SAND2016-9675C

IBCTR

INTERNATIONAL BIOLOGICAL and CHEMICAL THREAT REDUCTION

Prototype Laboratory Design Concept

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Sandia National Laboratories

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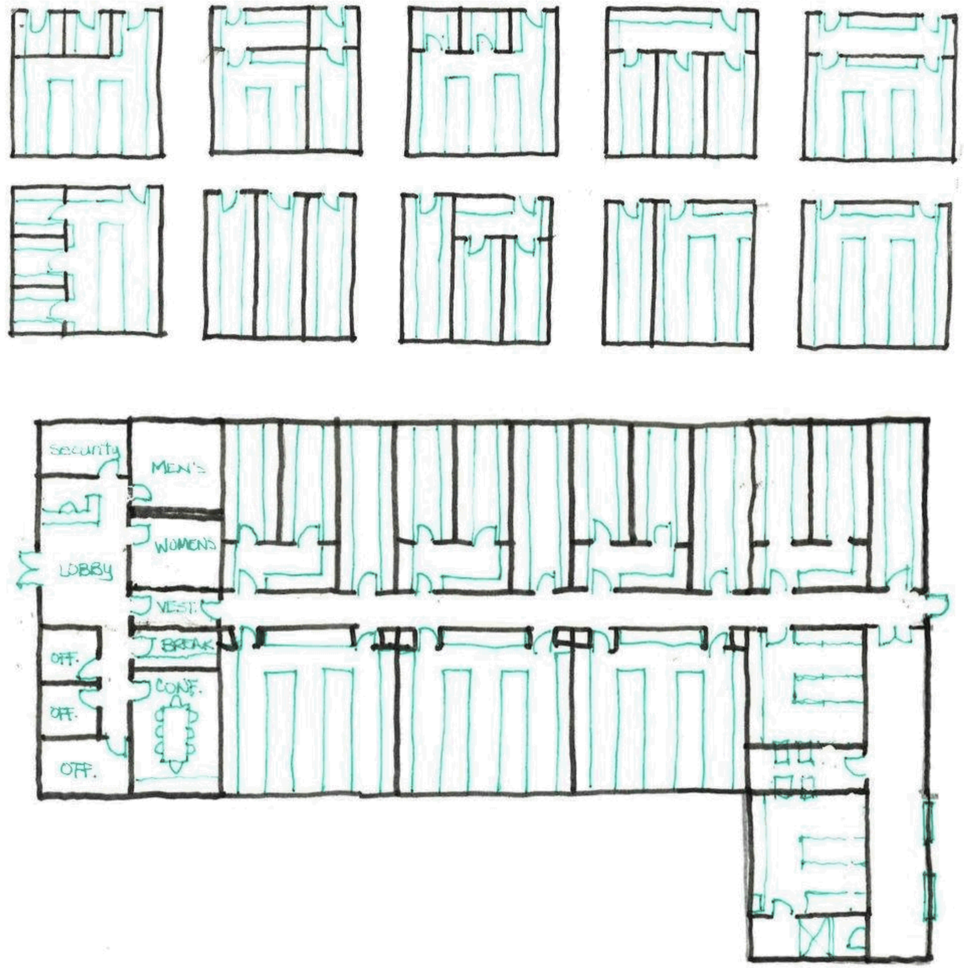

INTRODUCTION

Innovative Design

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INTRODUCTION

Reduce Time

INTRODUCTION

Reduce Travel

INTRODUCTION

Reduce Cost

- Training
- SOP Development
- Operation & Maintenance Plans
- Flow Analysis
- Adjacencies
- Biosafety & Biosecurity
- Site Integration

INTRODUCTION

Focus Efforts on Needs

- Uninformed Design
- Design at a Distance
- Cultural Differences
- Language Barriers

CURRENT DESIGN STRATEGIES

Traditional Design Process Challenges

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- Sustainability
- Climate
- Maintenance
- Dimensional Constraints
- Delivery/Transport

CURRENT DESIGN STRATEGIES

Prefabricated Design

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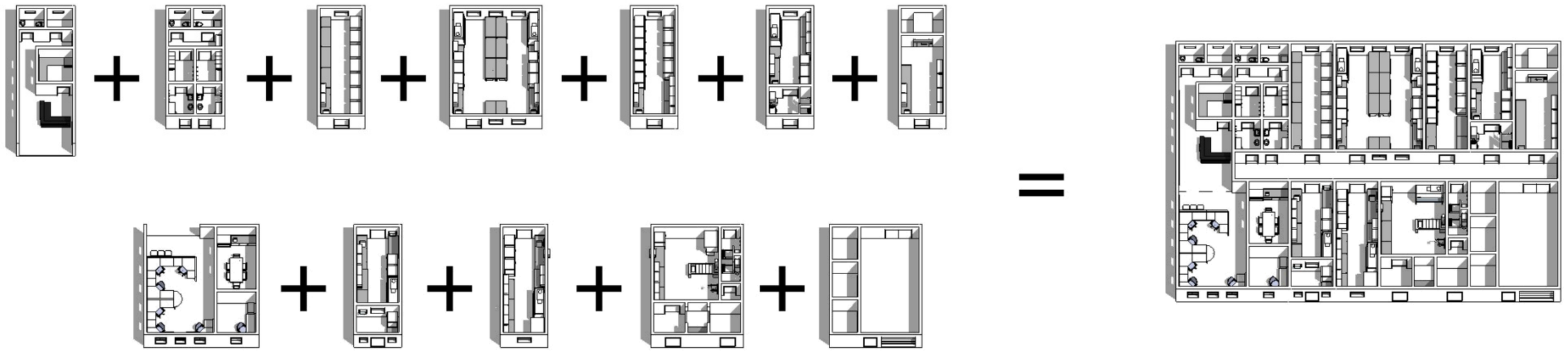

PROTOTYPE LABORATORY DESIGN CONCEPT

Overview & Description

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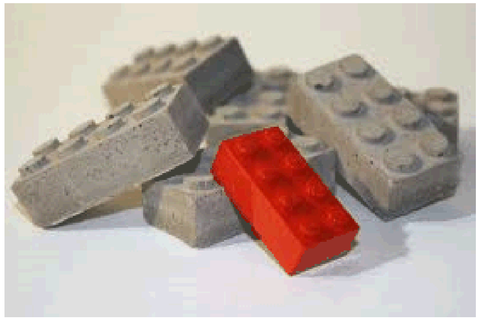

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- Design
- Scalable
- Repeatable
- Predictable Costs
- Peer Review
- Maintainable
- Ease of Manufacture
- Sustainable

PROTOTYPE DESIGN

Key Concepts

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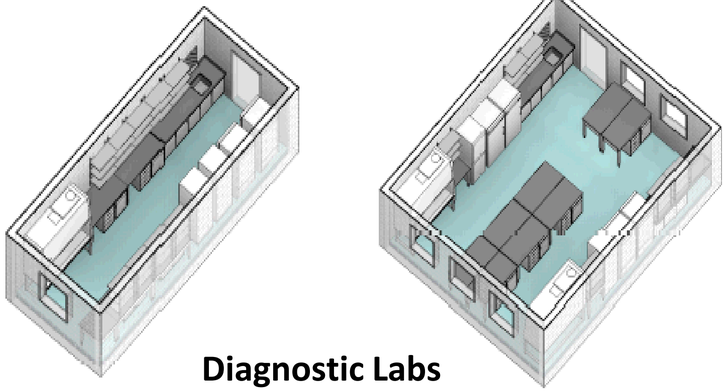
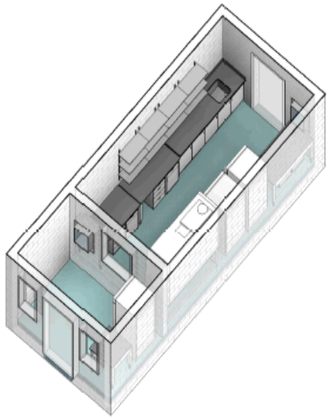
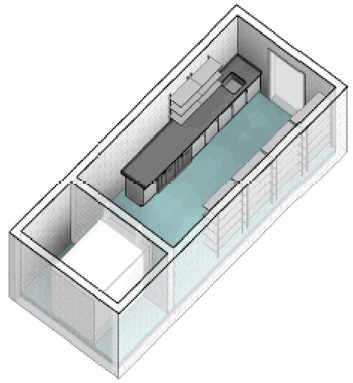


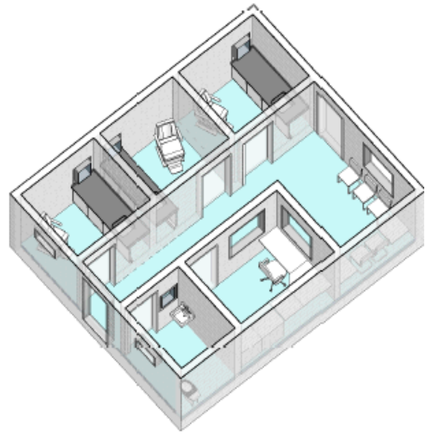
Diagnostic Labs



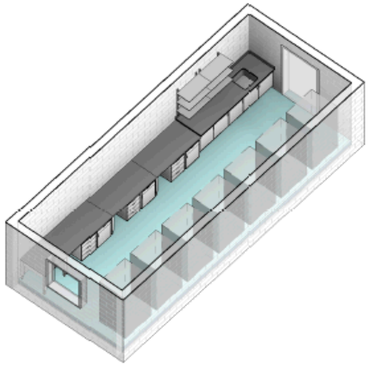
Sample Receipt



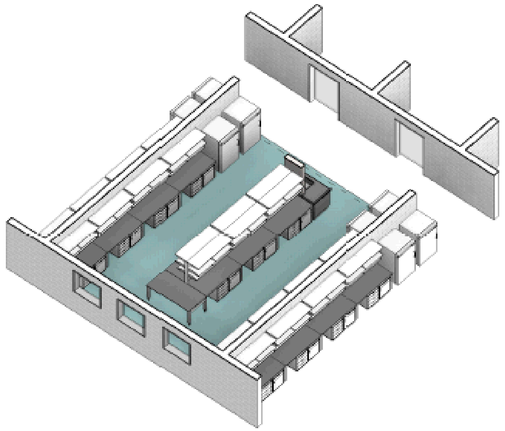
Cleaning & Sterilization



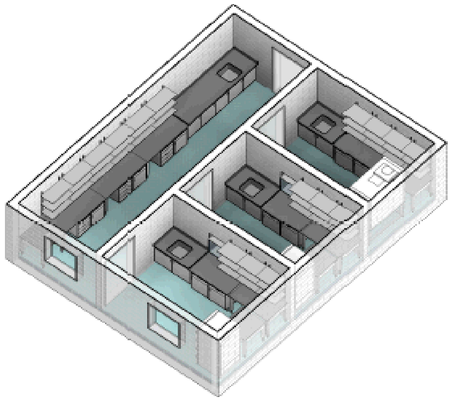
Clinical Collection



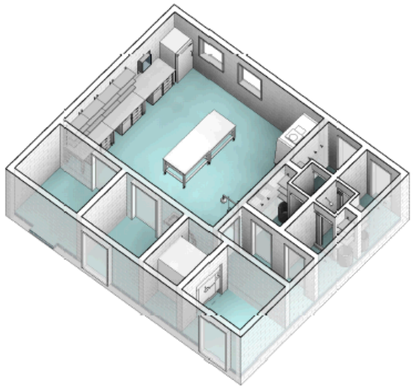
Equipment Lab



Open Lab



Molecular Suite



Post Mortem

PROTOTYPE DESIGN

Key Components – Laboratory Spaces

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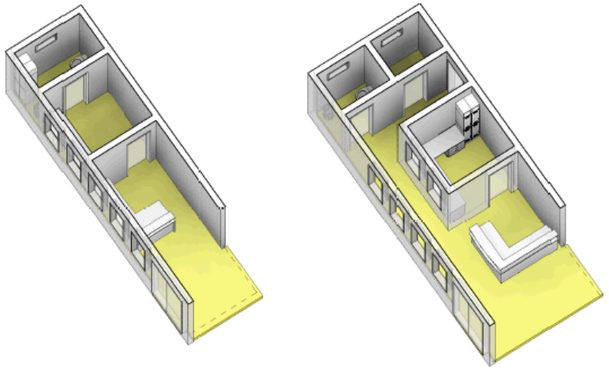
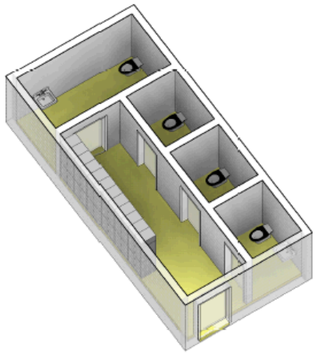
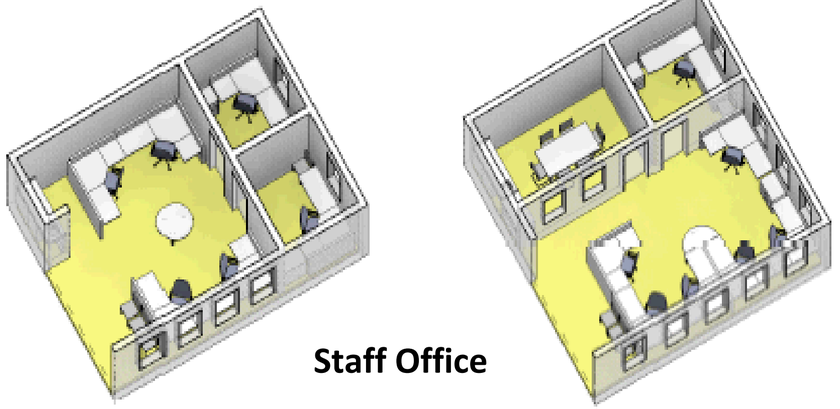


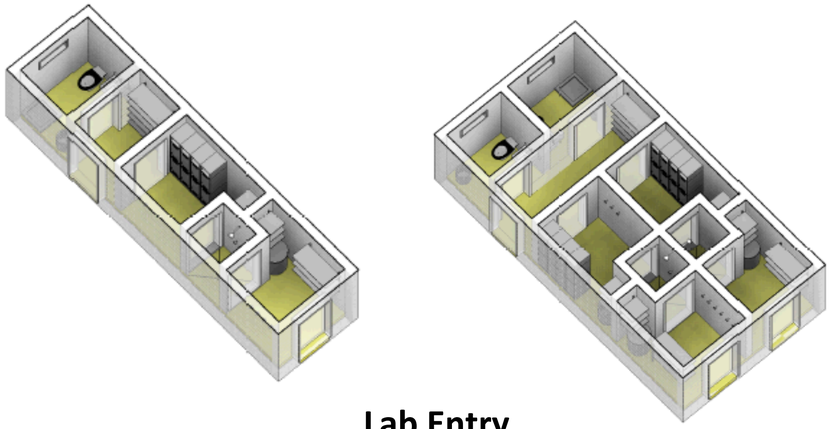
Secure Entry



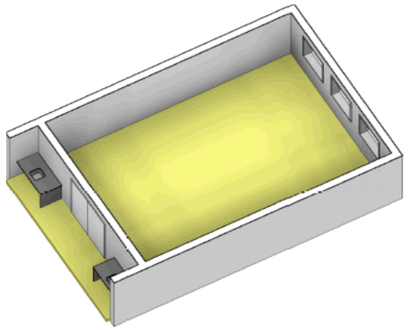
Wash Room



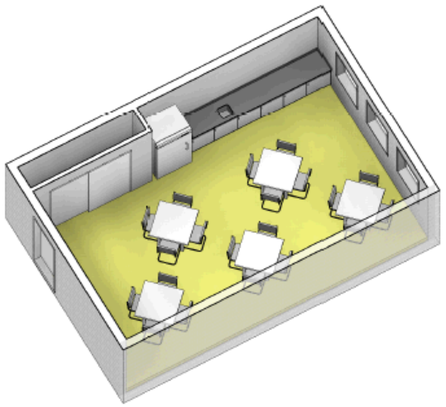
Staff Office



Lab Entry



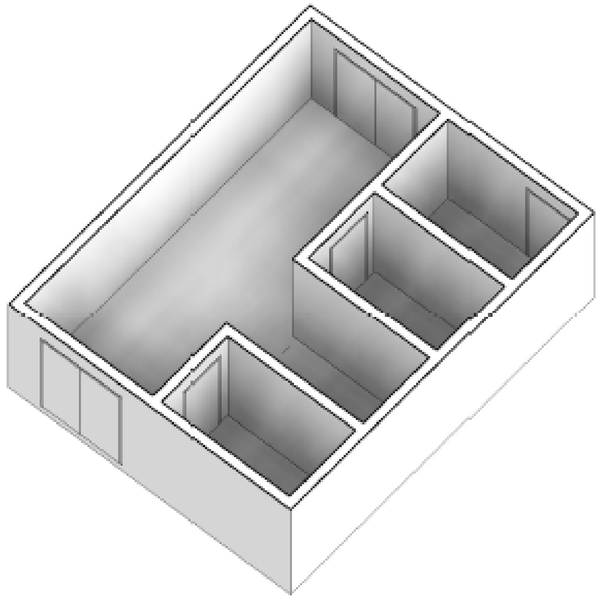
Multifunctional Room



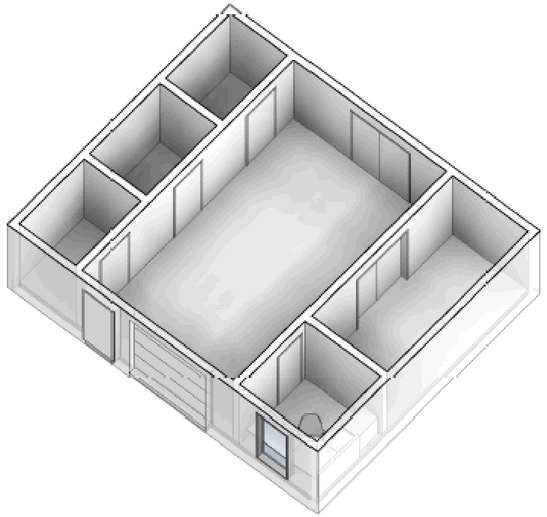
Break room

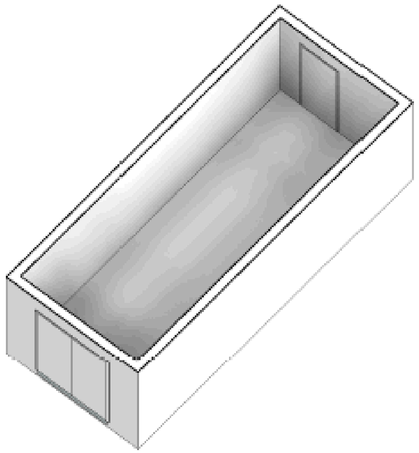
PROTOTYPE DESIGN

Key Components – Amenity Spaces

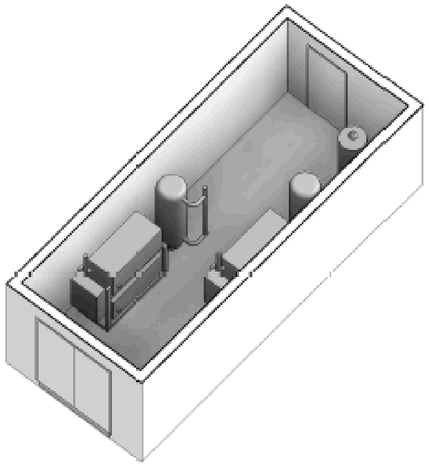


Loading & Storage



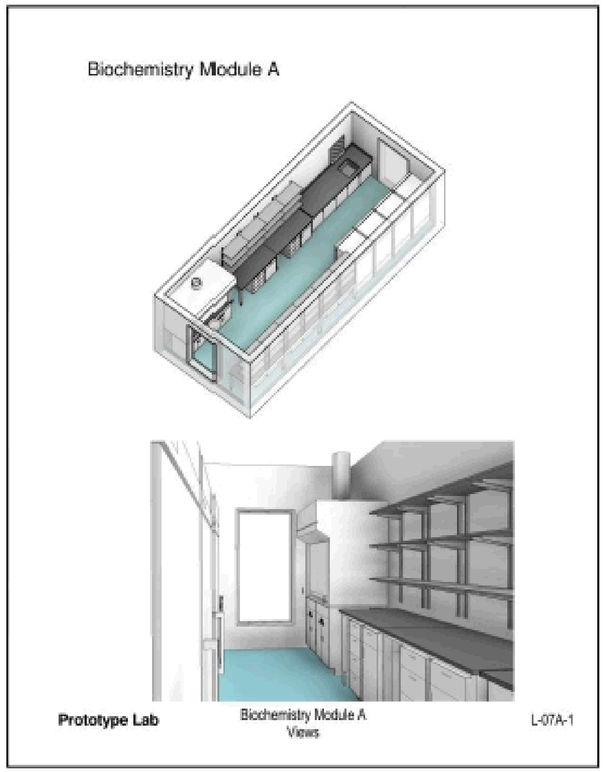


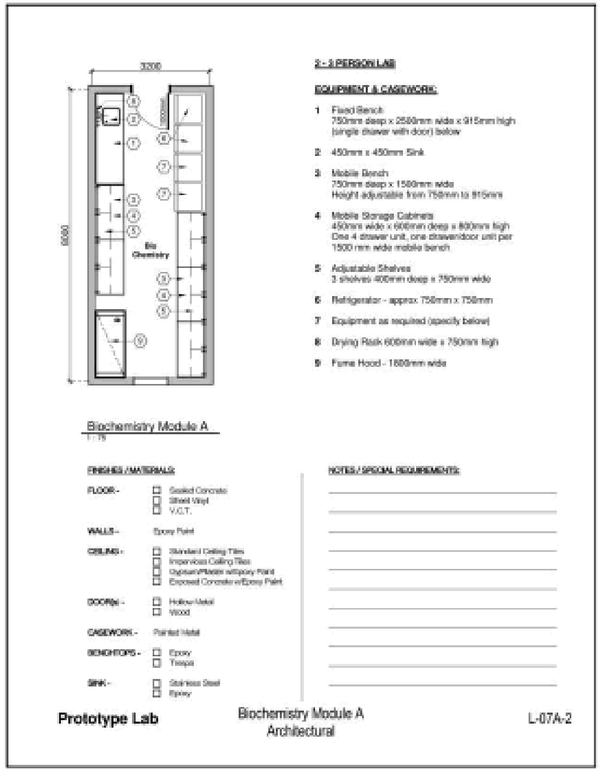
Electrical & Plumbing

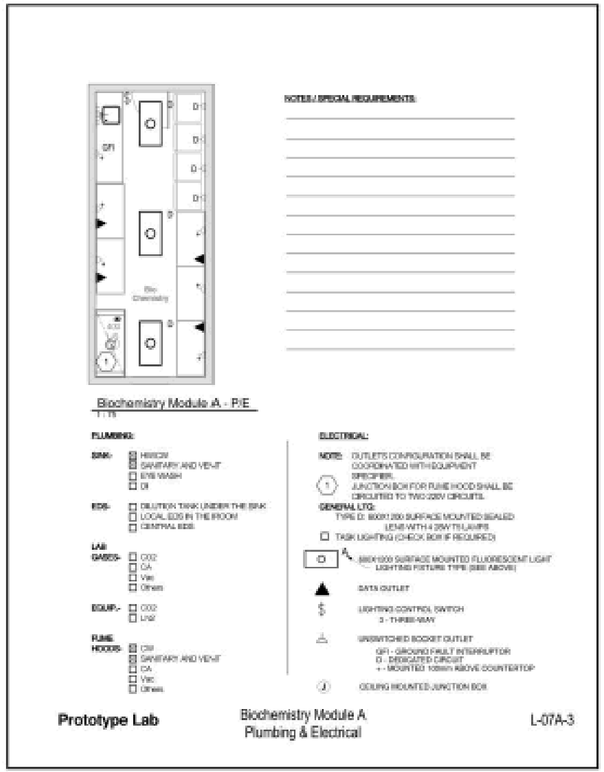


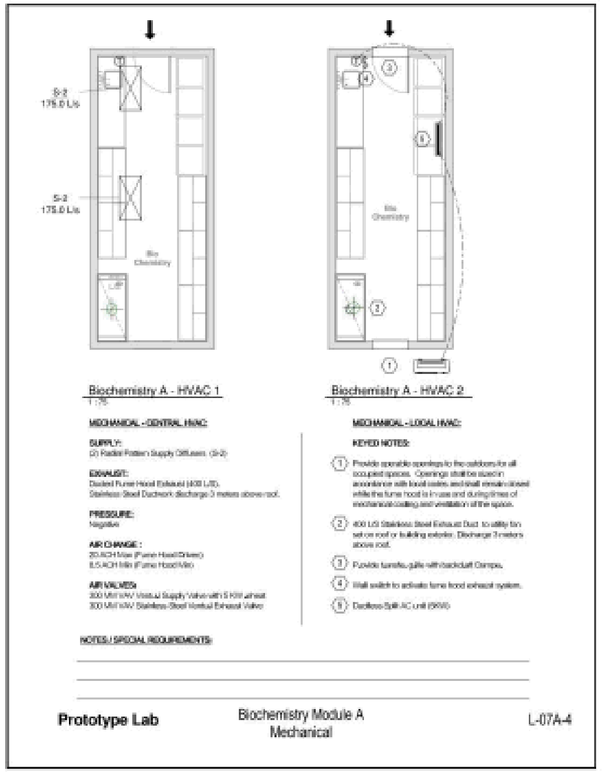
PROTOTYPE DESIGN

Key Components – Support Spaces









PROTOTYPE DESIGN

Module Drawing Sets

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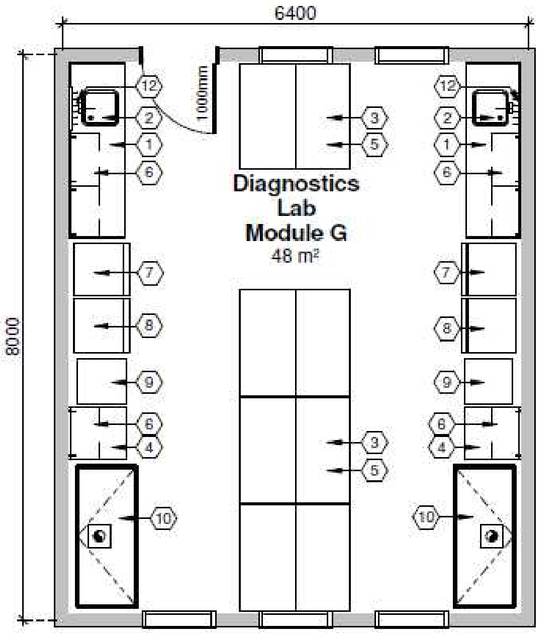


Diagnostics Module G

1 : 75

EQUIPMENT & CASEWORK:

1 Fixed Bench
750mm deep x 2500mm wide x 915mm high
(single drawer with door) below

2 450mm x 450mm Sink

3 Mobile Bench
750mm deep x 1500mm wide
Height adjustable from 750mm to 915mm

4 Mobile Bench
750mm deep x 750mm wide
Height adjustable from 750mm to 915mm

5 Mobile Storage Cabinets
450mm wide x 600mm deep x 800mm high
One 4 drawer unit, one drawer/door unit per
1500 mm wide mobile bench
One drawer/door unit per 750 wide mobile bench

6 Adjustable Shelves
3 shelves 400mm deep x 750mm wide

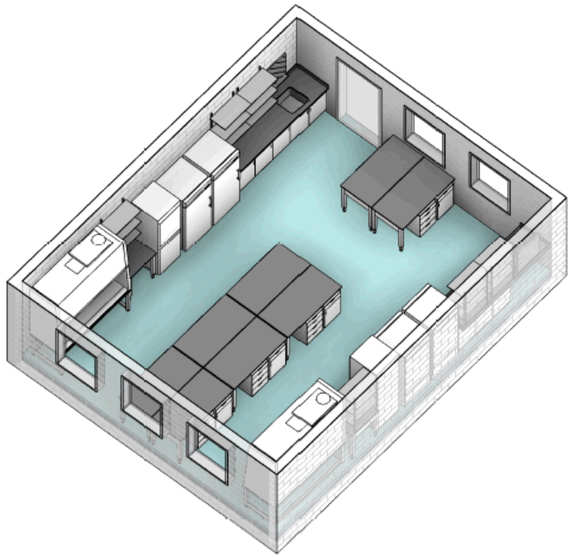
7 Refrigerator - approx 750mm x 750mm

8 Freezer - approx 750mm x 750mm

9 Equipment as required

10 Biosafety Cabinet 1800mm
Ducted / Thimble Connected / Recirculating

12 Drying Rack 600mm wide x 750mm high



PROTOTYPE DESIGN

Module Drawing Sets

FINISHES / MATERIALS:

FLOOR -	Sealed Concrete / VCT / Sheet Vinyl / Epoxy
WALLS -	Paint / Epoxy Paint / High Build Epoxy
CEILING -	Exposed / Lay in Tile (Impervious) / Gypsum / Plaster (Paint in same manner as walls except tile)
DOOR(s) -	Wood / Hollow Metal / Stainless Steel / FRP (Paint wood or hollow metal in same manner as walls)
CASEWORK -	Wood / Painted Metal / Stainless Steel
BENCHTOPS -	Epoxy / Stainless Steel
SINK(s) -	Epoxy / Stainless Steel

SERVICES:

SINK(s) -	CW / HW / DI Water / Eyewash
EQUIPMENT -	CO2 / LN2
FUME HOODS -	CW / CA / Vac / Other _____.
AT BENCH -	CA / Vac / CO2 / Other _____.
EXHAUST AIR -	HEPA Filtered / 100% Exhaust / Recirculated
SUPPLY AIR -	Natural Ventilation / Mechanical Ventilation / HEPA Filtered
EFFLUENT -	Direct discharge / Neutralization / Effluent Decontamination System (Batch / Flow Through)

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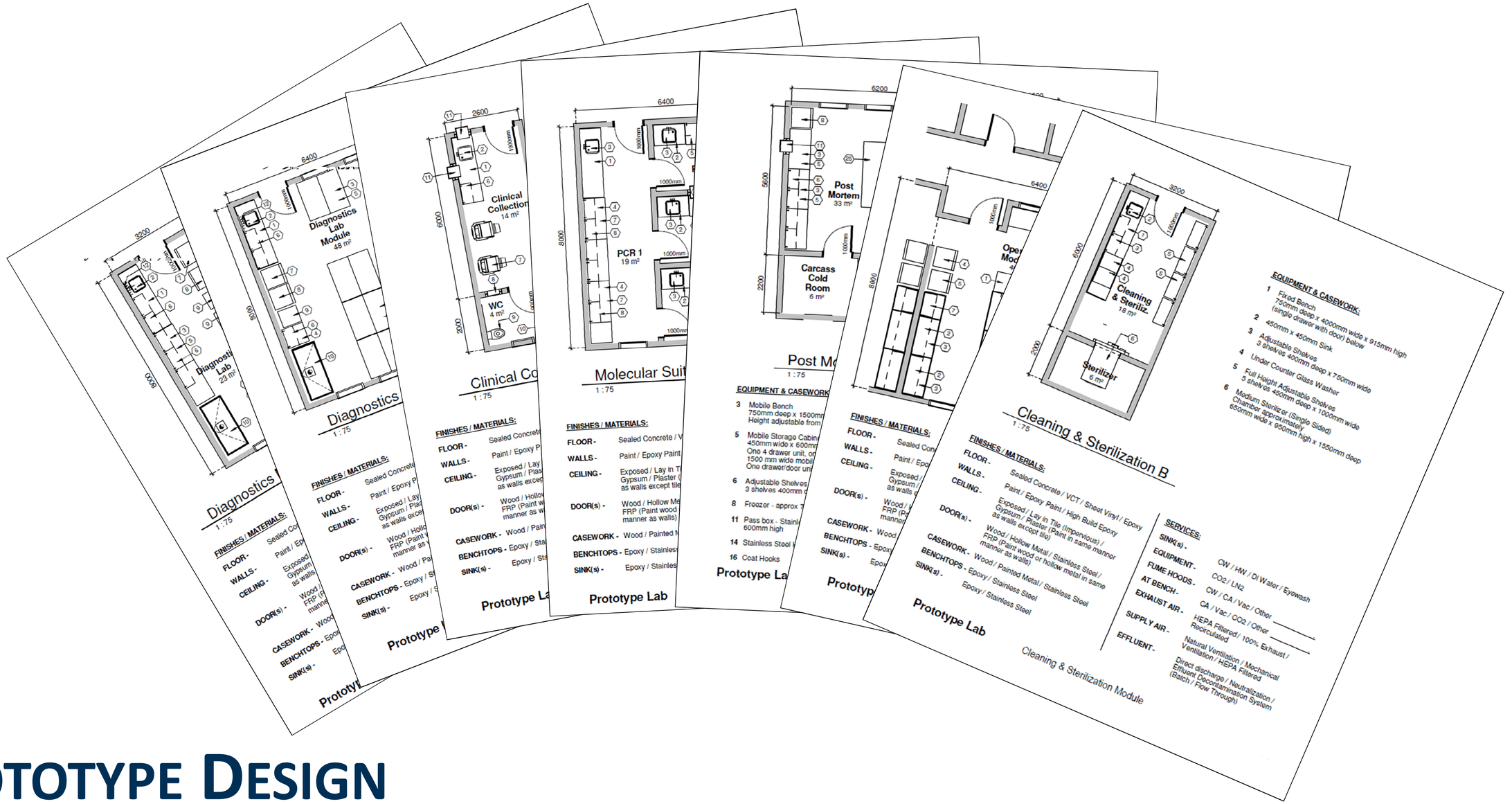
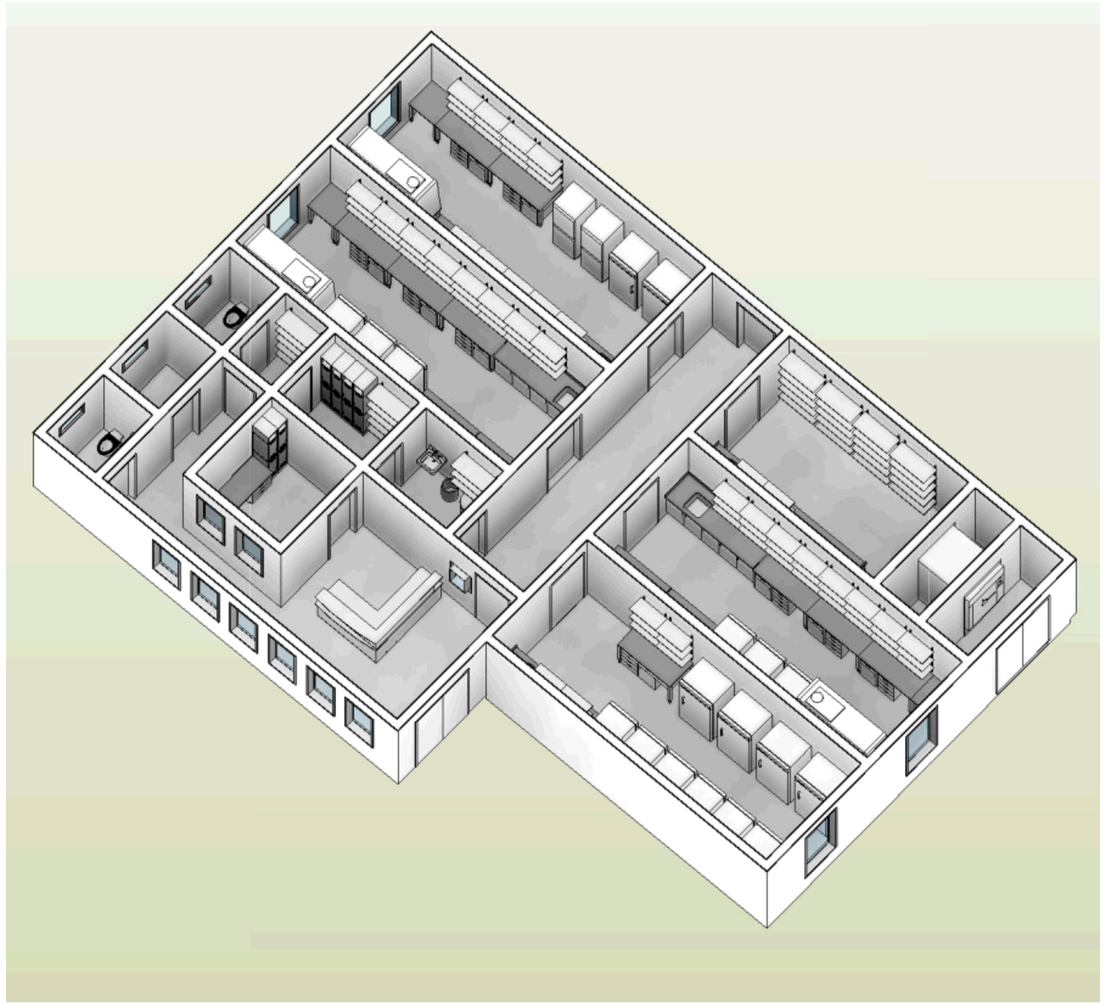
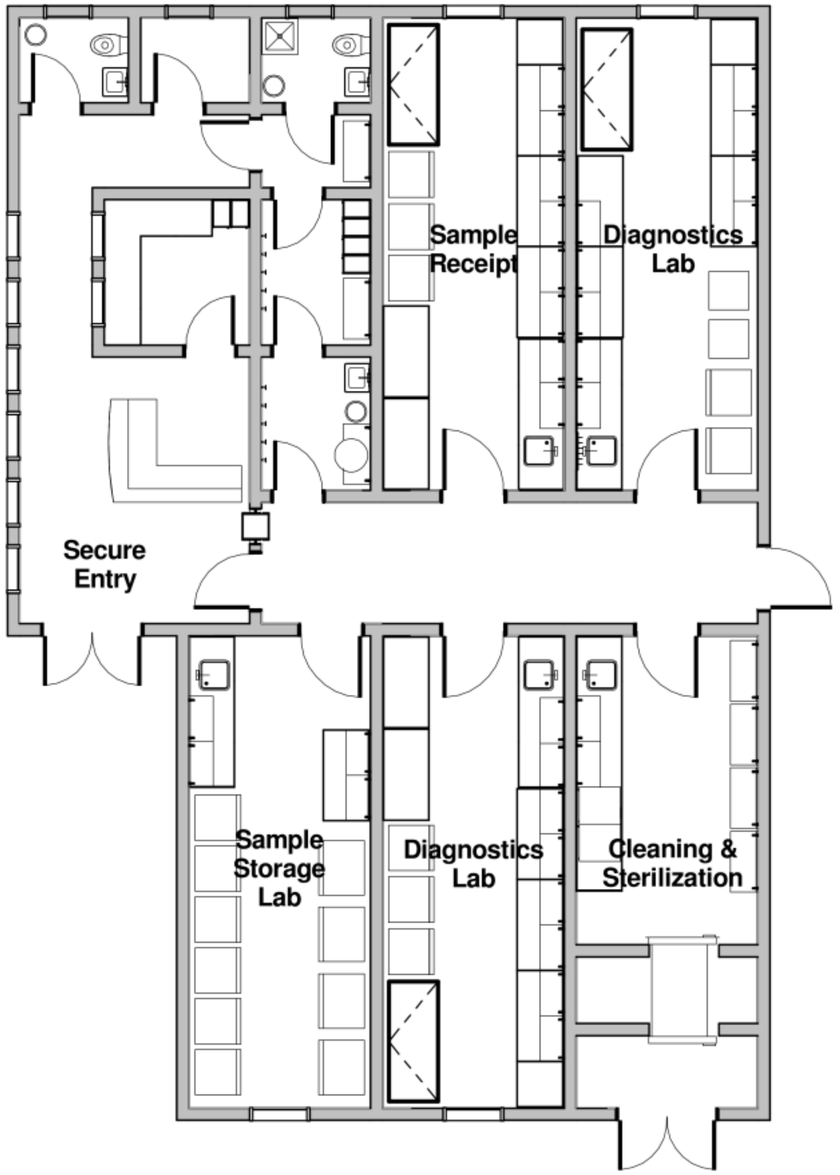


PROTOTYPE DESIGN

Module Catalogue





PROTOTYPE CONCEPT

Design Examples – District Lab

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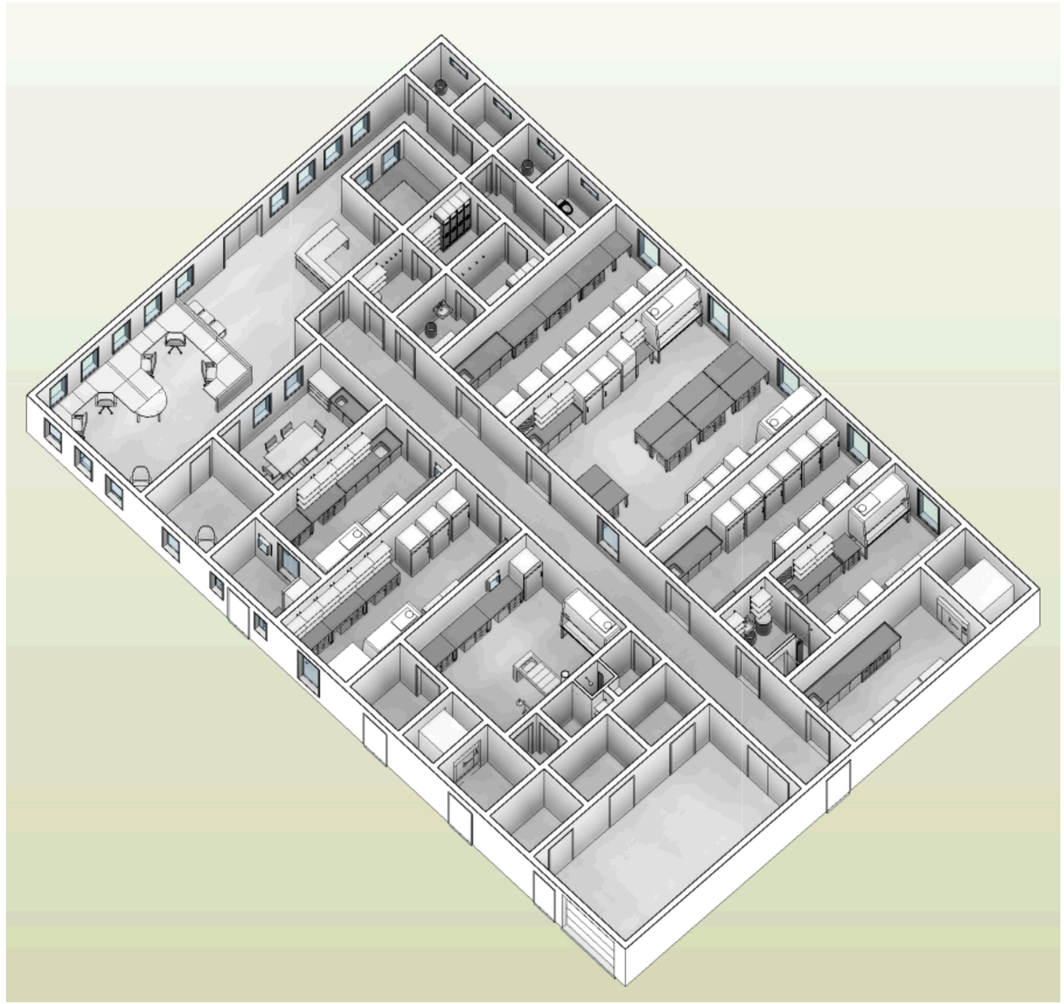

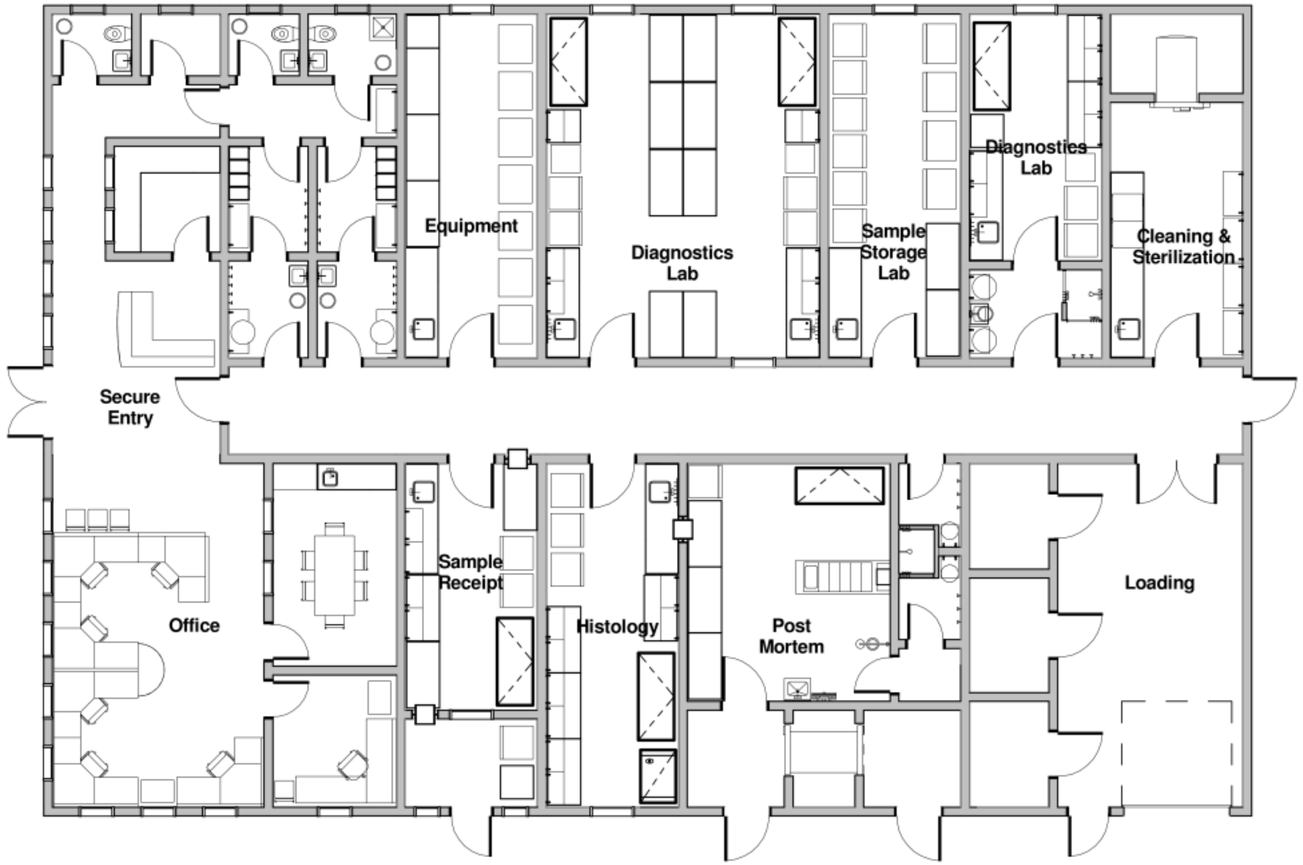

PROTOTYPE CONCEPT

Design Examples – Regional Lab

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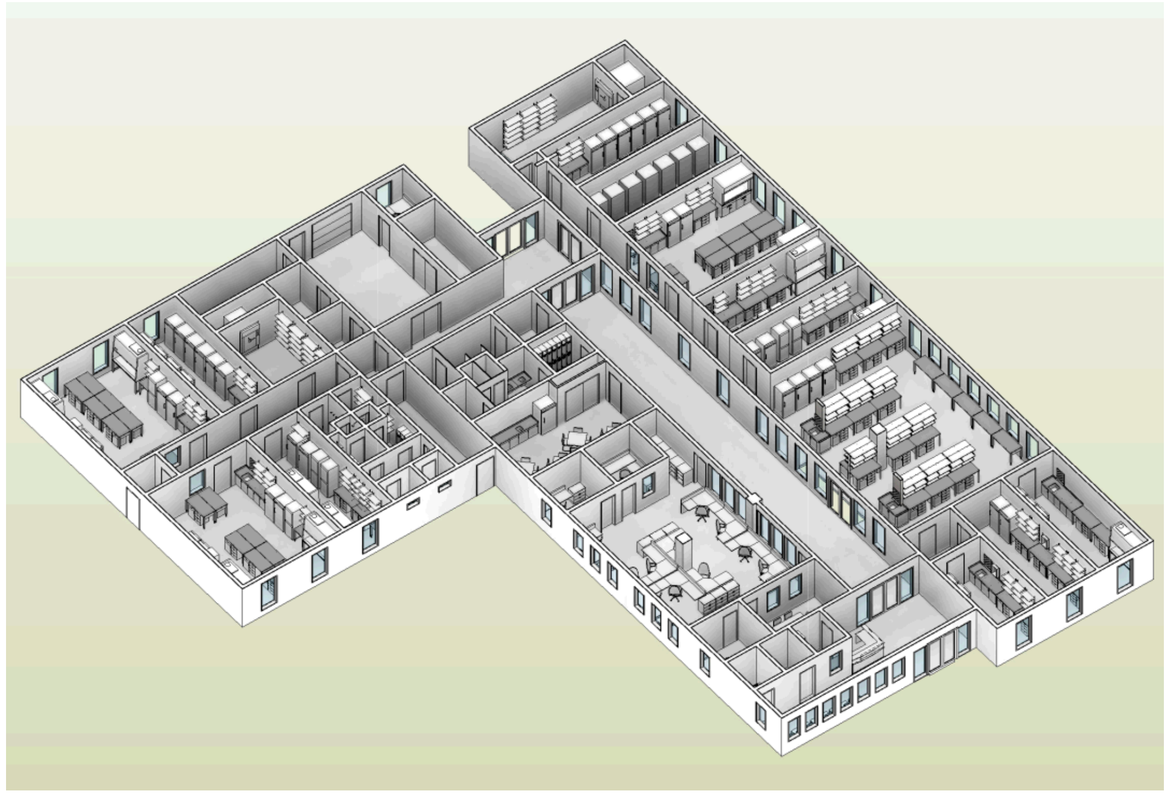

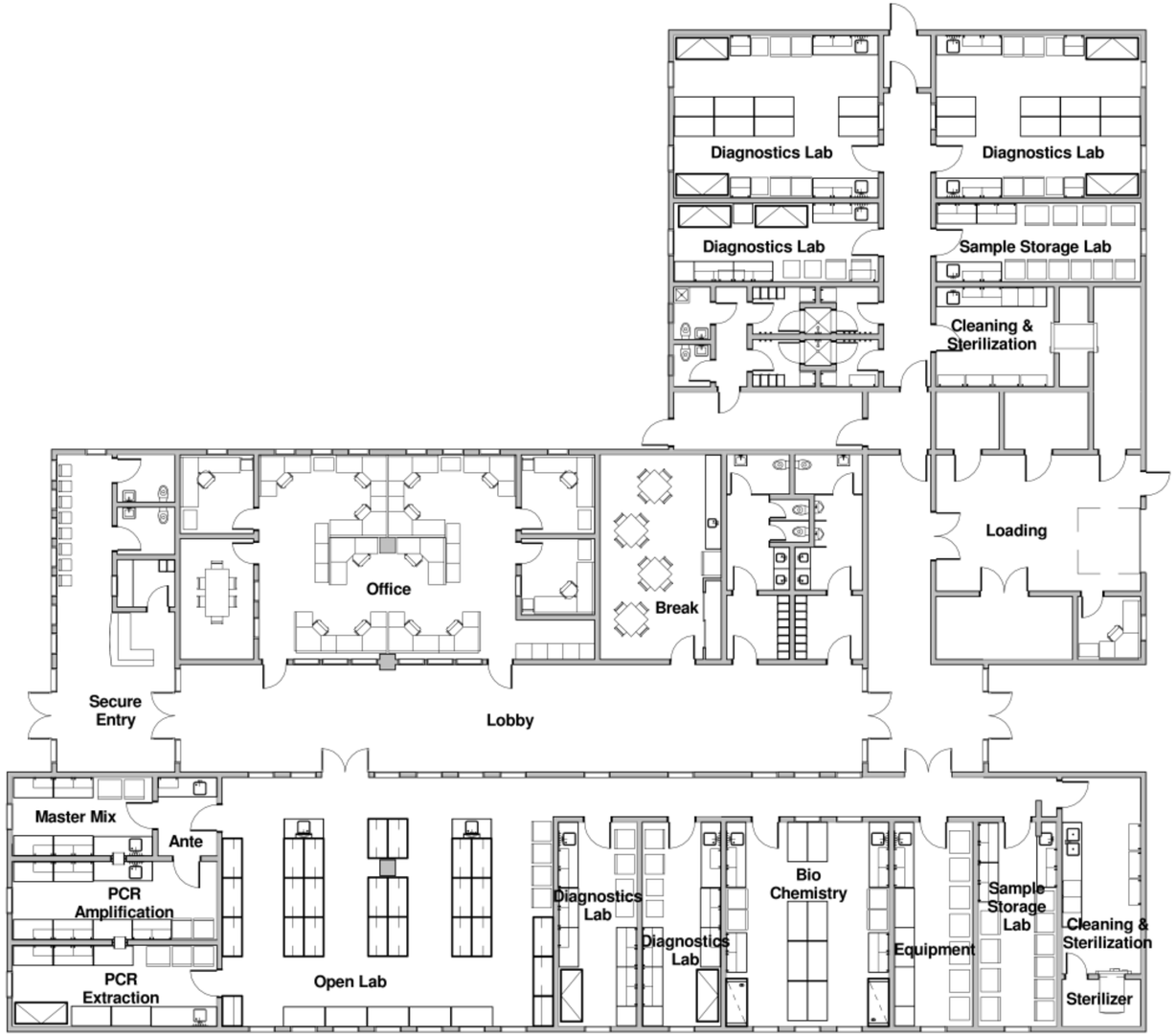

PROTOTYPE CONCEPT

Design Examples – Central Lab

Functional Space Program

Spaces Required		Quantity	Area per Space M^2	Total area M^2
Laboratory Spaces				
L.01A	Diagnostics Lab Module A (single, bench only)	1	25	25
L.01B	Diagnostics Lab Module B (single 1 BSC)	0	25	0
L.01C	Diagnostics Lab Module C (single 2 BSC)	0	25	0
L.01D	Diagnostics Lab Module D (single w/ante rm)	0	25	0
L.01E	Diagnostics Lab Module E (single w/shower)	1	50	50
L.01F	Diagnostics Lab Module F (double, bench only)	1	50	50
L.01G	Diagnostics Lab Module G (double 2 BSC)	0	50	0
L.02A	Sample Receipt Module A	1	25	25
L.02B	Sample Receipt Module B	0	25	0
L.02C	Sample Receipt Module C	0	25	0
L.03A	Clinical Collection Module A	0	20	0
L.03B	Clinical Collection Module B	1	25	25
L.03C	Clinical Collection Module C	0	40	0
L.03D	Clinical Collection Module D	0	50	0
L.04A	Molecular Suite Module A	0	25	0
L.04B	Molecular Suite Module B	0	50	0
L.04C	Molecular Suite Module C	0	50	0
L.04D	Molecular Suite Module D	0	75	0
L.05A	Histology Lab Module A (single)	1	25	25
L.05B	Histology Lab Module B (double)	0	50	0
L.06A	Post Mortem Module A (small animal)	1	50	50
L.06B	Post Mortem Module B (large animal)	0	75	0
L.07A	Biochemistry Module A	0	25	0
L.07B	Biochemistry Module B	0	25	0
L.07C	Biochemistry Module C	0	50	0
L.08A	Clean Media Lab Module A	1	25	25
L.08B	Clean Media Lab Module B	0	50	0
L.09A	Cleaning & Sterilization Module A	0	25	0
L.09B	Cleaning & Sterilization Module B	1	25	25
L.09C	Cleaning & Sterilization Module C	0	25	0
L.09D	Cleaning & Sterilization Module D	0	50	0
L.10A	Equipment Lab Module A (bench & floor equip)	1	25	25
L.10B	Equipment Lab Module B (floor equip)	0	25	0
L.10C	Equipment Lab Module C (benchtop equip)	0	25	0
L.11A	Open Lab Module A	0	50	0
L.11B	Open Lab Module B	0	50	0
L.11C	Open Lab Module C	0	50	0
L.11D	Open Lab Module D	0	50	0
L.12A	Sample Storage Lab Module	1	25	25

Functional Space Program

Spaces Required		Quantity	Area per Space M^2	Total area M^2
Administrative and Amenity Spaces				
A.01A	Secure Entry Module A	1	25	25
A.01B	Secure Entry Module B	0	40	0
A.01C	Secure Entry Module C	0	50	0
A.02A	Office Module A	1	45	45
A.02B	Office Module B	0	45	0
A.02C	Office Module C	0	45	0
A.02D	Office Module D	0	45	0
A.02E	Office Module E	0	60	0
A.02F	Office Module F	0	60	0
A.02G	Office Module G	0	60	0
A.02H	Office Module H	0	60	0
A.03A	Lab Entry Module A (single with showers)	1	15	15
A.03B	Lab Entry Module B (double with showers)	0	30	0
A.03C	Lab Entry Module C (single no showers)	0	15	0
A.03D	Lab Entry Module D (double no showers)	0	30	0
A.04A	Washroom Module A	1	30	30
A.04B	Washroom Module B	0	40	0
A.05A	Break Room Module A	0	25	0
A.05B	Break Room Module B	0	40	0
A.06A	Prayer Room Module A	0	25	0
A.06B	Prayer Room Module B	0	40	0
A.06C	Prayer Room Module C	0	50	0

Functional Space Program

Spaces Required		Quantity	Area per Space M^2	Total area M^2
Support Spaces				
S.01	Loading & Storage Module A	0	25	0
S.02	Loading & Storage Module B	1	50	50
S.03	Loading & Storage Module C	0	75	0
S.04	Decontamination Module A	0	25	0
S.05	Decontamination Module B	1	25	25
S.06	Electrical Room	1	10	10
S.07	Pump Room	1	10	10
S.08	Corridor (1.8m wide)	17	3.06	52.02
	Total Interior Area With Example Selections			**612.02**

PROTOTYPE DESIGN

Space Program

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PROTOTYPE DESIGN

Cost Estimation

Cost Estimating

Building Areas	Quantity	Cost per M^2	Total per area
Amenity Areas	125	2,000	250,000
Laboratory Areas	400	4,500	1,800,000
Support Areas	163	2,000	326,280
		Total Area Cost	2,376,280
		Total Cost for Building Furnishings & Equipment	3,785,505

Furnishings	Quantity	Cost per Lin M or Unit	Total per item
Workstations	6	2,000	12,000
Desk Chairs	6	300	1,800
Side Chairs	20	200	4,000
Meeting Tables	4	500	2,000
Drawer Units	5	300	1,500
File Cabinets	2	300	600
Lockers (1/2 height)	18	150	2,700
Shelving (per linear M)	5	1,000	5,000
Toilets/Urinals	3	500	1,500
Sinks	4	500	2,000
Casework (per linear M)	9	1,500	13,350
Refrigerator (food)	1	1,500	1,500
		Total Furniture Cost	47,950

Equipment & Casework	Quantity	Cost per Lin M or Unit	Total per item
Biosafety Cabinets	5	14,000	70,000
Refrigerators	13	3,500	45,500
Freezers	23	5,000	115,000
Misc Equip (incubator etc)	15	5,000	75,000
Special Equip (necropsy tables, glass washers etc)	3	20,000	60,000
Sterilizers (Medium)	1	150,000	150,000
Passboxes	3	20,000	60,000
Sinks	17	1,000	17,000
Fixed Casework (per linear M)	36	5,000	182,250
Adjustable Casework (per linear M)	110	3,500	385,875
Mobile Storage Units	146	1,000	146,000
Shelving (per linear M)	89	1,000	89,250
		Total Equipment & Casework Cost	1,395,875

IBCTR HDR

- Kenya
- Diagnostic Focus
- 595m^2
- 30% Design Complete – Sep 2014
- Minimal Changes to Original Concept
- Locally Sustainable

KENYA

Animal Diagnostic Laboratory

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33600
3200
3200
3200
3200
3200
6400
11200
NORTH
2400
3900
3900
8000
18200
7000
1000
2200
1000
7000
Mechanical / Plumbing
Sterilizer
Cleaning & Steriliz.
Master Mix
Amplification
PCR Extraction
PCR Ante
Open Lab
Ante
Lab Corridor
Service Corridor
Emergency Shower
Access to Mechanical Space Above
Electrical
Loading Dock
Lab Storage
Waste Holding
Holding
Chemical Storage
Diagnostics Lab
Diagnostics Lab
Sample Storage Lab
Sample Receipt
Delivery Vestibule
Vestibule
Inner Change
Outer Change
Inner Change
Outer Change
Hall
WC
WC
Storage
Copy
Secure Server
Entry Lobby
Open Work Area

- Baghdad, Iraq
- Diagnostic Focus
- 8,000m^2
- 30% Design Complete – Jun 2014
- Adds Critical Capacity for Country and the Region
- Locally Sustainable

IRAQ

Central Veterinary Laboratory

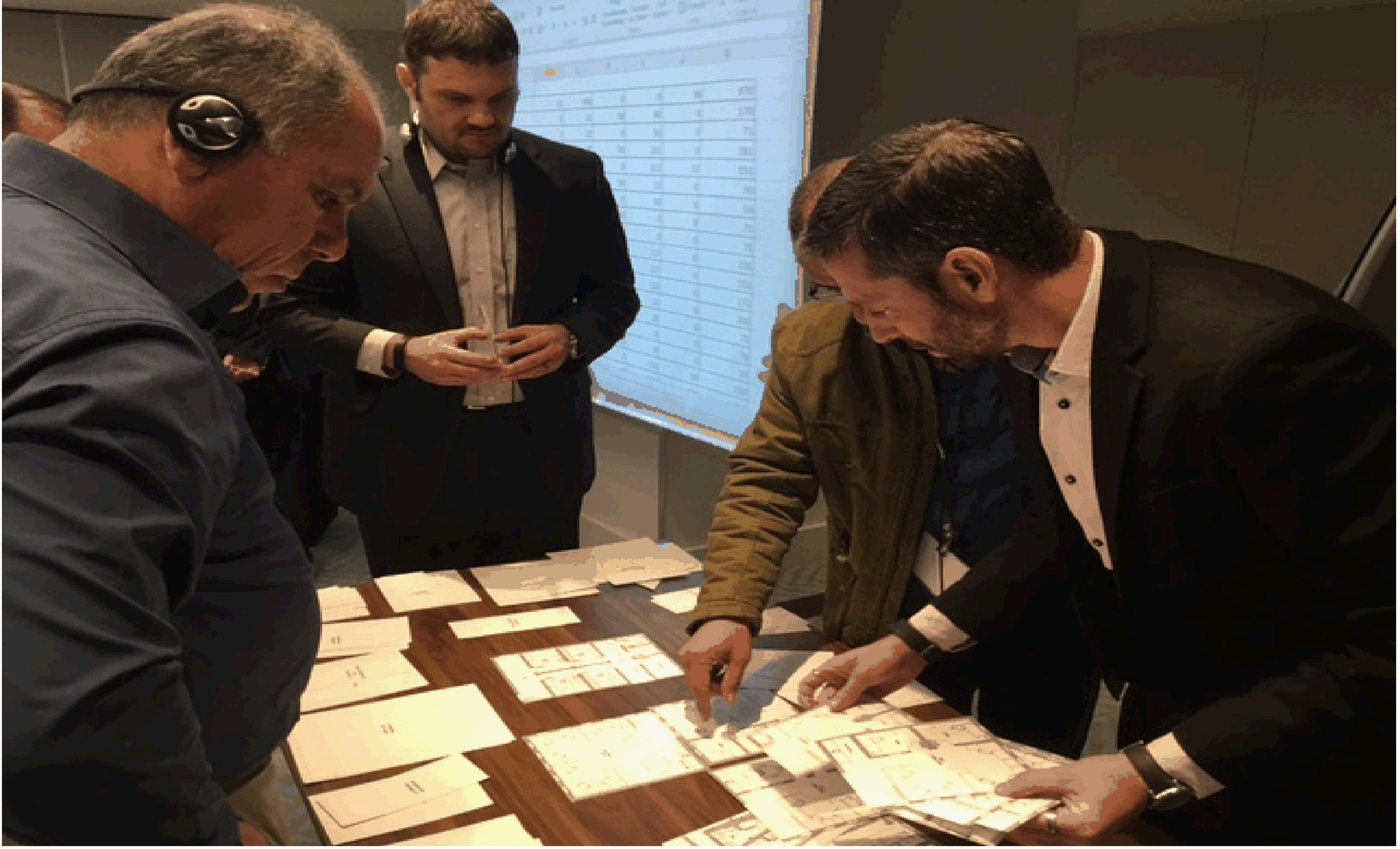
IBCTR HDR

IRAQ

Central Veterinary Laboratory

IBCTR HDR


OPEN OFFICE 55 m²
OFFICE 12 m²
OFFICE 13 m²
OFFICE 12 m²
OFFICE 13 m²
OPEN OFFICE 67 m²
OFFICE 13 m²
OFFICE 12 m²
OFFICE 13 m²
OPEN OFFICE 59 m²
CONFERENCE 23 m²
COPY / FILE 15 m²
CORRIDOR
BALCONY 19 m²
OPEN TO GREEN BELOW
HUDDLE 15 m²
OPEN TO GREEN BELOW
HUDDLE 18 m²
OPEN TO GREEN BELOW
BREAK 20 m²
OPEN TO GREEN BELOW
STAIR
DATA 7 m²
FOOD MICRO 11 m²
PARASITOLOGY MICRO 11 m²
STAIR
PARASITOLOGY LAB 48 m²
ENTOMOLGY LAB 48 m²
ENTRY & EQUIPMENT 20 m²
SEROLOGY LAB 70 m²
HEMATOLOGY LAB 20 m²
ENTRY & EQUIPMENT 20 m²
R&D GEL 23 m²
LOCKERS TOILETS 24 m²
JANITOR 10 m²
LOCKERS TOILETS 24 m²
FD
LAB CORRIDOR
PASSENGER ELEVATOR
SAMPLE ELEVATOR
FREIGHT ELEVATOR
ELECTRICAL ROOM 10 m²
SHAFT
PCR ANTE 6 m²
PCR MASTER MIX 16 m²
PCR AMP 23 m²
PCR EXTRACT 23 m²
FOOD TOXICOLOGY LAB 23 m²
FOOD MICROBIOLOGY LAB 48 m²
FOOD CHEMISTRY LAB 48 m²
PCR EXTRACT 23 m²
PCR AMP 23 m²
PCR ANTE 7 m²
PCR MASTER MIX 16 m²
POST PCR 23 m²
R&D LAB 23 m²
MYCOLOGY LAB 27 m²
SHAFT
METHODS DEVELOPMENT LAB 70 m²



- Save Time
- Reduce Travel
- Improve Consistency
- Reduce Costs
- Focus Efforts
- Locally Sustainable
- Promote Best Practices: Lab Design, Biosafety, and Biosecurity

PROTOTYPE DESIGN CONCEPT

Summary

IBCTR HDR

Thank you

Questions