and implementation.

A DEWATS was selected as the most efficient system. A baffled reactor and chambers will treat the effluent before it is drained to 2 retention tanks. Every week, the effluent will be pumped and evacuated from the centre. A soakaway pit will be built to avoid overflow in case of problem.

Grease traps are installed in the centre when needed.