Guidelines for Sustainability and Efficiency in Building Design

For Health Sub Centres, Wellness Centres, Primary Health Centres and Community Health Centres

SELCO Foundation | 2020

SELCO Foundation

SELCO Foundation is a 10 year old organisation that engages in field-based R&D, evidence and ecosystem building for deployment of clean energy solutions that alleviate poverty in tribal, rural and urban poor areas. The organization works closely with practitioners in the social sector, energy entrepreneurs and partners from various developmental sectors.

SELCO Foundation is an open source platform with a network of research and development labs that implement and disseminate sustainable social innovations through an ecosystems approach.

Model Subcentre design and implemented by SELCO Foundation in partnership with Karuna Trust in YK Mole, Karnataka

Background

Globally the building sector accounts for more electricity use than any other sector, 42 per cent.[1] Healthcare Infrastructure requires continuous functioning without interruption, which leads to ranking them to be the second most to use a large amount of energy in the building sector.

A study on emission of CO2 from different types of buildings in England was recently conducted. The study has shown that 8 buildings out of the top 10 most polluting buildings are healthcare facilities.2 A study undertaken by Energy Conservation Building Code (ECBC)3, India demonstrates that Indian healthcare facilities have a potential to conserve 42% of the energy consumption by implementation of energy efficient measures.

The health sector has a critical role to play in taking measures to improve the energy consumption benchmarks. At the onset, this can be done by looking at the active energy needs of the health centres in the forms of appliances and technologies used in health centres for provision of various services. But more importantly, it has been found that significant improvements can be made in the lighting and cooling needs of the health centre if the building is designed appropriately.

Thus, SELCO Foundation follows an integrated approach which sets benchmarks for both passive and active lighting and cooling through interventions in:

- **Efficiency in Building Design**
- **Efficiency in Appliances**

Such an approach would not just result in improved efficiency benchmarks for the healthcare facilities and reduced energy consumption, but also result in overall impact such as:

- Improved well-being for staff as well as in-patients
- Confidence in staff in being able to delivery quality service
- Climate resilience against heat stress and other environmental factors like flooding, cyclone, earthquake etc

[1] UNIDO, Energy Efficiency in Buildings: Module 18
[2] https://www.theguardian.com/environment/2010/jan/01/government-public-building-co2-audit accessed on 1-2-2019
[3] Energy Conservation Building Code,(ECBC) 2017
[4] Tulsyan, A., Dhaka, S., Mathur, J., And Yadav, J.V., 2012. "Potential of energy savings through implementation of energy conservation building code in Jaipur City, India"" Energy and Buildings.

What are Low Energy Spaces?

Shelters that have ample amount of natural lighting, cross ventilation or air circulation and are well insulated from the heat and cold to promote thermal comfort for habitation indoors are inherently low in their consumption of energy.

"Improved thermal comfort and reduced energy consumptions for health centers across geographies and climatic conditions"

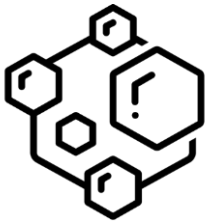
How do you achieve reduced energy consumption through built spaces?

Efficient Spatial Design

Planning, shape, orientation and shading – to limit or enhance solar heat gain and capture air movements of the micro climate

Material and Insulation

Treating the envelope and building with materials with appropriate U-value in response to local climatic conditions



Adaptivity to local social contexts and needs

Energy Efficient Appliances

Wattage, location, type, reflectors and products to optimise the active and passive system designs

Design of Fenestrations

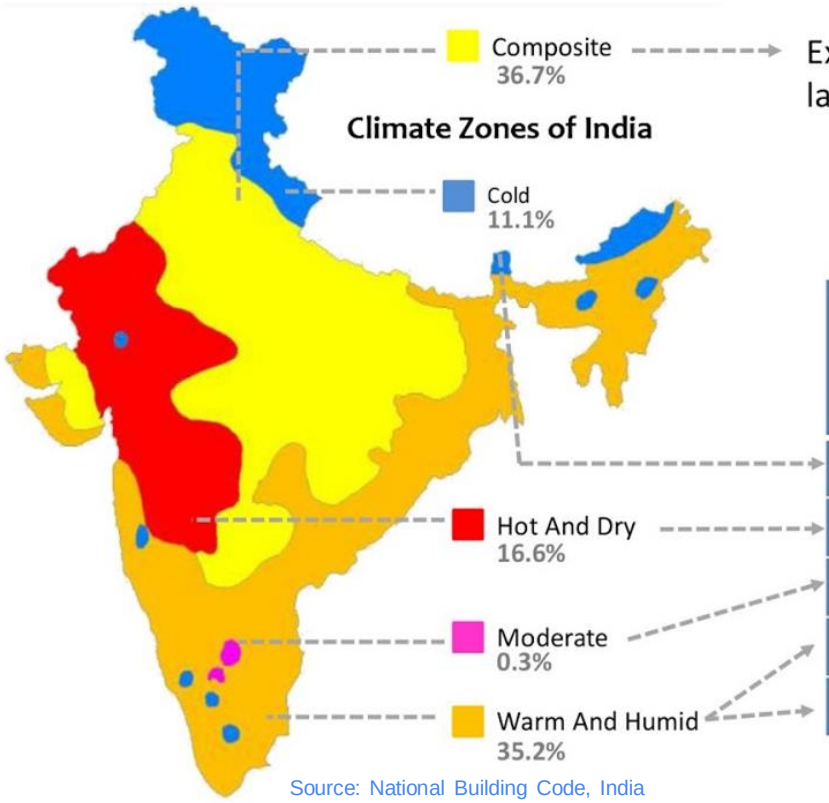
Size, location, type and accessibility of doors, windows, ventilators etc

Physiological and physical benefits to occupants of the space

Efficiency Benchmarks for various Typologies

India comprises of five types of climate zones ranging from extremely hot regions to high altitude locations with severely cold conditions i.e. Hot and Dry, Warm and Humid, Moderate, Cold and Composite. **A climate responsive building design is very important for ensuring energy efficiency as approximately 40% of the building energy consumption is used to achieve thermal comfort for heating or cooling.** Climate responsive designs facilitate are also important to maintain physical and psychological living conditions. They reduce the adverse public health effects from extreme climatic conditions.

Climate Zones of India



Select the appropriate Climate

Mean Monthly maximum Temperature (°C)	Mean Monthly Relative Humidity Percentage (%)
Below 25	All values
Above 30	Below 55
25 - 30	Below 75
Above 30	Above 55
Above 25	Above 75

Source: National Building Code, India

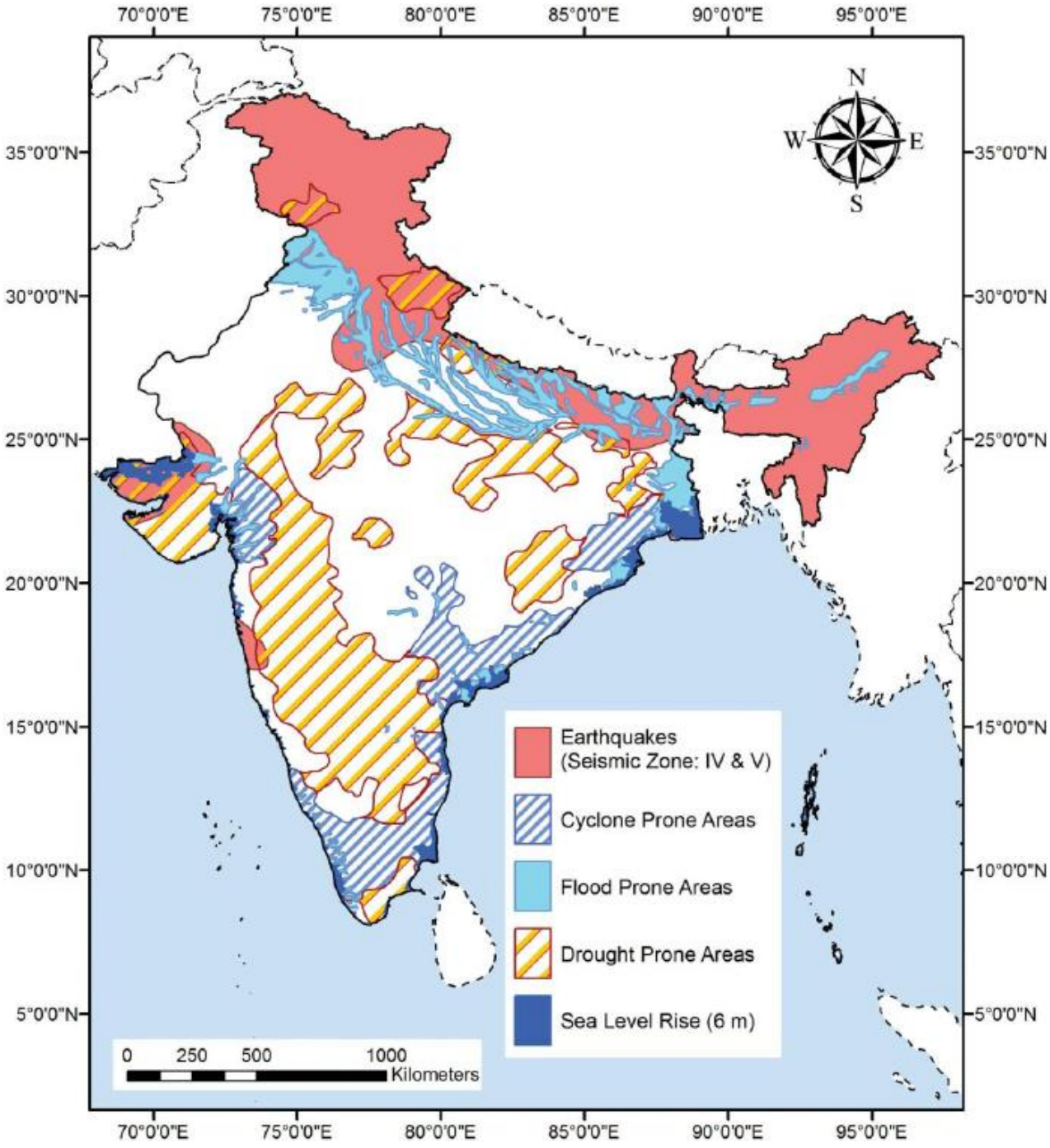
Other than the five climate zones, typology can also be defined by the

- Types of communities
  - Rural, Tribal, Urban, Migrant - can dictate the size and material for construction
- The services the health care infrastructure is providing
  - Labour and Delivery, Family planning, Eye care, Dental - for added benefits to upgrade to wellness centre
- Disasters the geographies are prone to
  - Cyclone, Floods, Earthquake - for resilience and rehabilitation/ occupancy of space for disaster and post disaster time
- Topography and soil conditions
  - Hilly, Plain, Desert, Coastal - material for construction as well as climate response

Resilience Benchmarks for various Typologies

India is vulnerable to many natural disasters like earthquakes, floods, cyclones and heat stress. Institutions providing critical services like health need to be made resilient against these stresses pre, during and post disasters.

Climate Stress and Disasters of India



Source: Chakraborty, Anusheema & Joshi, P.. (2016). Mapping disaster vulnerability in India using analytical hierarchy process. Geomatics, Natural Hazards and Risk. 7. 308-325. 10.1080/19475705.2014.897656.

Resilience Benchmarks for various Typologies

Disaster Type		Damages	Resilience measures
A	**Flood and Flash Flood**		
1.	Site Selection	Building Location	• Conduct site level hazard/ risk assessment • Avoid low lying areas and flood prone zones while selecting location for health centre • The road transport and access routes should not be cut off due to flooding. Roads to be built on embankments. Access routes like bridges need to be reinforced. • Site must be elevated from road levels • Build site level protections like embankments, earth mound raising or elevating the plinth or lower floor, landscaping and/ or building flood walls along the site boundary to divert flood water or reduce the impact*
2.	Orientation	Building Layout	Orientation of the building along the flow of the flood to reduce resistance and impact
3.	Structural System	Foundation	• Flood impact* and duration to be considered and its effect on soil properties and bearing capacity • ground settlement due to flood (amongst other factors). • Uplift (buoyancy) pressures on the building foundation to be considered
		Plinth/ Floor level	• Ground Floor plate needs to be located above flood levels. • Ground floor rooms should be waterproofed. • Construction joints must be made watertight.
4.	Envelope	Walling	• Impermeable construction materials and waterproofing at least upto 3 ft above flood levels • Waterproofing additives to be added to cement mixture
		Roofing	• Providing waterproofing of the rooftops • Minimum 3ft roof overhangs to protect the built envelope from torrential rains
5.	Openings	Windows and Doors	• Providing waterproof, watertight and impact-resistant window and door frames • Openings on the ground floor should be above flood level and provided with impact-resistant glazing • Shading or chajjas of 2ft to be provided over windows, ventilators and doors
6.	Services	Solar Systems	• Providing Rooftop reinforced solar panels to power all critical loads (ex. emergency lights, mobiles, fans, water pumps etc)
		Electricals	DG Sets as backup systems to be avoided
		Water Storage	Below-ground infrastructure (tanks, plumbing) should be designed to prevent leakage or contaminations. Overhead tanks recommended.
		Sanitation	Backflow prevention valves to be installed to prevent leakages Plumbing to be located above flood levels

Resilience Benchmarks for various Typologies

	Disaster Type	Damages	Resilience measures
B	**Drought and Heat Stress**		
1.	Site Selection	Building Location	Planting for local indigenous shading trees that consume less water and naturally shade/ cool the building
2.	Orientation	Building Layout	Linear along the east west axis to reduce the impact of the harsh low sun altitude
3.	Structural System	Foundation	Reduce usage of cement in the foundation
4.	Envelope	Walling	• Promotion and use of less water intensive construction methodologies (RCC is water intensive) • Prefabrication and precast technologies are more efficient and have a faster pace of construction reducing site usage of water
		Roofing	Insulated roofing technologies and cool roof paints and finishes to be used
5.	Openings	Windows and Fenestrations	Deep chajjas and shading on the southern and eastern facades Insulated glazing to be used
6.	Services	Solar Systems	Air conditioning and cooling systems to be solar integrated for efficiency in energy consumption
		Water Storage	Promoting rainwater recharge of ground water and/ or harvesting of rainwater for utility purposes
		Sanitation and Plumbing	• Usage of Low Flow Taps and Flushes • Biodigesters to be used for sustainable management of sewage • Greywater and Blackwater recycle and reuse for utility and gardening

Resilience Benchmarks for various Typologies

	Disaster Type	Damages	Resilience measures
C	**Cyclone*** *most cyclone prone regions are also affected by floods - refer option A*		
1.	Site Selection	Building Location	• Site location to have natural shielding from the wind direction • eg: site area behind mountain range, vegetation forming shield for wind pressure
2.	Orientation	Building Layout	• Compact building shape and orientation for high velocity winds to go through eg: cluster of building planned for wind to flow through easily without obstruction
3.	Structural System	Foundation & Plinth	• Heavy foundation for structures to avoid upturning
4	Envelope	Walling	• Corners of the walls to be strengthened with tie members. Diagonal braces to be used
		Roofing	• Roof form: The roof should be hipped roof instead of pitch roof • Verandah, patios,etc to have low roof to avoid lifting of roof structure • For RCC roofs, the roof to be anchored structurally to avoid uplifting • For Sheet roof, galvanised sheet with minimum 24 gauge • U bolt connection for roof cladding to purlin • Spacing of roof members to be 450-600mm for 24 gauge roofing sheet • Roof frame to be anchored with wall post and walls
5.	Openings	Windows and Fenestrations	• Window openings to have provision for securely closing during a cyclone.
6..	Services	Solar Systems & Electricals	• Use of decentralised energy supply for disaster time infrastructure damage of grid supply • Installation of panels & Mounting structure to be as as per IS875, IEC 61215 (model selection)
		Water Storage, Sanitation and Plumbing	• Design for overhead tanks to follow dynamic design procurement guidelines as per IS codes

Resilience Benchmarks for various Typologies

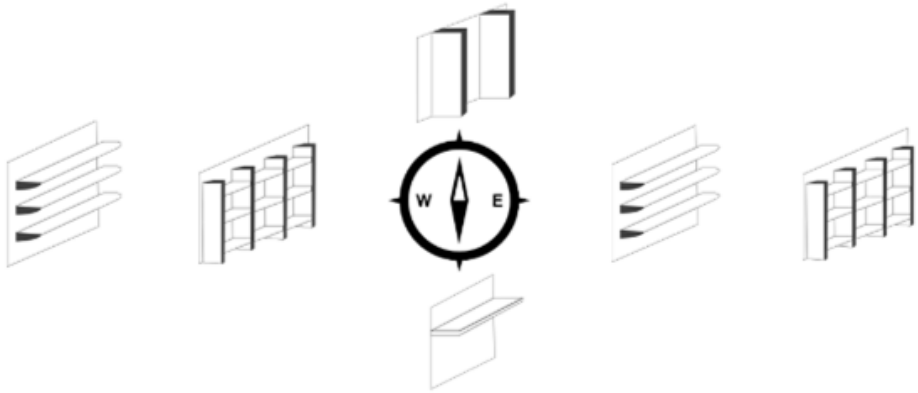
Disaster Type		Damages	Resilience measures
D	**Earthquake**		
1.	Site Selection	Building Location	Identify the seismic zone and follow structural guidelines as per. To avoid liquefiable soils
2.	Orientation	Building Layout	Uniform shapes and symmetric plans ensures that the building center of mass and center of stiffness are coincidental and the effects of torsion are minimized.
3.	Structural System	Foundation	• Base-isolating structures • Reinforced foundations to absorb shock waves • Framed (column-beam) structures or prefabricated box type structures
		Plinth/ Floor level	• Heavy foundation for structures to avoid upturning • A continuous reinforced concrete tie or reinforced brick runner provided in the walls
4.	Envelope	Walling	• Corners of the walls to be strengthened with tie members • Lightweight non structural materials or avoiding unnecessary fillings and finishings
		Roofing	• Projecting roof overhangs and shading devices to be avoided. • If the projecting parts cannot be avoided, they shall be properly reinforced and firmly tied to the main structure • Suspended ceiling shall be avoided. If provided, they shall be light, adequately framed and secured.
5.	Openings	Windows and Fenestrations	Dampers and shock absorbers to be provided on glazing
6.	Services	Solar Systems	Maintain reliable energy
		Water Storage, Sanitation and Plumbing	Seismically retrofit water tanks (anchoring to foundations) Strengthen concrete tank walls and promote above ground storage
			• Built-in furniture and bolting of furniture is best practice • Fire frequently follows an earthquake and therefore, buildings shall be constructed to make them fire resistant

Efficiency Benchmarks for various Functions

Depending on the function defined for each space, temperature, humidity and lux value can differ. Accordingly the layout, window placement, ventilation as well as the active technologies can be designed for. The following table lists down the different functional spaces defined for primary health centres (first point of reference) and sub-centres (first point of care), relating to their needs. An understanding of this, in relation to the overall climate helps further narrow down the kind of technologies that are appropriate for a particular health centre.

	Function	Temperature (DB)	Relative Humidity	Lux Value (min)
A	**Health Centre**			
1.	Ramp & Entrance, Waiting Areas, Staff Duty rooms/ Passages with informatory posters	24 to 26 ℃	45 to 55%	150
2.	Consultation and Examination Room	24 to 26 ℃	45 to 55%	200
3.	Labor and Delivery room	17 to 27 ℃	45 to 55%	SCs & PHCs - 300 to 500 CHCs- 500
4.	Recovery and Patient rooms/ Wards	24 to 26 ℃	45 to 55%	150
5.	Operation theatres	17 to 27 ℃	45 to 55%	500
6.	Auditorium	Summer - 23 to 26 ℃ Winter - 23 to 24 ℃	Summer - 50 to 60 % Winter - Not less than 40%	250
7.	Washroom/ Passage	24 to 26 ℃	45 to 55%	100
8.	Pharmacy/ Storage	17 to 27 ℃	45 to 55%	100
B	**Accommodation**			
1	Kitchen	24 to 26 ℃	45 to 55%	200-300
2	Living Room	24 to 26 ℃	45 to 55%	150-200
3	Bedroom	24 to 26 ℃	45 to 55%	100-150
4	Bathroom	24 to 26 ℃	45 to 55%	70-100

Design Strategies for Efficiency Benchmarks



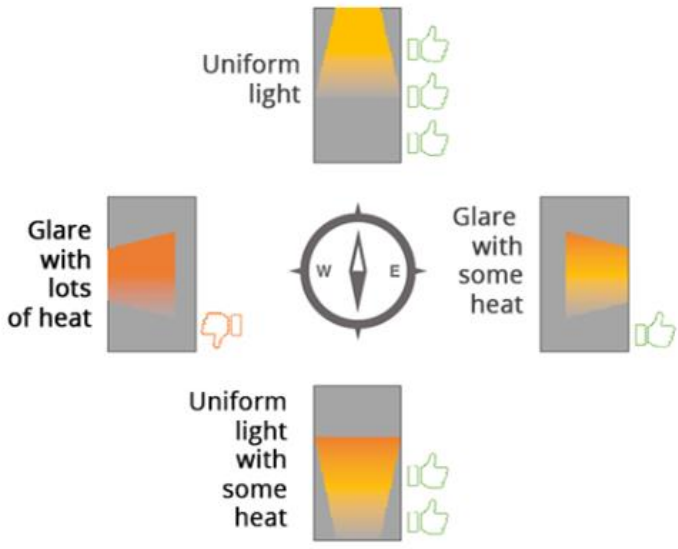
Source - Eco niwas

Shading Devices:

- Roof overhangs can block sun rays and rain water from directly hitting the building envelope and can act as weather protection agent.
- External shading devices would block the sun rays following on the window glass altogether. This would reduce the solar heat gain through the window and keep the building cooler.
- North facing windows require minimal shading as they do not receive direct sun for most part of the year. In cold places windows can be unshaded to receive the sun.
- Horizontal overhangs (Chajjas)/ extended roofs are most effective in shading the afternoon sun in south direction.
- Both horizontal & vertical louvers in combination can be used for protection from rising & setting sun in East & West Direction.
- Adding internal shading devices like curtains and blinds can further your control over heat and light entering the room

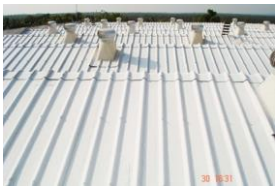
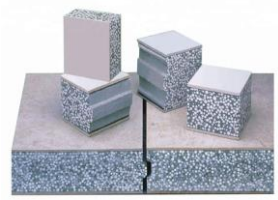
Daylight Orientation:

- Frequently used spaces which must be well lit should face North-South direction.
- Window facing North provide glare free comfortable light and are suggested for hot climate.
- South facing windows are preferable for colder climate as they provide ample amount of light and also heat up the room.
- East and West facing windows both bring in heat and glare and should be avoided for hot climate zones.



Source - Eco niwas

Material and Insulation for Efficiency Benchmarks

	Efficient Material Alternatives	Application	Availability
External Envelope			
	Cool roof paint	For GI Sheet as well as RCC slab on the exterior surface of the roof for thermal insulation. Hot and Dry Climate zone	Pan India
	Hourdi Block/ Hollow clay block Roofing	Flat Roof slab alternate for cooling the roof	Karnataka, Tamil Nadu, Orissa, Goa, Kerala, Maharashtra, Andhra Pradesh
	Precast cement/ ferrocement sandwich insulation (with foam or EPS) slabs	Flat Roof slab alternate for RCC	Pan India
	Clay or laterite aggregate in RCC slab	RCC jelly alternate	Coastal
	Mangalore Clay tile roofing with metal framework	RCC roof alternate for heavy rainfall zones	Coastal
	Fly Ash or AAC Cement Blocks	External and partition walls	Pan India
	Porotherm- Wienerberger Block or hollow clay block	External and partition walls	Pan India

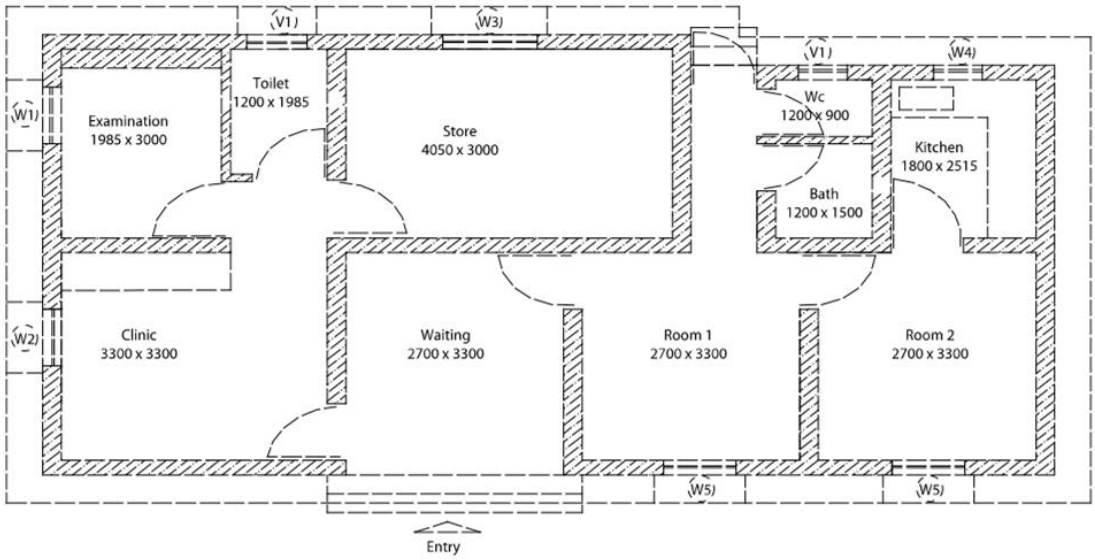
Material and Insulation for Efficiency Benchmarks

	Efficient Material Alternatives	Application	Availability
External Envelope			
	Laterite Blocks or CSEB	External Walling Material	Coastal
	Timber	External Walling/Roofing/Partition walls	Leh Ladakh, Jammu and Kashmir, Himachal Pradesh, Uttar Pradesh, Nilgiri
	Tombre Wall	External Wall	Leh Ladakh
Fenestrations			
	UPVC or Fibreglass Frame Windows and Ventilators	Fenestration	Pan India
	Window Glazing Material (Low emissivity)	Fenestration	Pan India
Internal Walls			
	Eco agri based boards or Sandwich panel walls (110mm thick)	Interior partition walls and external walls as sandwich panel	Maharashtra, Uttar Pradesh, Bihar, Gujarat, Delhi
	Seamless internal finishes in white either in Vinyl or seamless flooring tiles	Optimisation of active lighting as well as easy to clean surfaces	Pan India

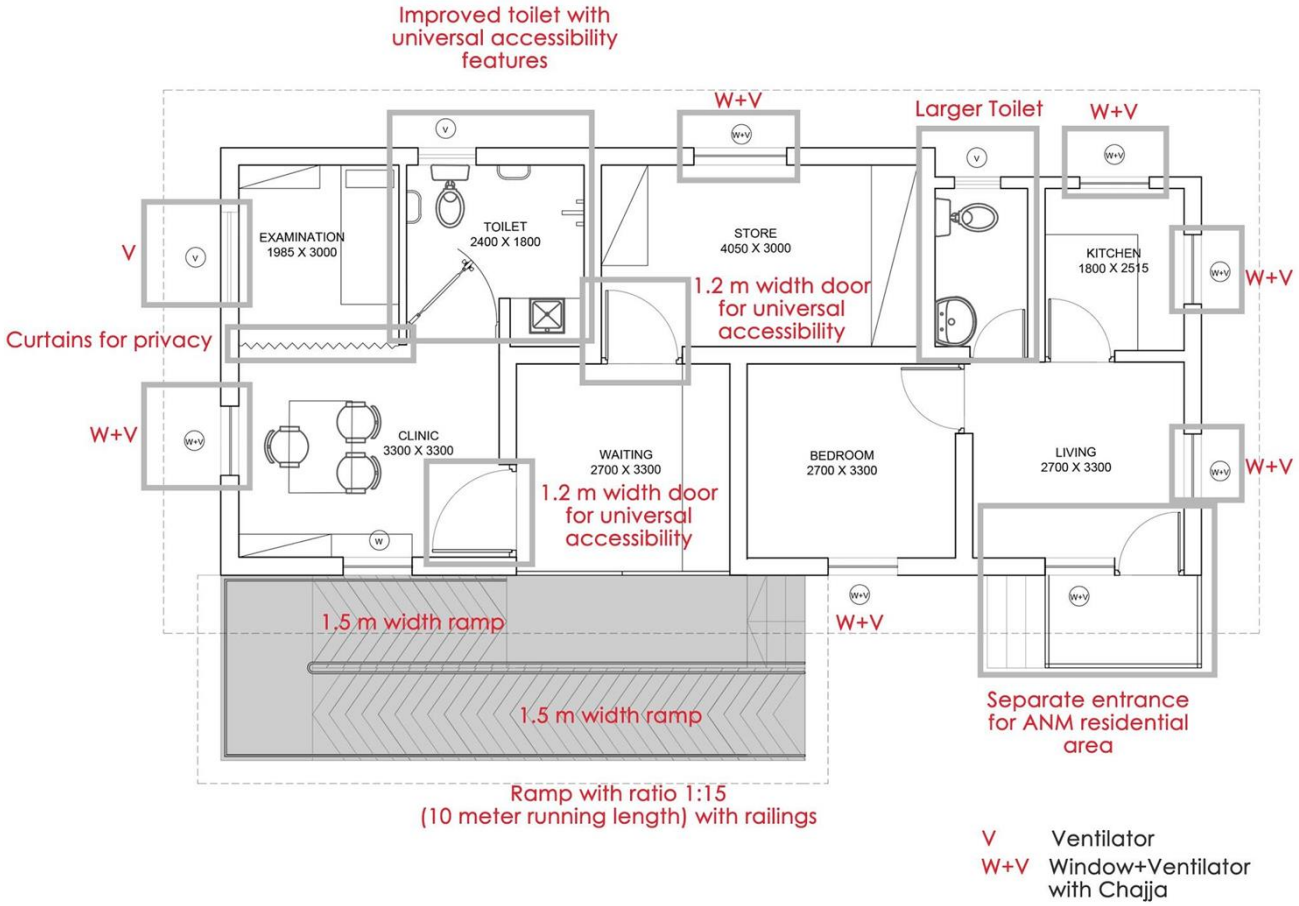
A1. Design Recommendations for Health Sub Centres

The Health Sub-centre is the most peripheral outpost and the first hope of healthcare for people living in remote areas. It fulfils the basic primary and quality health care needs of the families surviving in difficult circumstances in the remote areas. The centres are usually manned by an Auxiliary Nurse Midwife (ANM) whose focus is on primitive and preventive healthcare services, and to act as a referral to the Primary Healthcare Center (PHC) for curative services. Below are recommendations on IPHS guidelines, India.

Before (Sub centre without Labour Room - 85 sqm)

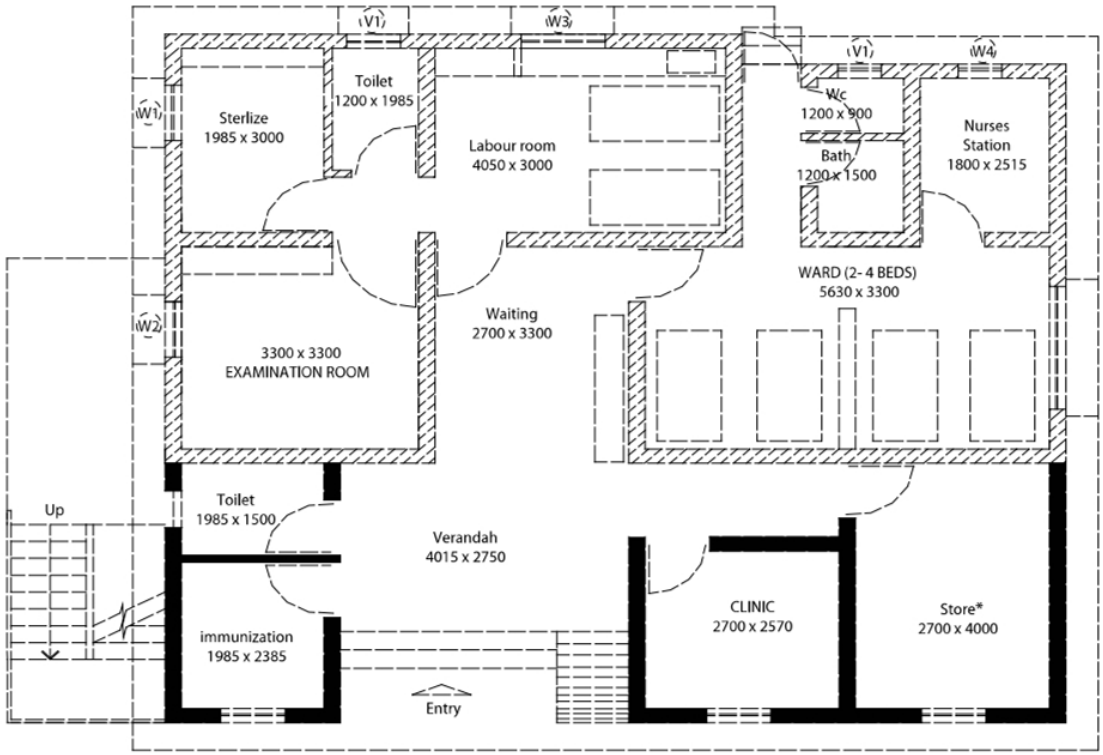


After (Sub centre without Labour Room - 85 sqm)

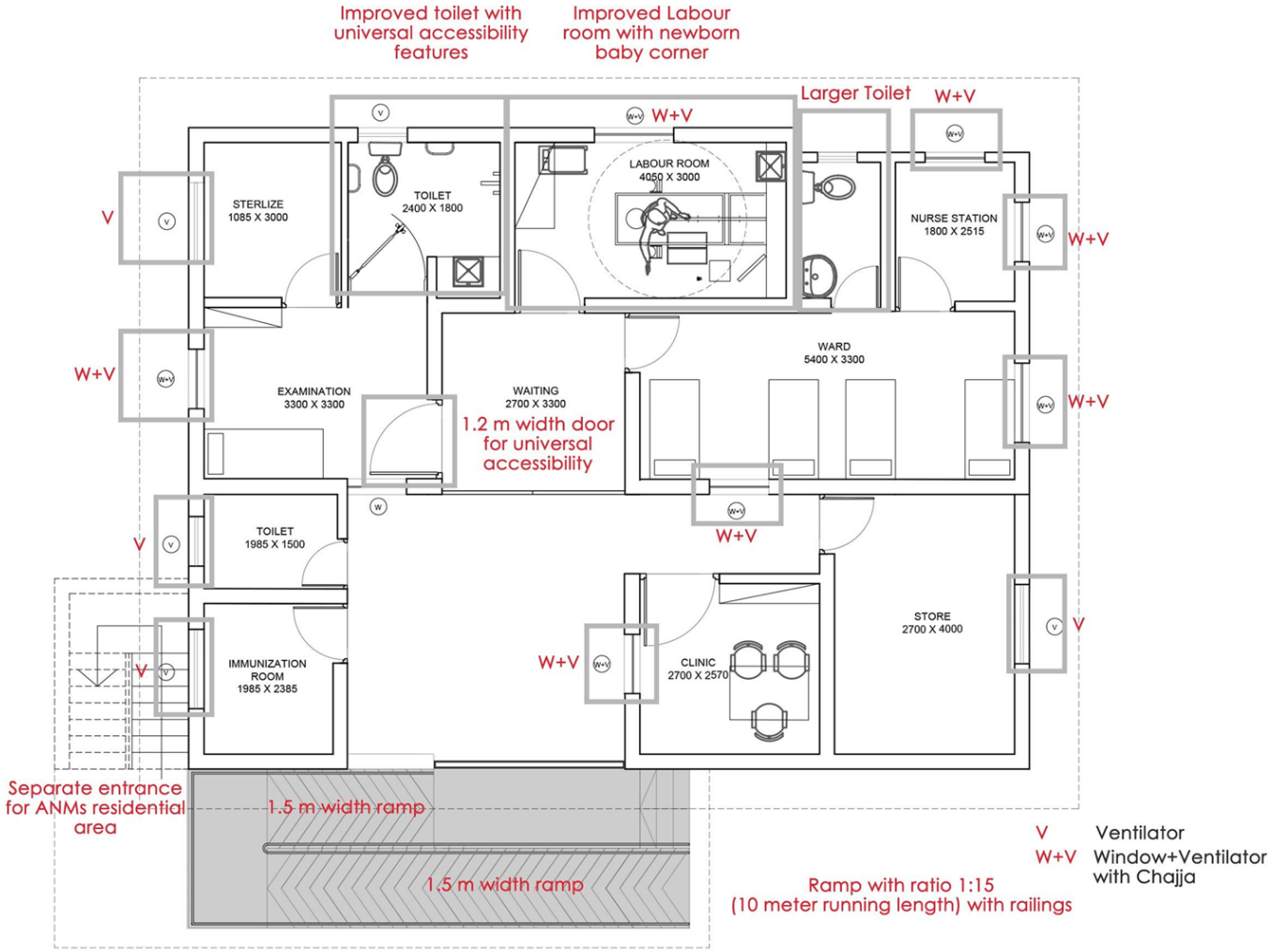


A2. Design Recommendations for Health Sub Centres

Before (Sub Centre with Labour Room - 265 sqm)



After (Sub centre with Labour Room - 265 sqm)



Other General notes:

1.All the doors to be 1.2 m wide for universal accessible.

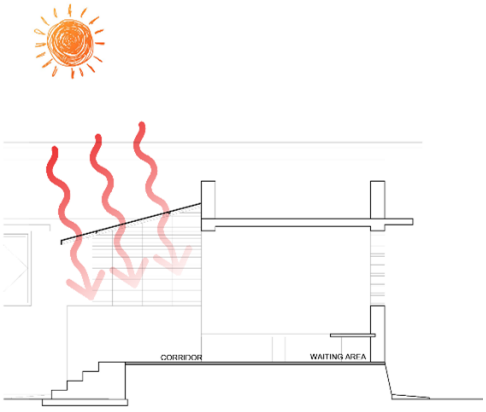
2. Windows to be placed based on the direction.

North direction to have larger windows –
1.2 m x 0.9 m

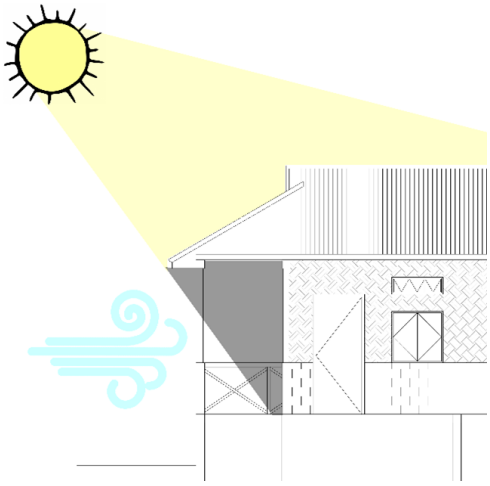
South direction to have longer windows with -Horizontal overhang

East and west side to have smaller windows with Horizontal and vertical fins.

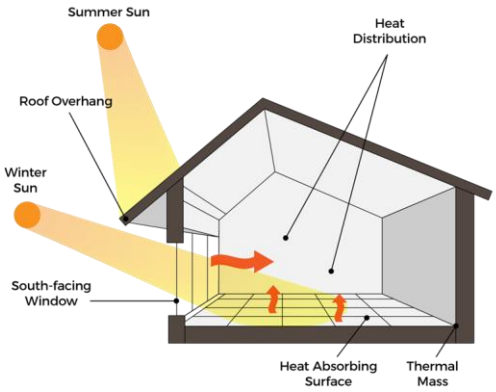
3. Ramp to be built considering 1:15 ratio for the slope.



For Hot and Dry climate



For Warm and Humid climate

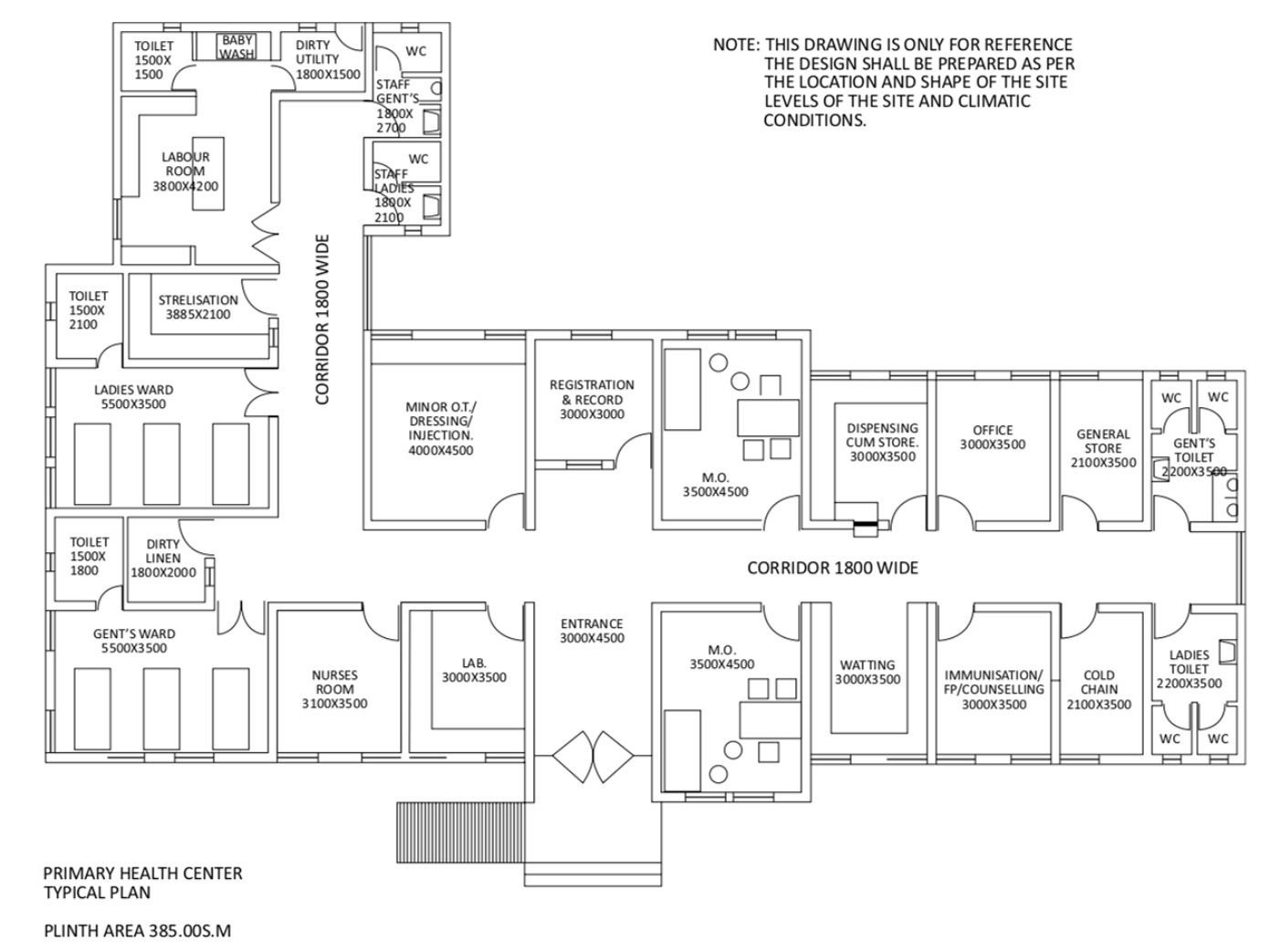


For Cold climate

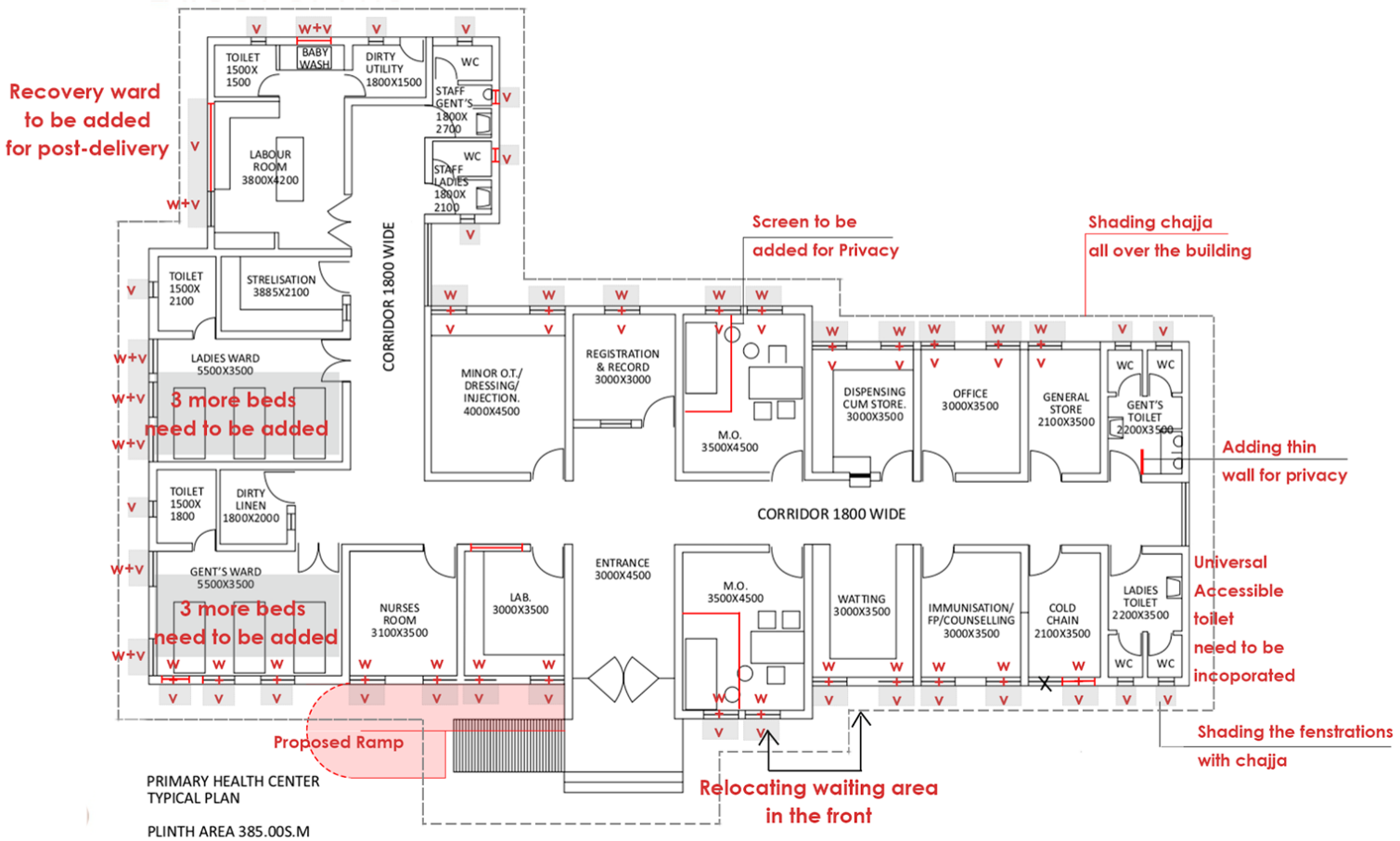
B. Primary Health Centres

The Primary Health Centre is the cornerstone of rural health services- a first port of call to a qualified doctor of the public sector in rural areas for the sick and those who directly report or referred from Sub-Centres for curative, preventive and promotive health care, it is an integrated curative and preventive health care to the rural population with emphasis on preventive and promotive aspects of health care. It has 4-6 indoor beds for patients. Below are recommendations on IPHS guidelines, India.

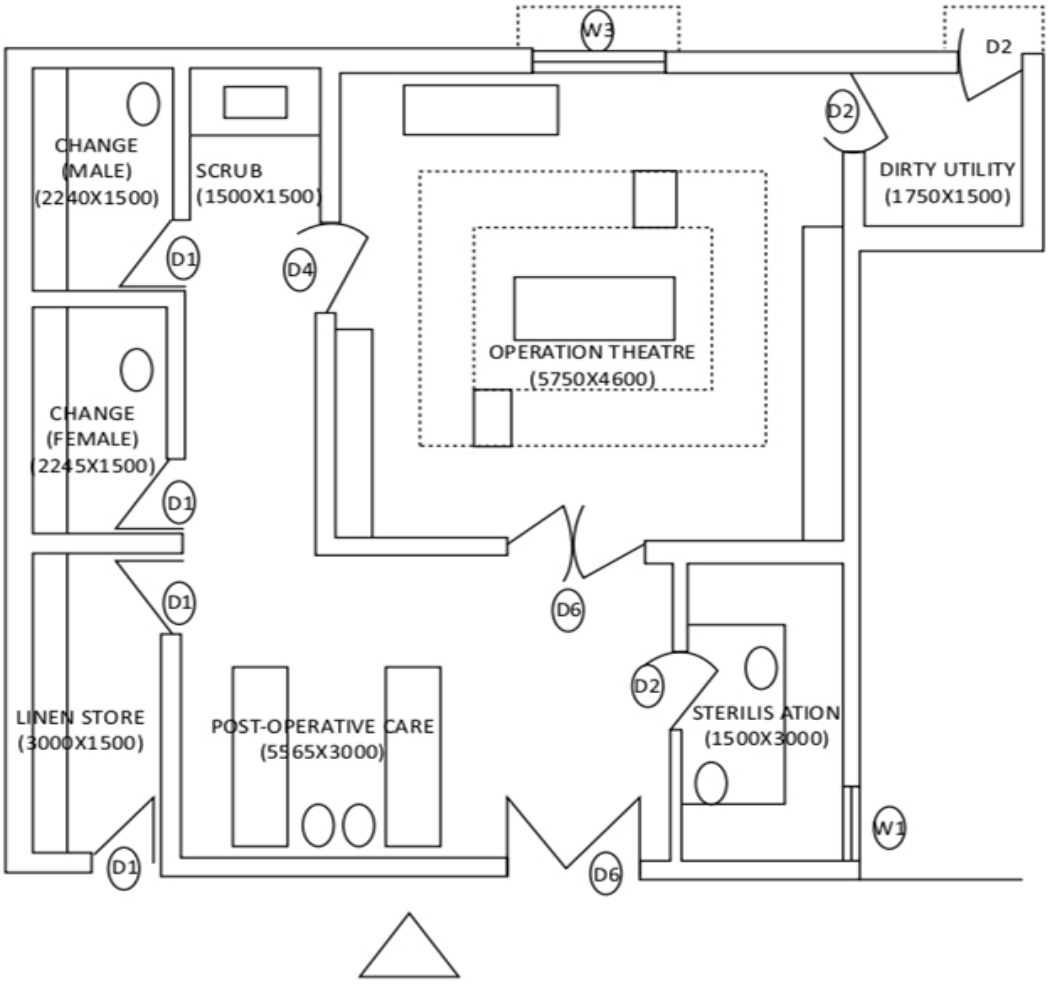
Before- Layout 1



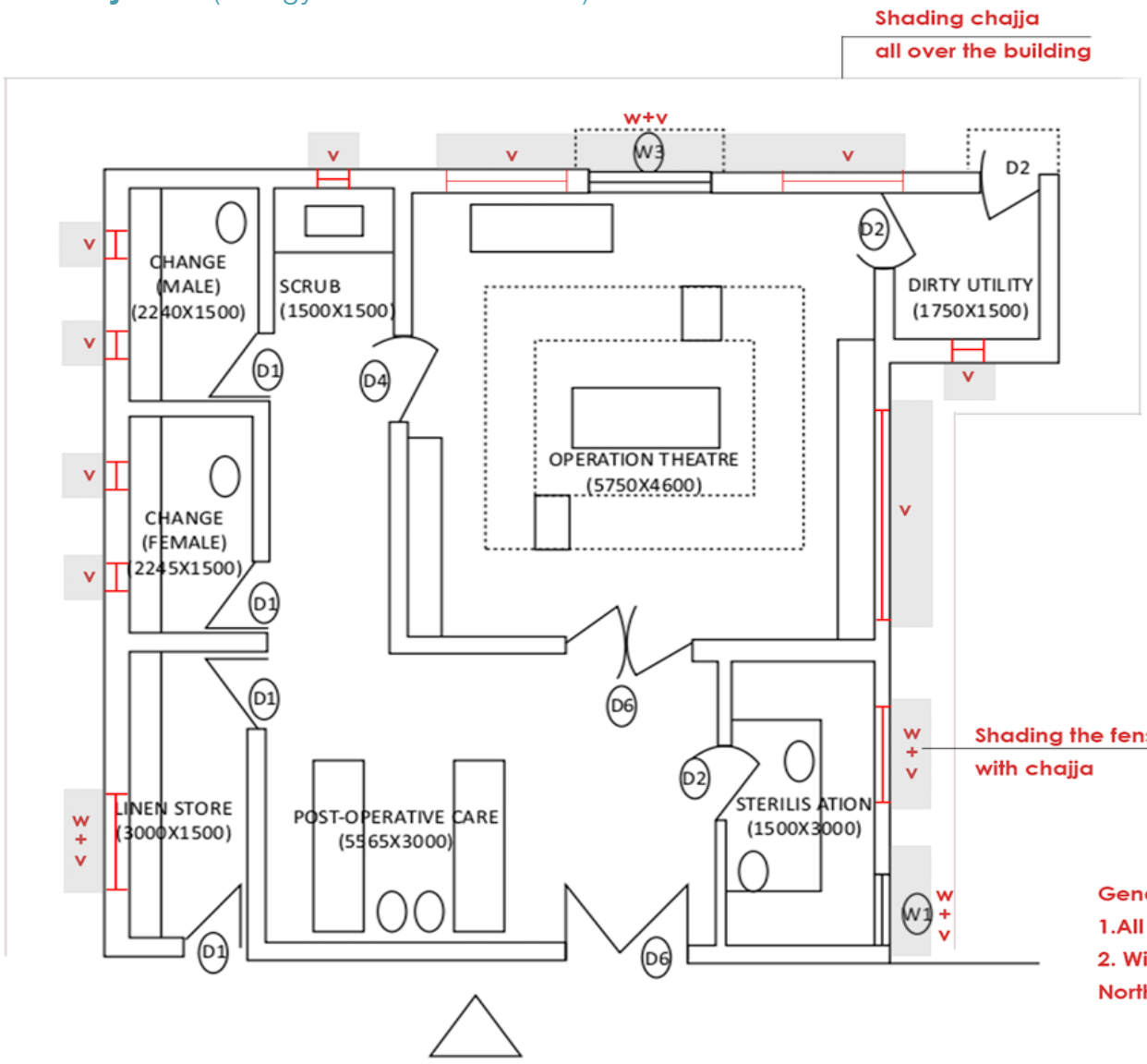
After Layout 1 (Energy Efficient Guidelines)



Before Layout 2



After Layout 2 (Energy Efficient Guidelines)



Summarisation

A. Health Sub Centres

Orientation

- Orientation of the Sub center building in Hot- dry and Warm-Humid climate should be such that East and West side of the structure have low exposure to sun.
- In Cold climate, the building orientation should be elongated along East-West to absorb maximum heat from sun.

Fenestrations

- Collective area of Windows and ventilators in a room should be at least 20% of the floor area of the same room to ensure adequate natural lighting.
- Windows [1.2 m by 0.9 m] + Ventilators[0.6 m by 0.9 m] in clinic, store, kitchen, living area and bedroom.
- Horizontal shading devices over windows in North and south sides - 0.60 m width and on East and West sides - 0.6 m width with vertical fins for shading.
- Building finishes should have light colour walls preferably white colour.

B. Primary Health Centres

Orientation

- Orientation of the Primary Health center building in Hot- dry should have courtyard planning to shade the entire structure, enhance wind movement through stack ventilation and improve natural lighting in whole campus. Higher ceilings with ventilators are prefered.
- In Warm Humid climates, long and linear orientation of the building is preferable with shaded verandahs all around to encourage cross ventilation. The longer facades need to face primary wind direction. Gable type room is preferable
- In Cold climate, the building orientation should have larger windows with glazing in South direction to absorb more heat from sun. Walls need to be well insulated to prevent heat loss.

Fenestrations

- Collective area of Windows and ventilators in a room should be at least 20% of the floor area of the same room to ensure adequate natural lighting.
- In Hot-dry and Warm-Humid climate zones, north direction to have larger windows - 1.2 m x 0.9 m.
- Windows [1.2 m by 0.9 m] + Ventilators[0.6 m by 0.9 m] in clinic, store, kitchen, living area and bedroom.
- Horizontal shading devices over windows in North and south sides - 0.60 m width and on East and West sides - 0.6 m width with vertical fins for shading.
- Building finishes should have light colour walls preferably white colour.

C. Community Health Centres

The Community health centre is the secondary level of health care, were designed to provide referral as well as specialist health care to the rural population.The CHCs were designed to provide referral health care for cases from the Primary Health Centres level and for cases in need of specialist care approaching the centre directly. It fulfills the specialist care in Medicine, Obstetrics and Gynecology, Surgery, Paediatrics, Dental and AYUSH along with Eye Specialist services (at one for every 5 CHCs). Emergency Services, Laboratory Services, National Health Programmes.Below are recommendations on IPHS guidelines, India.

Energy efficiency Modifications

<table>
<tr><td>Location</td><td colspan="2">-Centre should be located at the centre of the block headquarter in order to improve access to the patients.
-Should have the facility for electricity, all weather road communication, adequate water supply, telephone etc. –
-Should be away from garbage collection, cattle shed, water logging area, etc.</td></tr>
<tr><td rowspan="2">Outpatient department</td><td>Before</td><td>After Energy Efficient Modifications</td></tr>
<tr><td>-The facility shall be planned keeping in mind the maximum peak hour load and shall have scope for future expansion.
-Name of Department and doctor, timings and user fees/ charges shall be displayed.
-Layout of the Out Patient Department shall follow the functional flow of the patients: e.g.Enquiry→Registration→Waiting →SubWating→Clinic→Dressing room/Injection Room→Billing→Dignostics (lab/X-ray)→pharmacy→Exit</td><td>- Entrance - Waiting Area [On the ground floor with access to external courtyard or shaded space for multifunctional requirements like awareness camps. This will keep the space well lit and ventilated]

- Enquiry and Registration, Billing [Located with Ample Visibility, Must accommodate the capacity to queue [can face open area or waiting room]]

- Clinic, Dressing, Examination, Injection, Diagnostic, pharma - Brightly lit and well ventilated with jali walls or screens, skylights, ventilators, in a shaded colonnade] [20% window to wall ratio - dressing and diagnostic, ventilators and skylights preferred] internal ceiling and walls to be painted white</td></tr>
</table>

C. Community Health Centres

These clinics include general medicine, general surgery, dental, obstetrics and gynaecology, paediatrics and family welfare. Separate cubicles for general medicine and surgery with separate area for internal examination(privacy) can be provided if there are no separate rooms for each.		
Consultation and examination	The cubicles for consultation and examination in all clinics should provide for doctor's table, chair, patient's stool, follower's seat, wash basin with hand washing facilities, examination couch and equipment for examination.	Refer to sub centre document above – the space can be on the first floor [20% window to wall ratio - dressing and diagnostic, ventilators and skylights preferred].
Family Welfare Clinic	The clinic should provide educative, preventive, diagnostic and curative facilities for maternal, child health, school health and health education, environmental hygiene, clean habits, need for taking preventive measures against epidemics, family planning, non-communicable diseases etc. -Treatment room / operating room for IUCD insertion and investigation, etc. Should be in close proximity to Obstetric & Gynaecology. -Family Welfare counselling room should be provided. -Waiting room for patients.	-To be on the Ground floor -Brightly lit and well ventilated with jali walls or screens, skylights, ventilators, in a shaded colonnade] [20% window to wall ratio - dressing and diagnostic, ventilators and skylights preferred] internal ceiling and walls to be painted white
Pharmacy	-The Pharmacy should be located in an area conveniently accessible from all clinics. -The dispensary and compounding room should have two dispensing windows, compounding counters and shelves. The pattern of arranging the counters and shelves shall depend on the size of the room. -The medicines which require cold storage and blood required for operations and emergencies may be kept in refrigerators.	-To be on the Ground floor -Brightly lit and well ventilated with jali walls or screens, skylights, ventilators, in a shaded colonnade] [20% window to wall ratio - dressing and diagnostic, ventilators and skylights preferred] internal ceiling and walls to be painted white
Treatment room	-Minor OT, Injection Room and Dressing Room, Observation Room	-To be on the Ground floor -Brightly lit and well ventilated with jali walls or screens, skylights, ventilators, in a shaded colonnade] [20% window to wall ratio - dressing and diagnostic, ventilators and skylights preferred] internal ceiling and walls to be painted white

C. Community Health Centres

WARDS (Separate for male and female)		
Nursing station	-The nursing station shall be cantered such that it serves all the clinics from that place. -The nursing station should be spacious enough to accommodate a medicine chest/a work counter (for preparing dressings, medicines), hand washing facilities, sinks, dressing tables with screen in between and colour coded bins (as per IMEP guidelines for community health centres). -Examination and dressing table. -It should have provision for Hub cutters and needle destroyers.	-To be in both the floors -20% window to wall ratio -dressing and diagnostic, ventilators and skylights preferred internal ceiling and walls to be painted white
Patient Area	-Enough space between beds. -Toilets; separate for males and females. -Separate space/room for patients needing isolation.	Can be on the first floor with separate staircases and access path from OPD.
Ancillary Room	-Nurses rest room. -There should be an area separating OPD and Indoor facility.	For rooms without passive efficiency solutions, either ceiling fans or two wall mounted fans to improve ventilation, light coloured walls and higher wattage tube lights.
Operation theatre/Labour room	-Patient waiting Area, Pre-operative and Post-operative, (recovery) room, Staff area, changing room separate for males and females, Storage area for sterile supplies, Operating room/Labour room, Scrub area, Instrument sterilization area, Disposal area, New born care Corner (Annexure 1A).	-OT on the ground floor or first floor if elevator is present.
Public utilities:	-Separate for males and female; for patient as well as for paramedical & Medical staff. -Disabled friendly, WC with wash basins as specified under Guidelines for disabled friendly environment should be provided.	To be in both the floors with adequate ventilators and exhaust fan. Building standards to be followed for the no of urinals, WC and washbasins.

Summarisation

Benefits from End User Perspective

- Reduction in energy consumption leading to reduction in utility bills.
- Increase in more efficient natural air circulation, which reduces dependence on the active measures and improves productivity
- Natural cooling of internal spaces that improves well being
- Glare free uniform light accessed for most of the occupancy of the centres
- Incorporating efficient appliances and solar powering them to reduce dependence on the grid.
- Reduction in CO_2 emission due to usage of sustainable building materials and reduction in energy consumption.

Universal Accessibility Recommendations

- 5ft wide Ramp access across all spaces [1:15 ideal slope conditions] with landing every 16ft with firm, easy to clean and non-slippery material.
- Avoid thresholds or breaks/ step downs between rooms that limit physical movements. If included, must be limited to 6mm.
- Unisex accessible toilet should be no less than 1800mm X 2550mm where a floor mounted water closet is used. Toilets to have vertical circular hand railing/ grab bars for support near the WC, wash basin and shower.
- Guides on the floor or circular railings to guide in-patients from wards to toilets.
- Door handles, faucets, window sills and shutters to be accessible and within reach of patients in a wheelchair.
- Door widths to accommodate wheelchairs or assisted help and should open outward.
- For patients with visual impairment, appropriate colour contrast needs to be established between the wall and floor.

Precautions against damages from Wildlife

*Multiple sources

1. Prevent rodents (against snakes) by air tight storage of food supplies.
2. Eliminate dark, damp places, cracks, crevices, and holes to deter snakes from entering and residing in the health centres.
3. Repair and fix metal mesh on all ventilators, windows and doors.
4. Type of shrubbery and trees growing near the health care center should not be low shrubs and leafy bushes which will provide the perfect habitat for sheltering snakes.
5. Avoid grass and leaves around 500m from the health centres
6. Growing snake proof plants namely, MariGolds, Dracaena trifasciata, Kaffir Lime, Indian snakeroot, West Indian Lemongrass, Onion and Garlic near the health
7. No water sources to be around the center immediately like ponds where snakes and other reptiles can take shelters.
8. Cow dung slurry can be used around the building to repel the insects, small reptiles.
9. Neem , Eucalyptus (Nilgiri) leaves acts as mosquito repellant.
10. Building rubble compound walls around the center. Metal fences barriers around the center to prevent the elephant entering.
11. Beehive fencing, to keep elephants away from the health center which can also be an alternative livelihood for the locals.

SELCO Foundation's Role

Guidelines and processes for mapping out typologies along with existing healthcare ecosystem stakeholders in place (enabling factors)

Guidelines and processes for designing and implementing appropriate technical and financial interventions at regional levels (District and State)

- Selection and procurement of efficient appliances,
- Design and procuring appropriate need-based sustainable energy systems
- Design and execution of green built environments for the health value chain, enterprise/vendor selection
- Financial modelling and evaluation (financial and ownership design for maintenance and servicing)

Capacity Building across the Value chain and Health-Energy Nexus

Inputs for National and Global Policies with respect to Health-Energy Nexus

SELCO FOUNDATION

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