Standard Guidelines
for
Post-Disaster Reconstruction of Health Buildings

Government of Nepal
Ministry of Health and Population
2015
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Section-I: Introduction

1.1. General Background

As a result of the devastating earthquake of 25th April, followed by a major aftershock on 12th May, more than 600 health institutions in the fourteen hard hit districts (Gorkha, Dhadhing, Nuwakot, Rasuwa, Makawanpur, Kathmandu, Bhaktapur, Lalitpur, Kavrepalanchok, Sindhupalchok, Dolakha, Ramechhap, Okhaldhunga, Sindhuli) have suffered severe infrastructural damages. This damage to the physical infrastructure has substantially disrupted health service delivery in those districts.

In the aftermath of the earthquake, it has been a challenge for the government to restore proper health services in the damaged health facilities. In many locations, the government as well as relief aid agencies have erected temporary sheds, with an expected lifespan of a few months, to resume the health service delivery. While these structures have proven to be very effective for immediate response, they cannot be relied on for long term service delivery and long term infrastructure solutions are required. In this emergency situation, we have to ensure that these long term infrastructure solutions can be quickly setup, are environmentally friendly, as well as cost-effective.

To ensure that all the requirements are met, MoHP has developed a concise type design and specification for Health Posts and Primary Health Care Centers using pre-fabricated technology. In addition to the specifications, this guideline has been prepared to aid in the standardization of the post-disaster health infrastructure reconstruction works.

1.2. Objectives of the Guideline

- To provide guidance for post-disaster reconstruction work of health facilities and maintain coordination between concerned stakeholders, donors and technicians.
- To support concerned stakeholders in planning, designing, constructing, monitoring and supervising in reconstruction of health facilities.
- To define specific requirements of the health infrastructure that has to be duly considered before construction.
- To provide standard specifications and technical requirements for pre-fab construction technology.
- To define coordination mechanism between various stakeholders and to ensure timely completion and handover of the infrastructure.
Section-II: Standard Designs Guidelines

2.1. Scope of the Guideline

- This guideline covers the standard design of following types of health institutions:
  a. Health Post
  b. Primary Health Care Centre (10-14 bed)

2.2. Definitions

The terminologies used in these documents should be understood in term of the meaning only as defined here though whatsoever the term do signify literally.

a. **Implementing agency** – Any institution that is authorized to carry out health infrastructure construction that includes designing, tendering, contract administration, supervision and certifications.

b. **The Owner** – ‘The owner’ signifies the institution that is the user of the infrastructure to deliver health services, which also holds the ownership or user rights of that property.

c. **‘Prevailing codes and standards’** – signifies all those codes, byelaws and standards which are issued by the competent authorities for regulating good quality of service and effectiveness in functioning. The following documents must be strictly followed:
   i. Nepal National Building Code (NNBC) issued under Building Act 2055
   ii. Indian Standard Code
   iii. Standards for Establishment, Operation and Upgrading of The Health Institutions, 2070 (endorsed by MoHP on 2070.09.21, prepared under Governance Act, 2064).

2.3. Implementation of the Health Infrastructure Reconstruction Project

a) **Coordination Mechanism of Stakeholders**

There will be a coordination committee comprised of following members from stakeholders to conduct the reconstruction work.

- Chairperson - Chief of the Health Facility Operation and Management Committee
- Member Secretary - Chief of the Health Institution (District Public Health Officer is the chief of the health institution in case of Health Posts and PHCCs) or representative(s) appointed by the chief.
- Member - Chief or representative of the implementation agency.

b) **Regular Meeting:** Implementing agency must maintain close coordination with all the stakeholders from the initial need assessment phase to completion and handover phase. The coordination committee as mentioned in 2.3.(a) must be actively arranging meetings at least once a month. The committee may invite other participants (local leaders, elites, affected people, neighbours etc.) from the locality, when needed, for maintaining coordination with and support of local communities. All the decisions regarding following issues must be discussed and minuted:

- Information on construction materials and construction technology
- On decisions related to the selection of the construction site
- On the adoption of a particular design among the available type designs.
- Modifications (addition and subtraction) of available type designs.
- Periodic review of the progress (at least monthly)
Necessity of variation order
- Completion of the work
- Handover by implementing agency to the concerned health institution.

c) Sharing Project information: A copy of all the correspondences made in the contract and pre-contract procedures should be sent to concerned health institution. This includes a copy of full set of agreement documents (agreement, drawings and specification etc.), progress reports etc.

d) To construct as per the standard design: Construction of all the health facilities must follow the standard designs endorsed by Ministry of Health and Population.

e) To get approval for modification in standard designs: Modification to standard designs might be needed for ensuring the design fit with the existing site conditions. In such a case, if substantial modifications in standard design are required in terms of space dimension requirement and functional relation, implementing agency must take prior approval from the Ministry of Health and Population.

f) Compliance to Nepal National Building Codes (NNBC): All health facility design and construction works must comply with NNBC.

g) Working Drawings: Detailed working drawings must be prepared for architecture, structure, electrical, sanitary and mechanical works in compliance with the prevailing codes and standards. A copy of working drawings must be available at the construction site at all the times during the construction period. A readable as-built drawing of all these components must be prepared and included in the handover document and submitted to the concerned health institution. These working drawings should be prepared by the implementing agency and submitted to MoHP for approval. Construction of the building in question can only begin after receiving written approval on the working drawings from MoHP.

2.4. Construction Sites

a) Selection of Land for Construction: Land for the construction of the health infrastructure must be selected in compliance with the "Guidelines for Selection of Land for the Construction of Health Facilities" endorsed by MoHP (refer Annex - 1).

b) Change in Construction Site: The implementation agency should not construct the building at different site than the previously located one. If the selected land for the construction of health building has to be changed due to different justified reasons, implementation agency must seek prior approval from MoHP.

c) Ownership Documents: No process of construction should be started without assuring the ownership status of the land. Ownership certificate or the certificate of use right issued by competent authority must be collected and compiled in a project file. In case of a situation where the new building has to be constructed on land which has been occupied by the health institution since a long time but does not have any documents for use right or ownership certificate, the construction site should be carried out after obtaining written approval from MoHP. MoHP will take decision on this matter in reference to the recommendation letter from the concerned District Health Office and meeting minutes from the local stakeholders' meeting.
d) Construction in Vulnerable Sites: If the site is located in land with history of landslide, flood or other kinds of disaster, the site should be investigated for the disaster vulnerability study before to go for any type of construction work. If the investigation result suggested that the site is not suitable for the health facility, alternative site should be sought in coordination with concerned DHO and MoHP.

2.5. Technical Requirements of the Health Buildings
Health buildings have some essential technical requirements which must be met during implementation of the reconstruction works. These include aspects but are not limited to disaster resilience, sustainable practices, infection control, universal accessibility, inclusivity, ease for cleaning etc.

2.5.1. Disaster Resilience
The design and construction implementation of the reconstruction work should be in line with the disaster resilience principles. The building must be resilient to hazards such as earthquake, fire, flood, lightening etc. Land selection decisions may play an important role on reducing damage from landslide and flood hazards. Prevailing codes must be followed to mitigate the risk of those hazards. In addition, safety consideration should be adopted for to reduce injury from non-structural building elements such as partition walls, furniture and fixtures installations.

2.5.2. Choice of Building Material and Technology
Implementing agency shall make choice of building material and technology from the specifications as approved by MoHP. The approved specifications are included in section 2.6.

a) Standard Materials: All the construction materials including structural members, walling and roofing materials, accessories like screw and hinges should be in compliance with NS or IS standards.

b) Material for wall, floor and ceiling finish: The nature and type of surfaces and finishes used in health care facilities are critical to the management of infection control risks. All surface finishes, especially the floors should be selected such that it will allow for easy cleaning by wet mopping. The flooring should also withstand repeated exposure to hot water, detergents and disinfectants and should discourage the accumulation of dust. Walls, floors and ceiling surfaces should be smooth and made of non-porous materials such that a suitable environment for pathogen survival or development is not created. The same is true for all furniture and equipment used for patient care. Hence, materials used for walls, floors and benches should be smooth, impervious and seamless, especially in treatment areas and where there may be patient contact, blood or body fluid spills. Finishing materials shall be adopted from the list of material and specifications as follows.

Table 1 Schedule of Recommended Surface Finishes

<table>
<thead>
<tr>
<th>S.N.</th>
<th>Finish</th>
<th>Locations at functional spaces</th>
</tr>
</thead>
<tbody>
<tr>
<td>Floors</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.</td>
<td>PCC with Cement punning</td>
<td>Stores (general, clean, dirty), maintenance room, all the spaces where carpet is laid.</td>
</tr>
<tr>
<td>2.</td>
<td>Mosaic Flooring</td>
<td>All the spaces including corridors and rooms except</td>
</tr>
</tbody>
</table>
### 3. Vitrified Tiles
May be used in heavy duty corridors floors only or for other spaces as an alternative to mosaic flooring. In all OPD, IPD, therapeutic area, clean and sterile zones, and joints of the tiles must be filled with anti-microbial epoxy grout.

### 4. PVC/Vinyl flooring
May be applied on spaces as mentioned in SN 2. (Preferable for Delivery room and Dressing room)

### 5. Linoleum
May be applied on spaces as mentioned in SN 2.

### 6. Marble floor
Corridors and waiting spaces; staircase treads. *Not to be used in other rooms.*

### 7. Ceramic Tiles (Floor tiles)
All the bathroom floors. Ceramic floor tiles should not be used in the place recommended for vitrified tiles as in SN 3.

### 8. Self-leveling epoxy flooring (anti-electrostatic flooring)
Delivery room; Operation Theaters (OT room, Post-operative/recovery Pre-operative rooms, anesthesia room); Intensive Care Unit (ICU)

### 9. Terracotta clay tile on the top of elastomeric waterproofing coating.
On all terraces

### 10. Checkered Concrete tiles (or surface with rough texture for friction)
Ramp floors

### 11. Broom finish Concrete
Ramp floors

### 12. Carpet
Can be an alternative for finishes at office spaces and conference room. Duty rooms, Waiting areas

### 13. Interlocking concrete blocks
Outdoor pavements

### 14. Flagstone
Outdoor pavements

**Walls**

### 15. Cement Plaster finish
All general areas where not specified.

### 16. Ceramic Tiles
Glazed ceramic tiles for all bathroom walls up to the height at least 1.5m; walls of corridors and waiting spaces up to the height of 1.2m.

### 17. PoP or Wally putty finish
Walls of Operation theaters, delivery rooms.

**Ceiling**

### 18. Cement Plaster (1:3)
All general areas where other specifications are not given.

### 19. PoP or Wall Putty
Ceilings of Operation theaters, delivery rooms.

### 20. Suspended false ceiling (Cement Fiber boards, Gypsum or plywood according to availability)
All the ceilings where CGI Sheet are used.

**Others**
c) Roofing System: Appropriate roof design should be chosen on the basis of availability of building material, cost, climate and environment. Roof options could be RCC roof, CGI roof or Slates roof. In any case, following design consideration must be taken in due care during construction.
   i. CGI Thickness: In case of CGI roof, Heavy quality CGI at least 26 gauges must be used. 24 gauge sheets would be preferable.
   ii. Sandwich panel roofing system: At least 50mm thick sandwich panel as per fixing details supplied by the manufacturer.
   iii. False Ceiling: In case of CGI roofs, proper false ceiling must be used underneath. For false ceiling, it is suggested that water resistant material such as water resistant gypsum board, waterproof plywood, modular cement board ceiling etc. must be used. Recessed lights are preferable to use on the false ceiling.

d) Painting Work
Material for the painting work in health care buildings should be chosen as per requirement mentioned in this guideline.
   i. Environmental Consideration: The paint used in health facility should be washable and free of toxic emission and VOCs.
   ii. Table 2 - Paints type to be applied

<table>
<thead>
<tr>
<th>Space in the health facility</th>
<th>Type of Paint</th>
</tr>
</thead>
<tbody>
<tr>
<td>All the exterior wall if the wall finishes is in cement plaster or wall putty.</td>
<td>Best quality Weather coat Emulsion paint</td>
</tr>
<tr>
<td>All interior wall and ceiling.</td>
<td>Best quality Acrylic Emulsion Paint</td>
</tr>
<tr>
<td>Wall and ceiling at delivery room or OT</td>
<td>Anti-microbial acrylic paint (La HygieneCote or equivalent) or Water Based Anti-Bacterial Polyurethane Coating (La BioKleen Cote or equivalent)</td>
</tr>
</tbody>
</table>

2.5.3. Health care waste management
Health care wastes (HCW) are those resulted from various activities of health care including diagnosis, treatment, immunization and research. Waste accumulation cause negative effect on human health and his environment.

Approaches for waste management
- **Minimize**: Prevent and minimize waste production.
- **Recycle**: Reuse or recycle the waste to the extent possible.
• **Treat:** Treat waste by safe and environmentally sound methods. Appropriate method should be chosen according to the available resource and prevailing policies. Space should be allocated to accommodate that function.

![Diagram of Hospital Waste Cycle](#)

- **Dispose:** Intentional burial, deposit, discharge, dumping, placing, or release of any waste material into or on any air, land, or water in confined and carefully designed sites. On-site disposal locations should be indicated in the site plan.

### The following considerations must be taken while planning and designing a hospital.

**a) Hospital Waste Management Plan:** The Hospital Waste Management Plan should include proper drawings, illustrations, and should clearly indicate following information:

- **Circulation network:** Path network and routes for transporting waste throughout the health facility from source to the collection and processing site.

- **Trash-bin Sites:** Designated trash bins sites for every ward and department in the health facilities should be made available for health-care waste or other waste with colour codes, conforming to the waste segregation at source principles.

- **Storage and treatment sites:** Separate sites also called ‘waste holding space’ shall be designated. Following considerations must be made and mentioned in the design drawing of central storage sites.
  
  - **Signage:** The storage site should be clearly marked with signage that prominently displays bio-hazard symbol and mentions that the facility stores risky waste.
  
  - **Location:** It should be located within the health care institution premises close to the incinerator, if installed, but away from food storage or food preparation areas.
  
  - **Only sorted waste to be stored:** No materials other than hazardous waste shall be stored in the central storage facility. These materials should not be stored for more than 24 hours.
  
  - **Marked space for containers and equipment:** Space should be allocated to deposit and store trash bins, washing and disinfecting, protective clothing, waste-collection trolleys etc.
  
  - **Accessibility:** Should be easily accessible for collection vehicles and authorized staff, but totally enclosed and secure from unauthorized access, and especially inaccessible to animals, insects and birds.
  
  - **Water supply:** There should be a water supply for cleaning purposes.
• **Sun protection**: There should be protection from the sun.

• **Waste treatment site**: Waste treatment site should be allocated in site plan which can accommodate at least incineration plant, Chemical disinfection room, Autoclaving room, microwave room, space of other processing (encapsulation, inertization etc.).

b) **Use of standard signage:**
   - Warning sign for hazard
   - Proper arrow signs along patient movement route(s)

c) **Liquid waste disposal**: Liquid waste produced from disinfection procedures will require stabilization before disposal in sewerage systems. Septic tanks and soak pit are to be designed and constructed.

d) **Placenta pit**: Placenta pit should be constructed for safe disposal of placenta produced from birthing centre and BEONC if the health facilities do not have it previously or the previously available one is not functional. The standard design of Placenta has been included in Annex - 2

**2.5.4. Universal Accessibility**

Health infrastructure should be fully accessible to the differently able people. For this, prevailing codes and standards should be followed to design ramps, lifts, doors, toilets and other details. Following guidelines should be followed so that these means of access can accommodate wheel chairs as well as stretchers.

a. **Ramps**: Ramps should be provided in all health buildings to allow the free passage of pedestrians, wheelchair users and people with mobility problems. Following design considerations should be followed.
   i. **Location**: The main entrance and toilet entrance should be accessible through a ramp.
   ii. **Width**: The preferable width of the ramp is 1.2m whereas in the inevitable situation the width should not be less than 1m.
   iii. **Turning Radius**: If ramps have turning point it must have turning radius of at least 1.5 meter to turn trolleys.
   iv. **Slope**: The maximum gradient of the slope of ramps for hospitals is 1:12 i.e. 8%
   v. **Landings**: Ramps should be provided with landings for resting, maneuvering and avoiding excessive speed. Landings should be provided every 10.00 m, at every change of direction and at the top and bottom of every ramp. The landing should have a minimum length of 1.20 m and a minimum width equal to that of the ramp.
   vi. **Hand Rail**: A protective handrail at least 840mm high must be placed along the full length of ramps at both sides.
   vii. **Surface**: The ramp surface should be hard and non-slip. Use of materials like ceramic tiles, mosaic or carpet should be avoided. Checkered concrete tile, concrete with broom finish is recommended.

**2.5.5. Other Architectural Requirements**

a) **Coved corner**: All the corners in the corridors and the rooms in the health facility should be coved. In case of cast-in-situ mosaic finish, corners at wall-floor junction should be coved whereas corners should be chamfered if the tiles and marble were used as finishing. This detailing makes cleaning convenient and effective. [see fig 10 pg.- 12]
b) **Dado and skirting:** Wall of delivery room, dressing room should be provided with dado at least up to 1200mm height with the same material of floor finish or other material which is hard, non-porous and resistant to strong detergents. Whereas, for other spaces, skirting of 150mm should be provided.

Dado of at least 600mm high should be provided on the walls with working counters.

c) **Display areas:** Walls at the public areas (main and secondary lobbies) should have blank walls for displaying educational material and notices. Sitting arrangement should be designed according to the orientation of these display walls. Adequate special lighting should be designed for this wall.

d) **Waterproofing:** All the areas which are vulnerable to water seepage especially among those such as flat or slope roof which comes in continuous contact with water. Flat roofs decks, open terraces, walls and floors of toilets in case of pre-fab construction, drop slabs in toilet, underground RCC water tank, earth retaining shear walls etc. are needed to be provided with water proofing treatment.

e) **Working Counters:** Working counters should be provided in all the places such as lab, delivery, operation theatre, CSSD, Laundry etc. wherever is indicated. These counters should be ergonomically comfortable with the height appropriate to the average height to the people of that region. For Nepal, the recommended height is 810 mm (32”) above the finished floor level. In prefab construction, counters made up of stainless steel top with steel stand should be provided.

2.5.6. **Doors and windows**

Doors and windows of the health building should be specified as per the requirement of the functions. Following guidelines are provided to facilitate choosing the appropriate type and specifications.

**Table 3 - Function and specification Matrix**

<table>
<thead>
<tr>
<th>Functions and locations</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Main entrance</td>
<td>1200-1500mm wide, Metal or wooden panel doors</td>
</tr>
<tr>
<td>Inside and door towards</td>
<td>1500mm, Air tight doors with smaller view pans. Stainless steel doors or</td>
</tr>
<tr>
<td>all sterile and clean</td>
<td>Hermetic doors are preferable for OT main door.</td>
</tr>
<tr>
<td>area such as OT, ICU,</td>
<td></td>
</tr>
<tr>
<td>Delivery room.</td>
<td></td>
</tr>
<tr>
<td>Radiography Functions</td>
<td>1200mm wide, Lead lined flush doors</td>
</tr>
<tr>
<td>as X-ray Rooms; CT scan;</td>
<td>Windows with lead glass</td>
</tr>
<tr>
<td>MRI etc.</td>
<td></td>
</tr>
<tr>
<td>Corridors</td>
<td>1500mm, Double swing Doors panel doors with larger glass view pans</td>
</tr>
<tr>
<td>Doors for Inpatient</td>
<td>1200mm wide, Doors with smaller view pan of size 150mm x 250mm. Solid core</td>
</tr>
<tr>
<td>wards</td>
<td>flush doors are preferable in these areas. Two unequal leaf – one being</td>
</tr>
<tr>
<td></td>
<td>900mm wide and other being smaller.</td>
</tr>
<tr>
<td>Description</td>
<td>Specification</td>
</tr>
<tr>
<td>----------------------------------------------------------------------------</td>
<td>-------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>All the store rooms except dirty store/soiled room/dirty utility/sluide</td>
<td>1000mm wide, Flush Doors with louver that allows air circulation.</td>
</tr>
<tr>
<td>Toilets for Differently abled people.</td>
<td>1000mm wide, Single leaf double swing door with bar type handle.</td>
</tr>
</tbody>
</table>

**a) Materials:** Door and windows can be constructed from different material. Materials should be chosen as per availability in local market and the necessity of function. Some common available door window type are list below:

- Wooden doors and windows
- Aluminium doors and windows
- UPVC door and window
- Folded GI metal doors and windows
- Readymade solid core door shutters
- Hermetically treated doors
- Fire rated doors
b) **Flymesh and door closers:** Appropriate and effective methods for excluding or reducing vector numbers should be considered in designs of door and window. In addition to basic environmental control methods (such as proper drainage, waste disposal etc.), mosquitoes and flies can effectively be excluded from buildings by covering opening windows with fly screens and fitting self-closing doors to the outside.

c) **Sealing gaps in door and windows:** In case of use of aluminium or UPVC frames adhesive like silicon must be used to seal all the gaps around the door window frames. Similarly, good quality gaskets should be fitted to fix glass panes air tight.

d) **Bumper plates and Kick plates:** All the doors through which stretcher beds are to be entered, a bumper plate at the height of 900mm and kick plat at the height of 200mm from the floor level. These plates can be make of wooden bars or metal sheet.

e) **Grill (security bars):** Metal grill may be installed in ground floor windows without inhibiting the cleaning of the glasses. In pre-fab constructions, tension GI wiremesh grills are prefereable (figure 11, pg 10).
f) **Door Fastenings:** Door fastenings should be stainless and strong complying the NS or IS standards. Stainless steel fastenings are preferable. Following aspects have to be considered while deciding the door fastenings.

   - **Door locks:** Airdrops (Figure 1.f, pg. 12) made out of stainless steel or brass would be most preferable alternatives to the key locks (mortice locks).

   - **Tower bolts:** Tower bolts of door and windows in toilets and other rooms should be placed in such a way that it can reach easily and convenient for closing and opening. 300mm – 450mm long tower bolts are recommended for use.

g) **Sill heights for windows:** Sill heights of windows should be consciously defined as per the need of privacy and visual communications.

<table>
<thead>
<tr>
<th>Space Description</th>
<th>Sill Height from the floor</th>
</tr>
</thead>
<tbody>
<tr>
<td>All the general windows (including wards, OPD, Emergency Department etc.)</td>
<td>1200mm</td>
</tr>
<tr>
<td>OT and Delivery rooms</td>
<td>minimum 1800mm – 2000mm</td>
</tr>
<tr>
<td>X-ray room</td>
<td>no windows or small ventilation above 2100mm from floor.</td>
</tr>
<tr>
<td>Internal partitions in Lab area</td>
<td>level above 750mm – 900mm should be clear glass pan</td>
</tr>
<tr>
<td>All the office spaces in administration</td>
<td>900mm (this could be varied as per the location and need of daylight)</td>
</tr>
</tbody>
</table>

2.5.7. **Water Supply and Sanitary Design**

a) **Water supply and waste treatment system** - Existing Water supply system and waste treatment system should be assessed and design as per requirements of NNBC. Water storage tank, solar water heating system, septic tank, soak pit and placenta pit may need to be constructed if these items are not available at site or have been damaged by the earthquake.

b) **Drinking water, hand wash and shower:** Sufficient water supply for drinking and clean use must be made available at all times for drinking, food preparation, personal hygiene, medical activities, cleaning and laundry. If the water quality is not up to the standard for these uses, proper treatment plant also should be designed to achieve this requirement.
i. A reliable drinking-water point needs to be made accessible for staff, patients and care givers at all times. Drinking-water should be provided separately from water provided for hand washing and other purposes, even if it is from the same supply. Drinking-water may be provided from a piped water system or via a covered container with a tap where there is no piped supply. If water quality from the local source is doubtful, proper purification system (Euroguard or RO unit etc.) should be installed. Drinking-water points should be clearly marked with proper signage.

ii. Water points for hand washing should be sufficiently close to users to encourage them to use water as often as required. Soap or a suitable alternative should be available all the time in hand wash. Hand wash should be installed at all critical points within the health-care setting (operating theatres, wards, consulting rooms, dressing stations, etc.) and in service areas (sterilization, laboratory, kitchen, laundry, showers, toilets, waste zone and mortuary).

iii. Showering facility is required for patient, staff and carers in contact with infectious patients. Separate showers are required for staff and patients, and for both sexes, to ensure that all groups have adequate privacy and safety.

iv. If piped hot water is available, measures should be taken to avoid the proliferation of bacteria in the water system. For this reason, piped water and water from showers should ideally be maintained below 20°C or above 50°C.

c) **Hot water Provision:** Solar Water heating systems (or Electric Geyser if Solar system is not suitable) must be included in the design and cost estimate. Detail design should be done to give hot water supply for all hand wash taps except the public toilets.

d) **Toilets and waste disposal**

i. *(omitted as this is applicable only for larger hospital settings)*

ii. **Universal toilets:** A separate toilet for differently able person should be provided with appropriate standard size to accommodate wheelchair equipped with grab bars. No steps are allowed in toilets which inhibit the wheelchairs to enter. For this, prior arrangements should be made during construction of structural frame such as design of dropped slab or ramp for the raised toilets.

![Figure 1 Universal Toilet](image-url)
iii. **Patient toilets:** Patient toilets should be equipped to make them easy to use by people with physical disability, heavily pregnant women, elderly people and people who are sick.

iv. **Light and Ventilation:** Proper light and ventilation should be thought of while planning and designing toilets. At least one of the wall should be opening up to the exterior and the internal partitions within the public toilet block should be not more than 2100mm height. Modular toilet cubical is desirable wherever available.

For toilets without opening up towards the exterior, at least one wall should be opening up towards a shaft (duct) at least 600mmx600mm size so as to allow for maintenance and cleaning.

v. **Respond to local cultural and social conditions:** Toilets are designed to respond to local cultural and social conditions and all age and user groups.

- **Ablution tap:** Toilets designed and equipped to respond to cultural identities such as ablation tap for anal cleansing with water are required in the Nepalese context.

- **Alternatives between squatting pan and commode (water closet):** In all the toilets (except for handicapped which will be as per the standard design) choice between Commode (Water Closet) and squatting pan (Orissa Pan) should be discussed with local users and facility staff and should be minuted. Then, the project engineer should provide it in the design and estimate accordingly.

vi. **Hand wash:** All Toilets must have convenient hand washing facilities close by.

vii. **Accessibility:** Toilets should be easily accessible (that is, no more than 30 metres from all users) and can be used in all seasons (need covered pathway if the toilet is in detached block). In multi-storey buildings, there should be toilets available on all floors, and routes used to reach toilets should be smooth and flat, for easy access for people in wheelchairs.

viii. **Prevention of environmental contamination:** The most appropriate wastewater disposal option is connecting the health-care setting to a properly built and functioning sewer system, which is, in turn, connected to an adequate treatment plant. If the sewer does not lead to a treatment facility, an on-site retention system with treatment is necessary before wastewater is discharged. Black water should be disposed of in a septic tank, with the effluent discharged into a soak away pit or infiltration trench. All systems that infiltrate wastewater into the ground should be sited so as to avoid contaminating groundwater. There should be at least 1.5 metres between the bottom of the infiltration system and the groundwater table (more in coarse sands, gravels and fissured formations), and the system should be at least 30 metres away from any groundwater source. If the health-care setting has a septic tank, the sludge from the
tank should not be used for agricultural purposes, but should be buried following safe procedures.

ix. **Lowering the floor levels of toilets:** All the toilet floors must be constructed so that the floor level is 25 to 40 mm lower than the floor of the adjoining room.

e) **Special Sinks and Faucet**

i. **Scrub Sink:** Scrub sinks are special deep sinks installed nearby entrance of the operation theatres and delivery room which facilitates surgeons, doctors and other health workers to clean their hand fully from the palm to above elbow. Scrub sink should be made of 16 gauge stainless steel. It could both be wall mounted or installed on brackets. Following items must be come along with scrub sink.

   - **Elbow Tap:** The taps used for the scrub sink could either be sensor operated or otherwise should be lever action tap (also called 'elbow tap') as the health staff are not in situation to touch the tap by hand immediately after the operation or delivery. In case of sensor operated option, a switch must be provided which can be turned on by foot to use it the time of failure of sensor.

   - **Hand Dryer:** Due to chances of cross contamination through the towel, it is advisable to install sensor operated hand dryer at every scrub sink site.

   - **Metal tray:** A good quality stainless steel tray should be installed next to the scrub sink to hold all the betadine bottles, soap and sanitizing agents.

---

Figure 2 Special sinks and faucets for Scrub-up and Sluice

a. **Scrub Sink**

b. **Lever action Faucets**

---

16
f) Sanitary Works Details:

- **Sanitary Fixtures**: Sanitary fixtures shall be installed as per the detail as mentioned below (refer drawings for symbols).

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Description of item</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>S1</td>
<td>Stainless Steel (SS) single bowl sink - 500 X 400 steel sink with central hole</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Aerator type single lever mixer etc</td>
<td></td>
</tr>
<tr>
<td>S2</td>
<td>Stainless steel Clinical Scrub sink - 304 quality prime grade 16 swg thick</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Stainless steel (SS), mounted on SS frame. Size - 1200mm length, 400mm wide, and</td>
<td></td>
</tr>
<tr>
<td></td>
<td>600mm deep. (see figure c.) with hole on the sink installed with single</td>
<td></td>
</tr>
<tr>
<td></td>
<td>long lever elbow type mixer</td>
<td></td>
</tr>
<tr>
<td>S3</td>
<td>Stainless Steel (SS) Double bowl sink - bowl size 400 X 400 size each hole</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>on the sink installed with swan type bib cock with aerator.</td>
<td></td>
</tr>
<tr>
<td>B1</td>
<td>Porcelain clay white glazed Wash Basin - 400X300 size, wash basin with</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>pedestal and central hole Aerator type single lever mixer etc</td>
<td></td>
</tr>
<tr>
<td>B2</td>
<td>Porcelain clay white glazed Wash Basin - 550X400 size, wash basin with</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>pedestal and central hole Aerator type single lever mixer etc</td>
<td></td>
</tr>
<tr>
<td></td>
<td>all complete.</td>
<td></td>
</tr>
<tr>
<td>P1</td>
<td>580 mm Porcelain clay white glaze squatting Pan</td>
<td>4</td>
</tr>
</tbody>
</table>

- **Sanitary work details**:
  - All the horizontally running pipes shall be installed over the false ceiling except for those which is shown in the drawings.
  - All Water supply pipes (hot and cold) shall be Chlorinated Poly Vinyl pipe – CPVC (SDR 11 CTS, 22.5 kg/cm²) with fittings (tee, elbow, union etc) from respective standards.
  - All the pipes that has been installed on the surface of the wall shall be encased with the steel/PVC ducts (see figure g.)
  - Pipes, fittings and fixtures shall be secured tightly with the structural members.
  - Wherever required, pipes shall be fitted with flexible joints to avoid breaking of pipes or snipping of wires.

g) **Electrical Design**

a) **Safety from Lightening hazard**: It is mandatory that all the sites must be assessed for lightning hazards and appropriate mitigation measures must be included in the design for the safety of the both building, equipment and its occupants.

b) **Exhaust Fans**: Exhaust fan, chimney etc. should be compulsorily provided in Autoclave Room of all health buildings and kitchenette counter of staff residence

c) **Prevent Flickering effect**: If the ceiling fans are being installed, light fixtures should be hanged below the fan level so as to avoid flickering effect.

d) **Electric power backup system**: Solar Electric Backup system and/or generator backup must be provided in following spaces in addition to the generator backup system. Power backup capacities required for catering critical load is given in the table 5.
  - Operation Theatre (Main operating room and ancillary support rooms)
• Emergency Department
• Maternity service area (CEOC, BEOC, Birthing Centre)

e) **Light Fixture:** Light fixture and luminaire should be used with simple design. Decorative light fixtures are not suitable in health facility settings.

**Table 5 Power Backup Requirement for Health Facilities** *(Source: Manual for Standard Electrical wiring in Health Facilities [DRAFT], Management Division, DoHS, Prepared by HSSP-GIZ, Nepal)*

<table>
<thead>
<tr>
<th>Type of Health Facility</th>
<th>Solar installation (W)</th>
<th>Diesel Generator installation (VA)</th>
<th>Batteries and inverters where grid system available (VA)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Health Post</td>
<td>1000</td>
<td>1500</td>
<td>1400</td>
</tr>
<tr>
<td>PHCC</td>
<td>2400</td>
<td>3000</td>
<td>3000</td>
</tr>
<tr>
<td>District Hospital</td>
<td>15000</td>
<td>20000, 3 Phase</td>
<td></td>
</tr>
</tbody>
</table>

i. **Fire Safety Consideration**
   a. **Strict conformance of NNBC 107:**
   b. **Checklist of requirements for conformity to Fire Safety standards** *(NNBC, 107; 206 & 208).*

<table>
<thead>
<tr>
<th>Fire protection measures</th>
<th>Hospitals</th>
<th>PHCC</th>
<th>Buildings smaller than PHCC</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Fire Fighting System</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A stored-pressure fire extinguisher</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Wet riser system</td>
<td>✓</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Dry riser system</td>
<td></td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Water storage tank exclusively for fire fighting system</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Sprinkler</td>
<td>✓</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Fire alarm</td>
<td>✓</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td><strong>Exit System</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fire escape route (standards for corridors, doors, stairs)</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>External Fire escape staircase</td>
<td>✓</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Fire rated doors in designated locations</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>
ii. **Heating Ventilation and Air Conditioning (HVAC) System**
BEONC unit of PHCC are required to provide mechanical HVAC system as these areas need to have controlled environment in terms for clean fresh air, temperature is required. Birthing Unit in Health Post should be provided with room heating system (Halogen heater or other means).

iii. **Signage**
Spaces and circulation network of the health facility must be designed such that the user can orient and locate oneself in that space. Disorientation may result in chaos in people's movement and also result in unnecessary traffic. Proper signage should be mounted on wall or hung from the ceiling according to the space situation and the signage type.

iv. **Project Management**
   a) **Workmanship** - Construction works should be conducted using skilled and trained human resource under the supervision of technical personnel (Engineer or overseer). The work should be done with good finish in perfect line and level as per specification.
   b) **Demolition of the Existing Structures**: Some of the health facilities which have got damaged by the earthquake need to be demolished to construction new structure. The implementation agency shall make arrangements for safe demolition, proper storage of useful material and disposal of debris out of the site.
   c) **Project Period**: Project period should be defined after realistic appraisal. Detailed work schedule should be prepared before deciding the construction period. If any probable disturbances such as the blockage of seasonal road in rainy season, snowfall etc. exist, this must be reflected in project work schedule and define project period accordingly.
   d) **Resolve Disputes**: Concerned stakeholders should be proactive in resolving whatsoever disputes arising during project implementation thus not to disturb the progress of the construction work. Implementation agency must inform the concerned health institution and MoHP about the issue.
   e) **Prompt action against negligent contractor**: If the contractor is found negligent, then the project manager must act promptly to recover the time lapse. Following actions could be taken consequently as per need,
      i. Calling meeting promptly to discuss on the matter.
      ii. Sending written reminders
      iii. Publishing notice in the national level papers
      iv. Forfeit Performance security and Advance Payment securities
      v. Terminate the contract and proceed for black-listing.
vi. If in case the implementing agency found that the contractor is willing to complete the work if some time is extended, the agency can extend charging the liquidated damage as per agreement.

f) Quality Assurance: The implementing agency must receive Quality Assurance Plan from the contractor before signing the contract. Regular supervision and monitoring should be done for the quality of the work and material according to the agreed plan.

g) Operation and Maintenance: The implementation agency should make arrangements for orienting the users on the building design and their function along with maintenance requirements and methods.

h) Handover: Handing over is an important phase of the project which is a prerequisite step toward bringing the health infrastructure to operation. After a formal handover procedure, the health institution will takes over the infrastructure and bring the health facility to operation. Following guidelines for handover procedure shall be followed.

i. Completion Certificate: The implementing agency should arrange for a joint monitoring visit together with users, owners and other stakeholders and endorse the completion of the work before issuing completion certificate to the contractor.

   Any defects found during these visits should be listed down in meeting minutes attended by joint monitoring team and contractor. Soon after rectifying those defects within the agreed time frame and after endorsing the completion of work by the local level Health Building Reconstruction Implementation Committee, the completion certificate should be issued to contractor and handover should be done simultaneously.

ii. Infrastructure Handover to the Health Institution: The completed infrastructure should be formally handed over with the handover form and key in presence of concerned management committee. Following documents should also be handed over along with the building infrastructure.

   − Handover form
   − All the meeting minutes from commencement, during construction and after completion of the work.
   − A set of printed as-built drawings (Architecture, Sanitary, Electrical and Mechanical Design etc.) along with CAD soft copy in CD/DVD.
   − Completion Certificate issued to contractor by implementing agency.
   − List of work items that have to be done by health institution after taking handover. (E.g. three phase electricity line if it is not connected during construction period etc.)
   − All the warranty documents of the machinery/equipments (e.g. waterpump, generator, bathroom fixtures, solar heater and electric backup system etc.)
   − Operation and maintenance manual
b. **Standard Specifications for Pre-fab Construction**

Different options are available for the construction of Pre-fab buildings. In the interest of maintaining quality and having a standard design, the following general requirements are to be met while implementing construction projects using pre-fab material.

1. **Fire resistance properties** - The construction material used for the pre-fab construction shall be non-combustible and resistant to fire for at least 1 hour.

2. **Occupational injury** - The composition of the material used for construction (walling, ceiling, paints etc.) should be free of any harmful compound that may cause injury or allergy to the occupant of the space.

3. **Environment Protection Consideration**: The material used for the reconstruction work should be conforming to environmental protection standards. All the materials should have certifications of meeting all the applicable environmental standards. All certificates that certify that the material meets the environmental protection standards need to be presented to MoHP before the signing of the Memorandum of Understanding (MoU).

4. **Insulation properties** - The walling material should have insulating property against heat and sound equivalent to 9" thick brick wall.

5. **Requirements for Sanitary and Electrical installation** - All piping for sanitary installation must be neat and concealed having no corner and grooves to avoid probable bacterial and fungal development.

6. **Flooring requirements** - Flooring should be as per the standard requirement mentioned in 2.5.2.a. The most preferable flooring material for pre-fab construction is Vinyl or Linoleum flooring (at least 2mm thick) with all coved corners and welding joints.

7. **Sealant** - Pre-fab construction are done by assembling prefab elements such as wall boards, panels etc. in which joint are to be treated with due care so that the joint cracks do not appear later. Approved jointing compound and sealant material must be used.

8. **Lead Protection** – Proper protection from radiation using lead lining on the walls and openings of the X-Ray room of the Primary Health Care Center (PHCC) must be ensured.
OPTION - 1: Insulated Fiber Cement Board Dry Wall System

Fiber Cement Board Dry Wall is a system that is fabricated as stud wall in which fiber cement board is fixed on the either side of the metal frame. The wall used for the health post construction should meet the specification as follows:

- **Internal Partition**
  - **Total Thickness**: at least 76 mm thick
  - **Support Frames** - GALVALUME sections (minimum 0.55/0.75mm thickness with AZ coating of 150gsm, **Covering Board installation** - 8mm thick High Pressure Steam Cured Non Asbestos Fiber Cement Standard Wall Board (TYPE Density>1250kg/cubic meter, Everest Wall board or equivalent) confirming IS 14862 & ISO 8336, tested as per AS-1530 part 3 & BS-476 Part 4,5,6,7&8, on either side of the framework with 25 mm fully threaded self-tapping screws @ 300mm center to center.
  - **Stud system** - Frame should be made of 51mm studs (0.55mm thick having one flange of 36mm and another flange of 34mm and placed at 610mm c/c in 76mm floor and ceiling channel (0.50mm thick having equal flanges of 32mm G.I steel). For Door and window extra support has to be provided with 2” Steel Medium Square Pile.
  - **Joint treatment** - Boards are to be fixed horizontally/vertically in a staggered manner to avoid through joints on both sides. To have a joint less finish, uniform gaps (typically should not be more than 2-3mm) should be covered with manufactured recommended jointing compound.

- **External Partition**:-
  - **Total Thickness**: at least 76 mm thick
  - **Support Frames** - GALVALUME sections (minimum 0.55/0.75mm thickness with AZ coating of 150gsm, **Covering Board installation** - 9mm thick (heavy duty) High Pressure Steam Cured Non Asbestos Fiber Cement Standard Wall Board (TYPE Density>1250kg/cubic meter, Everest Wall board or equivalent) confirming IS 14862 & ISO 8336, tested as per AS-1530 part 3 & BS-476 Part 4,5,6,7&8, on either side of the framework with 25 mm fully threaded self-tapping screws @ 300mm center to center.
  - **Stud system** - Frame should be made of 51mm studs (0.55mm thick having one flange of 36mm and another flange of 34mm and placed at 610mm c/c in 76mm floor and ceiling channel (0.50mm thick having equal flanges of 32mm G.I steel). For Door and window extra support has to be provided with 2” Steel Medium Square Pile.
  - **Joint treatment** - Boards are to be fixed horizontally/vertically in a staggered manner to avoid through joints on both sides. To have a joint less finish, uniform gaps (typically should not be more than 2-3mm) should be covered with manufactured recommended jointing compound.

**Joint between board and CGI sheet**: Joint between board and CGI sheet should be properly sealed with appropriate material (recommended - foam spray).
OPTION - 2: Sandwich panel

Sandwich panel are one of the alternatives that can be used as walling material in pre-fab construction. It is generally made of three layers: low density core inserted in between two relatively thin skin layers. This allows achieving excellent mechanical performance at minimal weight. Varieties of sandwich panels such as PUF (Polyurethane Foam) Panel, Rock Wool Panel, Glass Wool Panel, EPS (Expanded Polystyrene) Panel etc. are available in market among which following material options are listed along with specifications.

Glass wool Panel

Glass wool Panel wall system consists of prefabricated sandwich panels made of GI Sheet and glass wool.

- **Material Dimensions of Glass wool Sandwich Panel**
  - **Sandwich Composition** - Glass wool insulation material fill in between 0.5mm BMT (Base Material Thickness) colour steel sheets both sides.
  - **External Wall** - 75mm thick
  - **Internal wall** - 50 mm thick

- **Flooring** - Vinyl Sheet Flooring or Linoleum Sheet Flooring or PVC Sheet Flooring
  - The flooring material shall be raised up to 1200mm high as dado in delivery room and all toilets with coved corner. Rest of all rooms shall be provided with skirting 150mm high with coved corner.
  - **Option - 1: Sparkling Heterogeneous Vinyl Flooring (2.6mm thick)**
    - Providing & laying 2.6 mm thick approved sparkling heterogeneous vinyl flooring (Sheets size 2m X 25m), residual indentation of 0.06mm and walking flexibility below 0.10mm according to EN433. It's slip resistance when wearing on floor is wet with soapy water is class ESF. It is composed of a transparent compact wear layer of 0.7mm thick, abrasion group T, and reinforced compact double layer with 15dB Impact sound reduction. It is also provided with an antibacterial protection surface treatment containing silver ions, a biostatic treatment and a stain protect ion lacquer to avoid any waxing throughout the life of the floor covering and with proven stain resistance R10. Vinyl to be installed over self-levelling compound of average 3mm thickness. Joint between the rolls shall be welded with hot welding rods to make it seamless.
    - Reaction to fire shall be as per EN13501-1:BFL-S1. Emission into air:T VOC as per EN ISO 16000 should be <75µg/m3. (Sarlon - Forbo or equivalent)
  - **Option - 2: Heterogeneous Vinyl Flooring (2mm thick)**
    - Providing & laying 2.0 mm thick heterogeneous vinyl flooring sheets (Sheets size 2m X 25m) as per EN 428. The product shall have 0.7mm transparent compact wear layer that provide better performance. A non-woven, fully impregnated, glass fleece layer functions as the backbone of the flooring. The backing layer shall not contain 40% re-used content. The material shall be conforming to all standards, including the new VOC emission classes. The welding/seaming of
the joints shall be done using hot air welding machine. Vinyl to be installed over cement based self-leveling compound. (SOLIDE - Forbo or equivalent)

- **Option - 3: Linoleum Flooring (2mm thick)** - Providing & fixing of antibacteriostatic Linoleum flooring of 2mm thickness GRIHA approved made up of natural raw rapidly renewable materials. The product will have 2 layers, the joints between 2 rolls are welded with multi-coloured welding rods including self-leveling base course all complete as per specification and instruction of engineer. (Marmoleum or equivalent)

- **Electrical Appliance**
  - Energy saving bulbs such as CFL or LED shall be used
  - All Power Sockets should be 15 Amp

- **Windows**
  - UPVC
  - Tensioned GI wire mesh on windows for burglar protection.

- **Doors**
  - Burglar Proof Steel Door shall be used for Main Door
  - Locks in doors should be installed with al-drop lock.
  - Door Frames should have 10 years guarantee

- **Sealant** - All joint between panels shall be treated waterproof, fire resistant silicon based sealant.

- **Structure Design Parameters**
  - Dead Load - 0.5 KN/sqm.
  - Live Load - 0.75 KN/sqm.
  - Wind Load - 0.78 KN/sqm. (130 Km/Hr.)
  - Earthquake Resistance - Grade 8

- **Insulation Property**
  - K Value = 0.44

- **Fire Resistance Property**
  - Fire Rating for Structural Members = 3 Hrs.
  - Walling material = 1Hrs.

- **Green certification**: The material should have taken green certification from the competent authority to certify that this product does not have environmental hazard on using and disposal of the debris.

- **Health hazard** - PUF has chemical property that cause allergy and other health hazard. The production company of the Sandwich panel should declare that the company has adopted all mitigation measure to prevent health hazards. The company also shall provide user manual for proper handling that mitigate health hazard to fabricators as well as end users.

- **Heat and sound Insulation** - The material should have adequate insulating property for the conduction of heat and sound equivalent to the 230mm brick wall.

- **Sanitary Works Details**:
  - Sanitary Fixtures: Sanitary fixtures shall be installed as per the detail as mentioned below.
<table>
<thead>
<tr>
<th>Symbol</th>
<th>Description of item</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>S1</td>
<td>Stainless Steel (SS) single bowl sink - 500 X 400 steel sink with central hole Aerator type single lever mixer etc</td>
<td>4</td>
</tr>
<tr>
<td>S2</td>
<td>Stainless steel Clinical Scrub sink - 304 quality prime grade 16 swg thick Stainless steel (SS), mounted on SS frame. Size - 1200mm length, 400mm wide, and 600mm deep. (see figure c.) with hole on the sink installed with single long lever elbow type mixer</td>
<td>1</td>
</tr>
<tr>
<td>S3</td>
<td>Stainless Steel (SS) Double bowl sink - bowl size 400 X 400 size each hole on the sink installed with swan type bib cock with aerator.</td>
<td>1</td>
</tr>
<tr>
<td>B1</td>
<td>Porcelain clay white glazed Wash Basin - 400X300 size, wash basin with pedestal and central hole Aerator type single lever mixer etc all complete.</td>
<td>4</td>
</tr>
<tr>
<td>B2</td>
<td>Porcelain clay white glazed Wash Basin - 550X400 size , wash basin with pedestal and central hole Aerator type single lever mixer etc all complete.</td>
<td>3</td>
</tr>
<tr>
<td>P1</td>
<td>580 mm Porcelain clay white glaze squatting Pan</td>
<td>4</td>
</tr>
</tbody>
</table>

- **Sanitary work details:**
  - All the horizontally running pipes shall be installed over the false ceiling except for those which is shown in the drawings.
  - All Water supply pipes (hot and cold) shall be Chlorinated Poly Vinyl pipe – CPVC (SDR 11 CTS, 22.5 kg/cm²) with fittings (tee, elbow, union etc) from respective standards.
  - All the pipes that has been installed on the surface of the wall shall be encased with the steel/PVC ducts (see figure g.)
  - Pipes, fittings and fixtures shall be secured tightly with the structural members.
  - Wherever required, pipes shall be fitted with flexible joints to avoid breaking of pipes or snapping of wires.
OPTION 3 : PREFAB SOLID WALL PANELS

It is a non-asbestos Fiber reinforced aerated cement concrete (FRACC) Sandwich modules made out of light weight fiber reinforced aerated cement/concrete core composed of Portland cement, fly ash, binders etc., and 4mm thick non asbestos fiber cement boards confirming to IS 14862; 2000 and ISO: 8336:1993(E) on either and side of the core, having a tongue and groove on longitudinal side of the modules.

- **Support Frames** - These Panel modules shall be erected/installed using galvanized iron steel tracks of 1.2 mm thick & of size 25x51x25mm(for 50mm)/25x76x25mm(for 75mm) as bottom track, 25x51x25mm(for 50mm)/ 25x75x25mm(for 75mm) as top track for fixing to the floor and top of the wall respectively

- **Covering Board installation** - At least 75mm thick non-asbestos Fiber reinforced aerated cement concrete (FRACC) Sandwich modules

**Panel properties**
- Wall Weight - 75mm[Thickness] - 58.2 kg/m²
- Fire Resistance Properties - The Solid Wall Panels are Non-Combustible & qualify for early Fire Hazard indices as per BS-476, Part 20 & 22
- Moisture Resistance Properties - The Solid Wall Panels are Moisture Resistant & are tested as per IS 2380
- Sound Transmission Class - 40db as per IS; 9901 [Part III]-1981
- Axial Compressive Strength - 420kN/Meter as per IS:2380 , P.8:77
- Apparent Density - 892 kg/m³ as per IS 2380 P.3:77
- Tensile Strength (Perpendicular to surface) - 0.35 N/mm² as per IS:2380 P.4:77
- Modulus of Rupture (MOR) - 3.8Mpa IS:2380 P.5:77
- Screw Withdrawal Strength - 0.37kN as per IS:2380 P.14:77
- Thermal Conductivity - 0.12k.cal/h.m°C as per ASTM C 177
- Fire Rating - 134 Minutes as per BS 476 Part 20 & 22

- **Joint treatment** - Boards are to be fixed horizontally/vertically and the joints shall be covered with proper jointing compound so that the crack along joints are not visible. Application of good quality wall paper is desirable in addition to the jointing compound.
Annexure

ANNEX -1
Guidelines for Selecting Land for the Construction of Health Facilities

Background
Site selection is the first step and one of the most important steps in the building construction process. In the past, and continuing today, most delays and high costs of health facility construction are due to inappropriate site selection. This has generally been the result of the lack of a policy on the selection of appropriate land for health facility buildings.

These guidelines also set the criteria for accepting donated lands.

Minimum Area of Land Required for Different Levels of Health Facilities
If the land provided for building a health facility is relatively flat, a minimum area of land is required for the different levels of health facility by ecological region (see Table 1). These minimum requirements are derived according to the ground coverage of existing standard designs for facilities and considering the support services needed. These support services include underground water tanks, septic tanks, soak pits, parking areas, open spaces, guard houses, staff quarters, generator houses and other support and ancillary services, as per the standard guidelines for implementing the standard designs. If the available land area is less than the standard mentioned below, the implementing agency must inform the health facility and MoHP in written. MoHP, MD - DoHS and concerned Health institution will jointly decide to resolve the issue.

Table 1: Minimum areas required for different types of facilities, by ecological zone

<table>
<thead>
<tr>
<th>Type of facility</th>
<th>Ecological zone</th>
<th>Mountains</th>
<th>Hills</th>
<th>Tarai (plain land)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Health post building</td>
<td>Mountains</td>
<td>4 ropanies</td>
<td>4 ropanies</td>
<td>7 katthas</td>
</tr>
<tr>
<td></td>
<td>Hills</td>
<td>9 ropanies</td>
<td>9 ropanies</td>
<td>18 katthas</td>
</tr>
<tr>
<td>Primary health care centre</td>
<td>Tarai</td>
<td>35 ropanies</td>
<td>35 ropanies</td>
<td>70 katthas</td>
</tr>
<tr>
<td>District hospital</td>
<td>Tarai</td>
<td>20 ropanies</td>
<td>20 ropanies</td>
<td>70 katthas</td>
</tr>
<tr>
<td>15 bed hospital</td>
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<td></td>
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<tr>
<td>Type 1 Pre-fabricated Health Post</td>
<td></td>
<td>1.5 ropani</td>
<td>1.5 ropani</td>
<td>2.3 Kattha</td>
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<tr>
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<td></td>
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<td>1 ropani</td>
<td>1.5 Kattha</td>
</tr>
<tr>
<td>Pre-fabricated PHCC</td>
<td></td>
<td>2 ropanies</td>
<td>2 ropanies</td>
<td>3 Kattha</td>
</tr>
</tbody>
</table>

Note:
1 ropani = 5,476 sq. feet = 508.92 m²
1 kattha = 3559.4 sq. feet = 330.80 m²

2.1 Sites in market centres

A compromise (up to a 20% reduction) can be made in the land requirement for construction sites that are located within market centres (where people come for services such as education, administration, police, markets) and that are a central place for many villages, with good transport services and that are connected to the main road. This can only happen as long as all the functions and links in the standard design and the sizes of the rooms and ‘units’ are not disturbed.

Other Major Criteria

Slope of the land

Areas of land proposed for construction that are totally flat or have a gradient of less than 5 degrees or 1 (height):12 (length) are considered to be flat for the purpose of these guidelines.

If relatively flat land is available then the construction process can be expedited after the necessary site investigations have been carried out as required by building codes and standard design guidelines. If a proposed site does not qualify within the above criteria (i.e. it has a 5 degree or more slope), agreement must be sought from the Management Division (Department of Health Service) for construction on the site. In this situation the Management Division, after consulting with technical experts, local authorities and the concerned department in the Ministry of Health and Population (MoHP), can, with adequate justifications, reject the proposed site and request the responsible authority to provide an alternative site for construction, or approve construction on the proposed site with some minor adjustments to the standard design.

If the land is terraced

If relatively flat land is not available but terraced land is available, the new facilities’ units (blocks) may need to be isolated (separate). In such cases, the natural slope of the site should be used as a ramp and the separate blocks linked with covered pathways to each other according to their functions. In such cases the area of land required will be double that specified in Table 1.

Land development costs — Sites that need more than 15% of the estimated cost of construction to be spent on land development (such as building retaining walls and levelling or filling land) should be considered unsuitable and should be rejected for the construction of health facilities in mountain and hill areas. In Tarai areas, land development costs must not exceed 10% of total building construction costs. In such cases where the cost exceeds the above mentioned limits, technicians who prepare estimates and surveys must declare such sites unsuitable for construction and report to the appropriate authority including the concerned health institution. Such cases shall be communicated to the Management Division (Department of Health Services) by both the technical and health facility authorities.

Orientation

In hill and mountain districts, north-oriented land or land that does not get direct sunlight should not be selected for health facilities as southern light is very important for natural heating and natural bacterial disinfection in these areas.

Location

Sites should not be located on the top of hills or in jungles or isolated away from settlements. However, if the catchment settlement is located at the top of a hill it is acceptable that the site is within the top on flat land.
**Sites that are ponds or water ponding areas**
Land that has earlier been ponds should not be used for building any (below ground) superstructures except underground water tanks or septic tanks (if the building of these tanks is technically feasible). Such land can be filled in if the bearing capacity of the soil is good and the filling work can be managed within the prescribed threshold of the existing total land development costs. Analysis must be made to ascertain that this does not require additional costs due to having to provide special kinds of foundations. In this case the bearing capacity of the land should not be less than the normal limits.

**Minimum risk land**
Sites selected for construction must be safe from landslides and flooding. A proper assessment of this must be made before the selection of areas for construction.

**Road connections**
In most areas, sites must be accessible and connected to a motorable road. The road must be wide enough for ambulances and fire fighting machines. For building health posts in very remote districts (that are not yet connected to the road network), where road connections are rare, sites must be selected where there is evidence that the site is likely to be connected to a road in the future.

**No expenditure on roads**
Health facility construction budgets should not be used to build access roads to sites. However, budgets may be used to build roads from the compound gate to the main entrance and other pedestrian pathways if the budget stays within the above-stated proportion admissible for land development costs (see Section 3.2). The construction of connecting roads shall be the responsibility of local governments or concerned line agencies.

**Continuous water supplies**
Sites must be connected to a water supply or have a water source within the site (or there be a possibility for connection). The source or supply must be able to fulfil the water supply needs of the proposed level of facility and its provision of services. For sites that are not connected to any water source or supply, health facility management committees are responsible to get sites connected to a water supply or source. If making a connection to a source of water can be managed within the authorized land development cost limits, then such costs can be included in the estimated costs of construction.

**Building construction and land development costs**
All land development costs and the costs of construction must be summarized separately by the technicians who prepare cost estimates.

**Compound walls**
Compound walls must not be packaged within the same contract as building construction contracts. If a wall is needed then the design and cost estimate, plus the justification for building a wall, must be separately submitted to the Management Division. These costs will be provisioned in the next budget by the Management Division based on priority and rationale. But if a compound wall can be managed within the authorized land development cost (as per Section 3.2) then it can be included in the same contract.
Voluntarily Donated Land

If the proposed site is donated land, the above criteria will apply for site acceptance only if they fulfill MoHP’s Framework for Land Acquisition and Resettlement Policy (NHSP-2). Any donated land that does not meet the criteria should not be accepted for the construction of a health facility.

The tradition will be continued where people voluntarily donate land to build community level health facilities that provide direct benefits to local communities. However, adequate safeguards will be built in to resettlement plans (for tenants and other affected persons) to ensure that such donations are unforced and that poor people are not asked for donations.

All voluntary land donations should meet the following criteria:

- There has been full consultation with project affected persons (PAPs) on site selection.
- Voluntary donations do not severely affect PAPs such that PAPs do not as a result lose more than 20% of their land holdings and fall below the poverty line.
- The land in question is free of squatters, encroachers or other claims.
- The voluntary nature of the land donation is verified in all cases through a formal public hearing.
- Voluntary donations are confirmed by a written record including a ‘no coercion’ clause verified by an independent third party NGO.
- The voluntary contribution of land cannot be accepted if the holdings of the affected households will be reduced to a marginal landholding, and if the donation is more than 20% of their total landholding.
- Land transfers should be completed through registration of the land to the acquiring authority.
- The leasing out of land and the rights of use of land will be properly documented.
- A grievance redress mechanism will be in place.

Public Hearings

The implementing agency must arrange for a public hearing to be held where there is new construction and the acquisition of land is involved. These hearings shall verify the information provided on land assessment data sheets. These hearings will be documented and attached to the construction plan of the facility investment proposal.

No formal tender notices shall be published until all the criteria under these guidelines are met. Otherwise the tendering entity will be held responsible for any discrepancies that arise from implementing the project in question.
ANNEX-2

Standard Design of Placenta Pit

Placenta is an organ, which grows up from the time of conception and takes over the production of hormones needed to sustain the pregnancy at around 12 weeks gestation. It supplies nutrition to the fetus. This is the only disposal organ ever made for human body. At full term, the placenta has a discoid shape; a diameter of 15 to 25 cm, approximately 3 cm thick and has weight of about 500 to 600 gm. Wastes such as placenta, body parts, animal carcasses etc., produced by health facilities are hazardous and need special disposal method. Due to its highly hazardous nature it is becoming a big problem in those health facilities where there are significant number of deliveries and surgical operations are occurred. Incinerator with high temperature chamber is the best solution to dispose placenta and other infectious wastes. Incineration reduces 90 percent of volume of waste. But it is costly to invest at first and difficult to manage for small district hospitals, Primary Health Care Center and Health Posts. Improper operation of incinerators not meeting the standard temperature may lead to the production of dioxins, furans or other toxic pollutants as emissions and/or bottom fly ash. Hence, WHO has scaled up promotion of effective, non-incineration technologies for the final disposal of health-care waste.

Placenta pit is an simple and safe method of disposing hazardous waste as mention above. In this approach, placentas are disposed inside a shallow pit with cover. It is also suitable to dispose other pathological wastes such as dead fetuses, body parts, body fluids, and animal carcasses. Shallow pits are made in a safe place where there are less chances of contamination of drinking water source. When the placentas are dispose inside the pit, it decomposes with biological phenomena and reduces the volume. The detail method of construction of placenta pit is as follow:

- **Dimensions:** Dig a pit about 3-4 meter depth (depends on quantity of placenta) and 1.5 meter wide. (see Figure 4)
- **Walling Material:** Build the wall of the pit with cement and brick to protect it from soil erosion. If brick is not available, pit can be made with cement ring made for culvert but the joint should be sealed properly with 1:3 cement sand mortar. If there is a high water level or water appears while digging the pit, make it water proof with cement to protect it from water contamination.
- **Cover:** Put a metal cover about 12 inches length and 18 inches wide. Open this cover only to dispose placenta. During the remaining period cover the pit in order to protect it from flies, birds and animals entering the pit. This will also protect from water entering inside the pit during rainy season.
- **Ventilation pipe:** Put a ventilation pipe with about 5 feet length and 4-5 inches wide. At the top of the pipe keep an umbrella shape cover with net so that flies and water does not get inside through this pipe.
- **Mouth hole position:** If there is a chance of flood during the rainy season, make the pit in high position, above the surface of the soil so that water cannot enter the pit.
- **Soil layer at the bottom:** Put a layer of soil at the bottom of pit so that it helps in decomposing the placenta.
• **Alternative pit:** In the hospitals where there is high caseload of delivery, make two pits side by side and near each other. In such cases, if one pit is full, the other can be used. After 6 months to 12 months, the volume of placenta reduces due to decomposition process and this pit can be used again.

![Design of Placenta Pit](image)

**Figure 3 Design of Placenta Pit**

1. Primary Health Care Centre in Pre-fab Construction
2. Health Post in Pre-fab Construction
Annex 4: List of Essential Furniture, Equipment/Instruments
TYPE -1 Drawings
GROUND FLOOR PLAN, DRAIN LAYOUT
Area: 124 Sq. M. (EXCLUDING COVERED VARANDAH)

PREFAB HEALTH POST DESIGN TYPE - 1

LEGEND

<table>
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<tr>
<th>SYMBOL</th>
<th>DESCRIPTION</th>
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<td>GREY WATER PIPE</td>
<td>SOIL PIPE</td>
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The Partition wall of the staff residence should be extended from floor to roof.
TYPE -2 Drawings
GROUND FLOOR PLAN

POWER SUPPLY LAYOUT OF TYPE -2

The Partition wall of the staff residence should be extended from floor to roof.

LEGEND

SYMBOL: POWER CIRCUIT
DESCRIPTION: DISTRIBUTION BOX

CIRCUIT CLASSIFICATION FOR BACKUP SYSTEM

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<th>WITHOUT BACKUP</th>
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Job Name: HEALTH POST TYPE -2
File No: AR/07
Scale: 1:100
Date: 2072/08/03

Post Disaster Recovery and Reconstruction
Standard Type Design

Ministry of Health & Population
Rasthah Path, Kathmandu
## Opening Type

**W1, W2, W3, W4**

<table>
<thead>
<tr>
<th>Opening Type</th>
<th>W1</th>
<th>W2</th>
<th>W3</th>
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<td>Ante-Post Natal Beds</td>
<td>Reception</td>
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**V1, V2, V3, D1**

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<th>V3</th>
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<td>Siding (Aluminium)</td>
<td>Siding (Aluminium)</td>
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<td>Auto. Clave</td>
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**D2, D3, D4**

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<td>Toilet, Anti-Natal Clinic, Delivery Room</td>
<td>Staff Residence, Slaice, Autoclave</td>
<td>Toilet, Store</td>
</tr>
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</table>
GROUND FLOOR PLAN

ELECTRICAL LAYOUT OF TYPE -2

The Partition wall of the staff residence should be extended from floor to roof.
GROUND FLOOR PLAN

POWER SUPPLY LAYOUT OF TYPE -2

The Partition wall of the staff residence should be extended from floor to roof.

CIRCUIT CLASSIFICATION FOR BACKUP SYSTEM

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LEGEND

- DISTRIBUTION BOX
- POWER CIRCUIT

The Partition wall of the staff residence should be extended from floor to roof.
GROUND FLOOR PLAN
DRAINAGE LAYOUT FOR TYPE 2

The Partition wall of staff residence should be extended from floor to roof.

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