REPUBLIC OF KENYA
MINISTRY OF HEALTH

KENYA MEDICAL LABORATORY TECHNICIANS & TECHNOLOGIST BOARD
Make Testing a Safe Reality

KENYA MEDICAL LABORATORY TECHNICIANS AND TECHNOLOGISTS BOARD

THE DESIGN AND OPERATION OF A MODERN DEMONSTRATION /TEACHING MEDICAL LABORATORY IN KENYA.

Pursuant to the Medical Laboratory Technicians and Technologists Act CAP 253 A Laws of Kenya.

KMLTTBQUALITY ASSURANCE SERVICES.

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	OWNERSHIP	REGISTRAR	

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COMPREHENSIVE DEMONSTRATION LABORATORY DESIGN FOR DIPLOMA IN MLS

Space: 8m W x 15m L = 120 sqm

Purpose: Teaching, demonstration, and practical training for Diploma in Medical Laboratory Sciences per KMLTTB/TVETA standards

1. ROOM ALLOCATION & LAYOUT

I. Main Demonstration Lab 8m x 10m = 80 sqmStudent benches,
- tutor demo bench, instruments

II. Preparation Room 8m x 2.5m = 20 sqm
-Media prep, reagent prep, sterilization

III. Store 8m x 1.5m = 12 sqm
-Consumables, chemicals, glassware storage

IV. Technologist Office* 8m x 1m = 8 sqm
-Records, microscopy QA, admin

V. Circulation - 1.2m corridor along 15m wall

- Recommended flow: Entry → Store → Prep Room → Main Lab → Office.
  This gives one-way movement to reduce contamination.

2. MAIN DEMONSTRATION LABORATORY: 8m x 10m

A. Bench Design

(a) Student Benches: 6 double-sided island benches, each 3.6m L x 0.75m W x 0.9m
(b) Seats 4 students per bench = 30 students per session.
-KMLTTB recommends 1:5 microscope ratio.
(c) Material: 25mm Trespa/Compact laminate top.
-Chemical, acid, heat resistant. White colour to see specimens/ spillage.
(d) Under-bench: Lockable cupboards + open shelves for kits
(e) Services: Each bench with 4 power sockets, 2 gas taps, 2 water taps, and sink every 2 benches
(f) Tutor Demonstration Bench: 4m L x 0.75m W x 0.9m H against front wall
(g) Raised 150mm platform behind it for visibility
(h) Built-in demonstration microscope with camera + wall-mounted 55" TV for projection.

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- Epoxy resin top for extra durability

B. Functions and Space Allocations for Specialized Demonstration/ Teaching Laboratory Benches

1) **Medical Entomology bench**: Used for examining and identifying arthropod vectors (mosquitoes, ticks, fleas) responsible for transmitting infectious diseases. Requires 1.5 to 2.0 square meters per student station, equipped with stereomicroscopes and light-reflecting bases.
2) **Histopathology bench**: Dedicated to processing, embedding, and sectioning tissue biopsies for disease and cancer analysis. Requires large flat anti-corrosive work surfaces with integrated grossing sinks and formalin exhaust, averaging 2.5 square meters per student.
3) **Cytopathology bench**: Utilized for staining and screening cellular smears (such as Pap smears) to detect abnormal cells. Requires 1.5 square meters per workstation with dual-head training microscopes and slide storage access.
4) **Clinical chemistry bench**: Focuses on quantitative and qualitative analysis of body fluids (blood, urine, serum) for metabolites, enzymes, and electrolytes. Requires 2.0 square meters per workstation to house spectrophotometers, centrifuges, and chemical-resistant epoxy sinks.
5) **Virology bench**: Applied for growing, isolating, and identifying viral agents or running serological assays (ELISA). Requires a dedicated biosafety cabinet area, allocating roughly 2.5 square meters per user with strict contamination control zones.
6) **Bacteriology bench**: Used for culture inoculation, incubation, Gram staining, and antibiotic susceptibility testing of bacteria. Requires 2.0 square meters per student, fitted with Bunsen burner gas lines, electrical outlets, and proximity to an autoclave.
7) **Mycology Bench**: Dedicated to the isolation and microscopic identification of pathogenic yeasts and molds. Requires 1.5 to 2.0 square meters of workspace with fungal culture hoods and lactophenol cotton blue staining kits.
8) **Molecular diagnostics bench**: Utilized for nucleic acid extraction, amplification (PCR), and genetic assays. Requires specialized PCR clean-room zoning (reagent preparation, amplification, and product detection areas), allocating at least 3.0 square meters per station to prevent template cross-contamination.
9) **Parasitology bench**: Used for macro and microscopic detection of protozoa and helminthes in stool, blood, and urine samples. Requires 1.5 square meters per student with integrated plumbing for direct wet mounts and concentration techniques.
10) **Haematology bench**: Dedicated to complete blood counts, coagulation profiles, and bone marrow slide evaluations. Requires 2.0 square meters per student space for automated analyzers, pipettes, and roller mixers.

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11) **Microscopy bench**: Designed specifically for low-light or bright-field optical analysis across pathology, microbiology, and parasitology. Requires vibration-free, height-adjustable optical benches providing 1.2 meters of linear width per student.
12) **Staining bench**: Used for applying differential dyes (Gram, Ziehl-Neelsen, and Giemsa) to slide specimens. Requires specialized acid-resistant sinks, running water, and slide drying racks, allocating roughly 1.5 square meters per use

C. Materials & Finishes

(a) Floor: Non-slip, chemical resistant vinyl or epoxy. Cove capping up wall 100mm. Color: light grey
(b) Walls: Washable gloss paint to 1.5m, then normal paint. White for brightness
(c) Ceiling: 2.7m high, washable ceiling tiles with LED panel lights 500 lux minimum
(d) Services:
(e) Water: Hot + cold to all sinks. Distilled water point in prep room piped to laboratory.
(f) Gas: LPG manifold outside, piped in. Or electric burners if gas not allowed
(g) Electricity: 3-phase for equipment. Emergency lighting + **UPS** for fridges
(h) Ventilation: 6 air changes/hr. Fume hood in prep room. Windows with fly mesh

3. PREPARATION ROOM: 8m x 2.5m

This is the "clean" support room.

(a) Benches: 8m continuous L-bench, 0.6m deep. Trespa top
(b) Equipment:
(c) Autoclave 50L, Hot air oven, Distilled water plant 10L/hr.
(d) Analytical balance, pH meter, magnetic stirrer
(e) Fridge 300L for reagents
(f) Sink: 2-compartment stainless steel sink
(g) Storage: Overhead cupboards for reagents. Chemical cabinet with venting
(h) Floor: Same epoxy as laboratory but with floor drain
(i) Biosafety: Hands-free taps, eye wash station

4. STORE: 8m x 1.5m

(a) Shelving: 4 tiers of chemical-resistant steel shelving on both 8m walls
(b) Cabinets: Lockable flammables cabinet, acids cabinet with tray
(c) Inventory: FIFO system. Separate area for glassware in boxes
(d) Environment: Cool, dry. Dehumidifier. No windows. Pest proof

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5. TECHNOLOGIST OFFICE: 8m x 1m

Small but functional along the entrance wall.

(a) Desk: 1.8m L-shaped desk + chair
(b) Storage: 2x 4-drawer filing cabinet for student records, QC logs
(c) Equipment: Computer, printer, small fridge for control sera
(d) Window: 1m viewing window into laboratory for supervision
(e) Board: Whiteboard + KMLTTB notices

6. KEY MATERIALS SPECIFICATION

Benchtop: 25mm Trespa Top Laboratory or Phenolic resin Acid/alkali/solvent resistant, no seams

(a) **Cabinet Carcass**: 18mm MR MDF with HPL ,Moisture resistant, easy to clean
(b) **Sink:**304 Stainless steel, 400x400x250mm, Corrosion resistant
(c) **Faucets** :Goose-neck, elbow operated, Reduce contamination
(d) **Flooring**: 2mm Homogeneous vinyl with welded seams, Non-porous, easy decontamination
(e) **Fume Cupboard:** 1.2m benchtop type in prep room for media preparation, stains

7. COMPLIANCE NOTES FOR KMLTTB.

1. Space per student: Aim for 3 sqm per student. 30 students fits.

2. Safety: Fire extinguisher CO2 + Dry powder, First aid kit, Biosafety manual displayed

3. Waste: Foot-operated bins for general, sharps, and biohazard. Contract with NEMA-licensed waste handler

4. Water: Must have reliable clean water.

KEY

MR MDF stands for **Moisture-Resistant Medium Density Fibreboard**.

HPL stands for **High-Pressure Laminate.**

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Part 1: Total Square Footage & Space Calculation (30-Student Cohort)

Regulatory bodies mandate a minimum architectural calculation formula for training laboratories: **Net Workstation Area + Circulation/Safety Factor (typically 40%) + Fixed Equipment Core Zones.**

Laboratory Zone / Bench Type	Net Space per Student	Total Net Space (30 Students)	Required Fixed Equipment Core Zones (Equipment, Sinks, Fume Hoods)	Total Allocated Space (Sq. Meters)	Total Allocated Space (Sq. Feet)
Microbiology Suite *(Bacteriology, Mycology, Virology)*	2.0 sq.m	60 sq.m	Autoclaves, Incubators, Biosafety Cabinets, 4 Sinks	85 sq.m	915 sq.ft
Pathology Suite *(Histopathology, Cytopathology, Staining)*	2.5 sq.m	75 sq.m	Grossing Station, Microtomes, Paraffin Dispensers, Fume Hoods	105 sq.m	1,130 sq.ft
Diagnostic Suite *(Haematology, Clinical Chemistry)*	2.0 sq.m	60 sq.m	Automated Analyzers, Centrifuges, Refrigerators	80 sq.m	860 sq.ft
Public Health Suite *(Parasitology, Entomology, Microscopy)*	1.5 sq.m	45 sq.m	Stereomicroscopes, Specimen Cabinets, 2 Sinks	60 sq.m	645 sq.ft
Molecular Diagnostics Suite *(Clean Room Layout)*	3.0 sq.m	90 sq.m	3 Segregated Zones (Prep, Amp, Detection), PCR Hoods	110 sq.m	1,185 sq.ft
Common Support Areas *(Chemical Store, Prep Room, Washroom)*	N/A	N/A	Eyewash/Showers, Reagent Prep, Decontamination Units	50 sq.m	540 sq.ft
SUBTOTAL (Net Programmatic Space)				**490 sq.m**	**5,275 sq.ft**

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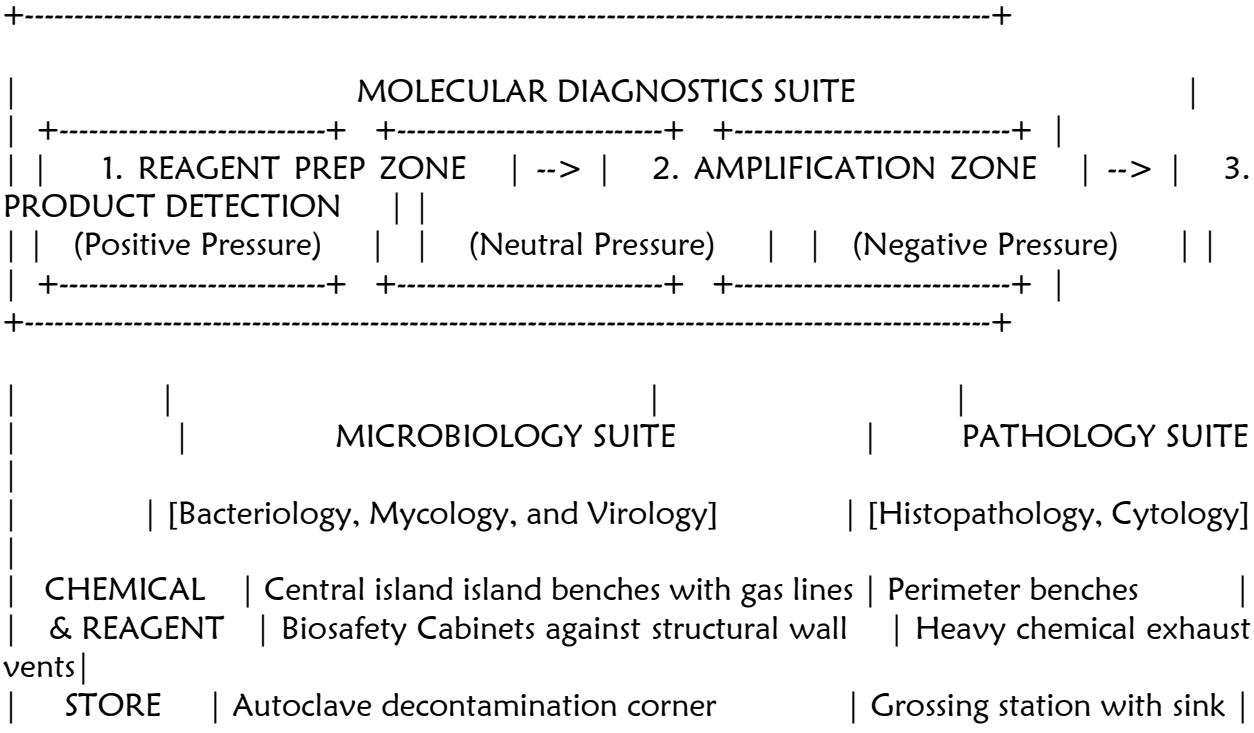
Circulation & Structural Factor (+40%)	*For emergency egress corridors, safe clearance behind student chairs, and fire pathways.*	**196 sq.m**	**2,110 sq.ft**	
GRAND TOTAL REQUIRED FACILITY FOOTPRINT			**686 sq.m**	**7,385 sq.ft**

Part 2: Structural Floor Plan Layout Blueprint

To satisfy biosafety standards and regulatory inspections, the facility must be divided into a **Five-Room Modular Layout** to prevent cross-contamination.



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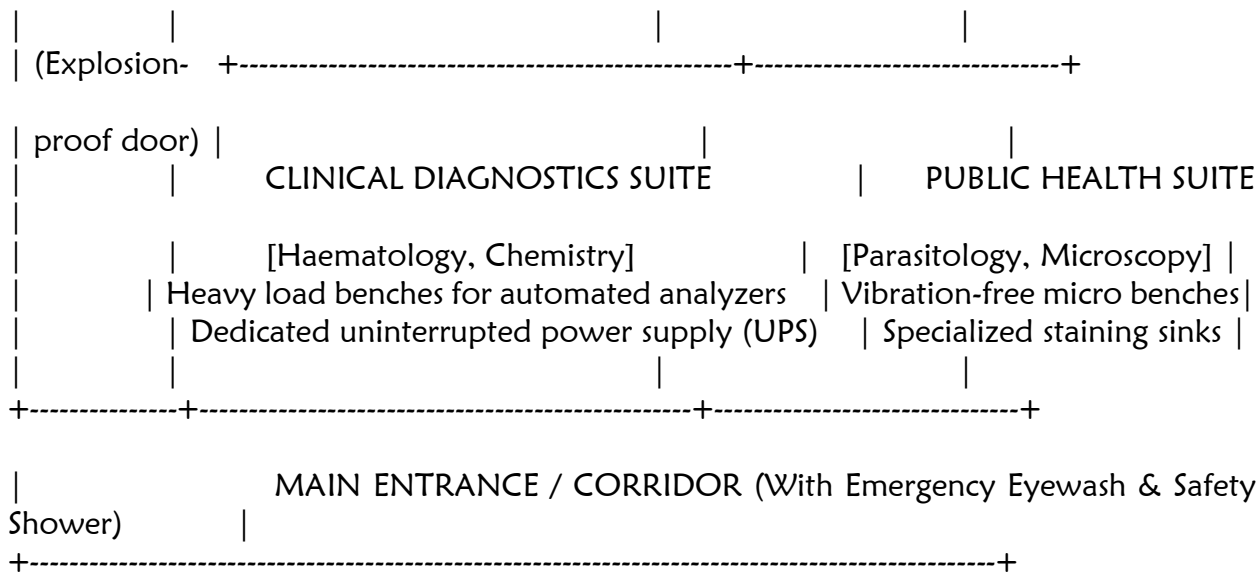

Prt 3: Technical Utility Placements (Gas, Water, Power)

Each bench category has highly specific engineering requirements to ensure safety and equipment compatibility:

1. Medical Entomology & Microscopy Benches

(a) ⚡ **Power**: 2 dedicated 240V/13A sockets per student station for built-in LED microscope illumination.
(b) 💧 **Water**: None required at the immediate workstation to protect optical equipment.
(c) 🔥 **Gas**: None.

2. Histopathology, Cytopathology & Staining Benches

(a) ⚡ **Power**: 240V/15A clean power circuits for automated tissue processors and embedding centers.
(b) 💧 **Water**: High-volume, chemical-resistant epoxy or stainless steel sinks with foot-pedal operated taps. Must route to an acid-neutralization tank before entering the main drainage.
(c) 🔥 **Gas/Ventilation**: No gas lines (flames are a hazard around volatile processing solvents). Requires dedicated slot-blot mechanical exhaust ventilation and local chemical fume hoods to pull formalin and xylene vapors away from the breathing zone.

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3. Bacteriology & Mycology Benches

(a) ⚡ **Power**: Power strips mounted on raised central raceways (away from spills) for micro-incubators and vortex mixers.
(b) 💧 **Water**: Double-bowl central sinks with integrated emergency eyewash attachments.
(c) 🔥 **Gas**: Centralized LPG pipeline with individual needle-valve gas taps at every student station for Bunsen burners (essential for maintaining sterile fields).

4. Clinical Chemistry & Haematology Benches

(a) ⚡ **Power**: Heavy-duty dedicated circuits backed by a centralized online Uninterrupted Power Supply (UPS) and automated backup generator system. Automated chemistry and hematology analyzers are highly sensitive to power fluctuations.
(b) 💧 **Water**: Deionized/distilled water delivery lines dedicated to analyzer wash cycles.
(c) 🔥 **Gas**: None.

5. Molecular Diagnostics Bench (PCR Clean Room)

(a) ⚡ **Power**: Separate electrical distribution boards for each room segment to prevent electromagnetic interference across amplification equipment.
(b) 💧 **Water**: Sinks are strictly confined *only* to the Product Detection area to eliminate the risk of introducing aerosols/contaminants into the Reagent Prep zone.
(c) 🔥 **Gas**: Prohibited.

Part 4: General Regulatory & Safety Compliance Enforcements

(a) **Flooring**: Must be seamless, non-porous vinyl, continuous and coved up the walls by 100mm to prevent fluid pooling and allow total chemical disinfection.
(b) **Egress**: Every suite must have two distinct emergency exit doors pushing outward in the direction of escape.
(c) **Air Handling**: The Microbiology and Pathology suites require a minimum of 10 to 12 air changes per hour (ACH) with dedicated single-pass HVAC systems (no air recirculation

.....THE END.....

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