



Terra Universal's BioSafe® Modular Hybrid Cleanrooms

Engineering | Manufacturing | Project Management | Installation | Certification

Proven Track Record | Single Source Supplier | Guaranteed Performance

www.terrauniversal.com

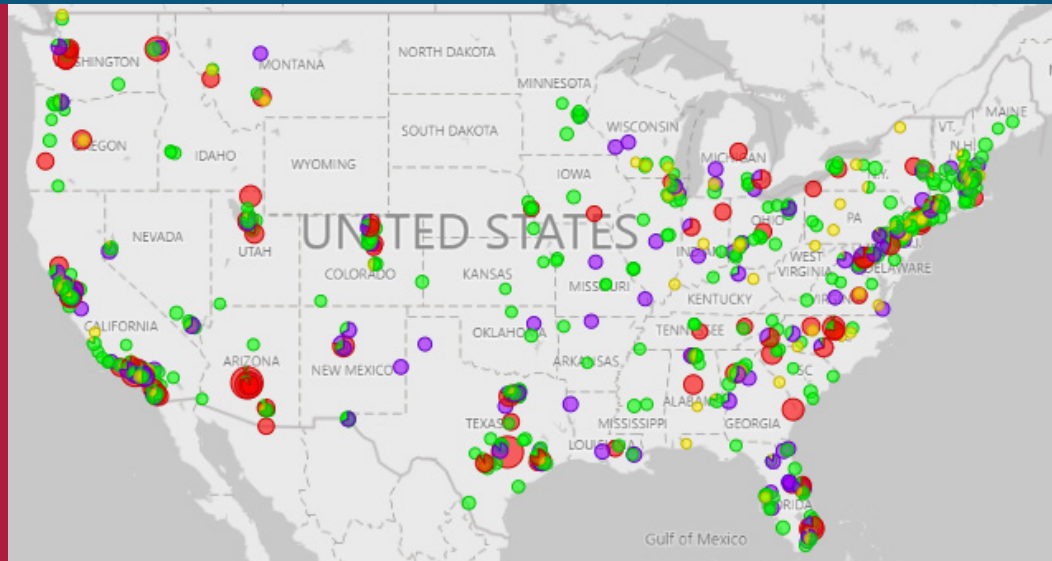


About Terra Universal

As a pioneer in the critical environment industry, Terra Universal has developed and manufactured innovative solutions for over 45 years. Combining high-throughput, automated fabrication equipment with a robust, active stock of raw material, Terra is capable of producing cleanrooms of any design, size, scope and complexity at industry-leading build times.

Terra builds and installs over 500 cleanrooms per year, on average. All cleanroom components are pre-engineered, quality control tested, and stocked for quick integration and assembly. In addition to product manufacturing, Terra offers a wide range of value-add services, including white glove delivery, cleanroom installation, structural seismic analysis, expedited production, qualification documentation and extended warranties. Order-specific certificates of compliance, listing each product's adherence to ISO, UL, OSHA and seismic standards, are supplied with every qualifying sale. The leader in critical environment solutions, Terra also manufactures laminar flow hoods, desiccator cabinets, glove box isolators, pass through chambers, and a broad array of cleanroom-compliant furniture, storage and gowning equipment.

Terra Highlights



Over 2,000
completed
projects since
2017



Multi-building,
high capacity
manufacturing
line



Main campus
located
in Southern
California



Founded in
1976



Over 30 global
partners

Long Standing Reputation

Since 1976, Terra has successfully designed, manufactured, and installed thousands of cleanrooms worldwide to customers in the pharmaceutical, biomedical, life science, aerospace and semiconductor industries. Terra's key customers include the largest research and production facilities across the globe.

Semiconductor

Hitachi Global
Lexmark Intl.
KLA-Tencor
Intel
IBM
Samsung
Hewlett Packard
GE
Qualcomm
Triquint

Aerospace

Boeing
Lockheed Martin
Rockwell Collins, Inc.
Raytheon Systems
JPL
SpaceX
Northrop Grumman
Lawrence Livermore
Sandia National Labs
Teledyne

Medical/Hospital

Kaiser Permanente
Mountain State Health
NIH
VA Hospitals
Cardinal Health
St. Jude Medical
Carestream Health
Providence Health
Baylor Health Care
Mayo Clinic

Medical Device

Siemens Health Care
Bacterin International
OPKO Diagnostics
Medtronic, Inc.
Abbott Labs
Covidien/Tyco Healthcare
Cameron Health
GE Healthcare
Ethicon, Inc.
Boston Scientific

Biotechnology

Millipore Corporation
Genzyme Corporation
Organogenesis, Inc.
Meridian Bioscience
Affymetrix, Inc.
Celgard, LLC
Life Technologies
Becton Dickinson
MedImmune, Inc.
Alcon Labs

Pharmaceutical

Pfizer, Inc.
Genentech
Baxter Healthcare
Amgen, Inc.
Teva Pharmaceuticals
Merck
GlaxoSmithKline
Johnson & Johnson
Watson Labs
Gilead

Universities

Ohio State University
Duke University
Penn State University
UCSF
UNC
Case Western Reserve
University of Texas
MIT
Harvard
University of Toronto

Other Key Clients

Google
Kimberly Clark
3MM
FLIR Systems
Moog Inc
NIST
Naval Research Lab
Kewaunee Scientific
Corning
Dow Chemical

Terra's Capabilities

01

Scope Definition and Cleanroom Design

During this initial phase, Terra's in-house team generates a detailed quote for the cleanroom portion of the project while defining the classification requirements, regulations, and technical specifications. The scope of the entire project is codified, including timeline, delivery schedule, critical terminations, and coordination with outside stakeholders.

02

Engineering

During the project-engineering phase, Terra's in-house mechanical engineers design the cleanroom footprint while working in tandem with our strategic partners to produce HVAC, mechanical, electrical and plumbing definitions.

03

Manufacturing and Construction

After project release, Terra manufactures all modular cleanroom components, including wall panels, ceilings, filter fan units, entry doors, viewing windows, pass through chambers, storage solutions and furniture at our 350,000 square foot manufacturing campus in Southern California. All cleanroom components are manufactured using high-precision fabrication machinery, tested to ensure quality, performance guaranteed, and delivered on time to the construction site. No matter the scale of the project, Terra's high capacity, streamlined production line is capable of manufacturing your cleanroom at industry-leading build times.

04

Procurement

Leveraging Terra's network of over 80 major suppliers and vendors, our project management team coordinates with project stakeholders to ensure cost savings and timely delivery of value-add products from brands like [Labconco](#), [Thermo Fisher](#), [Metro](#), [Eagle](#), [Biofit](#), [Rubbermaid](#), [Germfree](#) and more.

05

Shipping, Installation, and Logistics

Terra's logistics team coordinates with vendors, suppliers and project stakeholders to ensure consolidated, timely delivery of the cleanroom, and all associated equipment, to the construction site. Specialty freight services, such as white glove delivery, overnight shipping, and weekend deliveries are available. Terra's experienced, skilled installation team executes zone-build methodology, coordinates with specialty tradesmen, performs on-site validation, and handles equipment move-in.

06

Cleanroom Start-Up and Pre-Validation

During cleanroom pre-certification and pre-validation, Terra's engineers perform an array of tests to ensure the cleanroom operates according to design objectives and specifications, including air balancing, particulate counts, atmospheric control, air changes and pressurization. If required, equipment validation and testing, such as IQ, OQ and PQ, is performed and submitted prior to close-out inspection.

07

Maintenance

Terra's offers an array of comprehensive 24/7 service programs, such as planned maintenance, cleanroom shutdown and decommissioning, testing and balancing, filter replacement and equipment installation.

The Hybrid Advantage: Combining the Benefits of Modular & Stick-Built Designs

For companies considering the installation of a cleanroom, there are two primary design options: [stick-built \(brick-and-mortar\)](#) and [modular construction](#). Each design methodology has distinct benefits; certain applications favor one design over the other, given the specific criteria for industry compliance. Terra's innovative [BioSafe® Hybrid Cleanroom](#) combines the benefits of stick-built and modular methodologies without the limitations posed by each design.

Conventional modular systems often carry higher up-front costs and longer fabrication times, as the specialty cleanroom materials specified are harder to source. BioSafe® Hybrid Cleanroom materials and components are consistently pre-tested and stocked, allowing Terra to maintain industry-leading fabrication times.

Conventional modular wall systems don't include space to run electrical connections, plumbing lines, networking cables and gas connections, resulting in exposed lines running down wall panels or dropped from ceiling feed-throughs. Terra's BioSafe® Hybrid Cleanroom walls feature a plenum space to house utility lines, providing the end user with convenient access to gas, vacuum and water connections along with duplex outlets, control panels, and phone jacks.

Traditional modular wall panels attach to an extruded aluminum or stainless steel frame by metal screws, leaving hard-to-clean gaps that collect dust, contaminants, and bacteria. Terra's BioSafe® hybrid wall panels utilize joint connectors to maintain a flush finish; all gaps are filled by an FDA-grade sealant to ensure a leak-tight system without cavities where microbes colonize. Given the design of conventional modular framing systems, flooring integration, including coving, can present a significant challenge.

Terra's BioSafe® Hybrid wall system features pre-fabricated coving panels to accommodate wall-to-floor and wall-to-ceiling conversions, ensuring a smooth transition free of cracks, crevices and gaps. Traditional modular cleanrooms feature ceiling grids containing 2' x 4' tiles made of ISO-grade plastics, such as polypropylene, PVC or acrylic. These lightweight ceiling panels are frequently dislodged during spray-down disinfection cycles, creating burdensome repair work for the facility staff. Terra's BioSafe® Hybrid

Cleanrooms feature hard ceilings composed of robust, rugged components capable of handling daily spray-down cycles.

Conventional stick-built designs carry lengthy installation timeframes, given the high amount of skilled labor and on-site alterations required to complete the construction. Terra's BioSafe® Hybrid Cleanrooms are built from pre-cut, precisely engineered components requiring limited on-site modifications. Cleanroom installations are performed by a team of factory-trained, experienced technicians who quickly and effectively navigate on-site challenges. Traditional stick-built cleanrooms carry higher operational and maintenance costs, due to annual repainting, re-caulking, dent and scratch repairs.

Terra's BioSafe® Hybrid rooms are constructed from rugged, durable, ISO-rated materials resistant to scratches, dents and corrosion. To accommodate rare maintenance issues, Terra offers standard and extended product warranties including site visits from personnel trained to rapidly solve service claims.

Certain applications prefer stick-built designs, whereas other industries commonly opt for modular systems. For cGMP-compliant drug discovery and USP <797> drug compounding operations, stick-built designs are the common choice, given the ease of installing coved flooring, spray-down resistant wall and ceiling panels, and the ability to hide plumbing lines and electrical cords. As drywall is prone to mold and mildew growth in moist conditions, applications requiring humid environments, like vivariums, animal husbandry, and cell culture research, choose modular systems.

Biosafety level II and above facilities prefer stick-built rooms because integration with the building HVAC and exhaust scrubbing systems is paramount to maintaining operator safety and BSL-compliance. Terra's BioSafe Hybrid Cleanrooms, combining the benefits of modular and stick-built designs, are optimal for each application listed above, as well as medical device, biotechnology, cell and gene therapy, tissue banking, and life science.

Terra's BioSafe® Modular Hybrid Cleanroom System

UL-Listed

GMP-Compliant

ISO-Rated

Scalable

Flexible

Robust

Leak-Rated

TERRA UNIVERSAL

Tel: +1 (714) 578-6100 or Email: info@terrauniversal.com



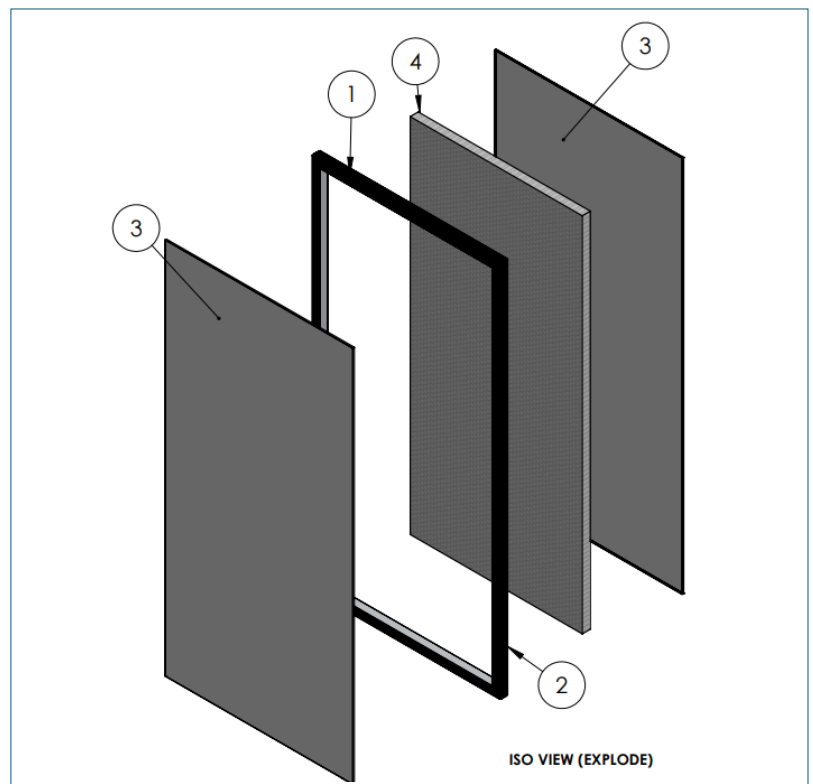
Wall Panels

Terra's [BioSafe® Hybrid Modular Wall Panels](#) are composed of an aluminum honeycomb core encased in a uPVC-laminated steel shell. The 2" thick panels adhere to ISO 14644-1 standard for ISO class 5 and below environments. The uPVC laminate finish ensures a fully flush surface that is robust, easy to clean, and resists common disinfectants, acids and corrosives. Seamless transitions between the ceiling, walls, and floors ensure an airtight, closed system to prevent contamination influx. Compliant with cGMP, GLP, and ASTM standards, the pre-engineered wall panels feature sealed joints with cold welded seams to create a monolithic finish that eliminates cracks and crevices where microbes colonize. All panels are installed onto an adjustable-height, recessed channel base to ensure a level and flush interface between the wall and the finished floor. Pre-formed corner pieces eliminate the need for surface capping or flashing. Suitable for operating temperature up to 60 degrees Celsius, the pre-fabricated, progressive wall panels are lightweight, cost-effective, and easy to install. The wall panels include a plenum space to house utility and filling lines, providing the user with convenient access to gas, vacuum and water connections, along with duplex outlets, control panels, and phone jacks.

- **Panel Size: 4' wide x 8' tall x 2' thick**
- **Core: aluminum honeycomb**
- **Shell: uPVC laminated steel**
- **Compliant with cGMP grades A, B, C and D**
- **Non-flammable**
- **Flush, smooth finish**
- **Resists corrosion, moisture, solvents and disinfectants**
- **Plenum space for utilities, water lines, gas connections**

DESCRIPTION

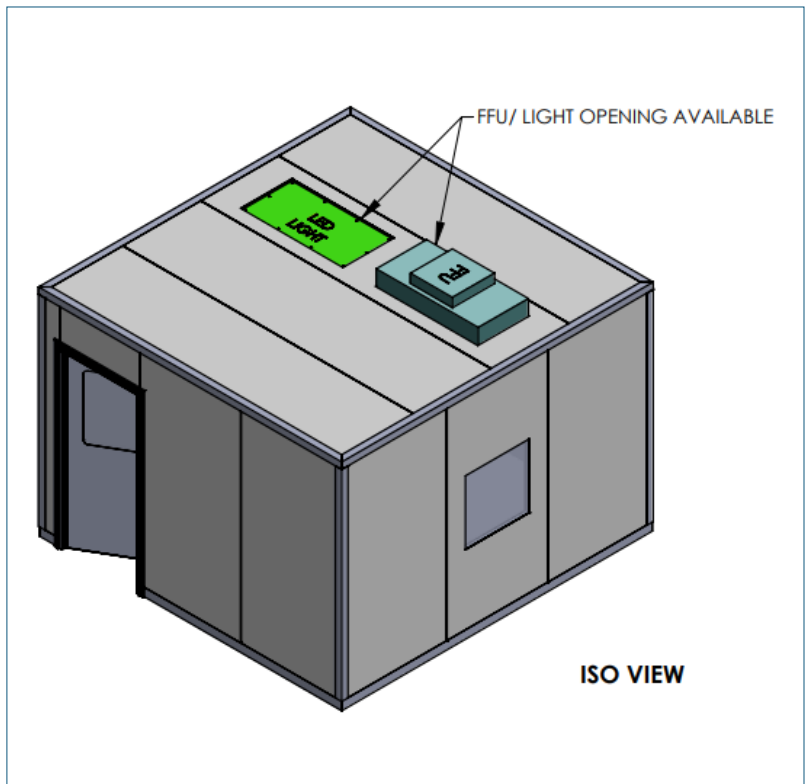
	DESCRIPTION
01	Extrusion, Aluminum, Honeycomb Frame, 2" x 2", 47.375" Long
02	Extrusion, Aluminum, Honeycomb Frame, 2" x 2", 95.35" Long
03	Panel, Pre-Coated Galvanized Steel, 26 GA, 47.3351" x 95.31"
04	Panel, Honeycomb Core, 43.375" x 91.35" x 2"



Walkable Ceiling System

Terra's BioSafe® Hybrid Modular Ceiling System is composed of the same pre-engineered, pre-fabricated panels featured in our BioSafe® Hybrid wall system, ensuring seamless wall-to-ceiling integrations. The ceiling panels are available with standard cutouts for HEPA-filtered fan units, lighting, sprinkler heads, video cameras, fire alarms, electrical drop, and gas penetrations. The entire ceiling system is walkable, allowing for easy access to equipment installed above the cleanroom and streamlined maintenance operations, such as HEPA filters change-outs. The ceiling panels maintain a flush, seamless surface for easy wipe-down or spray-down. The ceiling system is self-supported or suspended using a turnbuckle and hanger assembly, eliminating the need for a t-grid structure. The ceiling panels meet cGMP, GLP, ISO 14664-1 and ASTM standards.

- Panel Size: **4' wide x 8' tall x 2" thick**
- Core: aluminum honeycomb
- Shell: uPVC laminated steel
- Fully Walkable
- Cut-outs for FFUs, lights, sprinklers, HVAC
- Self-supported or suspended from facility ceiling
- Smooth, flush finish for easy spray-downs
- Seamless wall-to-ceiling integrations
- Non-flammable



BioSafe® Modular Hybrid Cleanroom: Features

Walkable Ceiling System

- Ensures a level and flush interface between wall and floor
- Height adjustable to accommodate flooring undulations
- Two piece system includes base channel and panel interface
- Compatible with BioSafe® Hybrid wall panel extrusion
- Optional coving pieces available
- Affixes directly to facility flooring with minimal hardware
- Robust, durable and built for long-term use



Pre-Formed Corner Pieces

- Joint-free assembly eliminates cracks and crevices
- Removes the requirement for surface flashing or capping
- Single-piece construction ensures air-tight system
- Optional coving pieces available
- Streamlines cleaning protocols



Cleanroom Windows

- Select from BioSafe® uPVC and stainless steel-framed systems
- BioSafe® design eliminates crevices where microbes colonize
- Windows mounts flush to the cleanroom wall
- CleanMount® design installs in less than 5 minutes
- Innovative clamping design eliminates drilling and hardware
- Choose from single-pane or double-pane systems
- Popular sizes are stocked for immediate shipment
- Compliant with ISO 14644-1 and cGMP standards
- Specialty fire-rated and smart-glass designs available
- All models include a 0.5" thick tempered glass pane
- Durable, robust, and built for long-term use



Cleanroom Doors



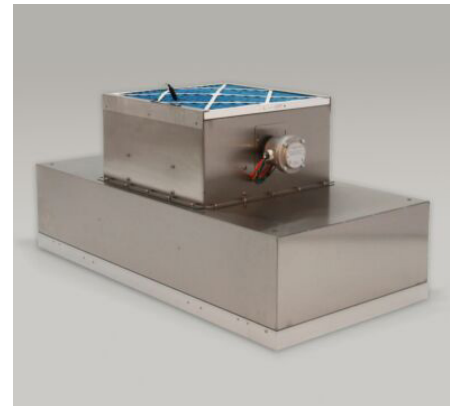
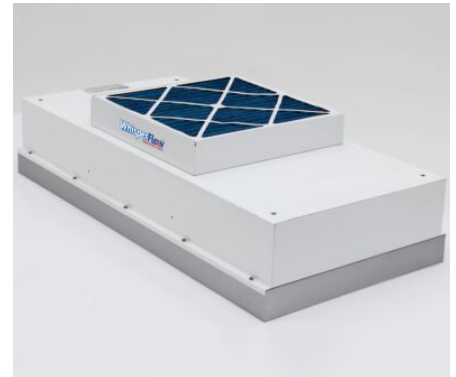
- Choose from manual and automatic designs
- Select sliding, swing-out, bi-parting and roll-up doors
- BioSafe® doors mount flush to the cleanroom wall
- Popular sizes and styles stocked for immediate shipment
- Compliant with cGMP, GLP, ASTM and ISO standards
- Pre-hung designs streamline installation
- Specialty fire-rated and high-speed systems available
- Interlocking systems available for GMP spaces
- Hermetically-sealed models available for BSL-rated areas
- Stocked units feature full-length or partial windows
- In-house engineering staff creates customized designs
- Select from left-swing or right-swing orientations

Pass Through Chambers



- Select from wall-mount or floor-mount models
- BioSafe® units feature rounded corners and autoclave-safe doors
- Smart units include an array of optional upgrades
 - HEPA Filtration
 - Refrigeration
 - UV Sterilization
 - Automatic, hands-free doors
 - Key Card Readers
 - Biometric Scanners
- All units include interlocks to prevent cross-room contamination
- CleanMount® systems install flush to the cleanroom wall
- CleanSeam™ units eliminate crevices where microbes colonize
- Popular models in stock for immediate shipment

Filter Fan Units



- UL-listed, ISO-rated, and CE-marked
- Thousands of units stocked for immediate shipment
- Choose from room-side and top-side replaceable systems
- Select from energy saving EC and standard AC motors
- HEPA and ULPA filtered models
- Wide selection of specialty configurations
 - Battery powered
 - Integrated LED light and ionizer
 - Explosion-proof (Class 1/ Division 1)
 - Reverse flow
 - Laminar flow terminal diffusers
 - Low profile and narrow footprint designs
 - GMP-compliant stainless steel models
- Optional audible filter replacement alarm system

TERRA UNIVERSAL

Tel: +1 (714) 578-6100 or Email: info@terrauniversal.com



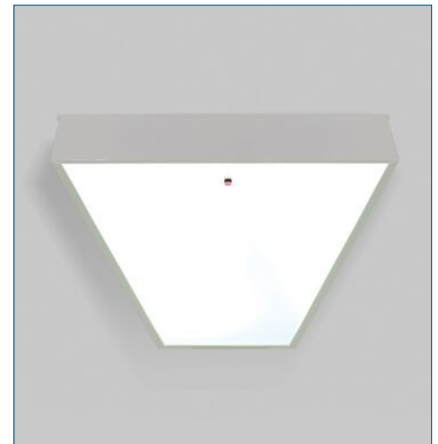
UL-Listed Cleanroom Control System

- Powers complete network of FFUs, lights, duplex outlets
- Scalable, plug-and-play system completely eliminates hard wiring
- Streamlines room permitting, compliance and certification
- Optimizes cleanroom relocation, maintenance and filter replacement
- Supports rapid cleanroom installation for time-sensitive projects
- Significant cost savings compared to standard, hard-wired systems



Cleanroom Lighting

- UL-listed, ISO-rated LED panels stocked for immediate delivery
- LED lights reduce cooling costs, exhibit longer life spans
- Choose from white, amber, red and blue colors
- Battery-powered LED emergency lights available
- Germicidal UV lighting available for GMP, biologics applications
- Teardrop and strip lighting for ISO class 4 and 5 environments



Additional Cleanroom Accessories

- GMP-compliant covered flooring
- HVAC and modular air conditioning systems
- Fire suppression and sprinkler systems
- Cleanroom intercoms, talk through panels, and phone systems
- Bumper rails and crash guards
- Air showers, personnel air locks and equipment air tunnels
- Access controllers: Biometric key cards readers, fingerprint scanners, and iris scanners
- Gowning room furnishings: sinks, benches, mirrors, dispensers, waste bins, hampers
- Storage solutions: garment racks, ISO-rated cabinets, bootie racks, high-security cabinets
- Process furniture: work stations, tables, work platforms, ladders
- Critical environments: fume hoods, glove box isolators, laminar flow benches, biosafety cabinets
- Cold storage: refrigerators, freezers, cryogenic systems

Controlled Environmental Rooms

GMP-Compliant Cold Rooms

- Ranging from small walk-in refrigerators to high-capacity coolers
- Validated cold rooms maintain temperature range of 2° - 8°C
- Walk-in freezer rooms maintain temperature range of -12° to -20°C
- GMP-compliant systems meet grade B, C or D classifications
- HVAC systems with building management integrations
- Full mapping and validation services available



Explosion-Proof Environmental Rooms

- Adheres to NEC Class 1/Division 2 requirements
- Includes potted fittings and steel conduit for electrical components
- Features NEC-rated control switches, lighting, FFUs
- Explosion-proof power distribution module includes relays, breaks
- Choose from FM-rated stainless steel, FRP or C-PVC panels
- Optional ionizers prevent static charge build-up



ICH Stability Testing Rooms

- Maintain temperature ranges from 25°C to 40°C
- Maintain humidity levels from 30% to 75% RH
- High degree of accuracy, stability and reliability
- Ramp rates up to 5°C per minute
- Available with air-cooled or water-cooled condensers



Dry Rooms

- Designed for lithium and EV battery testing and processing
- Maintains humidity levels below 0.5%
- Adheres to ISO 14644-1 requirements for class 6 – 8 spaces
- Maintains dew points from 0°C to -40°C
- Start-up, commissioning, and service training available



BioSafe® Modular Steel Cleanrooms

Terra's [BioSafe® modular all-steel systems](#) meets cGMP, GLP, and BSL-1 requirements. Each wall section is composed of two steel panels that snap together, with space in between for utilities, insulation and HVAC connections. Wall sections are interlocked, end to end, to form a continuous interior surface with very fine seams that are caulked to form a complete seal. Wall panels are fitted with flush-mount windows, entry and exit doors, and pass through chambers. Air exhaust vents connects to an exterior plenum that directs air into recirculating ducts or the facility exhaust system. An all-steel ceiling grid is equipped with steel HEPA-filtered fan units, LED lights, and ceiling tiles, caulked to ensure an airtight seal.



- Double-wall steel panels with rounded corners
- Smooth surfaces maintain aseptic conditions
- Modular construction accommodates customized floorplans
- Completely free-standing structure
- Wall panels bolt together for fast assembly
- Meets cGMP, GLP, BSL-1, USP <797> requirements
- Automated controls for cleanroom air balancing
- All-steel ceiling grid with steel filter fan units, ceiling tiles



Additional Projects





**SHOP TERRA UNIVERSAL
CLEANROOMS & EQUIPMENT**



+1 (714) 578-6100



info@terrauniversal.com

