Sri Lakshmi Narayana Institute of Medical Sciences

Date: 06.09.2019

From

Dr.JansiRani
Professor and Head,
Department of Biochemistry,
Sri Lakshmi Narayana Institute of Medical Sciences
Bharath Institute of Higher Education and Research,
Chennai.

To

The Dean,
Sri Lakshmi Narayana Institute of Medical College
Bharath Institute of Higher Education and Research,
Chennai.

Sub: Permission to conduct value-added course: Fire safety measures in a hospital

Dear Sir,

With reference to the subject mentioned above, the department proposes to conduct a value-added course titled: Fire safety measures in a hospital in Sep to Oct 2019. We solicit your kind permission for the same.

Kind Regards

Dr.JansiRani

FOR THE USE OF DEANS OFFICE

Names of Committee members for evaluating the course:

The Dean: Dr. Jayalakshmi

The HOD: Dr. Jansi Rani

The Expert: Dr. Kayalakshmy

The committee has discussed about the course and is approved.

Dean	Subject Expert	HOD
(Sign & Seal)	(Sign & Seal)	(Sign & Seal)

DEPARTMENT OF BIOCHEMISTRY
Sri Lakshmi Narayana Institute Of Medical Sciences
PONDICHERRY 605 502.

Dr. G. JAYALAKSHMI, BSC.,MBBS.,DTCD.,M.D.,
DEAN
Sri Lakshmi Narayana Institute of Medical Sciences
Osudu, Ageram Kudapakkam, Post,
Villanur Commune Puducherry-605 502.

PROFESSOR & HOD
DEPARTMENT OF BIOCHEMISTRY
Sri Lakshmi Narayana Institute Of Medical Sciences
PONDICHERRY 605 502

OFFICE OF THE DEAN

Sri Lakshmi Narayana Institute of Medical Sciences

OSUDU, AGARAM VILLAGE, VILLIANUR COMMUNE, KUDAPAKKAM POST,
PUDUCHERRY - 605 502.
[Recognised by Medical Council of India, Ministry of Health letter No. U/12012/249/2005-ME (P -II) dt. 11/07/2011]
[Affliated to Bharath University, Chennai - TN]

Circular

07.09.2019

Sub: Organising Value-added Course: Fire safety measures in a hospital. reg

With reference to the above mentioned subject, it is to bring to your notice that Sri Lakshmi Narayana Institute of Medical Sciences, **Bharath Institute of Higher Education and Research** is organizing **"Fire safety measures in a hospital"**. The course content form is enclosed below.

The application must reach the institution along with all the necessary documents as mentioned. The hard copy of the application should be sent to the institution on or before Sep to Oct 2019. Applications received after the mentioned date shall not be entertained under any circumstances.

Dean

Dr. G. JAYALAKSHMI, BSC.,MBBS.,DTCD.,M.D.,
DEAN
Sri Lakshmi Narayana Institute of Medical Sciences
Osudu, Ageram Kudapakkam, Post,
Villanur Commune Puducherry-605 502.

Encl: Copy of Course content

VALUE ADDED COURSE

1. Name of the programme & Code

Fire safety measures in a hospital

2. Duration & Period

30 hrs & Sep – Oct 2019

3. Information Brochure and Course Content of Value Added Courses

Enclosed as Annexure- I

4. List of students enrolled

Enclosed as Annexure- II

5. Assessment procedures:

Assessment - *Enclosed as Annexure- III*

6. Certificate model

Enclosed as Annexure- IV

7. No. of times offered during the same year:

1, Sep – Oct 2019

8. Year of discontinuation: 2020

9. Summary report of each program year-wise

Value Added Course- September -October 2017					
Sl. No	**Course Code**	**Course Name**	**Resource Persons**	**Target Students**	**Strength & Year**
1	BIO-11	Fire safety measures in a hospital	Dr. JansiRani Dr.Kajalakshmy	MBBS	20 students (Sep – Oct 2019)

10. Course Feed Back

Enclosed as Annexure- V

RESOURCE PERSON

1. **Dr.JansiRani**
2. **Dr.Kajalakshmy**

COORDINATOR
Dr.JansiRani

PROFESSOR & HOD
DEPARTMENT OF BIOCHEMISTRY
Sri Lakshmi Narayana Institute Of Medical Sciences
PONDICHERRY - 605 502

Course Proposal

Course Title: **Fire safety in a hospital**

Course Objective:

1. Overview of fire safety in a hospital
2. Fire accidents and its mode
3. Fire safety precautions

To sensitize the medical students about the importance and mishappenings that occur during fire accidents in a hospital and emergency measures to be taken during such accidents.

Course Outcome: Gained knowledge on fire safety and precautionary measures to be taken during fire outbreak in a hospital setting.

Course Audience: MBBS students of 2020 Batch

Course Coordinator: Dr.Jansirani

Course Faculties with Qualification and Designation:

1.Dr.Jansirani, Professor & HOD

2.Dr.Kajalakshmy, Assistant Professor

Course Curriculum/Topics with schedule (Min of 30 hours)

SlNo	Date	Topic	Time	Hours
1	15.9.2019	Introduction, background, objectives	4-5 PM	1
2	16.9.2019	Why fire safety needed in hospital?	4-6 PM	2
3	17.9.2019	Fire safety building planning	4-5 PM	1
4	18.9.2019	Interior designing	4-5 PM	1
5	19.9.2019	Environment safety	4-5 PM	1
6	20.9.2019	Fire safety standards	4-5 PM	1
7	21.9.2019	Fire safety design components	4-5 PM	1
8	22.9.2019	Fire safety hvac introduction	4-5 PM	1
9	23.9.2019	Ahu rooms weather maker	4-5 PM	1
10	24.9.2019	Cooling systemscooling towers	4-5 PM	1
11	25.9.2019	Cold rooms	4-5 PM	1
12	26.9.2019	Filtration	4-5 PM	1
13	27.9.2019	Typical o.t. check list for space provisions for central air conditioning works	4-5 PM	1
14	28.9.2019	Gas supply	4-5 PM	1
15	29.9.2019	Fire safety installation	4-5 PM	1
16	30.9.2019	Back Pressure Compensated Flow meter	4-5 PM	1
17	1.10.2019	Mobile theatre suction	4-5 PM	1

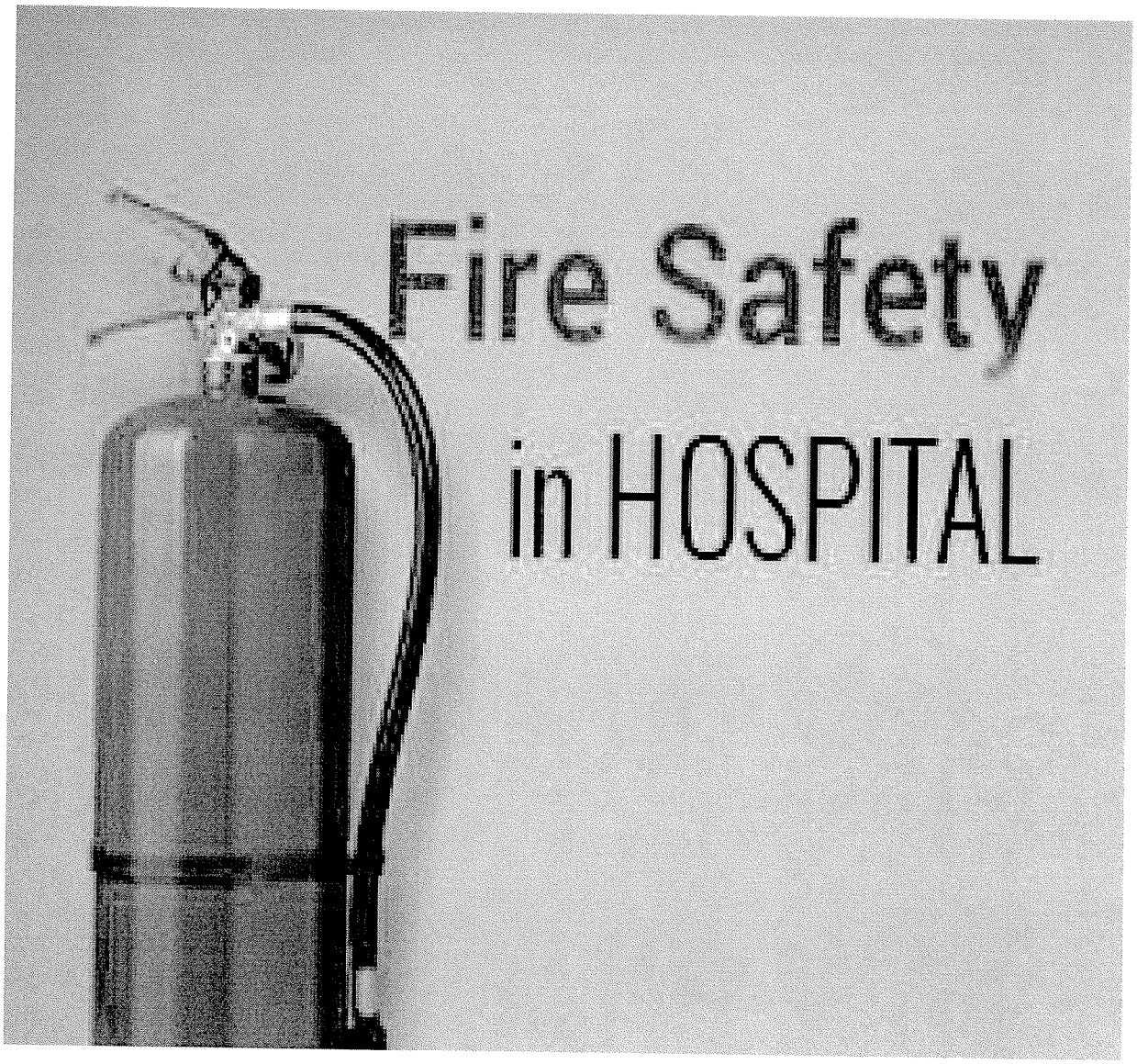
18	2.10.2019	Bed Head panel	4-5 PM	1
19	3.10.2019	Mixed essential and standby electrical power systems	4-5 PM	1
20	4.10.2019	Diesel fuel storage	4-5 PM	1
21	5.10.2019	Essential electrical systems for hospitals enforcing codes	4-5 PM	1
22	6.10.2019	Standby electrical power systems	4-5 PM	1
23	7.10.2019	Task illumination and selected receptacles in the hospital director's, engineering, and security and communications suites	4-5 PM	1
24	8.10.2019	Hot water circulatory and steam condensate return pumps	4-5 PM	1
25	9.10.2019	Critical branch	4-5 PM	1
26	10.10.2019	For mission critical facilities requirements	4-5 PM	1
27	11.10.2019	Hospital waste management	4-5 PM	1
28	12.10.2019	Autoclave hospital waste management Fire safety state-wide and combined treatment centers colour-coded bins for segregation of bio medical waste bio medical liquid wastes disinfection by sodium hypochlorite bio medical liquid wastes treatment by an effluent treatment plant	4-5 PM	1
29	13.10.2019	Other bio medical wastes treatment options	4-5 PM	1
30	14.10.2019	Inspection of fire safety arrangements in the hospital	3-7 PM	4
31	15.10.2019	What to be done during a fire outbreak? Demo class	3-7 PM	4
		Total		39

REFERENCE BOOKS:

1. Hospital Fire Prevention and Evacuation Guide - DIPECHO LAC

2. NABH & fire safety

Annexure I



PARTICIPANT'S HANDBOOK

BIHER SLIMS

Fire safety in hospitals

Particulars	Description
Course Title	Fire safety in a hospital
Course Code	BIO – 11
Topics and content of the course in the Hand book	1. Introduction 2. Laboratory errorsWhy fire safety needed in hospital? 3. Fire safety building planning 4. Interior designing 5. Environment safety 6. Fire safety standards 7. Fire safety design components 8. Fire safety hvac introduction 9. Ahu rooms weather maker 10. Cooling systemscooling towers 11. Cold rooms 12. Filtration 13. Typical o.t. check list for space provisions for central air conditioning works 14. Gas supply 15. Fire safety installation 16. Back Pressure Compensated Flow meter 17. Mobile theatre suction 18. Bed Head panel 19. Mixed essential and standby electrical power systems 20. Diesel fuel storage 21. Essential electrical systems for hospitals enforcing codes 22. Standby electrical power systems 23. Task illumination and selected receptacles in the hospital director's, engineering, and security and communications suites 24. Hot water circulatory and steam condensate return pumps 25. Critical branch 26. For mission critical facilities requirements 27. Hospital waste management 28. Autoclave hospital waste management

	29. Fire safety state-wide and combined treatment centers colour-coded bins for segregation of bio medical waste bio medical liquid wastes disinfection by sodium hypochlorite bio medical liquid wastes treatment by an effluent treatment plant 30. Other bio medical wastes treatment options 31. Inspection of fire safety arrangements in the hospital 32. What to be done during a fire outbreak? Demo class 33. Summary& conclusion
Advantages of learning and evaluation	• Proper Implementation of fire safety in a hospital • Strict follow up of maintenance by appropriate personnel • Awareness of precautions to be taken during a fire outbreak • Educates hospital staff for immediate action during emergency circumstances
Further learning Opportunities	1. Competency based assessment can be done. 2. As a responsible citizen, students are motivated and self-equipped with adequate knowledge 3. Creates awareness among future youngsters of the country 4. Motivates them to educate other peers of their age group to become a responsible citizen of our nation 5. Riddance of unnecessary fear during emergency situations and avoidance of chaos as a sequence of it
Key Competencies	• Evaluation by practical performance of what to be done during a fire outbreak setting – demonstration
Target Student	I MBBS
Duration	39 hrs , Sep – Oct 2019
Theory Session	35 hrs
Practical Session	4 hrs
Assessment Procedure	Assessment Evaluation by MCQ

Fire safety in hospital fire safety why fire safety in hospital?

The hospital, as an Institution is prone to fire because of

- Having many heat-dissipating equipments
- Combustible gasses /fuel, chemicals, used in different areas.
- A lot of electrical wiring, high voltage connections.
- Fire prone articles like gauze, cotton, linen, books and registrars.
- Heavy Equipments and electrical gadgets. That is inflammable and prone to hazardous incidents. Proper precautions have to be taken while planning the infrastructure.
- Adequate measures need to be considered, designed and practiced to ensure safety to all.
- Indicators like architectural designs, interior designs, electrical wiring, appropriate equipment planning and proper waste management are considered while planning such safety measures. Fires can be devastating, especially in a hospital where a large number of people who need to be evacuated may be vulnerable – immune-compromised, on life support, and incapable of moving on their own. There are special requirements that must be met with while evacuating such people in case of fire emergencies. But before that – "fires must be prevented".

Fire safety in hospital fire safety building planning

- The design of the building structure should be so planned that it allows pressurized exclusion of smoke in case of fire or any smoke leak.
- Must have enough doors and windows for proper ventilation.
- Adequate emergency rescue aids and suitable refuge area should be incorporated in the design.
- Ideally, a heavy-duty elevator especially for use of fire fighting personnel only and used in case of emergency only should be incorporated.
- The building should be so designed that it can resist damages due to earthquakes to a fair extent. Safe and easy means of access should be provided to and in every place of work /in patient area.
- This should enable access to all including the disabled to move easily.
- In case of an emergency, safe and rapid exit should be provided for all occupants.
- Each building must have separate fire exit, staircase with proper signage.

Layout planning

Following points must be kept in mind during building planning.

- There is sufficient open space around the building
- Sufficient open space between two buildings so as to minimize fire spread possibilities from or to neighbouring structures.

• Also there should be enough space for movement and parking of fire fighting vehicles, ambulances, etc in the premises and wide road approach to the building.
• Considering the size & number of occupancy, lobbies, staircases, ramps, etc should be sufficiently wide to ensure easy movement of traffic and quick evacuation during emergencies.

Fire safety in hospital fire safety interior designing

The interior designer also needs to incorporate the environment safety measures such as:-
• Adequate natural light, fresh air and colour therapy on walls and lights.
• The designs should be such that there is minimal use of combustible materials like gases, petrol or kerosene.
• The designs should use plenty of good quality fire retardant material for interior furnishing and decoration purposes.
• Appropriate waste management systems also need to be designed to prevent accidents due to hazardous waste.
• The gas and oxygen pipelines must be made of copper.

Environment safety

Following points must be kept in mind during Interior designing.
• The critical areas like Labs X-Ray, OT, ICU etc where heavy equipments are installed should be well protected and extra precautionary measures should be implemented in such critical areas,
• Interior should have fire proof doors, windows, walls and roof covered with fire proof materials.
• The floor should be so designed that they are free from obstructions, are slip-resistant & even.
• Openings in floors should be securely fenced or covered.
• Staircases, ramps should be provided with substantial handrails and other suitable support means to prevent slipping, wherever necessary.
• Easy access for the servicing and maintenance of plant, machinery and buildings should also be incorporated in a design.
• The building should be so designed that it can resist damages due to earthquakes to a fair extent.

Fire safety standards

Hospital engineering service provision for Fire Protection according to NABH:
1. Fire fighting installation approval must be obtained
2. Location of control room should be easily accessible.
3. Control panel & manned, PA equipment should be connected with detection system or fire alarm system.
4. Pumps and pump room

5. 2 separate pumps i. e .Electric and diesel pump should be available
6. Provision of Forced ventilation should be there.
7. Arrangement of filling Fire tenders
8. 4 way fire inlet must be present in case of emergency
9. Proper access for Fire tender to fire tanks
10. Fire Drill should be performed
11. Yard Hydrants should be available
12. Ring main and yard hydrants should be as per strategic locations.
13. 2 way fire heads to charge the ring main
14. Landing Hydrant & Hose reels

Fire safety design components:

1. PUMP ROOM • MAIN PUMP • JOCKEY PUMP • STANDBY PUMP / DIESEL PUMP • AIR TANK • PRIMING TANK • PUMP PANEL
2. FLOOR AREA • FIRE HYDRANT SYSTEM • HOSE REEL DRUM • SPRINKLER SYSTEM • FN 200 GAS (SERVER ROOM AND LABORATORIES) • FIRE ALARM SYSTEM :
    a) Smoke Detector
    b) Heat Detector
    c) MCP- Manual Call Point
    d) Fire Alarm Panel
3. FIRE ALARM SYSTEM • FIRE ALARM PANEL (LOBBY) a) WET RISER b) SPRINKLER RISER c) AIR RELEASE VALVE

Fire safety design components:

1. FIRE HYDRANT VALVE • RANGE : 15 TO 30 M • HIEGHT : 1 M ABOVE GROUND LVL • PIPE SIZE : 80 MM DIA • SINGLE HEADED VALVE
2. HOSE REEL DRUM • 30 M RUBBER HOSE • 1 SETUP NOZZLE • 1 BALL VALVE
3. HOSE BOX • SINGLE DOOR HOSE BOX • 3 M DISTANCE • 68% BLAST SYSTEM
4. FIRE ALARM PANEL • 14 ZONE FIRE ALARM PANEL • SMOKE DETECTOR DISTANCE : 5 M • HEAT DETECTOR IN KITCHEN AND O.T • GAS DETECTOR IN GAS BANK AREA • MCP
5. FIRE PIPES • MATERIAL : GI – C CLASS • DIAMETER : 1 TO 8 INCHES

Fire safety hvac introduction :

One of the keys to planning and selecting the HVAC system is to determine the codes to which the project must be designed, and to work from an architectural floor plan that has the appropriate space names identified. At this point, the project medical planner is an integral part of the HVAC design process. While some projects may include shell spaces, it is important for the HVAC designer to know the anticipated future use. For example, in an imaging suite with shelled areas, it is

important to determine if the space will be for magnetic resonance imaging or computed tomography (CT) with an equipment room or perhaps patient holding or ultrasound rooms. Each of these has different heating and cooling loads and air-change requirements. Prior to any design, it is important to understand the space use, the procedures to be performed and the number of patients who will receive treatment at any given time. This information helps to determine the HVAC design parameters for the project. It also provides a good platform from which to discuss the project with owners, architects and the AHJ so that agreement on the design approach and anticipated results can be reached. Designing an HVAC system for any building type requires careful planning. In health care, however, it also requires more information to meet the increased design complexity of these facilities

CENTRAL AIR CONDITIONING PLANT

Space requirements

i) Space requirement for central air conditioning plant shall be worked out on following basis: Chilling unit a) Reciprocating - 25-30 sq.m per unit (in case of single compressor unit). b) Reciprocating - 40 sq.m. per unit (in case of multi compressor unit) c) Centrifugal/ screw - 40-50 sq.m. per unit d) Centrifugal pump - 8-10 sq.m each pump e) Electrical panel - 20-25 sq.m per chilling unitf) Control panel - 20-25 sq.m

ii) Additional space for circulation shall be taken as 20- 25% of the above total space.

iii) Provision shall also be kept for anticipated future requirements.

iv) The minimum clear height of the plant room shall be 3.6 m in case of Reciprocating plants and 4.5 m in case of Centrifugal & Screw type plants.

iv) The entrance to A.C. plant room for centrifugal / screw type units shall be through rolling shutter/ suitable door shutters of steel or strong material to take self load having minimum width of 3 m & height not less than 4 m for centrifugal/ screw type units & 3.5 m for reciprocating type units.

Equipment location: The plant room shall have easy accessibility for moving in and out of equipments and shall be well ventilated. The location of the plant room shall also take into consideration the routing of the chilled water and condenser water lines from the plant room. As far as possible the plant room should be in close proximity to the electrical substation, since AC plant is main power load. The plant room shall be preferably located in a separate service building along with the substation. Basements shall be avoided from the fire safety point of view.

Floor loading and other structural requirements:

i) The floor loading of the AC plant shall be 2000 Kg/sq m

ii) ii) The Plant room should have a fresh water connection & drain trap.

Fire safety weather maker / ahu rooms weather maker / ahu rooms

Space requirements

i) Floor area requirement for the AHU room shall be as under: For AHUs upto 340 CMM : 4.5 m X 3.5 m For AHUs between 340 CMM & 680 CMM : 5.5 m X 4.5 m

ii) The minimum clear height of the AHU room shall be the same as that of the air-conditioned space to facilitate laying of ducts. Equipment Location AHU rooms should be contiguous to the respective areas to be air-conditioned by them. Their location should also take into consideration the feasibility of routing the ducts as well as provision of chilled water lines, water connections for the humidification equipments, fresh air inlet point and drain outlets. In multistoried constructions, the AHUs should be located in a vertical configuration to facilitate laying of chilled water lines. Individual AHUs shall not serve more than one floor from the fire safety point of view. Similarly each fire compartment shall have a separate AHU. Where the AHUs are located in the basement or in any floor below the air conditioned floors, individual shafts shall be provided for each AHU from the AHU room for the supply and return air, from the fire safety point of view.

Floor loading and other structural requirements.

i) The floor loading of AHU room shall be 800 Kg/ sq m

ii) The doors of the AHU rooms shall be single leaf, air tight having a minimum width of 1.2 m and openable outside. The floor of the AHU room shall slope towards the drain point. For clean room applications and other special requirements the internal finish of the AHU room shall be suitable for these special applications.

iii) All cutouts in the floor for the pipelines and cable shall be effectively sealed from the fire safety point of view.

iv) The clear height required to be maintained under the false ceiling shall take into consideration the ducting design and after allowing for the depth of the beams, thickness of the false ceiling including its frame work, recessed light fittings, etc.

v) The cutouts required in the floor slabs for installing the pipes, ducts and / or cables shall be decided at the initial planning stage and marked in the architectural drawings.

vi) Requirements for fresh air openings, water and drain in the AHU rooms as well as insulation of exposed roof slabs of conditioned areas as well as AHU room shall also be detailed in the initial planning stage.

vii) The beams in the ceiling of AHU rooms shall be of low depth to facilitate installing of supply air duct and return air duct. • Air exchanges In Operation Theatre Fresh Air Positive Pressure Unit = 60 Air Changes /hr • Air exchanges In ICU 30 Air changes /Hr • Total Air Changes Velocity 0.45 M/Sec • All adjacent rooms are on Negative Pressure • Temperature 20 +/- 3° Inside Operation Theatre • Have Variable Frequency Drive • Humidity Range Between 30% to 60% • Hepafilter 0.3 microns in Operation Theatre • Magnetic Differential Pressure Guage Provides Hepa Filter Working Status

FIRE SAFETY AHU SCHEMATICS

Designers should also consider adding casing components to the unit that will enhance ease of maintenance and service. These may include rigging devices (e.g., rails, lifts, winches) to assist with motor, fan or other large component removal and replacement; grease-fitting extensions to the exterior of the casing to allow service without entering the unit; inspection windows and adequate lighting (consider putting lighting on timers to prevent unnecessary usage and premature burnout); and pressure and temperature test ports in each section with a means for ease of opening and closing.

FIRE SAFETY COOLING SYSTEMSCOOLING TOWERS

The space occupied by each cooling tower & approximate operating weight for each cooling tower is given as under. In addition there shall be ample open space all around cooling towers for free flow of air. Equipment location These may be located at a well ventilated place either at ground level and contiguous to the plant room, or on the terrace of the building in consultation with the Architect. In case the cooling towers are located on the terrace of the building, the structural loading of the terrace shall be considered. For this respective columns are to be raised by two feet at the terrace. Cooling towers shall be installed in such a way that their load is transferred directly to the columns for which necessary Mild steel-I sections shall be provided by Airconditioning contractor. The cooling towers shall be rested on Mild Steel-I sections & not on terrace slab. Sufficient free space shall be left all around for efficient operation of the cooling tower.

MECHANICALVENTILATION/ EVAPORATIVE COOLING SYSTEM

Space Requirement

i) The space requirement for the equipments, air washers etc., shall be as per the manufacturer's recommendations.

ii) Space shall also be provided as required for the installation of the pumps along with the air washers.

iii) The minimum clear height of the equipment and air washer rooms shall be 3.6 m. The actual height required would depend upon the capacity of the equipment and manufacturer's recommendation.

Equipment Location i) The plant room shall be located contiguous to the space to be ventilated to reduce the pressure drop in the system. ii) Where air washers are also to be installed the room shall be treated with waterproof treatment and shall be located adjacent to the blower room. iii) The plant room shall be so located that it is conveniently possible to exhaust or inject the air to / from the ambient. Floor loading & other Structural Requirements i) The floor loading of the plant room and air washer room shall be 2000 kg./sq.m. ii) The doors of the plant room and air washer room shall be single leaf, air tight and open able outside. The floor and walls of the air washer room shall be properly treated, preferably with tiles to prevent seepage of water to the adjoining areas. The floor of the air washer room shall be properly sloped towards the drain point. iii) The air washer room shall be provided with water and drain points. iv) Fresh air opening along with masonry louvers, fresh water connection and drain outlet shall be provided in the plant room / air washer room

FIRE SAFETY COLD ROOMS COLD ROOMS Space Requirements i) The space requirement shall have to be worked out in individual cases depending upon the system selected. ii) Sufficient space should be kept around the equipment's for operation and maintenance purposes. iii) Normal room height in the building should be adequate for the equipment room as well as the cold room. Equipment Location i) Plant Room The plant room shall have to be necessarily adjacent to the cold room where DX system is used. The plant room shall have easy accessibility for men and materials and shall be well ventilated. In an air-cooled system, the condenser shall have to be located in a well ventilated space and preferably within the equipment room. Floor loading and other Structural Requirements i) The floor loading for the equipment room shall be 2000 kg /sq. m. ii) The floor loading/ weight of the equipment for AHU rooms and cooling towers shall be as under 3.3.4 & 3.5. iii) Where the cold rooms are located in the uppermost floor, the roof slab shall be provided with effective water proofing treatment to avoid any damage to the insulation of the cold room. For the same reason, the cold rooms shall be located away from the wet areas such as toilets. iv) Where the cold rooms are located on the ground floor, the flooring shall be effectively treated to prevent any seepage of water from the ground into the cold room. v) Suitable insulation along with vapour barrier shall be provided on all the sides of the cold room including the roof and flooring, especially in low humidity applications. GENERAL STRUCTURAL REQUIREMENTS i) If the building is air conditioned, the roof of the air conditioned areas & W.M. room shall have insulation on the roof (preferably over deck insulation wherever possible) and insulation in the walls. Buildings or complexes that have a connected load of 100kW or greater or an airconditioned area of 1000 m2 or more should comply with the thermal transmittance value (U-factor) requirements or R- value of insulation specified

below. The U-factor takes into account all elements or layers in the construction assembly, including the sheathing, interior finishes, and air gaps, as well as exterior and interior air films. The roof insulation shall not be located on a suspended ceiling with removable ceiling panels. ii) All the glazed window of air-conditioning areas shall preferably be provided with double pane glass windows. iii) Buildings or complexes that have a connected load of 100kW or greater or an air-conditioned area of 1000 m2 or more should comply with the fenestration requirements iv) All the doors/ windows of air-conditioned areas shall be made airtight. Air leakage for glazed swinging entrance doors and revolving Doors shall not exceed 5.0 l/s m2. Air leakage for other f enestration and doors shall not exceed 2.0 l/s m2. v) The following areas of the enclosed building envelopes shall be sealed, caulked, gasketed, or weather stripped to minimize air leakage: a) Joints around fenestration and door frames b) Openings between walls and foundation and between walls and roof and wall panels. c) Opening at penetrations of utility services through roof, walls, and floors d) Site-built fenestration and doors e) Building assemblies used as ducts and plenums f) All other openings in the building envelope vi) For air conditioning areas, where the return air is collected/ carried back to AHU rooms above false ceiling, the false ceiling shall be airtight & preferably shall be of Gypsum Board. vii) Total water requirements of air conditioning plant shall be assessed @15 litre/TR/Hr of plant operation. For 24 hour operation the number of operating hours shall be taken as 16. For small central plants a makeup water tank of same capacity shall be provided along the cooling towers with bottom of this make up tank being at least 0.75 mtrs above thesump level of cooling tower. For large size central plants an underground tank of total water requirement capacity shall have to be provided near the A.C. Plant room and a makeup water tank of part water requirement shall be provided along with cooling towers.

FIRE SAFETY FILTRATIONFILTRATION The efficacy of air filters is determined primarily by particle size, but can be affected by the relative electrical charges of particles and filters. Bacteria typically are quite small, requiring filters that remove particles below 1μm in size. ANSI/ASHRAE Standard52.2-2007(ASHRAE2007) specifies a test procedure for evaluating the performance of air-cleaning devices as a function of particle size, resulting in a minimum efficiency reporting value (MERV) for a given device. As shown in Table 2-3, for example, MERV 14 filters remove 75% to 85% of particles in the range of 0.3 to 1.0μm.Table2-4,from ANSI/ASHRAE/ASHE Standard 170-2008, gives requirements for prefiltration and final filtration in different areas. As indicated in Table 2-4, true HEPA (MERV 17; 99.99%) filters are required only for protective environment (PE) rooms; such filters are also required for pharmacies per U.S. Pharmacopoeia General Chapter 797 (USP 2012). HEPA filters are often specified

for bone marrow and organ transplant patient rooms and orthopedic surgery. The MERV rating system is described in detail in ASHRAE Standard 52.2-2007 (ASHRAE 2007). It is based on a test over a range of particle sizes. Standard designations of overall percent filter efficiency are no longer commonly used. AIR-HANDLING AND DISTRIBUTION SYSTEMS Review the preliminary life safety plan: Align AHU and air distribution zones with smoke compartment zones. This minimizes the required number of smoke dampers and simplify smoke damper control sequences. Identify areas with specialized air-handler requirements. :Some areas in the hospital, such as operating rooms, procedure rooms, bone marrow treatment areas, other special treatment areas, and telecommunications and electrical equipment rooms require additional air-handler components, increased airflow, or lower supply temperatures, because of their unique requirements. Consider optimal air-handling unit size.: Determine the desired capacity range for AHUs. Using a large number of small- capacity units can limit the disruptions to staff and patients caused by system shutdowns for maintenance or repair, but this requires significantly more maintenance time for filter changes, lubrication, coil cleaning, and other preventive work. Determine airflow requirements for each air-handler zone. :Develop a room-by-room airflow summary chart. Compare the air requirements for cooling load, air exchange rate, and makeup air. Consider system redundancy. :The designer should consider system redundancy early in the design process to ensure that any additional mechanical space for additional equipment or components is identified. System redundancy may be required by code or regulations or may be desired by the owner for certain mission-critical functions. Strategically locate mechanical rooms and chases. : Mechanical rooms housing AHUs requiring large amounts of outdoor air for ventilation, economizer cycles, or smoke ventilation need to be positioned near exterior walls or roofs to simplify air intake and relief. This decision may also be affected by aesthetic architectural considerations, such as which elevations can accommodate louvers. Determine AHU configuration and components.: To accurately determine the size of AHUs, the designer must determine each AHU's required components and arrangement. Include sufficient access sections for inspection and service. The designer should work with equipment vendors to confirm sizes and determine equipment weights for the structural engineer. Identify components requiring emergency power:. Many AHU components may require emergency power in order to maintain space conditions for critical areas, provide smoke ventilation, or maintain critical pressurization control. Remember to include any critical control components, such as pneumatic-control air compressors, control panels, and powered control devices.

FIRE SAFETY TYPICAL O.T. CHECK LIST FOR SPACE PROVISIONS FOR CENTRAL AIR CONDITIONING WORKS i) A.C Plant room ii) AC

plant room water connection & drainage iii) Cooling tower location iv) AHU room v) AHU room water connection & drainage vi) Shaft for carrying chilled water pipes vii) False ceiling co-ordination viii) Ceiling height to accommodate ducting ix) Water requirement x) Routes of piping/ cable xi) Thermal/ acoustic insulation xii) Air tightness of windows/ doors xiii) Insulation for AC areas on top floors. Outdoor Air Intakes Designers must carefully consider the location of the outdoor air intake for an AHU. Intakes must not be located near potential contaminant sources, such as boiler and generator stacks, laboratory exhaust vents, plumbing vents, cooling towers, ambulance waiting and vehicle parking areas, loading docks, and helipads. Many information sources provide generally accepted criteria for minimum separation distances from the outdoor air intake to potential contaminant sources to ensure adequate separation and dilution. These spacings vary from 10 to 75 ft [3 to 23 m], with 25 ft [7.6 m]

FIRE SAFETY GAS SUPPLY Medical gas piping is needed for oxygen, nitrous oxide, medical air, nitrogen, carbon dioxide, vacuum and anesthesia waste exhaust Scope of work The details of the Product and System is mentioned below & the Design, Supply, Installation, Testing and Commissioning of Central Medical Gas Pipeline System with all accessories and basic systems, should exactly conform to the hospital building and meet all the requirements of the hospital needs:- • The Bed Head Panels should be (Vertical and Horizontal) with Medi-Rail System. • There should be rigid / swivel / single arm / double arm pendants for the OT & ICU. • There should be an area Alarm Panel / Master Alarm Panel for all medical gases. • The Medi-rail system should be provided with all mounting accessories. • There should be a provision of a nurse call system. Pipe material • They should be solid, seamless, deoxidized, non arsenical, half hard, tempered & of degreased material confirming to HTM 2022 Standards. • The pipe sizes should be of the following standard size only, as under: 28mm OD x 1.2 mm thick 22mm OD x 0.9 mm thick 15mm OD x 0.9 mm thick 12mm OD x 0.7 mm thick • Fittings used for connecting copper tubing should be of Copper and brazed type connection as per BS: 864: Part 2:1983. All pipe-jointing fittings should be made of Copper as per BS 864 Standards and should be suitable for a steam of working pressure of 17 bars and especially be made for brazed socket type connections. • Shut off valves should be suitable for the pipe diameter of non lubricated 90 degree turn lever & having stainless steel hard chrome brass body with PTFE seat and S.S. ball. • Sizes to be appropriate for copper pipes with screw threaded ends and brass adapter .All valves should be pneumatically tested for double the working pressure and degreased for medical gases supply.

FIRE SAFETY Installation • Installation of piping should be carried out with strict cleanliness. • Only pipes, fittings and valves which have been degreased to be used. • Pipe fixing clamps should be of non-ferrous or non-deteriorating plastic

type suitable for the diameter of the pipe being used. Testing • After installation, all the pipes should be cleaned or purged with gas, and then the complete system to be tested at 1 1/2 times of working pressure for minimum 24 hours for any faults or leaks. Painting • All the existing and proposed exposed pipes will have to be painted with two coats of synthetic enamel paint & according to the colour codification as per IS-2379 of 1963. Terminal outlets • To conform to the following features: All outlets should accept, retain and release the probes by means of a quick release mechanism, to be of design for single - handed operation. • The terminal unit/probe connection will be of non-swivel type, so that any secondary equipment, such as a flow meter, is not tilted by the weight of the probe hose. • The outlet should be strictly totally leak proof, safe and easy to operate. • All the probes of a particular gas should be non-interchangeable specific gas and vacuum probes. • All outlets to be permanently identifiable with colour for specific gas / vacuum besides bearing labelled name of the gas, to be engraved on its face. GAS SUPPLY

FIRE SAFETY Back Pressure Compensated Flow meter • The flow meter should be sturdy and reliable for an accurate measuring of the flow of gases. • The flow meter should be made of chromium plated brass body. • The metering tube and cover should be made of unbreakable Poly carbonate. • The flow adjustment should be by a needle valve fitted with inlet filter- 100um. • The flow rate range should be between 0- 15 litres per minute. • The flush flow should be minimum of 60 litres per minute. • The reading in the flow meter should be on the centre of the floating ball. • The inlet pressure should be minimum of 60 psi. Ward Suction Unit • The whole unit should be wall mountable ward Vacuum Unit. • The capacity of the Jars should be between 550ml / 2000ml. • The range of control of flow should be between 0 To 700 Mm./Hg. • An over flow safety valve should be present in the Lid assembly. • The lid should be made of ABS Plastic variety. • The jar should be made of unbreakable poly carbonate material. • The jar should be sterilisable by steam to the temperature of above 132 Degree Celsius. • The vacuum control regulator should have an ON/OFF Knob. • It should have a high pressure hose at inlet and a low pressure hose at collection end of the jar. The operation theatre should be provided with :- GAS SUPPLY

FIRE SAFETY MOBILE THEATRE SUCTION UNIT Consisting of:- • Unbreakable Poly Carbonate Collection jars 2 Nos of 2000ml capacity each. • Provision of an ABS Lid with over flow safety valve is required. • A special 3 way valve is to be provided to operate either left hand side or right hand side and both should be operable simultaneously. • A regulator is to be provided to control the negative pressure from 0 to 750 mm./ Hg. with an ON /OFF knob. • All these items should be assembled on an Aluminium powder coated trolley with castors for mobility in the operation theatre. • A 1 – 2 mtr high pressure hose should be

provided at the inlet and 2-3 Mtr low pressure hose to be provided at collection end of the jar. OT PENDENT DESIGN: • Provision should be for 2 Oxygen and 2 Nitrous Oxide Gas Outlets. • Four Switch Sockets of 5/15 Amps each. • Stainless steel IV hooks with Infusion Pump Mounting Facility. • There should be 1 Monitor Shelve. Alarm System for Gases Should have the mandatory essential features:- • Wall Mountable. Digital display of line pressure in Psi. • An Audio Visual Alarm for High & Low level of gases. • A reliable pressure sensor. • The alarms should be provided with pressure sensors with an in-built On-Off switch. • The system should have a facility to be kept off as and when required. • The audio alarms to become active in case of any abnormality in the pressure and to be shut off by pressing the MUTE button to be provided in the system. • The audio alarm should restart automatically if the pressure does not come back to the normal range within 15 - 30 minutes, thus warning that the fault is still active and unattended. • The system should have feather touch buttons in the system. • A battery pack to be provided for uninterrupted power supply to the system with minimum 2 hours back-up supply for the system. • The whole area is to be made of fire-proof material as per international standard. GAS SUPPLY

FIRE SAFETY Bed Head panel • A horizontal Bed Head Panel with provision of all the Gas Outlets & Electrical 5/15 amps switches, Sockets, Nurse Call cut out as per requirement on each bed. • Each Bed Head Panel should be provided with the following :- • 2 each for Oxygen & 2 Vacuum Outlets. • 4 multi- pins 5/15 Amps, Switch Sockets outlets combined. • Medi-rail. Provision for Nurse Call Cut out. Nurse Calling System A digital nurse calling system for large hospital denotes quiet working & efficiency. The system should be having:- • A Wall mounted unit to be installed on each bed of good pleasant design of aluminium panel with screw attachment & coded colour powder coating. • The front panel should have the following : 1. 3 colour indicators : • RED for Calling. • GREEN for Ready • YELLOW for Wait • Reset switch • Hanging cord • Patient Switch to be installed at the nursing station. • Central monitor to have bright red digital display for bed numbers Features :- • Single 3 Sec beep on call or Periodic beep. • Acknowledgement switch on the monitor. • Flashing display on call & freeze mode on wait. • Central monitor to accommodate minimum 10- 20, beds capacity. • Siren mode if the patient is not attended after providing wait signal. • Electrical Installation of single wire to be laid from every bed to the nursing station through concealed conduits. • The central monitor to work on 230v 50hz supply. • Provision of DC voltage to be supplied to wall unit & patients switch so that micro shocks & leakage current shocks are avoided. GAS SUPPLY General Terms • The firm shall install the entire system in the hospital in accordance to the building plan requirements and measurements on completion of the construction. • The firm shall give an undertaking for 7 years comprehensive AMC after 2 years of warranty

period. • All safety standards have to be met during installation & after installation a compliance report will have to be submitted by the firm. • User & Technical /Maintenance manual will have to supplied by the firm. • The firm will supply the list of hospitals where the same equipment has been installed.

STANDBY ELECTRICAL POWER SYSTEMS • MIXED ESSENTIAL AND STANDBY ELECTRICAL POWER SYSTEMS For facilities where full standby power is required, it is permissible for the Standby Electrical System generators to provide power to the Essential Electrical System if the Standby Electrical System, as a whole, meets the requirement of the NFPA 99, NFPA 110, and other applicable codes. • COMMISSIONING (a) In addition to installation acceptance testing specified in NFPA 110, a commissioning plan shall be developed, specified, documented, and executed to ensure proper operation of the Essential Electrical System, both its individual components and the system as a whole. The commissioning plan shall include, but not be limited to, all sources of power, paralleling switchgear, transfer switches, fueling systems, and tank leak detection, interconnections to other systems, annunciators, load shedding, exercise functions, peak shaving, and communications pathways between equipment. (b) The A/E shall prepare control and operation drawing(s) or stipulate that the Contractor prepare them, as part of system commissioning and operations and maintenance documents. The drawings shall show all elements of the system and their interrelationships, including both power and control interconnections and sequences of operation. Physical locations of equipment shall be included. • EQUIPMENT AND RATINGS GENERATORS Generators used for the Standby Electrical System shall be rated as Limited Running Time prime power. If separate from the Standby Electrical System generators, generators dedicated to the Essential Electrical System shall be rated as standby. AUTOMATIC TRANSFER SWITCHES (ATS) ATS shall be 4-pole where the neutral circuit conductor is transferred by the transfer equipment, and the Standby or Essential Electrical System is designed as a separately derived system. ATS shall include the bypass isolation option. ATS shall be limited to 800A (amperes) maximum size and located to provide the highest practicable reliability in service to the load, which generally entails minimizing the switch-to-load distance.

STANDBY ELECTRICAL POWER SYSTEMS DIESEL FUEL STORAGE Diesel storage tank(s) shall be provided with leak detection, and a means to prevent degradation of stored fuel due to oxidation, microorganism growth, and corrosion. LOCATION (a) Do not locate the first level of distribution of the Standby Electrical System or Essential Electrical System, such as the generators and paralleling switchgear, in the same room with other power systems. (b) In the generator paralleling switchgear or distribution switchboard, Life Safety Branch overcurrent protective devices shall occupy a dedicated section or sections. •

EXISTING FACILITIES (a) Variations in wiring arrangements in existing facilities are acceptable if the performance and reliability specified in VA Master Construction Specifications and criteria herein are not compromised. Such variations may particularly occur with certain wiring in separate or common raceways, with certain functions connected to one or another system or branch, or with certain provisions for automatically or manually delayed restoration of power from the alternate (emergency) source of power. (b) The A/E shall submit a narrative describing the existing conditions and how the new design best meets the intent of applicable codes and provides an equivalent degree of performance and reliability. (c) When adding the ATS to an existing Essential Electrical System, the A/E shall match the existing pole switching configuration in terms of equipment and design, i.e., 3-pole or 4-pole transfer switches.

STANDBY ELECTRICAL POWER SYSTEMS ESSENTIAL ELECTRICAL SYSTEMS FOR HOSPITALS ENFORCING CODES • Alarm and alerting systems, such as Fire Alarm and Medical Gas Systems • Automatic doors: Used for building egress • Elevator cab lighting, control, communication, and signal systems • Exit signs • Generator set location: Task illumination, battery charger for emergency battery powered lighting units, and selected receptacles • Illumination of means of egress • Telecommunications Systems where used for issuing instructions during emergency conditions, including public address and Code One (Blue) systems and Disaster Control or Emergency Communication Centers CRITICAL BRANCH SHALL SUPPLY POWER TO: • Acute Nursing: Task illumination and selected receptacles • Stepdown Units: Task illumination and selected receptacles • Anesthetizing Locations: Task illumination, selected receptacles, and fixed equipment; task illumination includes battery back-up • Angiographic Laboratories: Task illumination, selected receptacles, and selected power circuits • Blood, Bone, Eye, and Tissue Banks: Task illumination, selected receptacles, and refrigerators • Cardiac Catheterization Laboratories and Rooms: Task illumination and X-ray unit • Coronary Care Unit: Task illumination and PBPUs • Emergency Room Treatment Areas and Life Support Rooms: Task illumination and PBPUs • General Patient Bedrooms: Night lights, an alcove or a lavatory mirror light, one receptacle per bedwall, preferably in the PBPU, if available, and a bathroom light • Hemodialysis Rooms: Task illumination and one receptacle for each dialysis unit PBPU • Human Physiology Labs: Task illumination, selected receptacles, and selected circuits • Intensive Care Units: Task illumination and PBPUs • Medication Rooms and Medication Preparation Areas: Task illumination, selected receptacles, and refrigerators • Minor Operating Rooms: Task illumination and selected receptacles • Nurse Call systems • Nurses Stations: Task illumination and selected receptacles • Pharmacy Dispensing Area (including Satellite Pharmacies): Power files, laminar flow hoods, refrigerators,

copier for transmittal of physicians' orders, task illumination, and selected receptacles • Psychiatric Bedrooms: Task illumination (ceiling only) • Surgical Operating Rooms: Task illumination (50% of the general fluorescent fixtures above the surgery table including battery backup within two of these fixtures), all X-ray units, and one film processor per suite

STANDBY ELECTRICAL POWER SYSTEMS • Surgical Recovery Rooms: Lighting fixture over each bed, one receptacle for each bed (or PBPU), night lights for each bed (or PBPU), and emergency alarm circuits • Main Computer Room, Backup Computer Room, Telecommunications Rooms, Telephone Operators Room, and Antenna Headend Equipment Room: All UPS equipment, lighting, and receptacles WARD TREATMENT ROOMS: TASK ILLUMINATION AND SELECTED RECEPTACLES • Dental Suites: Each ceiling track operatory surgical light, each dental operating unit, one duplex receptacle in each treatment area, and a storage refrigerator • Electrical Rooms: 50% of lighting and 50% of receptacles; also provide additional battery-powered lighting main electrical room • Engineering Control Center and Mechanical Equipment Rooms: UPS equipment, task illumination, and selected receptacles for operating and controlling internal auxiliary power, data gathering panels, control air compressors, dryers, and any electric control for heating, ventilating, and air-conditioning (HVAC) systems • Laboratory Service: Task illumination, selected receptacles in areas used to continue essential functions or critical experiments in the event of power failure, fume hoods, exhaust fans, and refrigerators • Pharmacy Delivery Systems and Delivery Areas: Task illumination, selected receptacles, dumbwaiter for delivery of STAT requests, and pneumatic tube system for STAT requests if no other delivery system is readily available • Respiratory Care Beds: PBPUs; when PBPU is not provided, task illumination and one receptacle for each bed • Security Station: Monitoring security alarm systems, task illumination, one receptacle, intrusion and duress alarms at agent cashier, pharmacy, drug storage room in warehouse, canteen office, canteen retail store room, and canteen storage • Special Procedure Rooms (Radiology): Task illumination and X-ray unit • HVAC for Surgical Suites, Intensive Care, Coronary Care, and Emergency Treatment Spaces, and other areas as deemed necessary by VA • Medical dispensing equipment

STANDBY ELECTRICAL POWER SYSTEMS Equipment Branch Non-Delayed Automatic Connection Arrange the following generator accessories for non-delayed automatic connection to the alternate power source: • Electrically operated louvers • Other generator accessories essential for generator operation • Transfer fuel pump Equipment Branch Delayed-Automatic Connection Arrange the following equipment for delayed-automatic connection to the alternate power source, including necessary controls: • Vacuum pumps and oral evacuation pumps serving medical and surgical functions, including controls • Sump pumps and other

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equipment such as associated control systems and alarms required for the safety of major equipment that may be exposed to water • Medical and dental air compressors serving medical and surgical functions, including controls (such systems may be connected to the Critical Branch; the A/E shall coordinate with the Chief Engineer at the facility) • Smoke control and stair pressurization • Kitchen hood supply and/or exhaust systems, if required to operate during a fire in or under the kitchen hood • Uninterruptible Power Supply (UPS) equipment serving other than telecommunications equipment • Medical and laboratory refrigerators and freezers as required • Oxygen storage control panel • Equipment and control systems for each elevator bank: Design control systems to operate at least one elevator at a time and designate one elevator to serve the Surgical Suite during emergencies • Fire pump, jockey pump, and make-up pump for water-based fire protection systems; lighting and selected receptacles in fire pump room • Hyperbaric facilities • Hypobaric facilities • Automatic operated doors • Autoclaving equipment (shall be permitted to be arranged for either delayed-automatic or manual connection to the alternate source)

STANDBY ELECTRICAL POWER SYSTEMS ADMINISTRATIVE AREAS: TASK ILLUMINATION AND SELECTED RECEPTACLES IN THE HOSPITAL DIRECTOR'S, ENGINEERING, AND SECURITY AND COMMUNICATIONS SUITES • Closed-loop water chilling equipment for linear accelerator • Domestic Water Pumps: Equipment, control system, light fixture, and receptacle near the pump • Electric tape for heat tracing of piping requiring freeze protection HEATING, VENTILATING AND AIR-CONDITIONING (HVAC) SYSTEMS: o Heating Equipment: Operating Suites, Recovery, Intensive Care, Coronary Care, Infection and/or Isolation Rooms, Emergency Treatment Spaces, and General Patient Rooms; under certain conditions, NFPA 99 may not require heating of General Patient Rooms and Infection Isolation Rooms o Air-conditioning equipment, lubricating oil pumps for centrifugal compressors, control air compressors, air dryer and absorption machine refrigerant pump to draw down lithium chloride before crystallization (omit for machines accomplishing this manually) o Chillers, chilled water circulating pumps, fans, and controls for surgical suites, recovery rooms, intensive care, and coronary care units o Chillers, chilled water circulating pumps, fans, and controls for animal research facilities o HVAC equipment for Bone Marrow Transplant (BMT) areas o HVAC equipment for Magnetic Resonance Imaging (MRI) Suites and Computerized Topographic (CT) Scanners o HVAC equipment serving emergency areas in outpatient clinics in seismic and high-risk hurricane areas o HVAC equipment for Main Computer Room, Telecommunications Rooms, Telephone Operators Room, and Antenna Headend Equipment Room o Exhaust fans serving Autopsy Rooms, reagent-grade Water Treatment Rooms, Orthotic Laboratory

special exhaust systems, battery charging areas, flammable storage rooms, and illustration rooms (Medical Media) o Supply, return, and exhaust ventilating systems for Infection Isolation Rooms, Protective Environment Rooms, and exhaust fans for laboratory fume hoods and nuclear medicine areas where radioactive material is used. These systems are permitted on delayed automatic system only, and shall not be served via manual system. Some systems may be placed on the Critical Branch. Coordinate with VA. o Ventilation, cooling, and control equipment for electrical rooms

STANDBY ELECTRICAL POWER SYSTEMS HOT WATER CIRCULATORY AND STEAM CONDENSATE RETURN PUMPS: Equipment, controls, and light fixture and receptacle near the pumps • Hot Water Generator: Equipment, controls, and light fixture and receptacle near the generator • Kitchen: Illumination and minimum equipment to feed patients during extended outage; freezers and refrigerators • Laboratory Air Compressors and Vacuum Pumps: Equipment, controls, and light fixture and receptacle near the compressors and pumps • Animal Ward lighting • Mortuary Refrigerator or Cold Room: Refrigeration equipment and task illumination • Radiology Suite: Task illumination, one automatic X-ray film processor, and one X-ray unit • Refrigerated Medical Storage: Refrigeration equipment • Sewage Pumps: Equipment, controls, and light fixture and receptacle near the pumps. SUPPLY, PROCESSING, AND DISTRIBUTION (SPD): o Task illumination and selected receptacles in the following areas: core, sterile storage, non-sterile storage, preparation, and decontamination o One ultrasonic cleaner, one ethylene oxide gas sterilizer, one steam sterilizer, one washer sterilizer, and one gas generator o Equipment in warehouse areas necessary to preserve subsistence drugs and X-ray film materials that may be subjected to damage from infestation, humidity, or temperature • Water and Sewage Treatment Plant: Lighting, receptacles, and equipment needed during emergency ALTERNATE SOURCE OF POWER (a) The alternate source of power shall be one or more diesel engine-driven generator sets. Provide physical space for one additional generator; paralleling switchgear shall be appropriately provisioned. Refer also to the Physical Security Design Manual. (b) Coordinate location(s) for generator remote alarm annunciator(s) with VA. The preferred locations are in the Energy Center control room and in the Security office or Telephone Operators Room (whichever is continuously staffed). **STANDBY ELECTRICAL POWER SYSTEMS CRITICAL BRANCH** In addition, connect the following items to the Critical Branch, arranged for delayed automatic connection to the alternate power system: • Nurse Call System • Patient Bedrooms: Bathroom light, an alcove or lavatory mirror light, night light, and one receptacle per bed wall • Electrical Rooms and Closets: 50% of lighting and one

receptacle • Main Computer Room, Backup Computer Room, Telecommunications Rooms, Telephone Operators Room, and Antenna Headend Equipment Room: All UPS equipment, lighting, and receptacles • Mechanical Rooms: Task illumination and one receptacle ALTERNATE SOURCE OF POWER The alternate source of power shall consist of a diesel engine-driven generator set. ESSENTIAL ELECTRICAL SYSTEM FOR OTHER HEALTHCARE FACILITIES The Essential Electrical System for other healthcare facilities shall comply with the Type 3 system as defined in NFPA 99. If electrical life support equipment is required or critical care areas are present in the facility, the Essential Electrical System shall comply with the Type 1 system as defined in NFPA 99. If a Type 1 system is required, connect the functions/items listed above in SECTION 4.6 to the Essential Electrical System. ALTERNATE SOURCE OF POWER. ESSENTIAL ELECTRICAL SYSTEM FOR OTHER FACILITIES. BOILER PLANT AND ENERGY CENTER. Provide emergency power for task illumination and equipment necessary for emergency operations during an extended power outage. These buildings generally have their own diesel engine-driven generator set. FIRE STATION. Provide emergency power for lighting and communication circuits necessary to sustain operation during power outages. If emergency generator power from an adjacent Boiler Plant or Energy Center is not available, provide auxiliary battery- powered lighting and communication devices.

STANDBY ELECTRICAL POWER SYSTEMS STANDBY ELECTRICAL SYSTEM FOR MISSION CRITICAL FACILITIES REQUIREMENTS (a) A Standby Electrical System may be required to provide full power backup for Mission Critical facilities. The Standby Electrical System shall be sized for full load operation of the entire electrical system, and must be capable of sustaining operation of all electrical loads for a minimum four-day period during which the electric utility source is not available. Additional sustainability time may be required for hurricane-prone areas, arctic areas, high seismic areas, areas vulnerable to other natural disasters, Continuity of Operation (COOP) facilities, or for other locations as specified by VA. (b) The Standby Electrical System may be sized, if required by VA to provide power for other new or existing buildings or loads in addition to the Mission Critical facility. STANDBY SOURCE OF POWER (a) The source of power shall be one or more indoor diesel generator sets that generate at the utility service entrance voltage, typically 5kV or 15kV nominal. The point of connection shall typically be the utility service entrance point. The generators shall be rated Limited Running Time prime power, with a suggested limit of 750 hours of yearly operation at this rating. (b) Provide physical space for one additional generator; paralleling switchgear shall be appropriately provisioned. (c) Investigate peak shaving, cogeneration, or load interruption incentives with the serving electrical utility and submit an analysis narrative with

recommendations to VA. Unless an advantageous interconnection agreement is obtained, the standby power system shall not parallel with the utility. (d) The location of the standby power system, including switchgear and diesel fuel storage, shall comply with the Electrical Design Manual, the Physical Security Design Manual, and applicable Codes.

FIRE SAFETY HOSPITAL WASTE MANAGEMENT Hospital Waste Management Once identified and segregated 1. Out rightly send Domestic Effluents to ..the municipal sewers 2. Isolate & Collect the infectious liquid wastes(streams 2 & 3), Disinfect completely and then send to municipal sewers Pack the segregated solid waste according to prescribed mode and send it for proper disposal May be At BMW CTDF (Bio- Medical waste common Treatment and Disposal Facility) Where, The BMW shall be treated using standard methods such as incineration, Autoclaving, Micro –Waving ,and the treated waste residue shall be finally disposed off in a secured landfill Hospital Waste classification Inspection & Re- Segregation SHARP STORAGE AND DISPOSALBIO MEDICAL PLASTIC WASTES DISINFECTION BY SODIUM HYPOCHLORITE BIO MEDICAL WASTES DESTRUCTION BY DOUBLE CHAMBERED INCINERATOR

FIRE SAFETY Waste Categories Description and Examples

1.General Waste No risk to human health eg:office paper,wrapper,kitchen waste,general sweeping etc.

2.Pathological Waste Human Tissue or fluid eg:body parts,blood,body fluids etc.

3.Sharps Sharp waste eg:Needle,scaples,knives,blades etc.

4.Infectious waste Which may transmit bacterial,viral or parasitica disease to human being,waste suspected to contain pathogen eg:labrotory culture,tissues(swabs)bandage etc.

5.Chemical waste Eg:Labrotory reagent,disinfectants,Film Developer

6.Radio-active waste Eg: unused liquid from radiotherapy or lab research,contaminated glasswares etc. Waste Categories Description with examples

7.Pharmacutical Waste Expired outdated drugs /chemicals

8.Pressurized container Gas cylinder,aerosal cans etc

9.Genotoxic Waste Waste Containing Cytotoxic Drugs(often Used In Cancer Therapy) • 2.Segregation: Done at point of Generation of waste and put in separate coloured bags.Color coding varies from nation to nation.For eg. In AIIMS hospital,New delhi, Following color code bags are practised. Infectious Waste/Pathological Waste HOSPITAL WASTE MANAGEMENT

FIRE SAFETY Generation,Segregation,Collection,St orage,Transportation and treatment of waste

1.Generation: Type Site of Generation Disposal By Non-Hazardous waste/General waste Office,Kitchen,Adminis tration,Hostels,Stores, Rest rooms etc Muncipal/Public Authority Hazardous (Infectious & toxic waste) Wards,Treatment room, Dressing room, OT, ICU,Labour room, Labrotory, Dialysis room, CT scan, Radio- imaging etc Hospital itself Step
1. Create policy devotion and accountability for wellness-care trash control Step
2. Make a national review of health-care waste techniques Step
4. Develop a policy on regional and collaborative methods of health-care waste treatmentc • Option 3: treatment of health-care waste in existing industrial or municipal treatment features (e.g. municipal incinerators), where these can be found. Containers Colour Tells other staff what is in the container • Tells the contractor what to do with the waste • Can apply to both sacks and rigid containers Safe for Disposal to General Waste Carcass, anatomical Sharps Cytotoxic Bio Medical Wastes Collection &Transport by Common Treatment & Disposal Facility **AUTOCLAVE HOSPITAL WASTE MANAGEMENT FIRE SAFETY STATE-WIDE AND COMBINED TREATMENT CENTERS COLOUR-CODED BINS FOR SEGREGATION OF BIO MEDICAL WASTE BIO MEDICAL LIQUID WASTES DISINFECTION BY SODIUM HYPOCHLORITE BIO MEDICAL LIQUID WASTES TREATMENT BY AN EFFLUENT TREATMENT PLANT** Sharp Management □ Must be collected at the point of generation, in a leak-proof and puncture-resistant container □ Containers must bear the international biohazard symbol and appropriate wording □ Containers should never be completely filled, nor filled above the full line indicated on box. Unauthorise d Use/Reuse Unsafe collection Unsafe disposa l HOSPITAL WASTE MANAGEMENT
FIRE SAFETY Other Bio Medical Wastes Treatment Options Other Bio Medical Wastes Treatment Options Plasma Pyrolysis Liquid Infectious Medical Wastes • Placed directly in the Biohazardous waste, • Autoclaved & the poured down a sanitary sewer, • Solidified using an approved disinfectant solidifier and discarded in the solid waste Liquid Infectious Medical Waste, i.e., the contents of suction canisters, may be disposed as follows Comparison of Treatment Technologies Pneumatic tube Pneumatic tubes (or capsule pipelines; also known as pneumatic tube transport or PTT) are systems that propel cylindrical containers through networks of tubes by compressed air or by partial vacuum

Annexures II

STUDENT LIST

DEPARTMENT OF BIOCHEMISTRY

S.No	Reg No	Name	Signature
1	U19MB331	NIRMAL KUMAR B	
2	U19MB332	NISHANTHI V	
3	U19MB333	NITIN NARAYAN M	
4	U19MB334	NIVASINY P S	
5	U19MB335	NUKUVOLU NIENU	
6	U19MB341	PRAKHAR GAUTAM	
7	U19MB342	PRIYADHARSHINI A	
8	U19MB343	PRIYADHARSHINI M	
9	U19MB344	PRIYANSHU KESHARI	
10	U19MB345	PULAK ACHARYA	
11	U19MB346	RAAJ SETHU VINAYACK R	
12	U19MB347	RABYA TABASUM	
13	U19MB348	RAHUL MAHESHVAR M G	
14	U19MB349	RAHUL RAJ	
15	U19MB350	RAJAGOPAL R	
16	U19MB336	PADMAJA T	
17	U19MB337	PAVAN KALYAN POTLURI	
18	U19MB338	PAVITHRA T	
19	U19MB339	PRABHU MANIKANDAN V S	
20	U19MB340	PRADHEEP K	

Nursing p. 5

1. The acronym "RACE" stands for:
   a) Rescue, alarm, confine, search
   b) Release, activate, contain, evacuate
   c) Run away to the closest exit
2. When using a fire extinguisher, the first step in PASS is:
   a) Aim the extinguisher at the base of the fire
   b) Discharge the extinguisher
   c) Pull the pin
   d) Check to see if the first extinguisher is full
3. The building fire alarm function which provides the earliest warning of a fire is:
   a) Sprinklers
   b) Employees
   c) Smoke detectors
   d) Public address system
4. Which of the following statements is not true:
   a) Elevators may sometimes be used in fire situations, if not located in a zone threatened by fire
   b) The most likely route for evacuation of patients is down stairwells
   c) Sprinklers are activated automatically by heat
   d) The risk of fire is higher when construction activity is present
5. There is a fire is a microwave oven. You activate the alarm, ask another staff member to call security and you locate the nearest fire extinguisher. Which of the following steps is incorrect:
   a) Pull the pin with the fire extinguisher upright
   b) Aim at the base of the flames
   c) Squeeze the lever while sweeping the nozzle slowly back and forth
   d) Replace the fire extinguisher in its original position when the fire is safely out
6. If a fire alarm is sounded, the fire/smoke zone doors:
   a) Close automatically

b) Should be propped open to facilitate lateral evacuation

c) Will remain open until someone closes them

d) Will remain in their usual position

7. A lateral evacuation of a patient care area involves:

a) Closing all patient care and other doors on the unit

b) Evacuating the patient through the smoke/fire to a safe zone

c) Conducting a head count of all patients and staff

d) All of the above

8. The fire alarms sound on a patient care unit. You begin closing doors. A visitor asks nervously what is going on. You respond:

a) The hospital has frequent fire drills and closing all doors is a part of our fire action plan

b) There is a fire close by and we should prepare to evacuate

c) I'm not sure what is going on!

9. A visitor decides to break the rules by having a quick cigarette in the bathroom. He accidentally drops the cigarette into the trashcan and a fire ignites. Which of the following statements are not true:

a) Patients in the room should be removed from the room

b) Visitors should be removed from the room

c) Occupants of adjacent rooms may need to be moved as a precautionary measure

d) There is no need to activate a pull station since the fire can be easily extinguished

10. Sprinklers are activated when:

a) There is smoke in an area during a fire

b) Someone activates a pull station during a fire

c) Heat from a fire activates a sprinkler

d) Fire safety quiz answers

Parvan

1. The acronym "RACE" stands for:
   a) Rescue, alarm, confine, search
   b) Release, activate, contain, evacuate
   c) Run away to the closest exit
2. When using a fire extinguisher, the first step in PASS is:
   a) Aim the extinguisher at the base of the fire
   b) Discharge the extinguisher
   c) Pull the pin
   d) Check to see if the first extinguisher is full
3. The building fire alarm function which provides the earliest warning of a fire is:
   a) Sprinklers
   b) Employees
   c) Smoke detectors
   d) Public address system
4. Which of the following statements is not true:
   a) Elevators may sometimes be used in fire situations, if not located in a zone threatened by fire
   b) The most likely route for evacuation of patients is down stairwells
   c) Sprinklers are activated automatically by heat
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Sri Lakshmi Narayana Institute of Medical Sciences

Affiliated to Bharath Institute of Higher Education & Research

(Deemed to be University under section 3 of the UGC Act 1956)

CERTIFICATE OF MERIT

This is to certify that **SATHISH KANNAN** has actively participated in the Value Added Course on Fire safety measures in a hospital held during Sep 2019 – Oct 2019 Organized by Sri Lakshmi Narayana Institute of Medical Sciences, Pondicherry- 605 502, India.

Dr. Kajalakshmy
RESOURCE PERSON
DEPARTMENT OF BIOCHEMISTRY
Sri Lakshmi Narayana Institute Of Medical Sciences
PONDICHERRY - 605 502.

Dr. Jansirani
COORDINATOR
PROFESSOR & HOD
DEPARTMENT OF BIOCHEMISTRY
Sri Lakshmi Narayana Institute of Medical Sciences
PONDICHERRY 605 502

Sri Lakshmi Narayana Institute of Medical Sciences

Affiliated to Bharath Institute of Higher Education & Research

(Deemed to be University under section 3 of the UGC Act 1956)

CERTIFICATE OF MERIT

This is to certify that **RAMANAN** has actively participated in the Value Added Course on Fire safety measures in a hospital held during Sep 2019 – Oct 2019 Organized by Sri Lakshmi Narayana Institute of Medical Sciences, Pondicherry- 605 502, India.

Dr. Kajalakshmy
RESOURCE PERSON
DEPARTMENT OF BIOCHEMISTRY
Sri Lakshmi Narayana Institute Of Medical Sciences
PONDICHERRY - 605 502.

Dr. Jansirani
COORDINATOR
PROFESSOR & HOD
DEPARTMENT OF BIOCHEMISTRY
Sri Lakshmi Narayana Institute Of Medical Sciences
PONDICHERRY 605 502

Course feedback form

Course title: Date : 1·10·2019

Course code: BIO - 11

Department: Biochemistry

S.no	Design of the course	1	2	3	4	5
1	The objective of the course clear to you				✓	
2	The course contents met with your expectations				✓	
3	The lecture sequence were well planned				✓	
4	The lectures were clear and easy to understand					
5	The audiovisual teaching aids were effectively used			✓		
6	The instructor's encouraged interaction and was it helpful			✓		
7	The contents were illustrated with examples			✓		
8	Overall Rating of the course			✓		

*** Rating: 5 – Outstanding; 4 - Excellent; 3 – Good; 2– Satisfactory; 1 - Not-Satisfactory**

Suggestions if any:

Good

Radiya
Signature

Course feedback form

Course title: Date : 1.10.2019

Course code: BIO - 11

Department: Biochemistry

S.no	Design of the course	1	2	3	4	5
1	The objective of the course clear to you				✓	
2	The course contents met with your expectations			✓		
3	The lecture sequence were well planned					
4	The lectures were clear and easy to understand			✓		
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6	The instructor's encouraged interaction and was it helpful			✓		
7	The contents were illustrated with examples			✓		
8	Overall Rating of the course			✓		

*** Rating: 5 – Outstanding; 4 - Excellent; 3 – Good; 2– Satisfactory; 1 - Not-Satisfactory**

Suggestions if any:

Good

Priyadarshini. M
Signature

Date: 30.10.2019

From

Dr.Jansirani
Professor and Head,
Department of Biochemistry,
Sri Lakshmi Narayana Institute of Medical Sciences
Bharath Institute of Higher Education and Research,
Chennai.

Through Proper Channel

To

The Dean,
Sri Lakshmi Narayana Institute of Medical Sciences
Bharath Institute of Higher Education and Research,
Chennai.

Sub: Completion of value-added course: Fire safety measures in a hospital

Dear Sir,

With reference to the subject mentioned above, the department has conducted the value-added course titled: Fire safety measures in a hospital from Sep to Oct 2019 for 20 students. We solicit your kind action to send certificates for the participants that is attached with this letter. Also, I am attaching the photographs captured during the conduct of the course.

Kind Regards,

Dr.Jansirani

Encl: Certificates

Photographs