Sustainable Energy and
Climate Responsive Infrastructure for

BASIC THERAPEUTIC CARE UNITS

At Baran District Hospital, Rajasthan

Organizations

The COVID-19 crisis has alarmingly brought to front the unpreparedness of the humanity to deal with such a crisis. It also lay to bare the glaring gaps in the health supply chains across the world. Previously, the gaps were main focused on the cost of delivering health services and its inaccessibility to the poorer populations across the world.

SELCO Foundations role in COVID19 response and the Health+Energy Nexus

SELCO Foundation some years ago started a Health Vertical to prove that an ecosystem approach to relook at Energy-Health nexus would be more impactful and make delivery of health more affordable, sustainable and most importantly accessible. SELCO advocated for sustainable energies like solar, in a decentralized manner, to be an enabler that could help the health sector close the gaps it was facing. Under the Energy-Health nexus, SELCO holistically evaluates, after a thorough energy-health assessment, the gaps, and maps out the specific solutions (including aspects of efficiency, sustainable energy and green building design) to improve resilience of health centers and decrease cost per patient care over time. The integrated approach has led to better building designs, more efficient and modular medical equipments, decentralization of services, better human resource retention and mapping, effective use of technology and a more customized approach the health.

SELCO hopes the nexus approach will not only integrate sustainability into the health sector in a deep manner but also help the respective stakeholders a faster way to reach the sectors goals.

WISH Foundation

Wadhwani Initiative for Sustainable Healthcare (WISH) is a flagship initiative of Lords Education & Health Society (LEHS). WISH based on its vision, ‘Quality health care for all’ works towards improving the quality of and access to primary healthcare services for the underserved populations by introducing healthcare innovations to build an equitable, innovations led, evidence-based quality healthcare system.

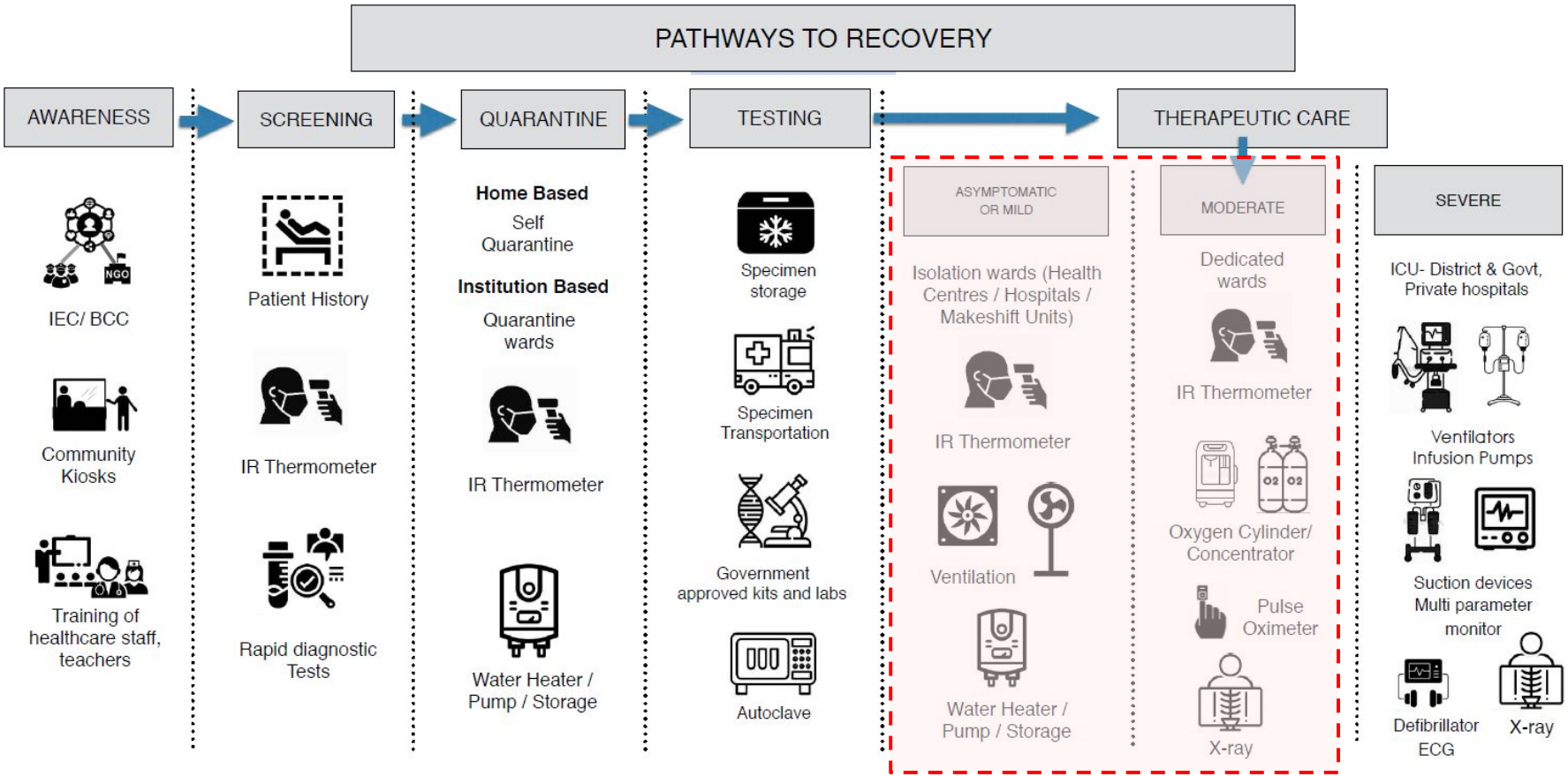
Infrastructure Gaps in Therapeutic Care

Following gaps have been observed in the Infrastructure required for COVID19:

Social distancing is a hard concept to follow in dense urban slums and vulnerable institutions catering to large number of individuals living in close proximity or using common infrastructure- such as toilets, water points etc. This may aggravate the community transfer of COVID-19

- Epidemic unpreparedness of district level health centers such as: unavailability of additional rooms, isolation beds, testing kits, quarantining & isolation facilities, ventilators and medical supplies; as the coping mechanism is very much co-related to quality infrastructure
- Local community centers and government buildings converted to temporary isolation wards lack access to reliable power supply critical for well-being and treatment of the patients
- Due to unreliability of the grid (power cuts and voltage fluctuations), these buildings rely on generators resulting in high operational costs
- Not originally designed to serve as isolation wards, these temporary isolations wards also can lack basic sanitation such as clean water, disinfected toilets and drainage facilities
- Certain states/regions in India (which will also be the case across other developing countries) have severe shortages in ambulances and oxygen cylinders- leading to poor accessibility of health services and broken supply chains for critical infrastructure like ICUs

Infrastructure Needs for Therapeutic Care

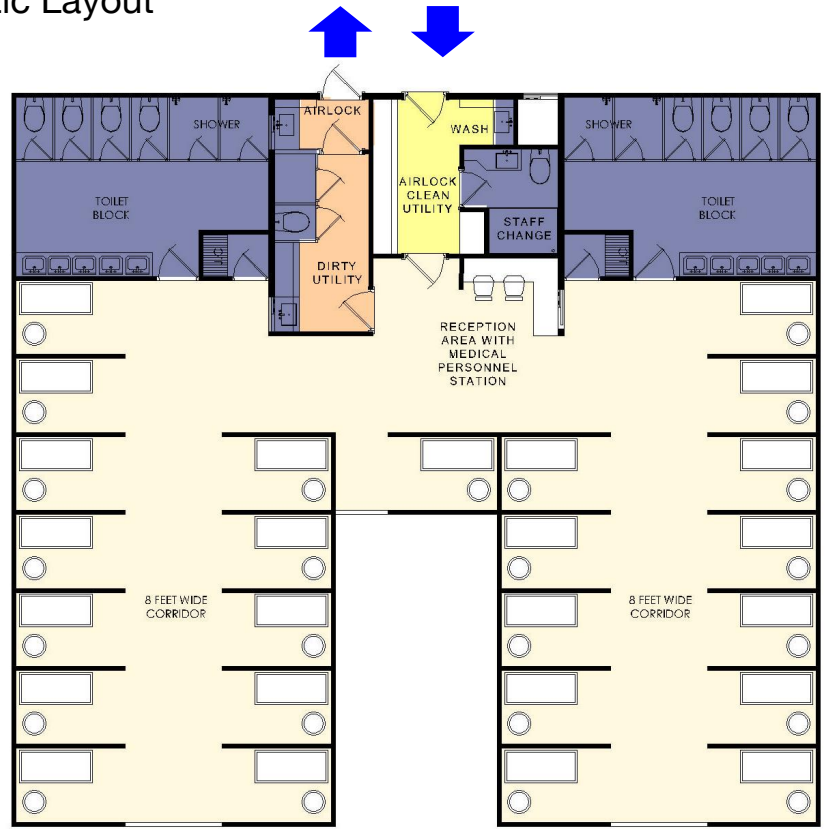


Infrastructure Needs for Therapeutic Care

#		Basic Therapeutic Care
1	Required Beds	For Isolation - 300 beds per 100,000 population For Basic Therapeutic Care - 4 beds per 100,000 population is essential
2	Human Resources	General Medical Officer, Medicine Specialist, Paediatric, Microbiologist, Psychiatrists/ Psychologists, Nurses, Lab Technician, Public Health Specialist
3	Appliances	Exhaust fans, Ceiling fans, Lights, Mobile charger
4	Medical Equipment	1 unit IR Thermometer**, 3 units Oxygen concentrator/ Cylinder, 6 units Pulse Oximeter (+2), 1 unit X-Ray Machine (for all wards)
5	Patient Beds per Module	6ft by 8ft floor area per patient - 25 Beds per module
6	Sanitation	4 toilets and 2 showers, 200 LPD Solar water heater, Water Pump (as per need)

Schematic Design for Patients Ward

Schematic Layout*



Entrance and Donning Area

In Patient Wards/ Medical Station and Storage

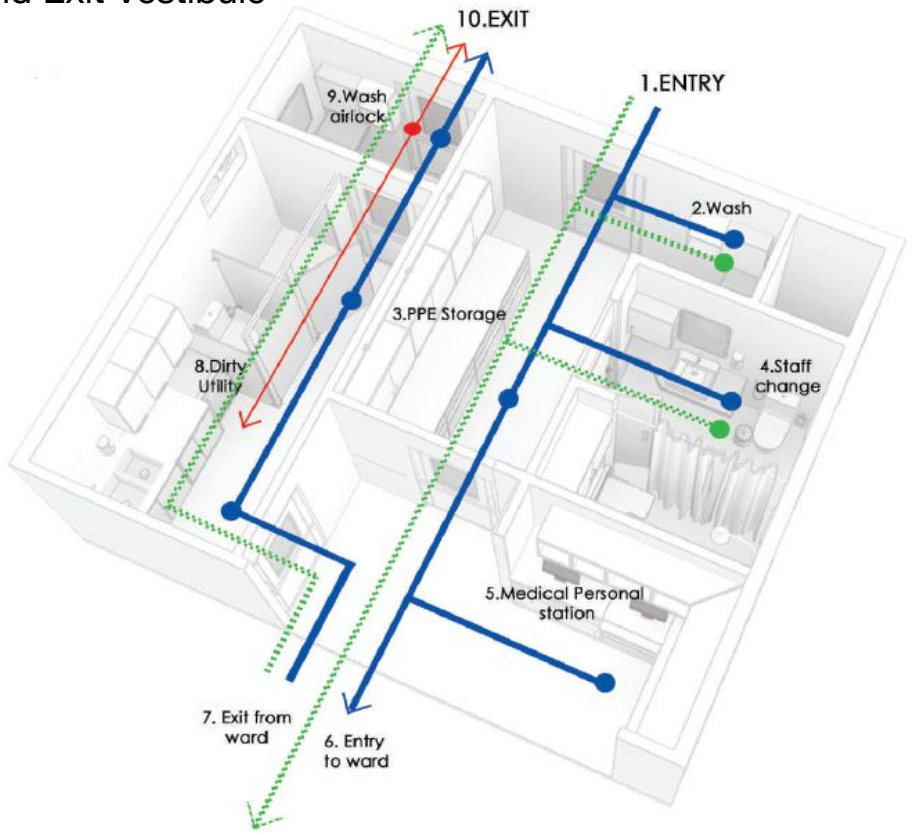
In Patient Wet Utilities

Dirty Utility and Doffing Area

*65 ft by 60 ft with 26 ft wide wings layout depends on area and services/ utilities available

Schematic Design for Patients Ward

Entry and Exit Vestibule



Schematic Design for Patients Ward

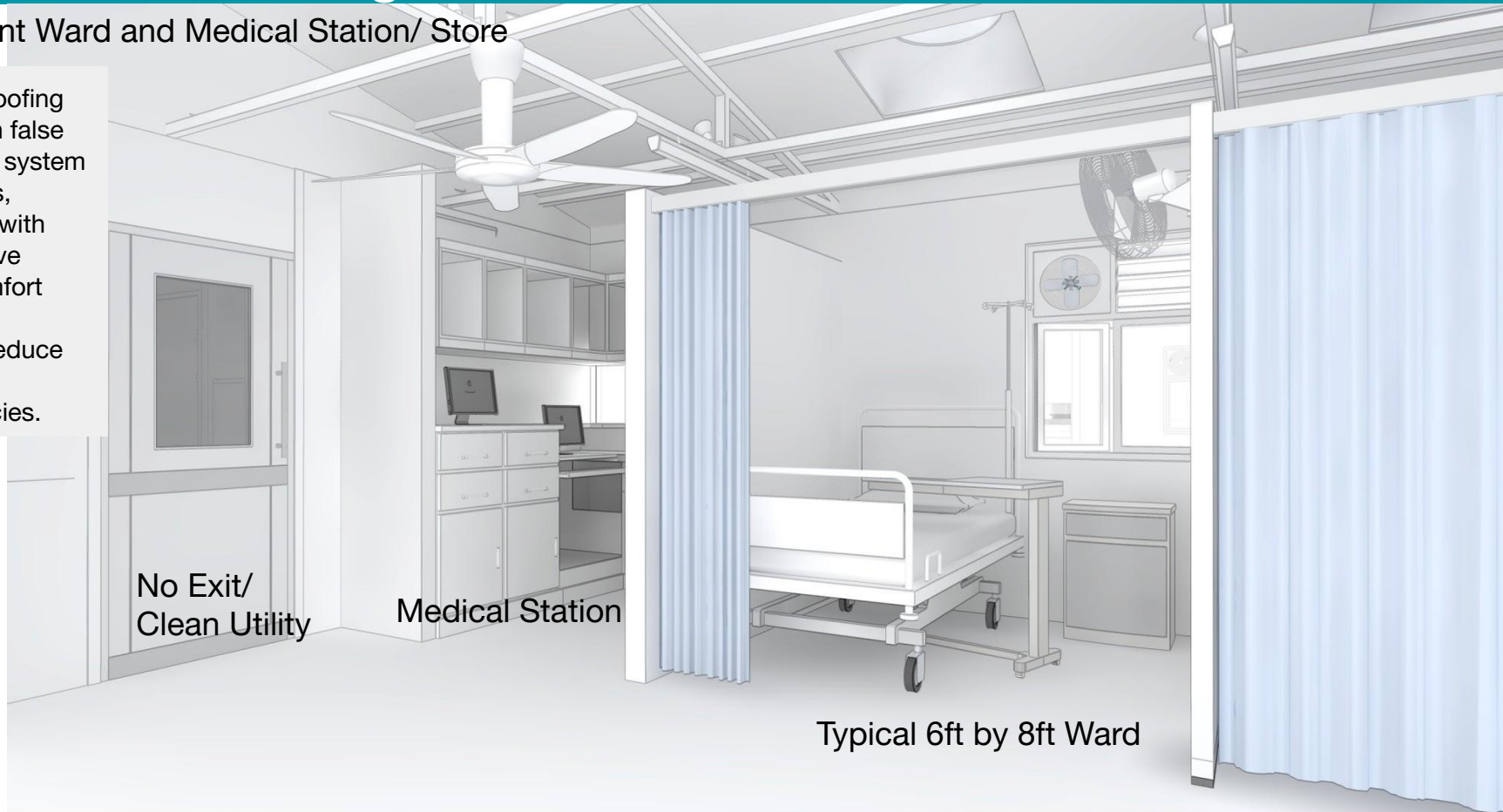
Entrance View

Negative pressure maintained with use of exhaust fan or turbo ventilator to prevent cross contamination of air

Schematic Design for Patients Ward

In Patient Ward and Medical Station/ Store

Insulated roofing panels with false ceiling and system of windows, ventilators with fans improve indoor comfort conditions. Skylights reduce energy dependencies.



Schematic Design for Patients Ward

Schematic Design for Patients Ward

Solar System Design -Entire Load Details

Load type	Load wattage	No. of appliances	Usage Hours			Total Power (W)	Total Energy (Wh)
			Day Time	Night Time	Total usage		
Room - Tubelight	20	25	2	4	6	500	3000
Ceiling Fan	26	25	7	8	15	650	9750
Mobile charging	20	25	3	1	4	500	2000
Tubelight	20	6	4	6	10	120	1200
LED Bulb	9	12	1	2	3	108	324
Tubelight	20	2	1	2	3	40	120
LED Bulb	9	4	1	1	2	36	72
LED Bulb	9	1	1	1	2	9	18
Room - Tubelight	10	1	4	6	10	10	100
Ceiling Fan	26	1	4	6	10	26	260
Mobile charging	20	1	4	6	10	20	200
LED Bulb	9	1	1	2	3	9	27
Ceiling Fan	26	1	2	2	4	26	104
Mobile charging	20	1	4	6	10	20	200
Oxygen Concentrator	350	5	2.5	2.5	5	1750	8750
Needle cutter	60	2	.5	0	.5	120	60
Infrared Thermometer		1					
Pulse Oximeter		1					
Street light	20	2	0	12	12	40	480

Schematic Design for Patients Ward

Solar Design for Entire Loads

Baseline Values for Calculation:

Total Load to be connected to the solar system	3824 Watt
Max units of energy (kWh) usage per day	27 Units

System Design & Cost (2 identical systems taking care of right and left block):

Sl. No.	Products	Capacity
1	Solar Module with Mounting Structure	6.6 kWp
2	Battery with Rack	400 Ah, 120 V
3	Solar Power Conditioning Unit with MPPT Technology	7.5 kVA, 120 V
4	Safety equipment Devices,	1 Set.
5	Cables & Consumables	1 Set.

Schematic Design for Patients Ward

Solar Design for Critical Loads

Rooms	Load type	Load wattage	No. of appliances	Usage Hours			Total Power (W)	Total Energy (Wh)
				Day Time	Night Time	Total usage		
Cubicle	Room - Tubelight	20	25	2	4	6	500	3000
	Mobile charging	20	25	3	1	4	500	2000
Corridor	Tubelight	20	6	4	6	10	120	1200
Toilet	LED Bulb	9	12	1	2	3	108	324
	Tubelight	20	2	1	2	3	40	120
Dirty utility area	LED Bulb	9	4	1	1	2	36	72
Clean utility area	LED Bulb	9	1	1	1	2	9	18
Medical Personal Station	Room - Tubelight	10	1	4	6	10	10	100
	Ceiling Fan	26	1	4	6	10	26	260
	Mobile charging	20	1	4	6	10	20	200
Staff Change	LED Bulb	9	1	1	2	3	9	27
	Ceiling Fan	26	1	2	2	4	26	104
	Mobile charging	20	1	4	6	10	20	200
Medical Equipment	Oxygen Concentrator	350	5	2	2	4.5	1750	7875
	Needle Cutter	60	2	.5	.5	0	120	60
	Infrared Thermometer		1					
	Pulse Oximeter		1					
Outside	Street light	20	2	0	12	12	40	480

Schematic Design for Patients Ward

Design for Critical Loads:

Total Load to be connected to the solar system	**3174 Watt**
Max units of energy (kWh) usage per day	**15.5 Units**

Sl. No.	Products	Capacity
1	Solar Module with Mounting Structure	7.2 kWp
2	Battery with Rack	400 Ah, 120 V
3	Solar Power Conditioning Unit with MPPT Technology	10 kVA, 120 V
4	Safety equipment Devices,	1 Set.
5	Cables & Consumables	1 Set.

Schematic Design for Patients Ward

Entire loads with backup systems

SL	Rooms	Load type	Load wattage	No. of appliances	Usage Hours			Total Power (W)	Total Energy (Wh)
					Day Time	Night Time	Total usage		
	Cubicle	Room - Tubelight	20	25	2	2	4	500	2000
		Ceiling Fan	26	25	2	2	4	650	2600
1		Mobile charging	20	25	3	1	4	500	2000
2	Corridor	Tubelight	20	6	2	2	4	120	480
		LED Bulb	9	12	1	2	3	108	324
3	Toilet	Tubelight	20	2	1	2	3	40	120
4	Dirty utility area	LED Bulb	9	4	1	1	2	36	72
5	Clean utility area	LED Bulb	9	1	1	1	2	9	18
6	Corridor	Tubelight	20	6	2	2	4	120	480
	Medical Personal Station	Room - Tubelight	10	1	2	2	4	10	40
		Ceiling Fan	26	1	2	2	4	26	104
6		Mobile charging	20	1	2	2	4	20	80
	Staff Change	LED Bulb	9	1	1	2	3	9	27
		Ceiling Fan	26	1	2	2	4	26	104
7		Mobile charging	20	1	2	2	4	20	80
	Medical Equipment	Oxygen Concentrator	350	5	2	2	4	1750	7000
8		Needle Cutter	60	2	.5	0	.5	120	60
		Needle Cutter		1					
		Pulse Oximeter		1					

Schematic Design for Patients Ward

Design for Back-up System:

Total Load to be connected to the solar system	**3824 Watt**
Max units of energy (kWh) usage per day	**15 Units**

Sl. No.	Products	Capacity
1	Solar Module with Mounting Structure	7.2 kWp
2	Battery with Rack	400 Ah, 120 V
3	Solar Power Conditioning Unit with MPPT Technology	10 kVA, 120 V
4	Safety equipment Devices,	1 Set.
5	Cables & Consumables	1 Set.

Case Studies

COVID19 Isolation Hospital in Bihar with Doctors for You and Doctors without Borders (MSF)

1. COVID19 Isolation Hospital in Bihar

Partner: Doctors for You and Doctors Without Borders (MSF)

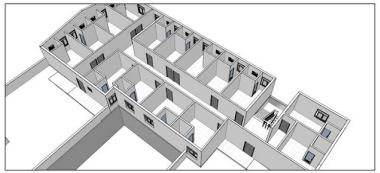
- **Sustainable Energy for Isolation Unit in hot climate conditions**
- **Sustainable Energy and Climate responsive infrastructure for COVID response staff quarters and emergency OPD and IPD**

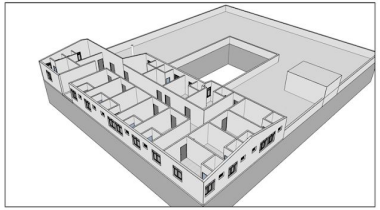
"**While we convert our hospital into a COVID19 Isolation Facility, we need to make sure of 2 things-**

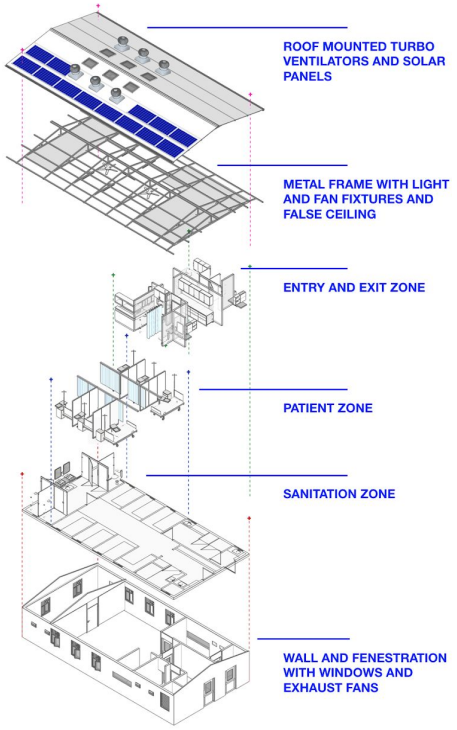
1) There is a clear separation between our emergency and OPD, IPD cases from the COVID cases;

2) We build comfortable facilities for our doctors and medical staff so that they can rest at the hospital premises and quarantine themselves from the families."

- Dr. Ravikant Singh, Founder, Doctors for You







Case Studies

Isolation Ward and Therapeutic Care (COVID Care Centers) in East Garo Hills, Meghalaya

3. Isolation Ward and Therapeutic Care in East Garo Hills, Meghalaya

Partner: Meghalaya Health and Family Welfare Department (Demonstration to Scale)

- **Sustainable design and implementation of Covid Care Units (Basic Therapeutic Care Centers) set up by the government for low resource areas**
- **Solar powering isolation wards at district level**

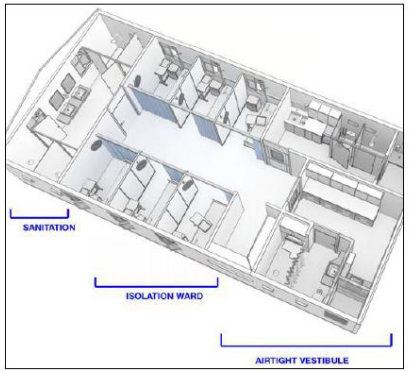
"We have come up with a three pronged strategy-

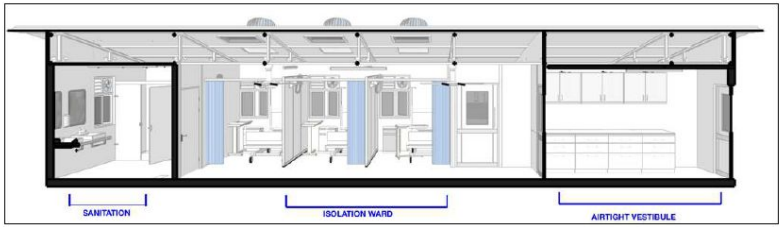
1) tracking of transmission and individuals travelling from neighboring states who might be affected;

2) Promote testing, set up quarantine and isolation or Corona Care Centres; and

3) Community capacity building to bring about awareness on how to live with the Virus."

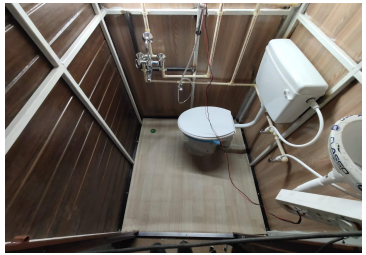
- Sampath Kumar (IAS)
Commissioner and Secretary, Health and Family Welfare Department, Government of Meghalaya





Reference Images

Construction and Finishing





Prefabrication / Modular methodology of construction for 25 Beds

Time to fabricate - 10 days
Transportation - 3 to 5 days
Installation on site - 7 days

Estimated Costs

Sl.No	List of Works	Estimation*
1	Built Infrastructure for 25 Beds	**66,36,945**
	OR	
2	Built Infrastructure for 25 Beds (including Fixed and Loose Furniture and Water Tanks)	**₹ 72,69,720**

*Logistics are as per actual

Estimated Costs

Solar System						
SL. No	**System Details**	**System Capacity**	**Cost (excluding transportation & Customisation of MMS cost)**	**Medical Equipments**	**Electrical Equipments**	**Total (INR)**
1	Entire Load Details (Off grid system)	Solar Module - 6.6 kWp; Solar Battery 400 Ah, 120 V; SPCA - 6 kWp, 7.5 kVA, 120 V	16,00,000	2,50,000	1,57,050	**20,07,050**
2	Critical Loads Only	Solar Module - 7.2 kWp; Solar Battery 400 Ah, 120 V; SPCA - 8 kWp, 10 kVA, 120 V	9,50,000	2,50,000	22,050	**12,22,050**
3	Back up for 4 hrs.	Solar Module - 7.2 kWp; Solar Battery 400 Ah, 120 V; SPCA - 8 kWp, 10 kVA, 120 V	9,50,000	2,50,000	1,57,050	**13,57,050**

*Logistics are as per actual