

Research Notes for Modular Temporary Dome Project

1. Requirements for Portable Research Laboratories

To design a functional portable research lab, it's essential to accommodate various scientific instruments and ensure the environment supports their optimal operation.

Essential Equipment:

- Analytical Balance: For precise measurement of small mass samples.
- Autoclave: Used for sterilizing equipment and media.
- Bunsen Burner: Provides a heat source for sterilization and combustion.
- Centrifuge: Separates substances of different densities.
- Colony Counter: Assists in counting microbial colonies.
- Deep Freezer: Stores samples at ultra-low temperatures.
- Homogenizer: Blends and homogenizes samples.
- Hot Plate: Heats samples uniformly.
- Hot Air Oven: Sterilizes equipment using dry heat.
- Incubator: Maintains optimal conditions for microbial growth.
- Laminar Air Flow Hood: Provides a sterile environment for sensitive work.
- Magnetic Stirrer: Mixes solutions using a magnetic field.
- Microscope: Magnifies small specimens for observation.
- pH Meter: Measures acidity or alkalinity of solutions.
- Spectrophotometer: Measures the intensity of light in a spectrum.
- Vortex Mixer: Mixes small vials of liquid rapidly.
- Water Bath: Maintains samples at a constant temperature.
- Water Distiller: Produces purified water for experiments.

Reference: Microbe Notes - Instruments Used in Microbiology Lab

Environmental Considerations:

- Temperature and Humidity Control: Maintain indoor temperatures between 18–26°C and humidity levels of 30–70% to ensure equipment functionality and sample integrity.
- Uninterruptible Power Supply (UPS): Essential for continuous operation of sensitive instruments during power fluctuations.

Reference: Guidelines for Mobile Laboratories for Molecular Diagnostic Testing

Space and Design:

- Adequate space to house equipment and allow safe movement.
- Controlled access to prevent unauthorized entry.
- Cleanable surfaces to maintain sterility.

Reference: Criteria for Research Lab Planning and Design

2. Requirements for Medical Shelters

Medical shelters must provide a safe and sterile environment for patient care.

Essential Features:

- Patient Care Areas: Beds and spaces for medical examinations and treatments.
- Medical Equipment: Basic diagnostic tools and emergency response equipment.
- Sanitation Facilities: Accessible restrooms and handwashing stations.
- Accessibility: Facilities must be accessible to individuals with disabilities.

Reference: ADA and Emergency Shelters

Special Considerations:

- Accommodations for individuals with minor medical conditions requiring daily assistance.

Reference: Medical Needs Shelters

3. Requirements for Emergency Shelters

Emergency shelters provide immediate relief and must cater to basic human needs.

Space Requirements:

- Minimum of 3.5 square meters of covered living space per person in warm climates.
- Minimum ceiling height of 2 meters to aid ventilation.

Reference: UNHCR Emergency Shelter Standards

Basic Amenities:

- Sleeping Arrangements: Beds or mats for rest.
- Food and Water Supplies: Adequate provisions for occupants.
- Sanitation: Toilets and washing facilities.

Accessibility:

- At least one accessible entrance on an accessible route.
- Facilities must accommodate individuals with disabilities.

Reference: ADA Checklist for Emergency Shelters

4. Site Considerations for Shelters

Given the prevalence of conflicts and natural disasters, shelters are often required in urban areas where infrastructure may be compromised.

Key Factors:

- Rapid Deployment: Structures must be quick to assemble.
- Scalability: Ability to expand capacity as needed.
- Adaptability: Suitable for various terrains and environments.

Reference: Emergency Shelter Solutions and Standards | UNHCR

5. Design Inspiration

Inspired by the efficiency of honeycomb structures in beehives, the hexagonal design offers:

- Modularity: Easy connection of multiple units.
- Structural Integrity: Even distribution of stress across walls.
- Space Efficiency: Maximizes usable area with minimal materials.

This biomimicry approach ensures the dome is both functional and resource-efficient.

1. Instruments Used in Microbiology Lab

<https://microbenotes.com/instruments-used-in-microbiology-lab/>

2. Guidelines for Mobile Laboratories for Molecular Diagnostic Testing

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC9057824/>

3. Criteria for Research Lab Planning and Design
https://fama.uark.edu/_resources/documents/ae-guide/part2_planning/criteria_for_Research_Labs.pdf
4. ADA and Emergency Shelters
<https://archive.ada.gov/pcatoolkit/chap7shelterprog.htm>
5. Medical Needs Shelters
https://www.ndhealth.gov/EPR/HP/hppconference/oref/Medical_Shelters-Sherry_Adams.pdf
6. UNHCR Emergency Shelter Standards
<https://emergency.unhcr.org/emergency-assistance/shelter-camp-and-settlement/shelter-and-housing/emergency-shelter-solutions-and-standards>
7. ADA Checklist for Emergency Shelters
<https://archive.ada.gov/pcatoolkit/chap7shelterchk.htm>