MODULE 12 | BUILDINGS, UTILITIES, WASTE AND WORKPLACE SAFETY

Safe Hospital Buildings and Reliable Utilities

49

LECTURE

Practical hospital governance in Punjab, Pakistan

Keep essential services working.
Find, control and close building risks.

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Edition 1.0 | 5 October 2026

SELF-STUDY PDF

What this lecture will help you do

The Medical Superintendent needs evidence that the building and its essential services are safe to use.

- Identify applicable rules, records and responsible people.
- Protect care during building work or a service failure.
- Check power, water, ventilation and medical gases.
- Use estimates and recognise their limits.

OFFICIAL SOURCE

A principle tied to a named law, standard or official guidance.

WORKING METHOD

A practical control or teaching format to adapt to the authorised system.

TEACHING CASE

An invented hospital example, used to practise applying the correct process.

Study output

A facilities risk list, an authority register and a plan for one essential service failure.

Module 12 | Presentation 1 of 3. Allow 45-60 minutes with exercises. All explanations are on the pages; check the cited sources before live use.

Three connected parts of hospital safety

Read this lecture with the waste and workplace safety lectures.

Lecture	Main question	Practical output
49 | Buildings and utilities	Can the building and essential services support safe care?	Risk list and service continuity plan.
50 | Healthcare waste	Can waste be traced safely from the ward to final disposal?	Waste plan and evidence of lawful handling.
51 | Workplace safety	Can staff prevent harm and respond safely to an emergency?	Safety controls, training and evacuation plan.

Engineering, infection prevention, clinical care and administration must work together.

WORKING METHOD | Illustrative material is identified in the text.

Treat a utility failure as a patient-care risk

A building can remain open while a vital clinical service has already become unsafe.

The operational question

- A power loss may also stop water pumps, ventilation, information systems or an oxygen plant. Review what depends on the failed service.
- Ask which patients and services are affected first, what safe alternative exists, and how long that alternative can support care.

The management response

- Name a clinical lead and a technical lead for each major failure. Keep current contact details for each shift and external support.
- Record the risk, temporary control, responsible officer and completion date. Close the issue only after someone verifies the result.

A repair report alone does not establish that patient care can safely resume.

WORKING METHOD | Illustrative material is identified in the text.

What PHC expects management to establish

The Punjab Healthcare Commission (PHC) Category I hospital manual links safe facilities to applicable laws and working evidence.

Indicator	Core requirement	Useful evidence
118	Know the requirements that apply to the facility.	Current applicability list and relevant staff awareness.
119	Assign an official to keep legal requirements updated.	Named officer, current source file and update record.
120	Implement the applicable requirements.	Inspection evidence and valid certificates where required.
121	Renew applicable registrations, licences and certifications.	Renewal register, maintenance records and service logs.

PHC examples do not create one universal certificate or one renewal period for every utility.

Sources: **U1**: Standard 21, indicators 118-121

WORKING METHOD

Build a register of applicable approvals

Identify the correct authority for this site, this building and this activity.

Field	What to record
Requirement and scope	Exact rule or order; the building, plant or activity covered.
Competent authority	The authority with jurisdiction; verify local, development or cantonment requirements as applicable.
Evidence and dates	Approval or certificate number, scope, conditions and actual expiry date.
Owner and action	Responsible officer, next action and escalation if a condition is unmet.

A hospital licence does not replace a separate building, fire, radiation or other approval that applies.

WORKING METHOD | Illustrative material is identified in the text.

WORKING METHOD

Keep one usable facilities evidence file

Store controlled copies where authorised staff can find them during and outside office hours.

01 Site plans

Approved plans, escape routes and drawings showing what was actually built.

02 Plant list

Location, service served, capacity, identification and responsible team.

03 Acceptance

Installation, testing, commissioning and handover records.

04 Maintenance

Schedules, completed tasks, defects and verification of repairs.

05 Approvals

Applicable inspections, certificates, conditions and renewal dates.

06 Continuity

Contacts, safe alternatives, failure procedures and exercise records.

A missing drawing or expired certificate needs an assigned action; a blank file is not a control.

WORKING METHOD | Illustrative material is identified in the text.

WORKING METHOD

Run a building risk round

Use a joint round with clinical staff, estates staff and infection prevention staff.

1	**Find the hazard**	Look for leaks, loose surfaces, unsafe access, blocked drains, exposed services and signs of damage.
2	**Assess the consequence**	Identify who could be harmed and which care services could stop. Urgency follows risk, not appearance.
3	**Control and assign**	Protect the affected area, arrange a safe alternative and assign a competent person to resolve the defect.
4	**Verify closure**	Inspect the result, record evidence and confirm that the temporary restriction can safely end.

Choose a review frequency based on local risk and condition; this is not a statutory inspection schedule.

WORKING METHOD | Illustrative material is identified in the text.

WORKING METHOD

Escalate possible structural danger

A Medical Superintendent should recognise warning signs and obtain a competent assessment.

Act on a credible concern

- New or worsening cracks, falling material, marked settlement or damage after a major event require prompt technical assessment.
- Where danger is suspected, restrict the affected area and protect patients and staff. Arrange relocation according to the clinical risk and site plan.

Require a written decision

- Ask a qualified structural professional to state the findings, restrictions, required work and conditions for safe use.
- Escalate any necessary closure, repair or capital work through the authorised institutional route. Retain the assessment and completion evidence.

A cosmetic repair, a contractor assurance or the absence of a complaint is not structural clearance.

WORKING METHOD | Illustrative material is identified in the text.

WORKING METHOD

Plan construction around continued care

Before alteration or expansion, check both the approval route and the effect on hospital operations.

1	**Define the work**	State the clinical purpose, scope, location, budget authority and relevant building or service approvals.
2	**Map the disruption**	Identify effects on patients, access, fire exits, water, power, medical gases and infection prevention.
3	**Agree safe controls**	Set routes, barriers, work hours, isolation arrangements and response to an unexpected service interruption.
4	**Authorise the start**	Keep the approved plan, named supervisors, contractor controls and clinical contingency arrangements.

Approval of expenditure is separate from approval of a building design or a safe method of work.

WORKING METHOD | Illustrative material is identified in the text.

Control infection risks during building work

Dust, disturbed water systems and changes to airflow can expose patients to avoidable risks.

Before work starts

- Use an infection-control risk assessment with clinical, engineering and infection prevention staff. Consider nearby patients and the work route.
- Select barriers, dust controls, separate movement routes and suitable protection for air and water systems. Match controls to the assessed risk.

During work and handover

- Check that barriers and agreed controls remain effective. Give staff a clear route to stop and escalate unsafe work.
- Before occupancy, complete cleaning and relevant service testing. Confirm that ventilation and other altered systems operate as intended.

CDC recommendations support technical decisions; their US regulatory categories are not Punjab legal provisions.

Sources: **U6**: construction and renovation recommendations

WORKING METHOD

Reopen an altered area only after checks

Use a written handover matched to the work undertaken.

01 Safe structure

Required professional checks and approval conditions completed.

02 Safe access

Patient movement and emergency exits checked on the actual route.

03 Clean area

Dust and debris removed; infection prevention checks completed.

04 Working services

Affected power, water, air and gas systems tested by competent staff.

05 Ready people

Staff know changes, contacts and failure arrangements.

06 Recorded decision

Remaining defects assessed; named officers approve safe use.

The opening ceremony or contractor bill does not replace safe handover.

WORKING METHOD | Illustrative material is identified in the text.

WORKING METHOD

Map what each critical service depends on

A backup system may share the same weakness as the main system.

Service	Dependencies to check	Common hidden weakness
Critical care	Power, oxygen, suction, ventilation and trained staff.	A backup outlet is not actually on a supported circuit.
Water supply	Source, storage, pumps and distribution.	Stored water cannot reach users without a powered pump.
Oxygen plant	Power, maintenance, monitoring and reserve supply.	The reserve cannot meet the required demand.
Digital systems	Power, network, servers and downtime procedures.	Staff cannot access a paper workflow during failure.

Verify dependencies with technical staff and clinical users. Do not rely only on a drawing.

WORKING METHOD | Illustrative material is identified in the text.

Different power systems do different jobs

The chosen solution must match the critical load and the interruption it can tolerate.

System	Purpose	Question for management
Normal supply	Supports routine electrical demand.	Which failures or supply limits are known?
Generator or other backup	Supplies agreed loads during an outage.	Can it start, transfer and carry the intended demand?
UPS	Provides stored power for a limited period; often bridges an interruption.	Which equipment is supported, and for how long at the tested load?
Distribution and protection	Delivers power safely to the intended users.	Are circuits, protection and changeover arrangements verified?

UPS means uninterruptible power supply. No backup arrangement can be judged by its nameplate alone.

Sources: **U3**: energy needs and reliable supply planning

WORKING METHOD

Test the backup service, not just the engine

Technical testing must protect patients and follow the approved test plan.

1	**Agree the test**	Clinical and technical leads define timing, affected services, safety controls and the response to test failure.
2	**Check readiness**	Competent staff check fuel, batteries, servicing, transfer arrangements and the intended supported load.
3	**Observe performance**	Record whether the system starts and supports the intended services under the approved test conditions.
4	**Close defects**	Record failures, assign repairs and verify results. Keep arrangements for a real outage while defects remain.

Do not disconnect a live hospital supply to demonstrate readiness without a safe, authorised technical plan.

WORKING METHOD | Illustrative material is identified in the text.

TEACHING CASE

Estimate fuel endurance carefully

Example only: all quantities below are invented.

Given	Usable fuel for the supported service is 1,000 litres. Measured consumption at the assumed load is 50 litres per hour.
Calculation	Estimated endurance = usable litres / litres used per hour = 1,000 / 50 = 20 hours.
What it means	The arithmetic estimate applies only while that consumption rate and usable volume remain valid.
What can change	Higher load, leakage, inaccessible fuel, mechanical failure or delayed delivery can reduce actual support.
Management action	Check the real load, usable stock, replenishment lead time and a safe contingency before the reserve becomes inadequate.

Twenty hours is a teaching result, not a prescribed hospital reserve or a guarantee.

TEACHING CASE | Illustrative material is identified in the text.

Match water quality to its intended use

Safe drinking water and water suitable for a specialised clinical process are different requirements.

Use	Main management question
Drinking and food preparation	Does the water meet applicable drinking-water requirements at the relevant point of use?
Hand hygiene and cleaning	Is suitable water available, accessible and managed with infection prevention advice?
Dialysis or other special process	Does the service meet its specific validated quality and monitoring requirements?
Sterile clinical use	Does the procedure require a specified sterile product? Ordinary drinking water is not a substitute.

Use the notified Punjab drinking-water standards; obtain separate clinical and technical advice for specialised services.

Sources: **U5**: notified drinking-water PEQS | **U6**: water-related infection prevention

Follow water from its source to the user

A satisfactory source sample alone cannot prove that every outlet is safe.

1	**Map the route**	Identify sources, treatment, tanks, pumps, pipes and outlets. Include separate buildings and low-use areas.
2	**Find weak points**	Assess contamination, leakage, stagnant sections, poor tank condition and loss of pressure or supply.
3	**Control and monitor**	Use an approved risk-based plan for maintenance, sampling and response with suitable laboratory support.
4	**Review findings**	Trend results, act on failures and verify that corrective work has controlled the identified risk.

Set sampling points and frequency from applicable requirements and the assessed system risk, not an invented universal interval.

Sources: **U2**: water and facility improvement method | **U5**: drinking-water requirements

WORKING METHOD

Respond to suspected unsafe water

Protect affected users while clinical and technical staff investigate the source and extent of the problem.

1	**Restrict affected use**	Identify which outlets and activities may be unsafe. Issue clear instructions and provide an approved alternative.
2	**Protect critical care**	Review dialysis, food services, cleaning and other affected processes with their responsible clinical teams.
3	**Investigate and correct**	Engage engineering, infection prevention and laboratory support. Preserve relevant samples and records.
4	**Verify restoration**	Resume the affected uses only after the required corrective work and verification support safe operation.

Do not assume that boiling resolves every type of chemical or microbiological water problem.

WORKING METHOD | Illustrative material is identified in the text.

TEACHING CASE

Estimate usable water endurance

Example only: storage volume and demand are invented.

Given	The usable reserve for the defined services is 12,000 litres. Their estimated combined demand is 600 litres per hour.
Calculation	Estimated endurance = 12,000 / 600 = 20 hours, if there is no incoming supply and demand remains constant.
Check the volume	Exclude inaccessible water and any reserve allocated to a different protected purpose. Confirm pumps can deliver it.
Check the demand	Use real measurements where possible. Include staff, patients, cleaning and the selected clinical processes.
Make a decision	Set replenishment and escalation triggers from lead time, patient risk and uncertainty, before supply becomes unsafe.

Tank capacity is not the same as usable water. This example is not a required reserve standard.

Keep drainage and sanitation safe

Water availability is not enough if toilets, drains or wastewater arrangements fail.

Routine management

- Check accessible toilets, handwashing points, leaks, drainage and cleaning arrangements. Protect privacy and safe access for patients and staff.
- Assign maintenance and escalation responsibilities. Investigate repeated blockage, flooding, pests or sewage odour instead of repeatedly treating symptoms.

During a failure

- Restrict contaminated areas, protect people and arrange safe alternatives. Use trained staff and appropriate protection for response work.
- Prevent cross-contamination of water and care areas. Do not assume that chemical or hazardous liquid waste can be discharged into a sewer.

Use the authorised wastewater route and applicable environmental requirements; Lecture 50 covers hazardous waste.

Sources: **U2**: sanitation and facility risk assessment

Cooling is not proof of safe ventilation

Airflow and temperature must suit the purpose of the room and the patients using it.

Define the clinical need

- Identify areas with special requirements, such as operating theatres, isolation areas and laboratories. Use the approved design and relevant technical standards.
- An air conditioner may cool a room without providing the required fresh air, filtration or pressure relationship.

Require technical evidence

- Have competent staff test and maintain the relevant system. Record defects, filter work and any restrictions needed for patient protection.
- After alterations, verify the required performance before the area returns to use. Do not apply one airflow figure to every type of room.

Clinical staff define the care risk; qualified technical staff establish and verify the engineering solution.

Sources: **U6**: air and ventilation recommendations

Prepare for heat, heavy rain and flooding

Use local hazard history and service dependencies to choose practical protection.

01 Patient areas

Identify patients most affected by heat and loss of safe room conditions.

02 Drainage

Check vulnerable drains, roofs and entry points before the risk period.

03 Power systems

Assess exposure of generators, panels and fuel access to water or heat.

04 Water supply

Plan for contamination, pump failure and disrupted delivery.

05 Staff access

Identify safe routes and staffing arrangements during disruption.

06 Recovery

Assign inspection, cleaning, testing and reopening responsibilities.

Resilience means maintaining safe care during a credible disruption and restoring services in a controlled way.

Sources: **U7**: safe and climate-resilient facilities

Manage oxygen as a complete supply system

A reliable oxygen source is only one part of safe delivery to the patient.

1	**Plan the demand**	Clinical and technical teams assess normal and surge demand, supply routes and reserve arrangements.
2	**Verify the installation**	Qualified staff check the source, storage, pipelines, alarms, outlets and commissioning evidence.
3	**Maintain readiness**	Keep the approved maintenance and monitoring arrangements, trained operators and emergency contacts.
4	**Plan interruption**	Define safe alternatives for affected patients and a controlled response to an alarm or supply failure.

Use the final WHO 2024 specifications with applicable local requirements and competent technical advice.

Sources: **U4**: medical oxygen system specifications

Control oxygen hazards without interrupting care

Oxygen supports combustion. A leak can make a fire start more easily and burn more intensely.

Prevent unsafe handling

- Keep ignition sources and incompatible oils or grease away from oxygen equipment. Use the specified compatible equipment and approved procedures.
- Secure cylinders, use suitable movement equipment and trained handlers, and follow the approved storage and ventilation arrangements.

Control a suspected failure

- Raise the alarm and involve the responsible clinical and technical teams. Protect patients who depend on the affected supply.
- Only trained, authorised staff should isolate a gas system under the emergency plan. They must understand which patients and areas the valve serves.

Do not issue a blanket instruction to shut all gas valves; interruption can itself endanger patients.

Sources: **U4**: oxygen safety and system controls

Include lifts, boilers and other fixed plant

Each system needs the competent inspection and maintenance arrangements that apply to it.

System	Questions for the MS
Lifts and access systems	Are faults controlled, required checks current and rescue arrangements understood by trained staff?
Boilers and pressure plant	Are competent operators, safeguards, maintenance and applicable inspections in place?
Sterilisation and steam services	Have engineering checks and the separate clinical process checks both been completed?
Other fixed services	Are pumps, suction, cooling and related plant included in the service register and failure plans?

Check the actual legal and technical requirements. Do not invent a common annual certificate for all plant.

Sources: **U1**: Standard 21; applicable systems and records

WORKING METHOD

Control a planned shutdown

A shutdown request must explain how care will remain safe during the work.

1	**State the scope**	Identify the service, affected areas, time window, expected duration and technical work required.
2	**Confirm alternatives**	Clinical leads confirm patient arrangements. Technical leads confirm safe isolation and restoration methods.
3	**Communicate and approve**	Inform each affected area and shift, agree escalation contacts, and obtain the required authorisation.
4	**Restore and verify**	Test the service and confirm safe clinical use. Record the actual interruption, defects and handover.

A planned shutdown may need to be deferred if the patient-care alternative is not ready.

WORKING METHOD | Illustrative material is identified in the text.

WORKING METHOD

Respond to an unplanned utility failure

Use the site emergency procedure and the service-specific clinical contingency.

1	**Protect patients**	Activate safe alternatives and prioritise patients whose treatment depends on the failed service.
2	**Control the hazard**	Call authorised technical staff. Restrict unsafe areas or equipment and establish the extent of the failure.
3	**Coordinate action**	Name the incident lead, record decisions and communicate with affected teams and external support.
4	**Verify and learn**	Confirm safe restoration, record patient and service effects, and assign actions to prevent recurrence.

Reporting that a pump or generator is running is not enough; confirm that the intended users receive the service.

WORKING METHOD | Illustrative material is identified in the text.

WORKING METHOD

Review reliability and fund the risks

Use a small monthly review to connect defects, patient impact and required expenditure.

Measure or decision	What it should reveal
Service interruption	Which services stopped, for how long, and with what effect on care?
Critical open defects	Which hazards remain, who owns them and what temporary protection exists?
Maintenance and tests	Which due tasks were completed, and what did the results show?
Approvals and funding	Which renewals, repairs, spares or replacements need a decision and by when?

Define measures consistently. A high task-completion percentage can hide one unresolved critical fault.

WORKING METHOD | Illustrative material is identified in the text.

WORKING METHOD

Make support available outside office hours

The service plan must work when the usual senior staff and vendors are absent.

People and contracts

- Keep a tested call-out list, named deputies and clear limits on who may operate or isolate systems. Include critical supplier support and response arrangements.
- Specify maintenance scope, required records, service response and verification in the authorised contract. Review actual performance before accepting completion.

Budget and evidence

- Plan recurring costs for maintenance, testing, fuel, consumables and essential spares. Escalate known gaps with the expected effect on care.
- Use the proper spending and procurement route. An urgent repair does not remove the need for an accurate record of authority, work and payment.

The management file should show the risk, available choices, decision, responsible officer and verified result.

WORKING METHOD | Illustrative material is identified in the text.

TEACHING CASE

A water pump fails during renovation

All events and hospital details in this case are invented.

Situation	A contractor interrupts power to a pump. An upper ward loses water, although the main storage tank remains partly full.
Immediate action	Protect affected clinical activities and activate the approved alternative. Call the clinical and technical leads; stop unsafe work.
Investigation	Confirm the affected circuit and service route. Check whether the work permit and dependency assessment identified the pump.
Restoration	Competent staff restore and test the supply. Clinical and infection prevention staff confirm safe use for the affected activities.
Follow-up	Record the event and service impact. Correct drawings, contractor controls and shutdown approval checks before similar work resumes.

The lesson is to verify dependencies and patient protection before work, not only after a service fails.

TEACHING CASE | Illustrative material is identified in the text.

Apply the process to three decisions

Write your answer and the reason before turning to the next page.

1 | Fuel reserve

Usable fuel is 900 litres. Consumption at the assumed load is 60 litres per hour.

What is the estimate, and why is it not a guarantee?

2 | Unverified reopening

A renovated ward looks clean. Testing of the altered ventilation is incomplete.

What evidence is still needed before safe reopening?

3 | Certificate file

A manager says the hospital licence covers every approval. A plant inspection is overdue.

What should you verify and record?

Use the facts stated. All three situations are invented.

TEACHING CASE | Illustrative material is identified in the text.

Answers and reasons

Use the evidence, the calculation and the cited source.

1 | Fifteen hours at the assumed load

900 / 60 = 15 hours. Confirm the usable stock and actual consumption. Mechanical failure, changed demand or delayed replenishment can invalidate the estimate.

2 | A verified handover

Do not use appearance as proof of safe ventilation. Obtain the relevant competent testing, clinical and infection prevention checks, and a recorded decision on safe occupancy.

3 | The specific applicable requirement

Check the plant, rule, authority, due date and risk. Obtain the required inspection or action and record temporary controls. A hospital licence does not replace other applicable approvals.

A sound decision links the patient risk, the applicable requirement and evidence of safe operation.

Prepare a one-page facilities action brief

Use a non-confidential real case or the invented examples in this lecture.

Risk list

Record five important defects, their patient effects, temporary controls, owners and due dates.

Authority register

List three applicable approvals with source, scope, current evidence and renewal action.

Failure plan

Choose one utility. State affected services, safe alternatives, contacts and restoration checks.

Review the brief with engineering, clinical and infection prevention staff. Resolve gaps through the authorised route.

Keep patient information and sensitive building-security details out of public teaching examples.

WORKING METHOD | Illustrative material is identified in the text.

Sources and continued use | 1

Select a source title or its official-source link to open the document.

U1

PHC: MSDS for Category I Hospitals

Reference Manual, 2024. Standard 21: Facility Management and Safety; indicators 118-121. Use the current manual for the hospital category.

Punjab Healthcare Commission | **Official source**

U2

WASH FIT: a practical guide, second edition

WHO and UNICEF, 2022. A risk-based improvement method for water, sanitation, hygiene, cleaning and selected facility services. Technical guidance.

WHO / UNICEF | **Official source**

U3

Energizing health: electricity access in health-care facilities

2023. Planning reliable electricity, assessing energy needs and financing suitable systems. International technical guidance, not a Punjab legal rule.

WHO / World Bank / IRENA / SEforALL | **Official source**

Educational material by Dr Qurban Hussain Khan. Source editions are stated; verify later amendments and applicable institutional orders before live use.

Sources and continued use | 2

Select a source title or its official-source link to open the document.

U4

Technical specifications: health facility medical oxygen systems

Final WHO publication, 31 December 2024. Safety and performance requirements for oxygen sources, storage and distribution. Use qualified technical staff.

World Health Organization | **Official source**

U5

Punjab Environmental Quality Standards for Drinking Water

Official 2016 notification and PEQS catalogue. Use the notified values, applicable requirements and competent laboratory advice for a live water-quality decision.

Punjab Environment Protection Department | **Official source** | **PEQS catalogue**

U6

Environmental Infection Control: recommendations

CDC guideline recommendations; construction, renovation, water and air sections. Clinical and technical guidance. US legal references are not Punjab law.

US Centers for Disease Control and Prevention | **Official source**

Educational material by Dr Qurban Hussain Khan. Source editions are stated; verify later amendments and applicable institutional orders before live use.

Sources and continued use | 3

Select a source title or its official-source link to open the document.

U7

Safe, climate-resilient and sustainable health care facilities

WHO overview, 2024. Connects safe buildings, essential services and climate resilience. Use alongside local site risks and applicable requirements.

World Health Organization | **Official source**

Educational material by Dr Qurban Hussain Khan. Source editions are stated; verify later amendments and applicable institutional orders before live use.