

# Maintenance Manual

Project Name

JJJJ

PPPPPPPP

# Maintenance Manual

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## I. Maintenance strategy

JJJJ and Contractor 'PPPPPPPPPP' concentrated its technology, and those buildings were completed. Whenever the building passes the age in the complex of a lot of materials and machines, deterioration and damage are caused. Deterioration and damage can not be avoided but it can be slow and few by a daily check and maintenance, and the building is held off, and can be used for the minimum safely, beautifully, and sanitary. This Maintenance-manual describes the point of the check and maintenance. Please peruse this Maintenance-manual, and please maintain, and check the building according to the content of the description.

This maintenance Manual is mentioned for the maintenance of the buildings of DHQ . For the maintenance of RHC or BHU Plus at Pashto, Rashang, Paimal Sharif and Shumlai, please pick up a necessary item from this Maintenance-manual.

And this maintenance Manual is mentioned for the basic maintenance idea, farther more information especially operation of Building equipment, please read on each Manual.

### 1. Necessity of Maintenance

Deterioration will start from the completion of the building. Specially a life cycle of building equipment such as electric or HVAC equipments are usually said around 15 years.

The longevity of Building and Building equipment can be extended by a premeditated maintenance management plan.

However, there is longevity in the element which composes the building respectively. It is possible to maintain it as complex to keep the function when the building is completed by appropriately changing the element by the check.

### 2. Maintenance matter or Warranty matter

After the Taking-Over of the building **the Defects Liability Period (one year)** will be started. Upon the expiration of **the Defects Liability Period**, Defect will be investigated on each building and it will be judged whether the thing which originates in maintenance of Building User or which originates in the Constructor by Engineer.

Defects are originated by the Contractor shall be repaired by the Contractor according to the inspection of Engineer.

Defects are originated by User's failure or mistake of the maintenance it shall be repaired by Owner.

For instance Damage glass, Damage of insect net of Window or Water leakage from the part without the waterproof etc. such as all damage due to carelessness shall be repaired with User's responsibility.

### 3. Maintenance Job System

The person who takes charge specializing in the operation and maintenance shall be provided so that the building may function as one organics, and the system to make the professional skill person allot for a technical field is necessary. Please refer to the system of

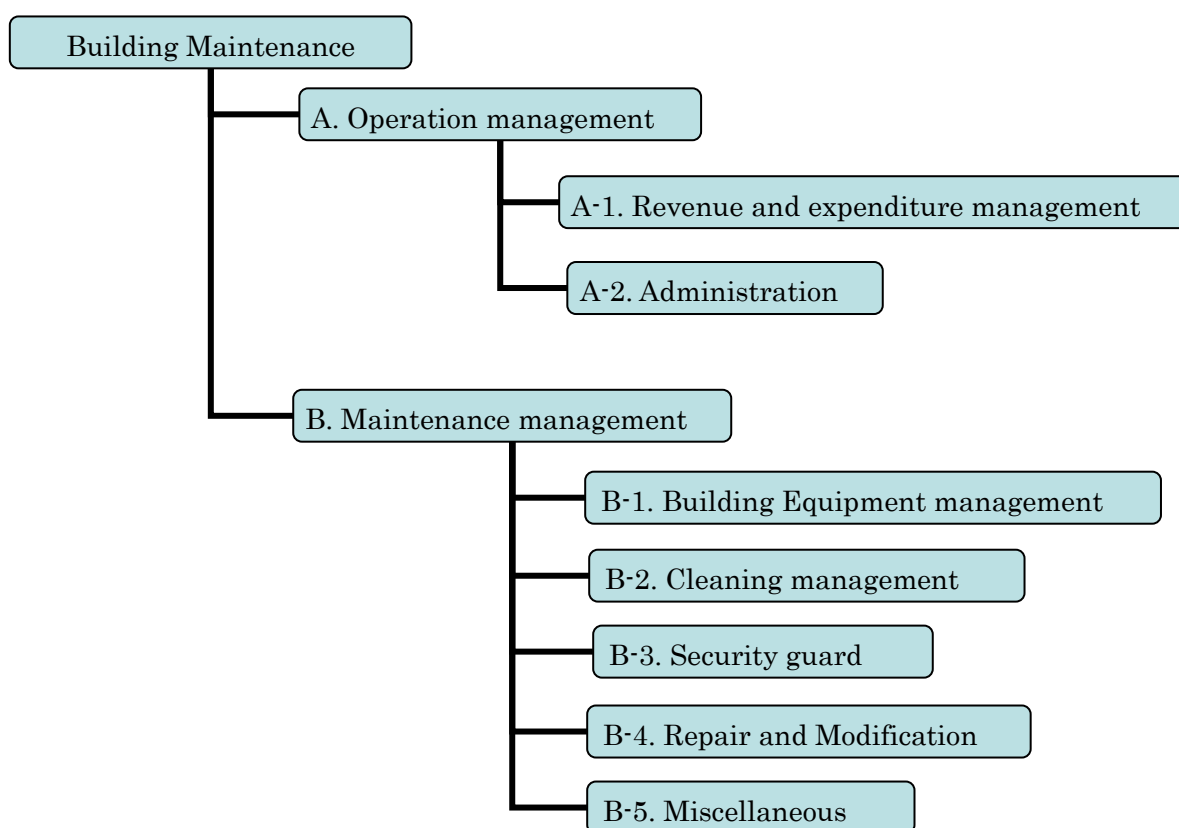
Figure-1 Job System for Building Maintenance.

The hospital governing body and each scale of this Maintenance Job System of GHQ, RHC, and BHU Plus should be united organically.

It is called **Corrective Maintenance** that when abnormality or the breakdown occurs in the building or the machine and is mended. On the other hand, it is called **Preventive Maintenance** to always check, to diagnose, and to do preventive treatment.

Preventive Maintenance has a big effect to extend the life cycle of the building.

**Figure-1 Job System for Building Maintenance**



The organization for Building Maintenance is consisted two parts.

One is Administration part (A. Operation management) which is in charge a businesslike work and the other is Technical part (B. Maintenance management) which is in charge a technical work.

‘A. Operation management’ includes following two kinds of work:

‘A-1. Revenue and expenditure management’ work means as such as following:

- a. Maintenance cost control
- b. Payment of Maintenance cost (Maintenance, Repair, Spear parts, Extension, etc.)
- c. Payment of Energy cost (Electricity, Water, Gas )

‘A-2. Administration’ work means as such as following:

- a. Make Maintenance Contract (Medical Equipment, Elevator, Septic tank, etc.)
- b. Facilities use management (Meeting room scheduling, Parking, etc.)
- c. Fire prevention management

- d. Public relations
- e. Vicinity adjustment
- f. Property management

'B. Maintenance management' includes following five kinds of work:

'B-1. Building Equipment management' work means as such as following:

- a. Operation and Watch of Building Equipment
- b. Regular service (Periodical Check) of Building Equipment
- c. Energy efficiency management

'B-2. Cleaning management' work means as such as following:

- a. Nosocomial infection prevention
- b. Medical waste treatment
- c. General cleaning
- d. General waste treatment
- e. Incinerator operation

'B-3. Security guard'

- a. Disaster prevention watch
- b. Crime prevention
- c. Patrol and Guard

'B-4. Repair and Modification' work

- a. Usage change and extension
- b. Daily small-scale repair and mending

'B-5. Miscellaneous

- a. Extermination of Rat and Noxious insect
- b. Planting management

#### 4. Necessity of Maintenance Contract

Some special jobs of Maintenance shall be ordered to the company which specializes in the work and the contract of the Maintenance shall be made with such Company.

Following the maintenance work need to make the contract for the operation or maintenance.

The septic tank should be cleaned in regularly to maintain and the compressor of the aeration tank of it shall be maintained time to time.

Special machines, for instance, large-scale Medical equipment, Elevator, Boiler or other HVAC equipments shall be maintained regularly for the safety and shall be checked regularly.

Operation of Electric facility needs a specialist having the exclusive knowledge.

#### 5. Contact-address and Chat-channel

In the term of the Defects Liability Period (one year), Contractor's chat-channel is most suitable inquiry window about the maintenance. When you or your maintenance staff has a question, please contact following address or telephone number.

When you contact at the chat-channel (Inquiry service window), your phone will be transferred to an appropriate person in charge who can answer, hear your situation from you and best mode of settlement will be answered. Moreover, he will answer whether originate from the problem of Maintenance or occurred by the time of construction way at this time.

Contact-address list is attached on the end of this manual.

**PPPPPPPP**

**Chat-channel Telephone Number:**

**Address:**

6. Warranty period is a training term of your maintenance staff

Warranty period one year is a good training term of your maintenance staff. Get full information from the Contractor and provide sufficient system for the maintenance which you have to execute by your organization after termination of the warranty period.

## II. Architectural work

### 1. Structure

#### 1-1. Outline of Structure

- The structure of all buildings is made with the frame of the reinforced concrete and the wall made by the hollow block. The building is designed to prevent to be destroyed by a pillar, a beam, and a floor structural material in union against the shake at the earthquake. Therefore, a reinforced concrete part cannot be basically damaged.
- The roof structure is a steel truss. This is an important structural material which installs GI sheet which prevents rain. This can do neither the change nor cutting.
- In general, the loading load of the floor is set with 180kg/m<sup>2</sup> (300kg/m<sup>2</sup> in case of office) for each area of each floor. Please do not exceed this set loading load when you put heavy luggage such as heavy bookshelves and safe on the floor.
- The crack occurs in the building during a big earthquake. This crack is a phenomenon that the building won't be resisted the power of the earthquake, and avoided with the result of preventing the building from collapsing and the generated thing. Please what influence have these cracks must structurally exerted after the earthquake, and do a special investigation.

(Photograph of frame structure and Hollow block wall)

#### 1-2. Notes when fiddling with structure

- The part of the reinforced concrete can not be changed basically.
- The part of the hollow block as a part of the partition between the outside and internal can be removed or an opening can be made by convenience in the



building because it is not basic structure against the earthquake.

### 1-3. Characteristics of Concrete

- Concrete might be dried, shrink, and a minute crack occur. It is very rare that this becomes a constructional problem.
- It reacts with carbon dioxide in air though concrete is alkalinity when time passes, and making to the carbonation from the surface gradually. When moisture is supplied there, rust is generated on a steel bar in reinforced concrete. Because this phenomenon is avoided, the maintenance of the mortar finishing of concrete or painting on the surface and are important.

## 2. Roof

### 2-1. Flat-roof

- Flat-roof covered by Concrete, tile or others material is treated a waterproof by the asphalt roofing. The water leak will be occurred when the asphalt roofing is damaged. So do not damage the floor.

(Photograph of Flat-roof)

- For avoiding the water-leakage from surroundings of a flat-roof, the asphalt roofing raises till the higher level of the roof floor. However, when the cleaning of the roof drain is not done and drain is able not to be done sufficiently, the water leak will occur from surroundings. When the snow collects, the water leak is similarly caused. Clean the roof drain, and remove the snow enough.
- The roof drain shall be checked daily and clean it.

(Photograph of the roof drain)

- The floor of a small terrace or a veranda covered by eaves or shades is protected by the simple waterproof layer called a mortar waterproofing. When this floor is damaged the water leak will occur.

(Photograph of the family veranda)

### 2-2. Pitched-roof

- The roof of most of the buildings are covered by the pitched roof (the sloped roof) made by the galvanizing corrugated steel sheet called GI sheet. This sheet is painted avoiding the rust and the re-painting shall be needed periodically at least once in three years.
- When the thing come flying by the strong wind, and the surface of GI sheet is damaged, the local corrosion is caused. It is necessary to always check.

(Photograph of the Pitched-roof of Casualty)

- This type's roof is a double roof structure except BHU Plus OPD. Under GI sheet roof there is a concrete slab. This slab is consisted with a porcelain tile, an insulation layer and a water proof layer. This space calling an attic is important for making good indoor environment.
- To check whether there is water leak in this space, there is the check entrance in the ceiling of each building. Check this space regularly. The check entrance to this space of Main-building of DHQ is in the machine room of No.1 elevator. See the attached plan of the attic of Main building.

(Photograph of the attic of Pitched-roof of Main building)

3. Exterior Finish

3-1. Exterior-wall

- The finishing material of the exterior wall protects a structure in the building and an internal living environment from a natural condition, and plays a social role to inform of the role of the building outside.
- There is life in the exterior material, and when deterioration is left, the decrease in a social image will be caused, and it enters the state that manager's management ability will be asked. Deterioration will cause a water leakage and a rust of steel-bar in concrete. And, the physical injury by coming off of the exterior material might be caused, and the society's responsibility might be asked to the manager.
- The waterproof longevity of the painting or the spray stucco is thought to be around five years. Maintenance of those materials shall be considered on annual budgeted.
- The exterior finishing shall be checked at least once in a month and such check result shall be recorded.

(Photograph of the exterior wall of Main building)

- Whenever power of the earthquake is transformed into the outside wall, the crack will be caused on the surface of the wall. The occurrence of this crack cannot be avoided. Moreover, the mortar finish might flake off from concrete or the hollow block partially. Investigate the outside wall without fail and confirm the presence of the crack and flaking off after the earthquake. And leave the result for the record.

3-2. Exterior-floor

- The part where rain is hit on the floor and a lot of people pass uses the material

which does not slip easily, however the slipping accident will occur when rain and the snow freeze. (Example: Each building entrance)

- The entrance floor of DHQ is covered by a ceramic tile finish which does not slip easily. However, the percentage of absorption of the ceramic tile is uneven, sometime it is over 3% by the tile, and the surface finish might flake off by freezing. This phenomenon won't be avoided. Please change it when damage is caused.
- The floor finished up by the ceramic tile and terrazzo is damaged and cracks by a heavy thing is dropped or dragged. Handle it very carefully.
- For the handicapped person, the stretcher or the wheelchair user, the level difference between the foot-pass and the road in front of the Main building is adjusted less than 20 mm. Rain water might flow in the building when big luggage is put on the this part. Do not put any obstacles on the road in front of the entrance.

(Photograph of the entrance of Main building)

### 3-3. Stairs, Ladder and Hand-rail

- When the stairs finished up by the marble and terrazzo, etc. are wet, it is slippery and dangerous. In that case, please prohibit traffic or take the treatment such as wiping off.
- As for the stairs handrail and the ladder made by steel, a big accident to drop out will occur when corrosion advances, and the responsibility of the manager who is managing the building will be asked. It is necessary to paint again before such a part is always checked, and rust is generated. Please paint at least in the rate once every three years again.

### 3-4. Miscellaneous

- The leak of electricity corrodes a buried steel pipe. It is called 'corrosion by stray current'. In Pakistan a lot of electric wires are not covered and the utility pole is a steel frame, so it is easy to stray current under the soil. It makes corrosion of many small pin holes on the surface of the pipe in the ground and it courses water leakage. Take watch carefully.
- The sealing material used for surroundings of the glass and the expansion joint etc. is deteriorated by ultraviolet rays, ozone, and by expansion and contraction the temperature change. It is necessary to check every two years - three years, and substitute to construct it when it is deteriorated.
- An exterior ceiling has repeatedly received the load by the wind pressure. As a result, the screw nail which stops the board floats and comes off. Immediately tighten the screw nail when find such a phenomenon, and change the ceiling board when the crack is in the board.

(Photograph of the entrance ceiling of Main building)

#### 4. Interior Finish

##### 4-1. Floor

- It leaks to the under floor when water is poured because the waterproof processing is not given to the floor in general excluding the room where water is used usually as the lavatory and the shower room, etc. The waterproof processing is given as for the room of the tile floor and such floor can be washed by water.

(Photograph of the toilet tile floor of Main building)

- The building of great dimensions is different movement at the earthquake according to the part in the building. There is a seam called the expansion joint to prevent the building being partially destroyed by this different movement.
- Especially, the part of the expansion joint on the floor causes water-leakage to the under floor when a large amount of water is poured. Please clean the floor by the wipe cleaning with the mop.

(Photograph of the floor expansion joint of Main building)

- The floor finished up by the ceramic tile and terrazzo is damaged and cracks by a heavy thing is dropped or dragged. Handle it very carefully.
- The wiring for electricity and calling is laid in the concrete slab. Please consider it enough so as not to damage these wirings when the anchor bolt is driven for fixation of the utensil.
- The surface of the resin tile called P-tile and the length seat is soft, so the thing is dropped or it is dragged, the surface is damaged. Especially, it is necessary to note that it is weak for heat and easily scorched by the cigarette.
- This floor finish material of the kind of is put on the surface of mortar with the adhesive. It peels off, warps, and leaks to the under floor when moisture infiltrates the bonding side. It is necessary to note the usual cleaning method.

##### 4-2. Wall

- A general wall is made by a hollow block wall. When the hardware or apparatuses is installed by a drill anchor in the wall, a big fixed power cannot be expected on a hollow block wall. Therefore, do not fix the heavy load on the hollow block wall.
- The wiring for electricity or calling and the water pipe is laid in the wall. Please consider it enough so as not to damage these wirings when the anchor bolt is driven for fixation of the utensil.
- As a deterioration phenomenon of the mortar layer, small cracks by dry or a

partial flake off by making of mortar acidity will be on the finishing surface. When this phenomenon extends, renovation will be necessary.

- As for painting, various kinds are used by the part used. A usual wall is not washable. It is necessary to repaint it when becoming dirty.
- The washable paint can be washed. In that case, please wash it with the neutral detergent. The painting color might change if a strong medicine is used.
- When you put the thing on the wall with the thumbtack or the tape, the mark will be attached or paint will be peeled off. Note this.

#### 4-3. Ceiling

- Do not use the ceiling grid bar when you hang the thing from the ceiling. The ceiling grid bar is very weak and as a result, unevenness in the ceiling will be caused.
- The acoustic tile can absorb sound and also has the characteristic called to absorb humidity easily. When it absorb a large amount of humidity such as cooking is generated, the transformation and mold will be caused.

(Photograph of the ceiling of acoustic tile of Main building)

(Photograph of the ceiling of Cement board of Main building)

#### 4-4. Dew condensation and Mold

- Dew condensation is caused by following reasons:
  - a. When the indoor humidity is high
  - b. When ventilation is insufficient
  - c. When the difference of the room temperature and the outside temperature is great
  - d. Place where air partially stays easily
- When the dew condensation is generated, it makes discoloration and mold are caused, and the swelling of painting and flaking off of the floor material are caused.
- This phenomenon is generated in any place such as the floor, ceilings, and walls, and it is generated in the wall. The following measures are necessary to prevent this phenomenon.
  - a. The indoor generation of steam is reduced as much as possible. The oil kerosene heater and the propane stove generate a large amount of steam.
  - b. The indoor temperature is not raised more than the necessity.
  - c. Often ventilation shall be done.
- How to distinguish the dew condensation or the water leakage  
The dew condensation is due to the indoor moisture, the water leakage is due to

the outside moisture, and the origin of water is an opposite. It extremely looks like same in the point said that water wet phenomenon will be caused internally in the part touching to the outside. Both can be distinguished by the following phenomenon.

- a. When a detailed drop of water is innumerable attached, it is the dew condensation.
- b. When a certain area is wet, it is the dew condensation.
- c. The wet is seen in summer, it is a water leakage.
- d. The wet is seen immediately after the rainfall, it is a water leakage.

It is necessary to note it for the judgment because it is from piping at the water leak.

- Mold and the dew condensation are in the relation while closely. The temperature, humidity, oxygen, and the nutrient are necessary for the generation of mold. The way to prevent mold is a removing humidity and a keeping dry well state.

## 5. Door and Window

Door & window are parts most frequently used in the building. Power might repeatedly join a closer, the lock, and the hinge, and the screw installing such part will be loose by the repeat operation. Check always such part and close the screw time to time.

### 5-1. Steel Door and frame

- The steel part of a door or a frame will rust according to the deterioration of the paint on the surface on it. So re-paint it periodically.

### 5-2. Aluminium Door and Window

- Because aluminium is oxidized easily, the anodized aluminium processing is given to the surface of the thing which has coloured and the thing which has not coloured.
- Corrosion starts there when this surface film is damaged easily, and damaged. Do not damage it.
- The acidity corrodes the surface of aluminium when it rains acidity. The drop of such water is dry and the acidity rise on the surface of the aluminium, corrosion like the point will be appeared. This phenomenon appears because the anodized aluminium processing on the surface of aluminium is deteriorated. Please wash the surface of aluminium when this phenomenon is seen, spread transparent lacquer, and make the protection skin on the surface of aluminium.

### 5-3. Wooden Door

- The wood door will breathe moisture in and it expands and contracts, and it will be twists such as warps with the passing age. At times the door does not close well. Especially, such a phenomenon occurs easily on the door of the room where the water is used such as the kitchen, the shower room, and lavatories.

- Moreover, if water splashes frequently in the wooden door at the cleaning, the warps are caused easily. When the door does not close well, it is necessary to adjust it.
- All wooden door frames are made by steel for preventing warps. Execute the maintenance of this item as well as the paragraph of the above-mentioned steel door and frame.

#### 5-4. Hardware of Door or Window

- Do not oil the lubricant when the key does not turn smoothly. Shave the pencil lead to make graphite powder, put up the powder in the key hole, and rotate the key several times.
- Oil the lubricant in the operation part of the door regularly such as a closer and the hinge.
- The oil of an overhead door closer might leak by using the repetition. Try to close the cap of the oil jar early when find the gauntlet.

#### 5-5. Glass

- Note that there is a case to crack glass by an internal heat stress of shutting up in the glass when paper is put on the glass or the thing touches the glass.
- The wire glass used in the steel door might sometime crack by the rust of steel wire.

### III. Landscape and Paving

#### 1. Drain

- Water might flow in the building at times when the poor drainage is caused by the fallen leaf and mud, etc. in the drain ditch or catch-basin. Check always, and clean it.
- Check whether grates of the drain ditch and the manhole cover has come off always. It is destroyed by the car, and person's fall accident is caused when coming off.

#### 2. Pavement

- Under the pavement there are many kinds of water pipe or electric pipes are in bedded. When you excavate the pavement, check the location of such pipe prior the work.
- When damage on the surface of the pavement, it will be expanded soon. Check it and try to repair it immediately.

#### 3. Fence and Boundary wall

- Rust and corrosion are caused in fence and Gate by the passing age. Do the cleaning and repainting properly.
- Boundary wall is made by Hollow block reinforced with steel bar. From usual check a crack on the surface of it.

#### IV. Electric Equipment

##### 1. Outline of Electric facility and Notes

- The contractor should not be responsible of any damage or loss to any kind of equipment such as Panels, Lighting Fixtures, Fans, Power Outlets, Pumps, Distribution boards, Air Conditioners and Power Cables due to Fluctuation of Low Voltage and Over Load. The owner will replace the damage things by his own resources. Further, the physical damage done by maintenance staff or other person to any equipment then it will also not be the contractor fault and the owner has to rectify the same.
- The contractor will not be responsible of any loss if some thing happen due to over load. Furthermore, the physical damage done by maintenance staff to any equipment then it will also not be the contractor fault.
- In case of any problem the contractor should be informed through its Chat Cannel Telephone Number.
- Only authorized person/maintenance staff should have keys of Electric Room. The any kind of maintenance of panels should not be allowed until approval of Maintenance Engineer in charge.
- The voltage meter should be monitor regularly. If voltage is very low then it should not work properly and it should be made off.
- All the Panels should be away from any kind of water and should be saved from humidity.

##### 1-1. DHQ

###### 1-1.1. Outline

- The automatic electric system to run the facility has been designed. The Power (11KV) will come to Transformer (1600KVA) and then to Low voltage Panels (LT Panel) and then be distributed to each circuit by Distribution Boards (DB).
- In the case of short circuit, the circuit breakers installed in DB and LT Panels will automatically be operated off to avoid any damage or harm.
- The Power factor improvement panels have been installed to cater for electricity fluctuation/low voltage as APS(Auxiliary Power System)
- The electric system contains complete under ground wiring and above ceiling which has earthing system for safety purpose. Main power cables are run in Trench and over G.I. Cable tray above the false ceiling.
- On/Off switch are installed in each room/area for the lighting fixtures, Fans and Power outs.
- Halogen lights over outer building walls are installed for external lighting.
- A separate Energy Center Building has been constructed where Transformer and Electric Generators are installed in separate rooms.
- Generators are mentioned in the Item of 'VIII. Disaster Prevention and Safety



Equipment’.

#### 1-1.2. Receiving and Transforming facilities

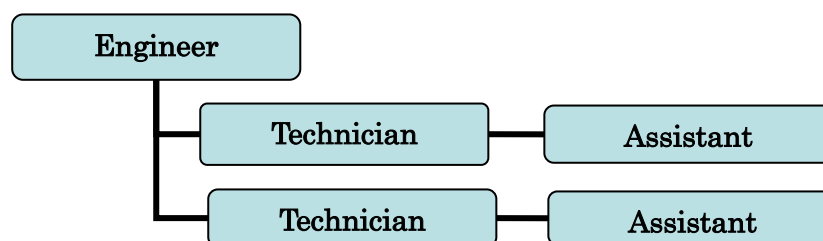
- This transform room is belonging in WAPDA. Only the person having permission from WAPDA can enter in it.
- Contact WAPDA immediately when you feel abnormality of something in this room.

#### 1-1.3. LT Panel room and Electric room

- Electric Room is situated in Main Hospital Building at Ground Floor. This facility has main 2000 amp air circuit breaker to put on/off the all electric supply to the facility. Main LT Panel, Auto Transfer System Panel, Emergency Electric Supply Panel and Power Factor Improvement Panels are also installed in Electric Room.
- Main Power cables supplies are reached to Electric Room through trench and under ground piping. All the Panels should be kept clean and should be avoid from dust.
- All the Panels should be kept clean and should be avoid from dust. In case of maintenance of any panel, the main 2000 amp air circuit breaker should be must off first.
- The maintenance staff is not allowed to touch any thing towards upcoming side i.e supply side/Energy Center Side of said main breaker. After maintenance, it should be assured that there is no any tool left inside which could make short circuit.

#### 1-1.4. Basic Maintenance Organization

The maintenance of this size electric facility needs the specialist having enough knowledge and experience as the chief of Electric room. The maintenance needs following organization.



#### 1-1.5. Other Electric Equipment

- Telephone exchanger is provided for exchanging telephone which the battery is built into. See the manufacture manual for further more information.
- Electric Pumps for HVAC works which are installed above the false ceiling and energy center will be controlled by near D.B.
- Electric Pumps for HVAC works which are installed above the false ceiling and energy center will be controlled by D.B.
- Air conditioners are installed in the rooms which will be controlled by Motor Control Panel.
- Electric Geysers which are installed in the Bath Rooms.
- All these equipment should not be run in case of low voltage. It should be assured that equipment has started the functioning after the pushing button on.

## 1-2. RHC

### 1-2.1. Outline

- The automatic electric system to run the facility has been designed. The Power (11 KV) will come to Transformer (400KVA) and then to LT Panels and then be distributed to each circuit by Distribution Boards.
- In case of any short circuit the circuit breakers installed in DB and LT Panels will automatically off to avoid any damage or harm.
- The electric system contains complete under ground wiring and above ceiling which has earthing system for safety purpose.
- Main power cables are run over G.I. Cable tray above the false ceiling.
- On/Off switch are installed in each room/area for the lighting fixtures, Fans and Power outs.
- Halogen lights over outer building walls are installed for external lighting.
- The maintenance of this size electric facility needs the specialist having enough knowledge and experience as the chief of Electric room. The maintenance needs like as DHQ organization.

### 1-2.2. LT Panel room (Electric room)

- Electric Room is situated in Energy centre. This facility has main 500 amp main breaker to on/off the all electric supply to the facility. Main LT Panel, Auto Transfer System Panel, Emergency Electric Supply are also installed in Electric Room.
- Main Power cables supplies are reached to Electric Room through trench and under ground piping.

### 1-2.3. Other Electric Equipment

- Electric Pumps for HVAC works which are installed above the false ceiling and Boiler room which will be controlled by Distribution board.
- Air conditioners are installed in the rooms which will be controlled by Distribution board.
- Electric Geysers which are installed in the Bath Rooms.

## 1-3. BHU Plus

- The Power (240V) will come through Transformer (25KVA) to the distribution Boards.
- On/Off switch are installed in each room/area for the lighting fixtures, Fans and Power outs.

## V. Plumbing Equipment

### 1. Water Supply System

- Tap water is provided at each site. This tap water system does not have any filtration equipment to remove mud or sand. Because mud and sand collect in the receiving water tank, it is necessary to clean it regularly.
- Do the water-quality tests of tap water and confirm whether appropriate water

can be used for the beverage or to treat of the patient.

- Lock so that the check lid of the receiving water tank may prevent the foreign matter invading or being turned on.

## 2. Hot water Equipment

Individual hot water supply method is taken for all facilities. Electric hot-water heater called Gezer is provided in the medical facility. Its capacity is 8 gallon. In the residence Gezer is not installed but the hot-water pipe line are installed in the kitchen and the shower-room.

## 3. Drainage

- The device called a trap is set up in a floor outlet or various sanitary wares in the building. This intercepts the stink which occurs in the drainpipe by the seal water. Water in the device evaporates when the room or the sanitary ware is not used for a long term and this function does not work. Check the room and apparatus regularly.
- There are three kinds of drains, Sewage drained from the toilet, gray water drained from the kitchen and the shower room and rain water. Gray water and sewage are processed in the septic tank, and drained.
- Gray water contains much oil element, so processing is most difficult water. Do not throw oil as much as possible.
- Dirt adheres when using the drainpipe for a long term and the flow worsens. Check always, and clean in the drain pipe.

## 4. Sanitary ware

- Clean is a basic condition of Hospital. Sanitary ware is used by many persons, so it will be dirty soon. But if it is left as it is, such dirty will spread to other part soon. Cleaning of Sanitary ware is basic action to keep clean in side hospital.
- Do not use detergent containing chlorine or hydrochloric acid for the cleaning of sanitary ware. It will damage the drain pipe.
- Packing of faucet, the shower hose, and the hose of toilet shower etc. are articles of consumptions. Provide spare parts always.

## 5. Septic Tank

- Septic tank is a plant treating Sewage and Gray water. Operate the compressor sending air to the aeration tank always.
- Abandon residues regularly collected in the setting and separation tank by vacuum pump. Such maintenance will be needed once in half year.
- Other part shall be maintained to spray water stone and wash in side the Septic tank.
- Make a contract with a suitable cleaning company to maintain Septic tank.

## VI. HVAC Equipment

### 1. Entire system of Heating and Air-conditioning

- Hot-water heating system using Radiator and boiler is provided on Main Building, OPD and Casualty of DHQ and Main Hospital of RHC.
- Heating system by Air-handling unit and air-duct is provided at Lobby of Main Building of DHQ.
- Main Building of DHQ and Main Hospital of RHC have several Cassette type air conditioners at some special purpose rooms.
- Air-conditioning system by Radiator and Cassette type air conditioners is provided at Auditorium of Main Building of DHQ.
- Air-conditioning system by Air-handling unit with air-duct and Cassette type air-conditioner is provided at the operation theatre of Main Building of DHQ.

### 2. Hot-water heating system using radiator and boiler

#### 2-1. Hot-water heating system

- Hot-water heating system can heat the room without making the air of the room dirty by heated the radiator by the warm water sent from the boiler. Moreover, the temperature of each room can be adjusted by operating the valve of an individual radiator installed in each room.
- Because air is warmed without humidifying the air of the room, the indoor relative humidity is decreased with the temperature rise, and dry.
- This air-dryness causes a wooden part dry and warp of a door, and it causes that a door dose not open smoothly.
- Such dryness negatively affects a certain kind of patient, especially who has disease of respiratory system. Please adjust humidity by the temperature adjustment or, in that case, adjust humidity by setting up the humidifier.

#### 2-2. Boiler

- Boiler of DHQ is installed in Boiler room of Energy Centre of South area of DHQ and it of RHC is installed in Boiler room beside Landry of RHC.
- The operation of the boiler needs a specialist because Boiler is one kind of pressure vessel. When handling is mistaken, it is very dangerous.
- Farther more information, check the manual of Boiler.

#### 2-3. Radiator and Piping

- The radiator and the piping repeat shrinkage and the expansion by the temperature of the supplied warm water. Therefore it might be loaded repeatedly in the installation hardware part, and the part might be loosened. Check the installation part before the season.

#### 2-4. Zoning

- The radiator piping takes the zoning system according to the building scale and using time. This can be operated by the manual operation of the switch in the

MCC panel. The Panel location map is attached.

- OPD of DHQ is one zone and Casualty is also one zone.
- Main building of DHQ has three category zones as follows;
  - a. 24 hours area: Ward area
  - b. 16 hours area: Operation area and Medical activity area
  - c. 8 hours area: Management area and Auditorium
- Those zoning operation can be done at the MCC Panel on manual.

### 3. Heating system by Air-handling unit and air-duct

- Lobby of Main building is big space, the ceiling height is 3.7m and the area is 344.5m<sup>2</sup>. Heating of this area is covered by the air-duct supplying warm air coming from Air-handling unit.
- Lobby temperature can be controlled by the operation of Air-handling unit and the valve of the hot water.
- The filter inside of Air-handling unit needs cleaning. Check it periodically.
- Air outlet and surrounding air outlet will become dirty soon. Make keep clean.

### 4. Cassette type air conditioner (Room air conditioner)

- DHQ and RHC have many Cassette type air conditioners.
- The filter inside of Cassette type air conditioner needs cleaning. Check it periodically.

### 5. Air-conditioning system by Air-handling unit with air-duct and Cassette type air-conditioner at Operation theatre of DHQ

#### 5-1. Heating system by Air-handling unit

- Air-handling unit (AHU) is a device to warm air passing the coil which is warmed by hot water sending from a boiler.
- This air-handling unit is used for the heating and supplying fresh air.

#### 5-2. Cooling system by Cassette type air-conditioner

- The operating room temperature can be controlled by manually on each room by room because the operating room often uses at lower temperature than a general room according to the content of the operation.

#### 5-3. Air balance of Ventilation

- The air pressure in Operation theatre should rise more than the outside so that the operating room may prevent miscellaneous germs from entering from the outside. Adjust the damper of the duct from AHU, and always keep this air pressure higher than the outside.
- Operation theatre No.1 and No.2 are considered the prevention of hospital acquired infection from the operation of patient of infectious disease. Those rooms all supply air is disposed to outside. Those rooms air pressure shall be lower than the corridor.

## 6. Ventilating installation

- Ventilation is done by the ventilation fan installed in each bath room and it can be operated by manual.
- Ventilation fan's blade will be dirty by use. Properly, clean the blade.

## VII. Elevator Equipment of DHQ

### 1. Basic Information

There are two elevators in the Main building of DHQ. No.1 elevator is located near the ward area and No.2 elevator is located near the management area.

The whole operation process of those elevators are automatically carried out by the calls registered. A key switch is provided in each car operating panel for urgent carriage of the patient. This elevator has the following performances for the stretcher transportation.

- Capacity: 1600kg (24 persons)
- Speed: 60 m/min
- Car internal size: 1500mm(W) x 2500mm(D)
- Door opening size: 1200mm(W) x 2100mm(H)

Check to the manual issued by the elevator company when you want to have further more information.

### 2. Electrical power failure

- During normal power failure, the elevator (No.1) service continues with the help of Generator (200KVA).
- During normal power failure, No.2 elevator will take the next item's action.
- In the event of the power failure, the elevator power automatically switches to a rechargeable battery built in controller that moves the car to the nearest floor and passengers can exit safely.
- In case of the power failure, Emergency car lighting lights automatically.

### 3. Maintenance

The contract for the maintenance of the elevator shall be made with the maintenance company and periodically it shall be checked. For keeping safety this is the duty of the Building manager.

## VIII. Disaster Prevention and Safety Equipment

### 1. Fire fighting

#### 1-1. Strategy for Fire fighting

- A combustible material is not used for the element of the building. In furniture and the machine parts set up in the building, there are wood products or other combustible one. It is necessary to always limit the part where the fire is used in the building, and prohibit using the fire in other places. Especially, the part

where an attendant for inpatient can use the fire is only family veranda.

- It is necessary to educate the staff of the hospital as the fire prevention plan is made, and they are well informed of the rule of fire prevention, etc.
- The limitation of the smoking area shall be well-known especially.

#### 1-2. Automatic fire alarm system

- The automatic fire alarm system has been installed in Min Hospital Building. This system includes Automatic Smoke Detectors, Heat Detectors, Call Station and Bell.
- If any smoke or heat is observed in the building, this system will automatically detect and inform about specific area/room at Panel Board installed in Guard Office at Ground Floor of DHQ.
- The above-mentioned Panel Board of RHC has been set up in the reception.
- The person on duty will go to the said location and will observe the situation and take necessary measures to avoid any accident.
- The detectors have to reset again after necessary measures.
- The any kind of maintenance of panels should not be allowed until approval of Maintenance Engineer in charge.
- The contractor will not be responsible of any loss if some thing happen due to low voltage, the physical damage done by maintenance staff to any equipment then it will also not be the contractor fault.

#### 1-3. Fire extinguisher

- The fire extinguisher is arranged at an appropriate position in the building. The building manager is all without fail by the place well-known in the staff.
- There is longevity in the fire extinguisher. Confirm the expiration date, and change the medicine for the appropriate time.

#### 1-4. Siamese connection

- Five Siamese connections are provided for the fire brigade at DHQ Main Building. See the attached the map of Siamese connection.
- The fire brigade can send water to the hydrant box having 30m fire hose by this Siamese connection from the out side of DHQ.
- Do not allow to park any car in front of Siamese connections for parking of fire truck.

## 2. Measures when blacking out

#### 2-1. GLT (guide light)

- Escape entrance is shown by the escape guiding lighting (GLT).
- The battery of this lighting fixture shall be checked periodically.

#### 2-2. Emergency power supply for DHQ and RHC

For the maintenance of the generators, keep following items

- The Generators oils for fuels and engine and radiator water should be checked carefully on daily basis. A Performa should be made to keep the record of voltage, load, fuel and engine oil, engine temperature etc as per Generators Maintenance

Manuals.

- The any kind of maintenance of Generators should not be allowed until approval of Maintenance Engineer in charge.
- All Filters and Oil Changing should be made as per manufactures manuals.
- Manufacturers Operation Manuals should be read carefully and the maintenance of Generators should be done accordingly.

#### 2-2-1. DHQ

- Two generator, 200KVA and 350KVA are installed in the energy centre.
- Those generators will be started automatically in case of the power failure.
- Electric Generator of 350 KVA covers the medical activity areas of Main Building, OPD Building, Causality and Mortuary to keep on lighting fixtures, power outlets and medical equipments except X-rays.
- And this 350 KVA Generator also covers one outlet and one lighting fixture in a room of the management area in the main building of DHQ and all the evacuation way lighting.
- This 350 KVA Generator also covers Hot-water Heating system including boilers and Water supply system.
- Electric Generator of 200 KVA covers to Operation Theaters, No.1 Elevator and Causality.

#### 2-2-2. RHC

- Two generator, 150KVA and 60KVA are installed in the energy centre.
- Electric Generator of 150 KVA covers all area of the medical activity of Main Hospital (one outlet and one lighting), Mortuary, Hot-water Heating system including boilers and Water supply system.
- Electric Generator of 150 KVA covers Operation-theater, Recovery room, Delivery room, Labor room and Gynecology word area.

#### 2-3. Escape way of Main building of DHQ

- The balcony, the external or internal stairs and the corridor are the emergency escape way. Do not put the obstacle so as not to hinder the evacuation in the emergency.
- All lighting of escape ways, corridors and stair-cases are kept by Electric Generator.

### 3. Noscomial infectious disease of DHQ

- Domestic management for Noscomial infectious disease is most important matter of Hospital management.
- It is necessary to make Noscomial infection prevention plan, and always educate to not only the medical treatment field but also all staff concerning Noscomial infection.
- Especially, there is danger of Noscomial infection by the resistant microbe in such a large-scale hospital. This shall is recorded in the Noscomial infection prevention plan and there is a well-known necessity in all staff.



- Operation theatre No.1 and No.2 are considered for Noscomial infection prevention. The operation tools can be returned to the dirty room directly after use through the return window not through clean corridor.

#### 4. Premises traffic

The road area in front of Main building is not a road for the street traffic. This area is connecting space between Main building, Casualty and OPD. The facilities manager should prohibit all cars passing this part to south area here including a general car related to the hospital cars from and the doctor for those who call and the patient to the hospital.

### IX. Special facility and Miscellaneous

#### 1. Trench pit

In the hospital, the repair work, the extension of facilities and the additional construction are frequently done according to the development of the medical inspection equipment and changing of the circumstance of the medical activity of the hospital. In DHQ, the extension of the ward is planned as a forward planning. Moreover, it is forecast that the medical inspection equipment will be changed according to the hospital situation in the future.

By the modification of the facility, the building equipment like as Electricity line, Drainage line or other basic communication line shall be modified. However the hospital is working for 24 hours. Because the influence of construction on medical services is made a minimum, the shaft and the trench pit for the equipment piping are set up in each place in Main-building of DHQ. And it connects to OPD and Casualty by the tunnel diameter 1200mm in bedded under Main road. See the attached the map of the trench pit. On the map the entrance of the trench pit are shown.

(Photograph of the trench pit of Main Building)

#### 2. Ramp way

In the centre of Main Building there is the ramp way. This ramp way is installed for patient's movement with the stretcher when blacking out and pedestrian. The percent of slope of this ramp way is 14%, this inclination is a rapid ascent for running for oneself of wheelchair. The inclination ratio for wheelchair's ramp is usually 12%. The help is necessary for the wheelchair's passing on this ramp way.

The ramp ways are installed at RHC, BHU Plus and Exterior aria have 12% inclination ratio. It is available for running for oneself of wheelchair.

(Photograph of the Ramp way of Main Building)

#### 3. Incinerator

This incinerator was developed for the incineration of a medical waste by WHO. Capacity

is 50kg/hour. For getting high temperature enough volume of waste shall be provided and use it continually.

Lifespan of this incinerator is called for 3 – 5 years.

**(Photograph of the incinerator)**

#### 4. Repainting

When you repaint somewhere, refer to Colour list.

As a reference document Colour list is attached. All colour paint is used from the paint of Berger Paints Pakistan Limited. All code of Colour list is come from Colour sample book of Berger Paints Pakistan Limited.

#### **Berger Paints Pakistan Limited**

D-31 South Avenue S.I.T.E Karachi-75700, Pakistan

Website: [www.berger.com.pk](http://www.berger.com.pk)

#### X. Reference Document and Manufacture's Manual

1. Contact-address list
2. The plan of the attic of Main building of DHQ
3. The map of MCC Panel of DHQ
4. The map of Siamese connection of DHQ
5. The map of the hydrant box of DHQ
6. The map of Fire extinguisher of DHQ
7. The map of the trench pit of DHQ
8. Daily check item table for Architectural part
9. Daily check item table for Building Equipment part
10. Colour list (DHQ, RHC, BHU Plus)
11. Colour sample book of Berger Paints Pakistan Limited
12. Elevator Manual
13. Boiler Manual