PROPOSED LADIES HOSTEL
FOR
BSA UNIVERSITY

DESIGN BRIEF
ON
ELECTRIFICATION,
PUBLIC HEALTH ENGINEERING
FIRE FIGHTING- Rev 2

Consultant:

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3. *PUBLIC HEALTH ENGINEERING:*

3.1 APPROACH TO PLANNING

The Plumbing services for the project shall be designed keeping in view the following:

3.1.1 Requirement of adequate and equal pressure of cold water in toilets, floor pantries, kitchen, washing areas and other designated areas.

3.1.2 The water storage tank (underground and over head tank) capacity shall be adequate to ensure availability of water for 1.5 and 1 days.

3.1.3 Recycling of treated waste water (from sewage treatment plant) for, flushing and horticulture water use.

3.1.4 Implementation of requirements of MOEF relating to rainwater harvesting, water conservation, use etc

3.1.5 Drainage and water supply provision for Landscape area.

3.1.6 Water conservation using low flow fixtures .

3.2 SYSTEM REQUIREMENTS

3.2.1 Domestic and Non domestic water supply shall be through gravity feed systems.

3.2.2 Sewage and sullage collection & conveyance system based on ASPE standard and applicable guidelines by NBC.

3.2.3 Storm / rain water drainage system from the roof terrace and various levels of the building, including balcony drains by means of draining and surface run-off water to be collected in the recharging pit and if it over flows to the storm water drain which is provided all around the building. Rain water design will be based on the data released by IMD as “guideline for storm water design for the city of Madras”

3.3 WATER REQUIREMENT

A. It is estimated that the daily water requirement for the phase 1 approximately 87KLPD as below

S.no	Description	Domestic (in Liter)	Drinking/ cooking (in Liter)	Flushing (in Liter)	Total (in Liter)
1.	No. of occupancy -205 persons= 205 111Ltrs/day/person- *refer Note1*	13940	615	8200	22,755
2.	No of meals per day- 3000 persons = (2426)x 15 Litre/day/person-- *refer Note2*	29,911	7,278		37,189
3.	No of working persons in dining and kitchen, maintenance , security - 15 persons- *refer Note3* =15 x 15 Litre/day/person	180	45		225
4.	Washing utensils, cleaning in kitchen – 2500 litres / session- *refer Note4*	7,500			7,500
5.	Cooking purpose in kitchen – 2500 Litre / session- *refer Note4*		7,500		7,500
6.	Steam boiler for the usage of kitchen-500 Litre/ 8 hour/ day- *refer Note4*	4,000			4,000
7.	Filter backwash	2,000			2,000
8	Landscape water			6000	6000
	TOTAL	57531	15438	14200	87,169

Note1 : For Domestic water usage 68 Ltrs per head per day and for Flushing water usage 40 Ltrs per head per day and for drinking 3 ltrs per head per day was considered.

Note2 : In this building ,totally 3000 meals are served per day , 574 is for the inmates and the remaining for the floating population is 2426(3000-574)persons. 12 Ltrs per head per day for domestic water usage and 3 Ltrs per head per day for drinking water was considered for 2426 persons .

Note 3 : For Domestic water usage 12 Ltrs per head per day and and for drinking 3 ltrs per head per day was considered for working persons (chef , server , cleaners, and security guards)

Note 4: Sourced from the kitchen consultant employed by the university.

B. It is estimated that the daily water requirement for the phase 2 approximately 42KLPD as below

S.no	Description	Domestic (in Liter)	Drinking/ cooking (in Liter)	Flushing (in Liter)	Total (in Liter)
1.	No. of occupancy – 369 persons= 369 x 111Ltrs/day/person- *refer Note1*	25,092	1,107	14,760	40,959
2.	No of working persons in dining and kitchen, maintenance , security - 15 persons- *refer Note 2* =15 x 15 Litre/day/person	180	45		225
	TOTAL	25,272	1,152	14,760	41,184

Note1 : For Domestic water usage 68 Ltrs per head per day and for Flushing water usage 40 Ltrs per head per day and for drinking 3 ltrs per head per day was considered.

Note 2 : For Domestic water usage 12 Ltrs per head per day and and for drinking 3 ltrs per head per day was considered for working persons (chef , server , cleaners, and security guards)

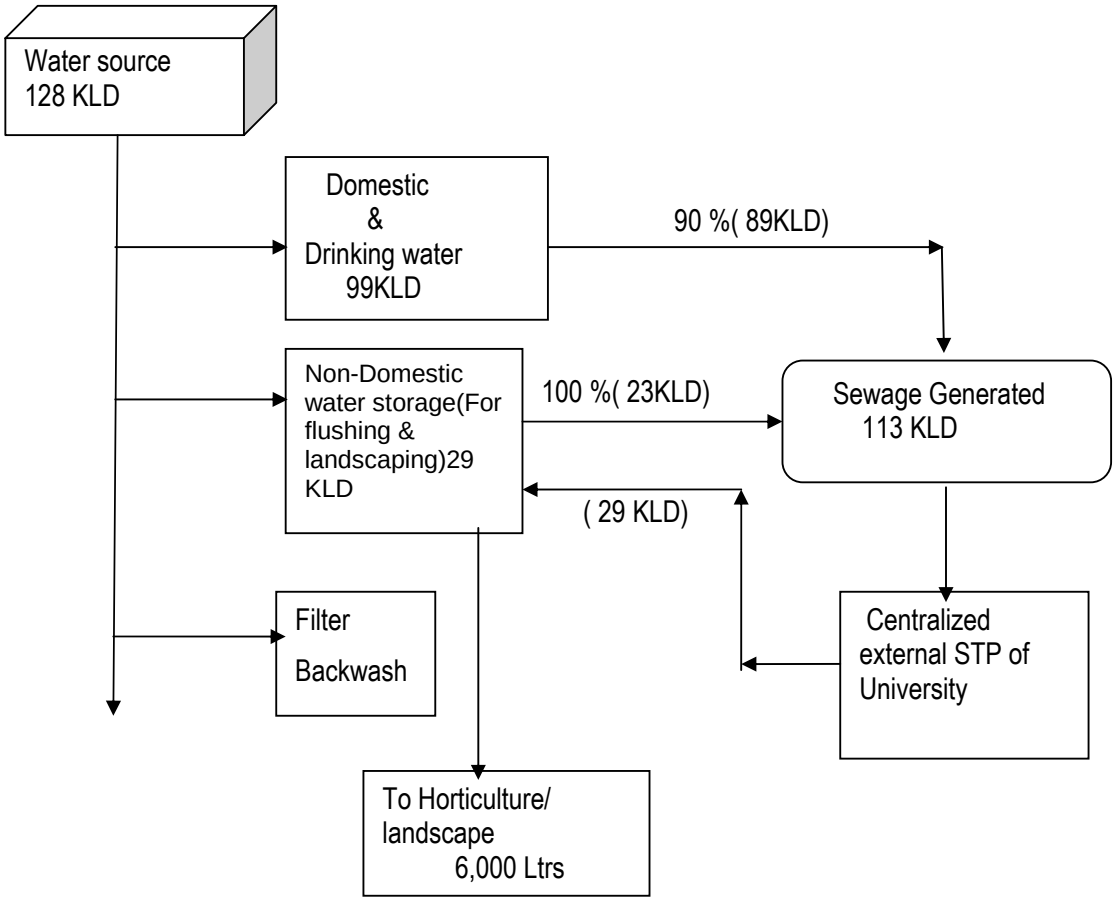
3.4 SEWAGE GENERATION PER DAY:

- Total domestic water consumption (Phase 1 and Phase 2)is
  =72,972 + 26424 = 99,396 Liters / day
- Total flushing water consumption is 22,960 Liters / day

Sewage Generation = 90% of Domestic water + 100% of Flushing Water
= (90% x 99,396)+ 22,960= 112,416 Liters / day

Expected per day sewerage out flow from ladies hostel : 113KLD

3.5 WATER BALANCE SCHEME FOR ENTIRE DEVELOPMENT(Phase 1 & Phase 2)



3.5 SOLAR – HOT WATER SYSTEMS:

- Hot water requirements are computed on the basis of ASHRAE APPLICATIONS 2003.
- Hot water requirements are essentially for Hostel rooms, kitchens boiler preheating etc.
- Hot water is achieved by means of centralized solar heat exchangers. Using renewable energy heat sources from the ambient air to heat water, these heaters can provided hot water round clock and throughout the year in energy efficient and affordable way. The vacuum tube collector absorbs the heat from solar radiation & heat up the water stored in the system through the thermos phonic effect. (Water in the glass tubes heats, it becomes

lighter and rises naturally into the tank above .Meanwhile ,cooler water in the tank flows down the tubes to the bottom of the collector ,causing circulation throughout the system).This process continues steadily for number of hours till the water stored in the tank heated up. The heated water in this manner stored overnight in the insulated tanks and is available for use the next day.

- Kitchen Boiler preheating requirement as communicated by the kitchen consultant is 4000 liters / day
- Hot Water consumption per occupant per day is 20 liters

  For Phase 1 : Total head count is 205 persons

  = 205x20 liters and kitchen

  = 4100 liters / day + (4000 liters / day)kitchen requirement

  = 8100 liters / day is the total requirement of solar per day for phase 1

  For Phase 2 : Total head count is 369 persons

  = 369x20 liters

  = 7380 liters / day

  = 7500 liters / day requirement for phase 2

  The total requirement of hot water to be around 16000 liters per day for both phase 1 and 2.
- Electrical back up in the form of heating coils shall be considered for the solar system to tide over rainy/cloudy days. Various options like Heat pump systems also are available which if cascaded with solar panels will lead to energy conservation. Details of the choice of system shall be further frozen after discussion with the university.

3.6 QUALITY OF GROUND WATER:

The quality of raw water available has to be tested for quality. If the water available does not confirm to the quality standards, a water treatment plant shall be provided for treating the raw water available. A chemical and bacteriological analysis of the sources of water is essential for establishing a water treatment process. Water from bore wells tends to have more dissolved solids. Such water can be rendered potable through RO (Reverse osmosis) plant to bring it to acceptable potable quality. If the TDS(Total dissolved solids) level of ground water is within permissible limits, normal softner/filters alone need to be opted to render the water potable. The type of treatment can be decided only after testing the water sample. The water treatment plant for the domestic water primarily consisting of:

1. Pressure quartz filters
2. Softeners with brine tank
3. Activated Carbon Filters
4. Chlorine dosing for dis-infection
5. Cartridge filters
6. R.O system
7. Dis-infection

However considering residential genre of the project we propose to go for a basic filtration plant or water softener as a central water treatment facility near to underground storage sumps.. The parameters listed in IS for drinking water consumption are as follows.

Sl.No	Parameter	Desired	Relaxation
1	PH	6.5 to 8.5	Nil
2	Colour (Hazen Units)	5	25
3	Turbidity(NTU)	5	10
4	Hardness(Caco3)	300	600
5	Iron as Fe	0.3	1.0
6	Chlorides as Cl	250	1000
7	Dissolved solids	500	2000
8	Calcium as Ca	75	200
9	Magnesium as Mg	30	100
10	Copper as Cu	0.05	1.5
11	Manganese	0.1	0.3
12	Sulphate	200	400
13	Nitrate	45	100
14	Flouride	1	1.5
15	Mercury	.001	Nil
16	Cadmium	.01	Nil
17	Selenium	.01	Nil
18	Arsenic	.05	Nil
19	Cyanide	.05	Nil
20	Lead	.05	Nil
21	Zinc	5	15
22	Chromium	.05	Nil

3.7 WATER SOURCE AND DISTRIBUTION :

University has communicated that the sole source of water feed for the building is Tanker water sourced from external agencies. However, the following sources of water may be explored to reduce dependency on external sources.

1. Bore wells.
2. Water tankers.
3. Rain water.
4. Treated water from STP.

The incoming tanker water feed shall be led into the UG sump dedicated for domestic water then it will be transferred to the Overhead Tanks at the Terrace level. Down feed from the overhead tank for domestic and for other uses will be by gravity feed.

The water distribution will essentially be serving:

- Hostel Rooms
- Kitchen
- Laundry
- Other Public Access

For Flushing purpose, treated water from the external centralized STP shall be transferred to the dedicated UG sump for non-domestic purposes (toilet flushing)and it will be feed by a set of pumps (1 running and 1 standby) into an Overhead Flushing Tanks water.

For drinking purpose, Water from the centralized RO plant which is located near by university campus then the RO treated water shall be fed to overhead tank from its transferred into a common area water point in each floor levels and kitchen sink.

The quality of water feed for kitchen purpose will be sourced from the kitchen consultant to consider factoring the quantity for designing the water treatment plant.

The user points at all floor levels will be fed by gravity from these domestic/ flushing tanks. Automatic water level controllers with float switches can be installed for automatic switch ON/OFF of pumps.

3.8 WATER STORAGE TANKS:

It is proposed to provide underground storage of *one and half day* consumption for domestic water and one day storage for consumption for flushing water. OH tanks of *half day* storage capacity will be provided for both domestic and Non domestic application.

**For Fire - combined over head tank shall be provided for both phases 1 and 2.*

Water storage capacities of the tanks are as follows:

Underground Sump	Capacity (In Liters)
Domestic water sump	1,50,000 Ltrs
Non domestic sump(STP treated water) Flushing & Landscaping.	30,000 Ltrs

Phase1

Over head tank	Capacity (In Liters)
Domestic Tank	30,000 Ltrs
Drinking water Tank(RO treated)	8,000 Ltrs
Non domestic (STP treated water)	8,000 Ltrs
*Fire tank	25,000 Ltrs

Phase2

Over head tank	Capacity (In Liters)
Domestic Tank	13,000 Ltrs
Drinking water Tank(RO treated)	1,000 Ltrs
Non domestic (STP treated water)	8,000 Ltrs

3.9 SOIL/WASTE DISPOSAL

The drainage system considered in the design is a basic 2-pipe system in which the soil & waste pipes are distinct and separate. The soil pipes shall be connected to the soil stack and all waste appliances shall be connected to an independent waste stack. All waste appliances shall be provided with deep seal traps. Soil and waste pipe to be connected to Anti symphonic pipe for vent at each toilet level

The kitchen stacks will be connected to a horizontal header at the ceiling of ground floor. Then these pipes would then be connected to an sewerage network and then led to a external Sewage Treatment Plant located away from the ladies hostel. The treated water from this centralized STP will be pumped to the underground storage sumps of ladies hostel to be subsequently used for Flushing Purpose and for horticulture purpose.

It is proposed to use uPVC SWR Non pressure category pipes for soil / waste drainage. The soil & waste piping shall be under-slung (in the ceiling slab of floor below) and the horizontal header shall be subsequently connected to the vertical stack located inside the associated pipe shaft which shall be coordinated carefully with other services. Care shall be taken to avoid pipe runs in electrical switch rooms and other critical areas. Provision for cleaning shall be made at strategic locations to allow the system maintenance. Grease interceptors are proposed for kitchen/pantry waste, floor washing waste and block located close to the source of grease. Gully traps are provided in waste water down takes. The design of grease inceptors meant for shall be in accordance with ASPE standard and shall include cleanout at entry and exit. The cover shall be non-slip. The waste lines from the kitchens will run separately through PVC Pipes. Grease interceptors will be located in the before connecting it to the sewage manholes .

Vent system shall be designed to facilitate escape of gases and odour from all parts of sanitary and waste system to the atmosphere at a point above the building and to allow admittance of air to all part of the system, so that siphonage, aspiration or back pressure conditions do not cause loss of seal at traps.

3.10 SEWAGE TREATMENT PLANT (STP):

Again, as in case of power infra, the existing STP which is about 100 KLD is grossly insufficient to cater to the present or future population expected in the university. As a result of the deliberations held during the preliminary design review meeting held at the university, it was perpetually agreed to consider a centralized STP as part of the master plan to cater to both phase 1 & 2 of ladies hostel . The scope of the design for ladies hostel phase 1 & 2 would be limited at defining the sewerage network to the proposed external network.

3.11 RAIN WATER HARVESTING AND STORM WATER DRAINAGE:

The storm drainage systems are designed for rainfall intensity of 62.5mm/hr(IMD data). All pipes will be PVC for vertical drain system and external horizontal runs. Rainwater harvesting systems have become mandatory as per the municipality requirements and the same will be explored when the detailed designs are developed.

Rain Water vertical down take of PVC pipe will be left 110/160mm above the finished ground level with elbow spouts. Under these spouts ,the rainwater from the roof top will be treated with basic sand filtration then the treated rain water to be fed into the raw water sump for reusage purpose . The catch basins will also meant for drainage of the open surface surrounding the catch basin. There will be a catch basin along the roadside to take care of the roadside storm water drainage. These catch basins shall be connected to the main storm water drainage system, which may be divided into two or three parts to reduce the depth of the manhole as to suite the site conditions. The discharge from these main drains will be discharged in to rain water-harvesting pits. These pits will be located at different location to suite site conditions.

Rainwater Harvesting Pit consists of a collection cum dispersion pit, with borehole at its center. The borehole is fitted with perforated pipe. Suitable filter and dispersing media such as gravel, boulders and over-burnt country bricks etc is to be filled in the arrangement as per the detailed drawing. The rainwater harvesting arrangement helps in replenishing the underground aquifers.

3.13 Sanitary fixtures and fittings(To be further deliberated with the client/Architect)

The selection of sanitary fixtures and fittings shall be carried out in consultation with Client / Architect. However, the following configuration is proposed:

- All sanitary wares shall be white vitreous china. Water closets (European pattern) shall either be wall hung / floor mounted. Water closet shall be provided with concealed dual flush type cistern.
- All wash basins throughout the complex shall be of white vitreous china under counter / oval wash basin / flat back wash basins with pedestal, pillar cock, waste coupling with CP bottle trap fixed to the outlet. Inlet connections shall be connected by CP angle stop cocks below the counter.

- All sinks in kitchens shall be of stainless steel with single / double drain board and mixer fittings with CP waste coupling and bottle trap.

3.14 MATERIAL LIST:

(a)	All soil, waste and fittings.	PVC SWR Type-B pipes for sunk, raised or vertical in exposed shafts. and for under slung- Stilt ceiling .
(b)	Waste pipe from sinks, wash basins and urinals etc.	uPVC 6 kgf/cm^2
(c)	Rain water pipe and vent pipe	PVC SWR Type-A pipes for vertical in exposed shafts.
(d)	Water Supply Pipes	For underground, Vertical riser/down takes and terrace ring mains – uPVC SCH-40(ASTM D – 2466) with SCH-80(ASTM D 2467) fittings. Toilet concealed lines CPVC SDR -11 (IS 15778) with fittings (ASTM D -2846)

3.15 REFERENCE CODES AND STANDARDS:

i) National Building code2005 Part-9

ii) CPWD Specification and Guidelines

iii) Relevant IS Codes

iv) Uniform Plumbing code.

v) IMD Data.

4. *FIRE FIGHTING:*

4.1 BASIC FIRE FIGHTING REQUIREMENTS:

The basic system for Fire Fighting shall be designed as per the provisions of the National Building Code.

The Fire Classification for this Complex would be a " Class A" – Residential Buildings and under Sub Division A 3 – Dormitories.

The height of the Buildings would be above 15 and not exceeding 35M.

As per NBC & Tamil Nadu Fire & Rescue Service Dept. Norms

Type of installation								
Fire Extinguisher	Hose Reel	Dry Riser	Wet Riser	Down Comer	Yard Hydrant	Automatic Sprinkler system	Manually Operated Electric Fire Alarm System	Automatic Detection and Alarm system
R	R	NR	NR	R	NR	NR	R (see note-1)	NR

Water supply		Pump capacity	
Underground Static water storage tank (in Litre)	Terrace tank (in Litre)	Pump Near UG static water storage tank	Pump at the Terrace level with minimum pressure of 2.0kg/cm^2.(in LPM)
NR	25,000Ltrs	NR	900

R: Required
NR: Not Required

Note:

1) *Required to be provided for buildings with height above 15m.*

4.2 FIRE WATER STORAGE AND DISTRIBUTION:

Static firewater storage tank for Fire Protection System has been provided as overhead storage of 25000 litres capacity on terrace level.

Water shall be drawn from the Fire Reserve Tank in terrace by gravity feed through an electrically driven fire pressure booster pump located at the terrace and supplied into a internal hydrant and ba Wet Riser system.

The system will be kept pressurized with minimum pressure of 2.0kg/cm^2 at all times in order to ensure instant availability of water at all points.

4.3 FIRE HYDRANT SYSTEM:

Internal fire hydrant system shall be provided with 2 no's of Fire Hose Reel drum with rubber hose and nozzle, double Outlet landing valve, 2 lengths of 63mm dia hose with male and female coupling, one branch pipe and one fireman's axe and Two no's of Fire Hose Cabinets shall be located at each floor level.

As per the NBC norms, external hydrant is not required for this building.

4.4 FIRE DEPARTMENT CONNECTION:

There will be a set of fire department inlet connections with 4 Nos. 63mm dia. male outlets, located on the external wall of the building near the main entrance. These inlets will have connections to the main riser as well as by-pass to the Static Storage tank. These connections will be housed in special boxes.

4.5 FIRE EXTINGUISHER:

Portable fire extinguishers of water (gas pressure), Carbon-di-oxide and foam type shall be provided as first aid fire extinguishing appliances. The appliances shall be so distributed over the entire floor area, that a person is not required to travel more than 15 m to reach the nearest extinguisher

Further, for rooms containing electrical transformers, switchgears, motors and of electrical apparatus, minimum 2 Nos. dry powder or carbon di oxide type/sand buckets extinguishers shall be additionally provided within 15 m of the apparatus. These shall be placed or hanged on wall in a group on several suitable places.

The following portable type First Aid Fire Extinguishers, shall be provided to cover the entire building, as per IS 2190:1992.

1. For Electrical Rooms : 4.5 Kg. Carbon Dioxide and 5.0Kg. Dry Chemical Powder @ one Set of Cylinders / Electrical Room.

2. For Plant Room : 10 Kg. (2x5 Kg.) Dry Chemical Powder @ one set of Cylinder(s)/ Plant Room.

3. For D.G. Room : 9 Ltr. Foam Type, @ one Cylinder / Room.

5. For Kitchens : 2 Kg. CO2/Clean Agent Cylinder/Kitchen.

6. For Rooms : 9 Ltr. Water CO2 @ one Cylinder / floor

7. For LPG cylinders Storage room: 10 Kg. Dry Chemical Powder @ 2 cylinders/LPG Room.

All fire extinguishers shall conform to relevant Indian Standards (IS: 2878 for CO2, IS: 2171 for Dry Powder and IS: 10204 for Foam type.) and shall be with ISI marks and from approved manufacturers only.

The specified extinguishers shall be deployed in strategic location(s), as per rules and requirement and to the approval of consultant.

4.6 REFERENCE CODES AND STANDARDS:

i) National Building code 2005 Part-9
ii) Tamil Nadu Fire & Rescue Services Rule book.
iii) Relevant IS Codes
iv) NFPA standards.