BSL-3 & 4 Biocontainment Portfolio

Design that promotes safety and drives performance.

Think Lab. **Think** LTS

500,000
Hours committed to lab improvement

40+
Countries

500+
Projects

3
Offices

We're there.

We have been helping laboratories achieve their full potential all over the world.

@ThinkLTS

LTSHealth.com

LTS Est. 1998 20 YEARS OF EXCELLENCE

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Biocontainment laboratory design that exceeds expectations.

With more than 20 years of biocontainment laboratory design expertise, we deliver unparalleled custom designed, cost-effective laboratories in a reduced timeframe.

International leader in the design and construction of **safe** and **cost-effective** containment facilities.

We understand how to translate the highly **complex regulations** for infectious disease testing into **engineering requirements** and **building specifications,** thus removing the risk from our clients.

We understand pathology processes and follow good laboratory design **practice** which can only be achieved through extensive **experience.**

We document and regularly update **processes, standard equipment** and **environmental conditions** required in BSL-3 laboratories.

When it comes to biocontainment laboratories, we think of it all.

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Our unparalleled expertise in containment laboratory design ensures that everything is planned, designed and implemented to achieve success.

BPR (Business process reengineering) is included as standard

- BPR ensures that all designs are process based
- BPR also ensures the optimal utilization of resources in the new facility

Security, safety and a comfortable work environment are guaranteed

- Our primary design objectives are security and safety
- The integration of ergonomic concepts and principles are included as standard
- Ensures sufficient space for effective work

Flexible spaces designed for longevity

- Experienced in designing adaptable spaces that incorporates flexibility, convertibility and expandability
- Proven capability to design furniture systems that are easy to adjust and adapt

Based on international leading practice

- More than 20 years' experience in laboratory design in more than 40 countries
- Regulatory compliance with WHO, NIH, IUSS, SANAS and ISO

We accommodate future technology

- In-depth knowledge of all diagnostic, pathology and life sciences disciplines, not only blood sciences
- We consider current and future technology trends from across the globe

Innovation through a holistic understanding

- We have a diverse knowledge base of tried and tested solutions
- Able to provide solutions from outside the traditional pathology industry
- BSL-3, BSL-4, Automation, Clean room, Microbiology, Pharmaceutical, Molecular & PCR, Support Functions, Training / Research Anatomical Pathology, Routine Clinical Pathology

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BSL-3 Laboratory Assessments

What are you doing to actively manage risk in your BSL-3 laboratory?

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Working with highly infectious and potentially lethal pathogens pose a severe risk to the wellbeing of staff with potential legal liability and crippling financial exposure for management and shareholders. We offer peace of mind in knowing that your BSL-3 facility is fit for purpose.

Mitigating your risk is as easy as 1-2-3

1. **Assess:** We will visit your lab to understand your needs and challenges and perform a detailed risk assessment.
2. **Report:** We will get you up to date with the latest standards, trends and legislation.
3. **Support:** If you need expert advice, we're only a call away.

PEACE OF MIND

As a business owner or a laboratory manager, risk management is essential for the welfare of your staff.

GROW YOUR BUSINESS

Having evidence that you are managing your risks gives you the edge when competing for grants, projects and research opportunities.

EXPERT ADVICE

With an international footprint and more than 50 BSL-3 laboratories designed, built or refurbished, we offer you the latest and most relevant professional advice.

With over 20 years of global laboratory performance improvement experience. Let LTS Health help you actively manage your BSL-3 risks.

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BSL-3 Maintenance Management Application

How do you ensure your BSL-3 laboratory remains compliant and fit for purpose?

Think Lab. Think LTS

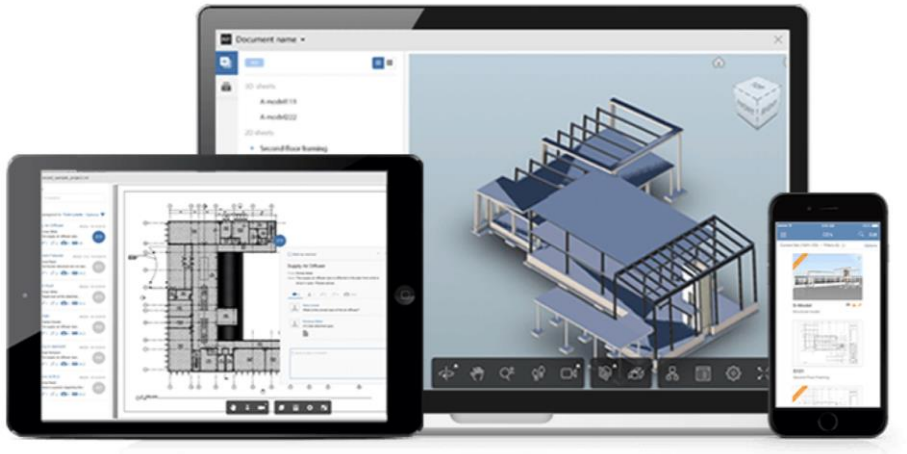
Creating facilities that protect the laboratory workers, the surrounding environment and the community from potentially lethal pathogens is at the core of LTS Health's business. We offer peace of mind in knowing that your BSL-3 facility remains compliant and fit for purpose for years to come through a predictive and preventative maintenance management application.

Mitigating your risk is as easy as 1-2-3

1. **Status Report:** We will visit your lab to generate an asset data list, take measurements and determine your lab's maintenance status.
2. **Maintenance Schedule:** Your lab's assets and associated data will be imported into building design software from where a maintenance schedule will be prepared.
3. **Maintenance Management App:** The maintenance schedule will be imported into an App available on your tablet, pc or phone. We will facilitate and assist you to keep track of all required maintenance for the agreed services period.

PEACE OF MIND

Working with highly infectious and potentially lethal pathogens pose a severe risk to the wellbeing of staff with potential legal liability and crippling financial exposure for management and shareholders.



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Mobile BSL-3 Laboratories

Truck-based mobile BSL-3 laboratory.

- LTS' mobile laboratory can be adapted to fit a wide variety of platforms. Most popularly on a flatbed truck offering a clean slate to work from. It can however be contained within a converted bus application as well.
- Designed to be self-sustaining with its own electrical and water supply and telecommunication hub.
- Built-in sanitizing of solid and liquid waste.
- Negative pressure and built-in HEPA and safe change filter housings, air conditioning and ventilation unit.
- Designed to park at a facility and with minimal validation operate as a BSL-3 facility.
- The interior designed can be adapted for different diagnostic equipment according to the needs of the facility.

Container-based semi mobile BSL-3 laboratory.

Container

- ✓ Two x 12-meter containers.
- ✓ Chromadek inside wall panels.
- ✓ Cleanroom Doors with locks and interlocks (8x).
- ✓ Sanitizing autoclave area.
- ✓ Cleanroom viewing panels (8x).
- ✓ Vinyl floor cover.
- ✓ Burglar bars.
- ✓ Electrical wiring with LED lights, switches, socket outlets and distribution board.
- ✓ Internal partitions.

Container-based semi mobile BSL-3 laboratory continued.

Installation

- ✓ Provision for connection to municipal services including water, drainage and electrical supply.
- ✓ Local delivery.
- ✓ Delivery on-site to a pre-determined area, setup and commissioned.

Project Management

- ✓ LTS professional design and project management.

Fittings

- ✓ Separate ventilation, air conditioning and controls with two stage HEPA filter bag-in and bag-out units.
- ✓ Hydroboil for hot water supply.
- ✓ Chemical resistant laminate worktops.
- ✓ Plumbing hand wash basin and sink complete with mixer taps, hot water and cold-water supply and drainage.
- ✓ Underbench cupboards to design.
- ✓ LPG gas supply line with double outlet tap.
- ✓ Communications hub, including 12-point patch panel.
- ✓ 8 x CAT5e data points.
- ✓ 5 x CAT3 telephone points.
- ✓ Cabstrut Jupiter double-channel power skirting including appropriate socket outlets.
- ✓ Loose furniture including office desk, filing cabinet, office chair and two laboratory chairs.
- ✓ 3 x Class II Biosafety Cabinets B2 fitted with thimble extraction units to extraction ducting.

Pre-fabricated modular BSL-3 laboratory.

- Made of multiple 12-meter container units put together to form a larger containment facility.
- Solution can be put together faster than a traditional building but is not as mobile as the container and truck solutions.
- Fed from external power to facility.
- Complete BSL-3 HVAC system, including HEPA air filters is placed next to the Pre-fab solution on a concrete plinth for easy access and maintenance.
- Customized interior layout to provide maximum working area from minimal footprint.

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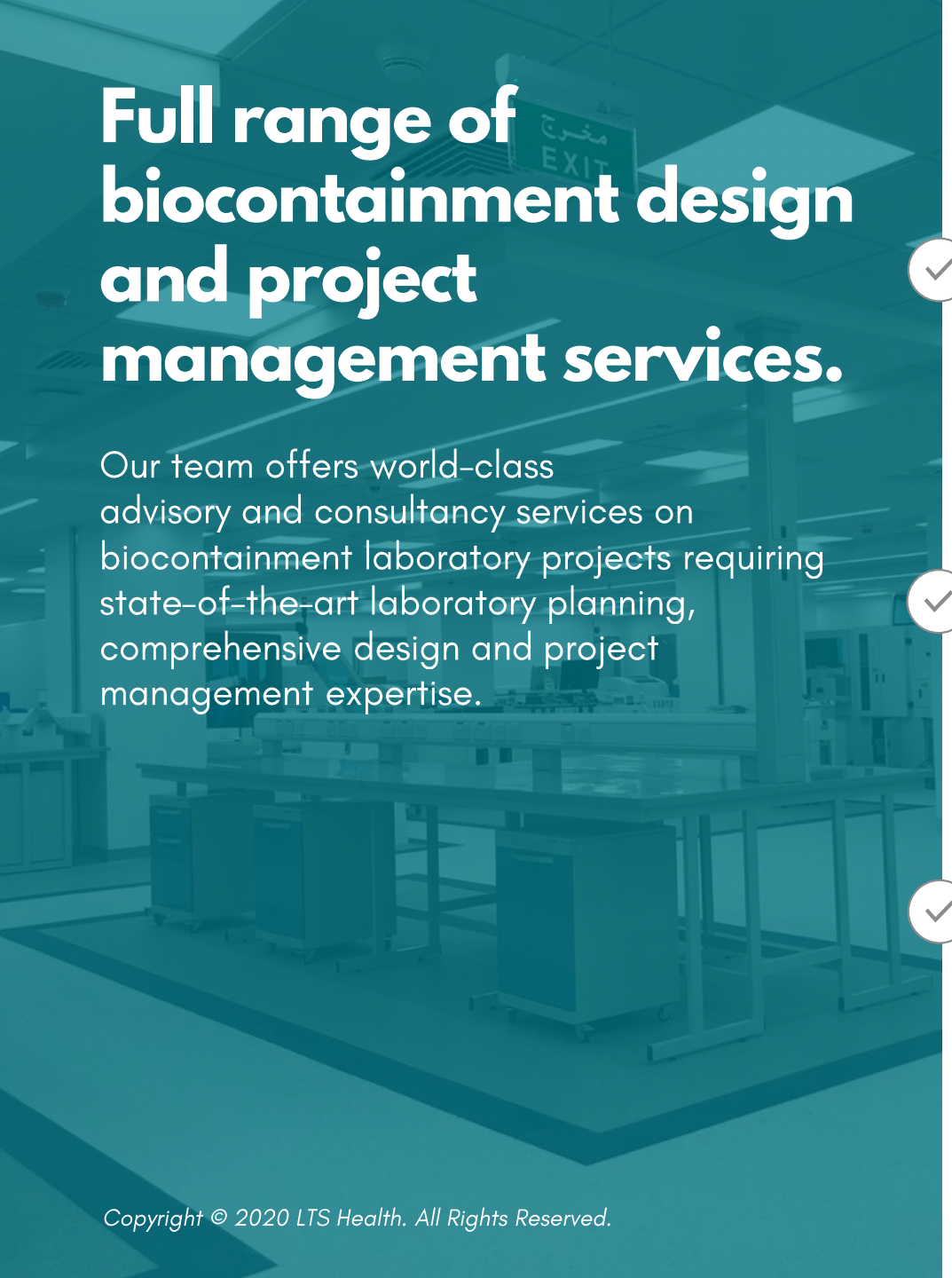
BSL-3 Design and Specification Service



Full range of biocontainment design and project management services.

Our team offers world-class advisory and consultancy services on biocontainment laboratory projects requiring state-of-the-art laboratory planning, comprehensive design and project management expertise.

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Advisory and Consulting

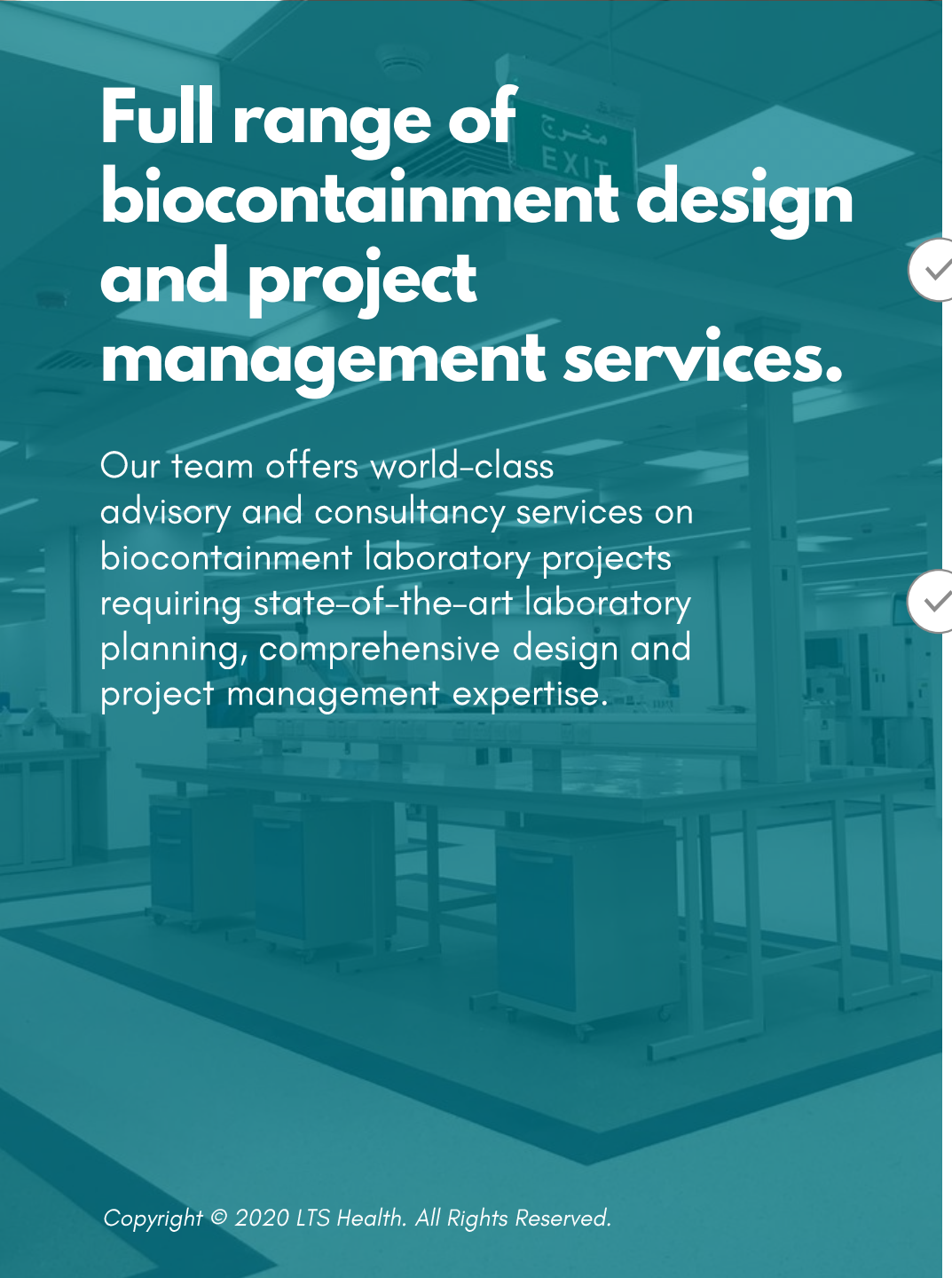
Expert, evidence-based biocontainment laboratory advisory and consulting service based on more than 20 years of experience. Our expert team of designers and consultants is fully equipped to understand your requirements and offer fit-for-purpose solutions. Our global experience will ensure that your biocontainment laboratory will be efficient, safe and highly productive.

Project Brief

We are biocontainment industry experts with in-depth understanding of laboratory processes, workflows, equipment, regulatory and safety standards. LTS Health has developed a unique combination of data collection and analysis methods to produce comprehensive, fit-for-purpose biocontainment project briefs for our clients.

Design

LTS Health provides a pure laboratory-focused, process driven, specialist biocontainment design service. Our design team can bridge the gap between your operational optimization and architectural design. This ensures an efficient implementation of workflows, layouts and optimized facilities – and in turn, the capacity, productivity and sustainability required by your laboratory. Our satisfied clients in over 40 countries are evidence that LTS delivers on its promise to deliver world-class biocontainment laboratory designs. You can be confident that your targets will be achieved.



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Specifications

We understand that building a biocontainment laboratory includes complex and highly technical specifications. We assist with the development of these, and help industry professionals understand and respond to specification requirements related to laboratories.

Project Management

LTS Health offers turn-key project management solutions. We have a proven track record of delivering complex biocontainment projects successfully. We believe that effective planning is the key to ensuring project objectives are realised and delivered on time and within budget.

Task Applied Science TB BSL-3 research facility, South Africa

The BSL-3 research facility was designed to allow for optimal sample and personnel flow while considering and integrating with the lab's standard operating procedures.

Facility biological safety was ensured by means of the physical barriers and air pressure cascades. Physical barriers included personnel entrance through an anteroom with electronically controlled interlocking doors, along with sample transfer and disposal via pass-through boxes and waste water decontamination systems. The specifications of laboratory fittings and finishes were of laboratory grade and were selected based on ease of decontamination, chemical resistance and antibacterial properties.

To reduce the risk of airborne contamination, the facility was designed to be under constant negative pressure. This was achieved by creating a series of cascading differential pressures between rooms, ensuring that air from high-risk areas would not be transferred into "cleaner" areas. High volume HVAC units ensured that the required fresh air changes were achieved as specified by the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) and Centre for Disease Control and Prevention (CDC) guidelines and regulations.

The BSL-3 research facility was designed within the constraints of an existing building by following the LTS Health process-driven methodology.

The exhaust system was designed with full redundancy and HEPA filtration system to ensure that facility pressures were maintained while ensuring that no pathogens were released into the atmosphere.

The new BSL-3 suite included two research suites which could be fully isolated from the facility and each other, allowing for selective area decontamination and removing the need for full lab decommissioning. The larger facility allowed researchers to focus their time and energy on testing new drug treatments to counter the TB epidemic currently experienced in Southern Africa.

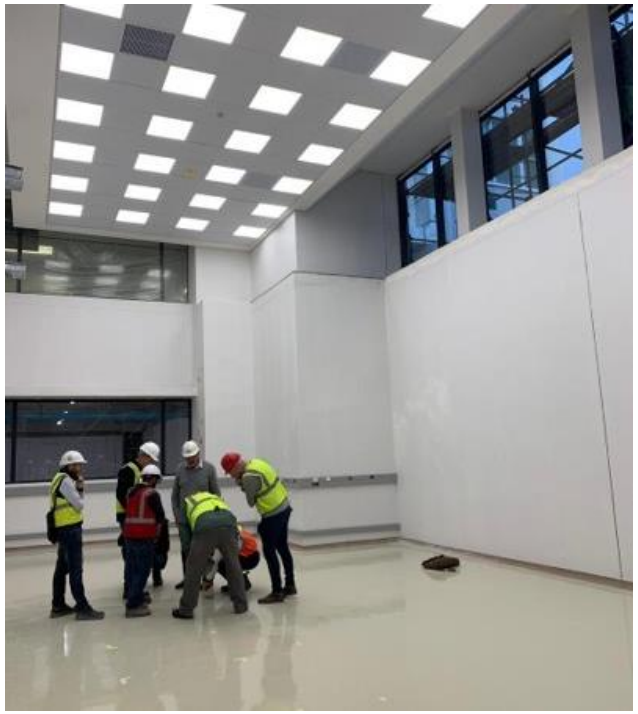
Infectious Disease Research Facility

Biomedical Research Institute (BMRI), Tygerberg medical campus, South Africa.

Client:	University of Stellenbosch, Faculty of Medicine
Services:	Facility Design
Contract Value:	R 670 000 000
Project Value:	R 970 000 000
Facility Size:	±40 000 sqm
Laboratories Size:	±10 000 sqm
Status:	Under Construction Jan 2019 – Dec 2022.

LTS was appointed as laboratory specialist consultant to identify and quantify the requirements, as well as design the laboratories in 13 departments across the University of Stellenbosch's medical campus. These included:

- ✓ Core analytical chemistry
- ✓ Bacteriology and infectious bacteria research
- ✓ Virology and infections disease research
- ✓ Cell culture and sterile media production
- ✓ Infectious molecular and molecular biology
- ✓ Genetic research and malignancy testing
- ✓ BSL-3 research suite

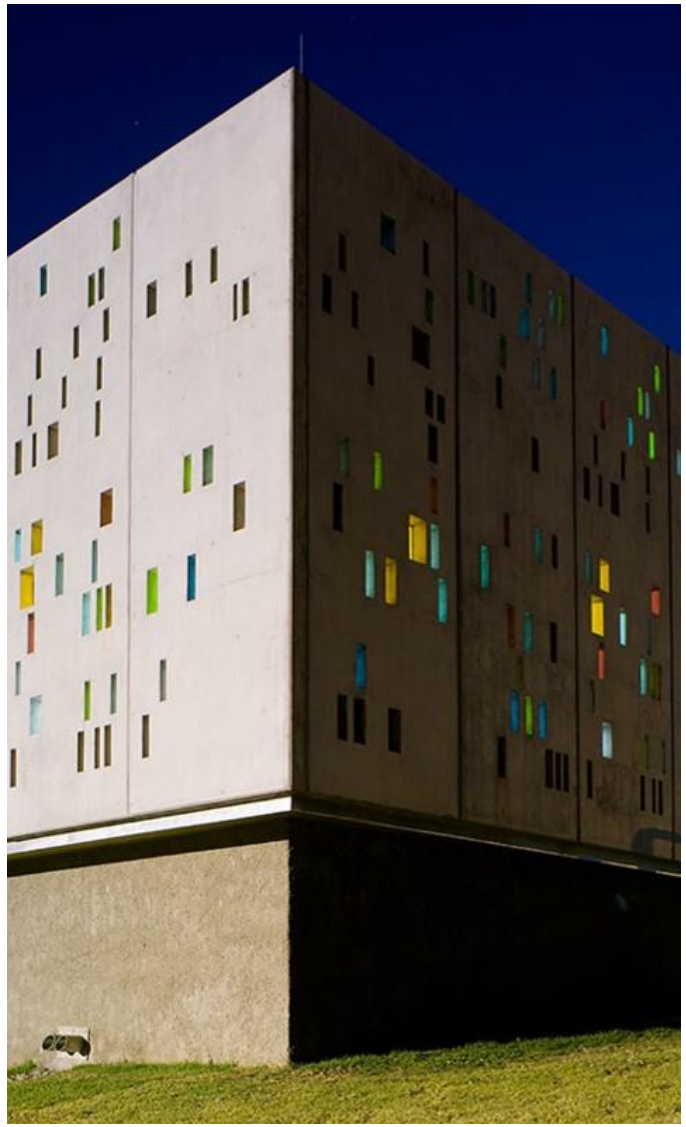


NICD, TB reference laboratory, South Africa.

Client: National Institute for Communicable Diseases
Services: Facility Design and Project/Construction Management.

LTS designed and managed the construction of South Africa's National Institute for Communicable Diseases (NICD) National TB Reference Laboratory, a combination Biosafety Level 2 and 3 laboratory specifically set-up for testing tuberculosis.
The project included:

- ✓ A general-purpose TB Laboratory;
- ✓ An Opportunistic Infection and High-Performance Liquid Chromatography Laboratory;
- ✓ Drug Susceptibility Testing and Multi Drug Resistant laboratories;
- ✓ A multi-lab configuration for molecular testing;
- ✓ A unique feature of the building is the façade, based on an IS6110 restriction fragment length polymorphism pattern of Mycobacterium tuberculosis.



NICD, BSL-4 laboratory, South Africa.

Client: National Institute for Communicable Diseases
Services: Facility Design and Project/Construction Management.

LTS Health was appointed by the National Institute for Communicable Diseases to manage the refurbishment and upgrade of its Biosafety Level 4 facility in Sandringham, Johannesburg. This laboratory falls under the Special Pathogens Unit that is primarily responsible for the diagnosis and investigation of biohazard class-4 viruses. This requires the use of a maximum-security laboratory (BSL-4).

Class-4 viruses known or considered likely to occur in Africa include Marburg, Ebola, Rift Valley Fever, Crimean- Congo Hemorrhagic Fever and Lassa Fever-related viruses. The Unit is recognized as a World Health Organization (WHO) Regional Collaborating Centre for Reference and Research on Viral Hemorrhagic Fevers and Arbo viruses.

As this laboratory has the highest Biosafety level, it requires maximum containment. Staff are highly trained and only allowed to work in the lab when clothed in full protective suits and under large negative pressures to ensure that no contamination of peripheral areas can occur. Strict operational procedures are followed to ensure the safety of all staff working in the facility.

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Viral reference laboratory, NVRL, UCD, Ireland.

LTS Health was employed to optimize the workflow and increase testing capacity in times of outbreak at the facility.

- ✓ Virology
- ✓ Molecular
- ✓ Infection Control & Outbreak Centre
- ✓ Training Laboratory
- ✓ Teaching Facilities

US Animal House Facility, Tygerberg Campus, South Africa.

Client: University of Stellenbosch
Services: Facility Design and Project Management
Value: R3 000 000
Size: 120 sqm
Status: Completed 2016.

LTS Health was approached to act as the laboratory specialist for the design of an A-BSL3 facility for the housing and testing of multi drug resistant tuberculosis at the University of Stellenbosch's medical campus. The facility included the following areas:

- ✓ Animal Holding
- ✓ IVC Holding
- ✓ Cage Changing
- ✓ Infection Room
- ✓ Procedure Room
- ✓ Decontamination

By using a process driven approach, the flow of animals, waste, samples and personnel through the facility was considered. To minimize biological risk; clean and dirty areas were set up in the facility. These containment areas are maintained by the utilization of a combination of physical barriers and air pressures.

Core Delivery Team

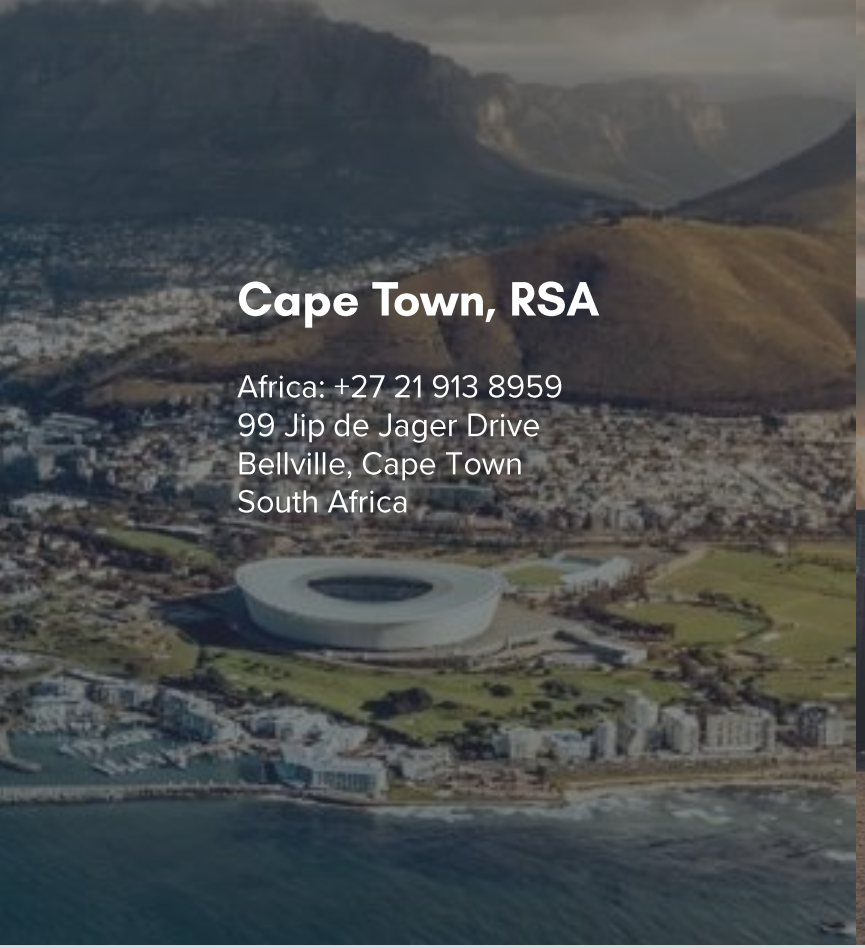
Our experienced professional team ensures that all BSL-3 laboratories are designed to the latest WHO, CDC, ISO 17025 and NIH standards. By combining the applicable standards and a process-driven design approach, we ensure that the resulting facility not only complies with the highest safety standards but also promotes sample workflow while taking into consideration ergonomics and user comfort.

Core Delivery Team

	POSITION IN TEAM	CURRENT POSITION	YEARS OF EXPERIENCE	EDUCATION, REGISTRATION, MEMBERSHIPS	RELEVANT SPECIALIST AREAS OF KNOWLEDGE AND EXPERTISE
Menno Schagen 	Design SME	CEO: Europe and Middle East, Director	16 years Facility Design Public and Private Sectors	B.Eng. (Industrial), AMSAIIE, Pr. Eng. ECSA Prince2 Six Sigma Black Belt	• Project Management • Business Process Reengineering • Technology Management • Laboratory Facility Design • Implementation Management • Performance Assessments • Laboratory Consolidations
Liezl Laubscher 	Design Workstream Lead	Head of Design, Managing Consultant	18 years Healthcare Facility Design Public and Private Sectors Design Standards Development and Implementation	M.Sc. Planning Buildings for Health (Medical Architecture Research Unit) B.Consumer Science SAFHE	• Healthcare Facility Design • Project Management • Requirement Analysis • Workshop Facilitation • Implementation Management
Wouter Viljoen 	Laboratory Consultant	Principal Consultant	8 years Laboratory Design, Implementation Management	B.Eng. (Industrial), AMSAIIE, Pr. Eng. ECSA GBCSA Prince2	• Business Process Reengineering • Workflow Optimization • Workshop Facilitation • Requirement Analysis • Laboratory Facility Design • Project Management • Implementation Management

Core Delivery Team

	POSITION IN TEAM	CURRENT POSITION	YEARS OF EXPERIENCE	EDUCATION, REGISTRATION, MEMBERSHIPS	RELEVANT SPECIALIST AREAS OF KNOWLEDGE DEMONSTRATING SUITABILITY FOR POSITION
Su-Anrie Aucamp 	Laboratory Consultant	Principal Consultant	7 years Laboratory Design, Implementation Management	B.Eng. (Industrial), AMSAIIE, Pr. Eng. ECSA GBCSA	• Business Process Reengineering • Workflow Optimization • Workshop Facilitation • Requirement Analysis • Laboratory Facility Design • Project Management • Implementation Management
Ben Haarhoff 	Project Delivery Systems and BIM Manager	Senior Consultant	10 years Healthcare Facility Design Public and Private Sectors Design Software, Standards Development and Implementation	B.Tech. (Architectural Technology) ND. (Architectural Technology) SACAP	• Performance Software Development • Innovation and Process Implementation • 3D Facility Modelling and Design Coordination • Laboratory Facility Design • Project Management • Industry Building Information Modelling (BIM) • Code Compliance



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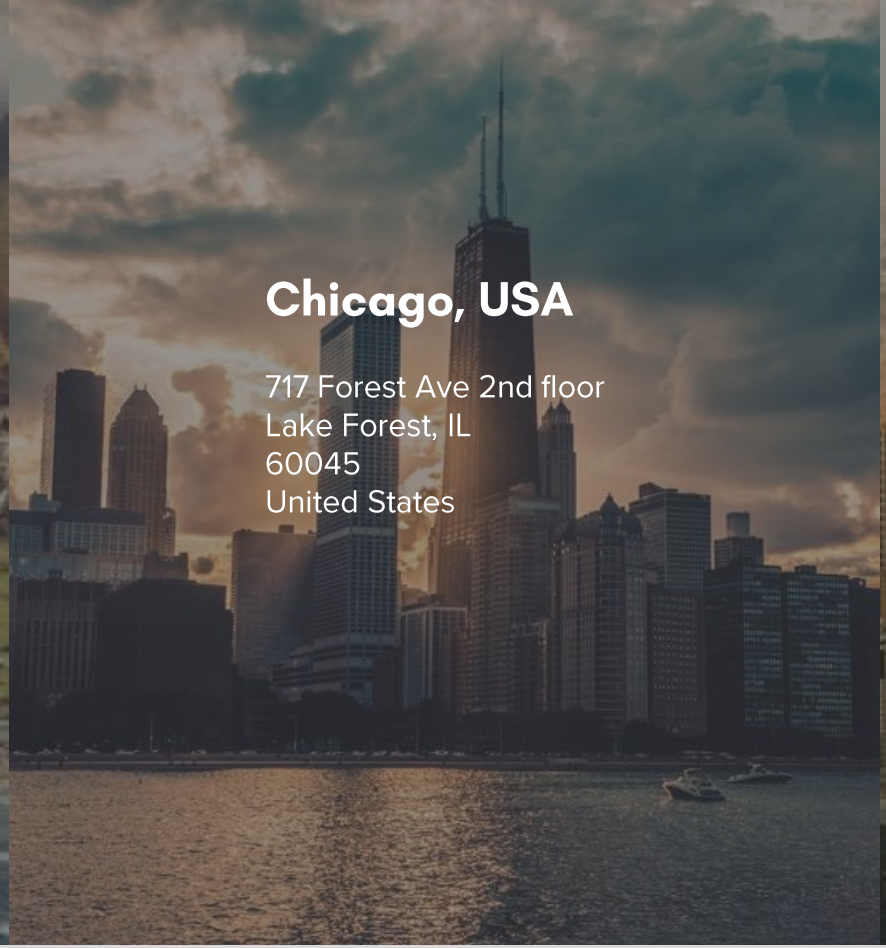

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