ENGINEERING DIRECTORATE

ECBC ENGINEERING

Design→Build→Test→Support

ENGINEERING TEST CAPABILITIES

U.S. ARMY RDECOM

EDGEWOOD CHEMICAL BIOLOGICAL CENTER

A U.S. Army RDECOM Laboratory

INTRODUCTION

Edgewood Chemical and Biological Center (ECBC) Engineering has the expertise and infrastructure to test product performance in surety and non-surety environments. Engineering's unique chemical agent facilities and highly skilled personnel test products against a variety of dangerous and toxic compounds. Engineering conducts non-surety product testing in accordance with MIL-STD and ASTM standards. Representative test environments are created to allow user interface for the purposes of logistics demonstrations, human factor evaluations and proper equipment employment. Engineering offers a full range of test services for non-Department of Defense (DoD) entities under test service agreements (TSA). These TSAs can be used to evaluate commercial and military equipment. Results from the tests are provided to the design team for continuous product improvement.

Mission: Conduct Chemical Biological (CB) commodity area lifecycle testing, including technology development, in support of engineering and manufacturing development and production.

Core Competency: Hands-on chemical warfare agents, novel threat agents, toxic industrial chemical and simulant testing.

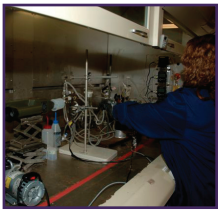
Capability: Bench scale to systems testing in a laboratory, chamber and range setting. Individual and collective protection, contamination avoidance and decontamination materials, component and systems testing.

Customer Base: Joint Program Executive Office for CB Defense (JPEO CBD), Joint Project Managers (JPM), Product Director Test Equipment Strategy and Support, Joint Science and Technology Office, First Responder entities and CBD private sector.

CHEMICAL WARFARE AGENTS, NOVEL THREAT AGENTS AND TOXIC INDUSTRIAL CHEMICALS

APPLIED DETECTION TECHNOLOGY

ECBC Engineering's detector evaluation involves testing with chemical agents and toxic compounds in a wide range of environmental conditions. Detector evaluation testing is ISO 17025 accredited.



Capabilities

- Lab-based, portable and/or kits detection system evaluations
- Liquid, aerosol, vapor and solids testing using chemical warfare agents (CWAs), novel threat compounds and toxic industrial chemicals (TICs)
- Military lifecycle, Commercial-off-the-Shelf (COTS) and prototype detection
- Environmental conditions (e.g., temperature and relative humidity)
- Lab and field testing using various interferents
- Ultra-trace to high level concentrations
- Analytical Detection Methodology Development
- Approved customers may be present during testing for real-time adjustments to detector parameters

Equipment

- Gas Chromatographs (GC) (FPD, FID, PFPD and XSD) including MINICAMS®
- Ultra Violet/Visual (UV/Vis) Spectrophotometer
- Patented Vapor Generation System
- Three 100-ft^3 environmental chambers
- Sixteen surety-approved fume hoods, walk-in hoods and glove boxes

QUALITATIVE PERMEATION TESTING

ECBC Engineering permeation testing capabilities allow for the testing of chemically protective semi-permeable and impermeable materials. All permeation testing is ISO 17025 accredited, and complies with military standards and specifications.

Capabilities

- Qualitative testing of chemical-protective materials against nerve and blister agent, liquid and vapor challenges
- First article and acceptance testing
- Individual and collective protection application

Equipment

- Q170 System – Congo red paper (blister agents) and M8 Paper (nerve agents)
- Q171 System – Glass cups/Fruit flies (nerve agents)
- Aerosol, Vapor and Liquid Assessment Group (AVLAG) cells and glass cups

QUANTITATIVE PERMEATION TESTING

ECBC Engineering manages quantitative permeation testing. Quantitative permeation testing tests chemical warfare agents, novel threat compounds and toxic industrial chemicals. This includes the testing of military commercial and unique protective materials. Quantitative permeation testing is ISO 17025 accredited.

Capabilities

- Quantitative testing of materials against liquid and vapor challenges
- Permeating testing per TOPs 8-2-501, MIL-STD 282, and ASTM 739
- Novel method development to meet novel challenge and more stringent operational testing requirements
- Unique permeation test hardware design
- Near-real-time and offline analyses under challenging test conditions

Equipment

- AVLAG System
- DAWSON Cups System
- Three 12-port permeation manifolds
- GC
- MINICAMS®

ADSORBENT AND FILTER (CHARCOAL) TESTING

ECBC Engineering's charcoal testing has been conducted at ECBC for more than 75 years. Due to the threat and use of chemical agents, testing the integrity of charcoal for protective materials and filters is one of ECBC's primary missions. Charcoal testing is ISO/IEC 17025 accredited and complies with Military Certification Testing.

Capabilities

- Gas life charcoal adsorbent and respirator canister/ filter penetration testing
- Challenge materials - Dimethylmethylphosphate (DMMP), hydrogen cyanide (AC), phosgene (CG) and cyanogen chloride (CK)
- Physical property testing including density, moisture, particle size and hardness
- Production lot acceptance and military specification testing
- Certification, first article and developmental testing
- Surveillance testing of in-service items

Equipment

- GC with FID and FPD
- IR and ICP spectrometers

SIMULANT AGENT RESISTANT TEST MANIKIN AGENT TESTING SYSTEM

ECBC Engineering's Simulant Agent Resistant Test Manikin (SMARTMAN) agent testing enables the laboratory to simulate human breathing, and provide a more realistic respirator system challenge. SMARTMAN testing is ISO 17025 accredited and complies with National Institute for Occupational Safety and Health/ Center for Disease Control and Prevention (NIOSH/ CDC) Certification, Homeland Security Certification and National Institute of Standards & Technology (NIST) Certification Testing.

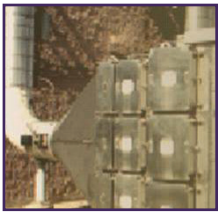
Capabilities

- Agent and industrial chemical testing of complete mask/respirator systems
- Targets system penetration and permeation
- Vapor and liquid challenge testing sarin (GB) and mustard (HD)
- Developmental testing
- First article performance testing
- Validation and certification testing

Equipment

- SMARTMAN headform
- MINICAMS® detects breakthrough
- Photoacoustic
- MIRAN® challenge referee

LARGE-SCALE AGENT AND EXPLOSIVE CHAMBERS



ECBC Engineering's large-scale agent and explosive chambers are designed for total containment in the testing of chemical-related equipment (military and industrial) and explosive, toxic and munitions materials.

Capabilities

- Chemical agent (CA) liquid, aerosol and vapor
- Explosive dissemination of CA; CONUS unique
- Two cylindrical (32' diameter x 20'), 16,000 cubic foot test volume
- Vehicle access door and 19 access ports
- Multiple sampling and control systems
- Personnel Reliability Program (PRP) Category I trained in chemical agent handling, explosives and hazardous operations
- Supporting sample preparation and analytical laboratory

Equipment

- 5,000 cubic feet per minute (cfm) Chemical, Biological and Radiological (CBR) filtration systems
- 10,000 gallon hazardous waste storage
- 500 gallon decontamination solution storage
- Operations control room
- Cadre controlled egress

ANALYTICAL CAPABILITIES

ECBC Engineering's analyses in complex matrices include chemical agents and toxic industrial compounds. Testing of trace-level analytes in complex matrices is ISO 17025 accredited.

Capabilities

- Chemical surety and non-surety agent analysis
- Chemical compound rapid screening
- Sampling and analytical method development
- Near-real-time and offline analyses under challenging test conditions
- Quality control procedures and systems

Equipment

- Liquid Chromatography + Mass Spectrometry (LC-MS), GC, DFPD, automatic continuous environmental monitoring and a mass selective detector
- Research grade Varian GC with four detectors
- Gas, liquid and ion chromatographs, and mass spectrometers
- 50 sample autosample
- Sorbent sampling tubes and flame ionization detector
- Thermal desorption system
- Tenax TA 60/80 absorbent
- Perkin Elmer automatic thermal desorption systems
- Perkin Elmer autosystem GC
- Zebron ZB-1 capillary column
- Parker-Hannifin nitrogen, hydrogen and zero air generators

AGENT SIMULANT TESTING

RESPIRATOR AND ENSEMBLE FIT

ECBC Engineering's protection factor testing facility is designed to evaluate chemical protective capabilities of respirator systems, such as masks and protective clothing, targeting respirator seal leakage. Testing, such as respirator and ensemble fit testing, that occurs in the protection factor test facility complies with the standards of the Joint Service Standardization Agreement for Fit Factor Testing in the NIOSH, Biological, Radiological and Nuclear Certification Testing.

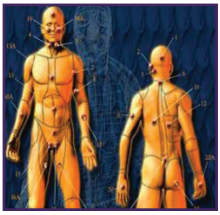
Capabilities

- Protection factor/fit CB simulant testing with corn oil aerosol
- Volunteer human subjects
- User performance testing (e.g., evaluations and obstacle courses)
- Typically eight individuals; 10 exercises and two trials

Equipment

- 10' x 16' x 32' aerosol and environmental fogging chamber
- Laser photometers
- M41 PortaCounts
- Updated data acquisition system

MAN IN SIMULANT TESTING



ECBC Engineering's Man in Simulant Testing (MIST) is the preferred method of determining the overall protection factor of chemical, biological, radiological and nuclear protection equipment to be used for protection against chemical warfare agents.

Capabilities

- Perform MIST Protection Factor technology development and performance screening of suit ensemble
- Vapor challenge testing with Methyl Salicylate (MeS)
- Approved Human Use Protocol and Standing Operating Procedure

Equipment

- Chamber - 40' L x 20' W x 14' H
- Five-stage clean room with overpressure
- Automated vapor generation system
- Foxboro miniature infrared gas analyzer (MIRAN®)
- Automated GC monitoring system (MINICAMS®)
- Data acquisition system
- Analytical lab utilizing GC systems

LARGE-SCALE SIMULANT CHAMBER

ECBC Engineering's large-scale simulant chambers meet diverse testing requirements in order to accept various generation, dissemination and sampling systems.

Capabilities

- CB agent simulant aerosol and aerosol countermeasure testing
- DMMP/Bacillus globigii
- Secondary contaminant

Equipment

- Chamber - 14,800 ft^3 test volume; 20' x 20' x 36' height
- Control system and high output simulant aerosol generation system
- 3,000 cfm filtration system and sampling system
- Turbulent mixing fans
- Wash down capable with bleach and/or water
- 2,500 gallon holding tank and sump

LARGE-SCALE WATER TEST LOOP SYSTEM

ECBC Engineering's large-scale water test loop system is used to evaluate models and sensors to predict the behavior of and detect CB agent simulants in various water systems. The large-scale water test loop system is the result of a partnership with the U.S. Environmental Protection Agency, National Homeland Security Research Center and the Army Corps of Engineers – Construction Engineering Research Laboratory.

Capabilities

- Testing of CB agents and simulants in a simulated water distribution system
- Real-time monitoring of water quality parameters

Equipment

- 1,300-gallon large loop
- 250-gallon small loop
- Commercially available water sensors
- Analytical lab for results analysis

COLLECTIVE PROTECTION EVALUATION

ECBC Engineering performs static agent vapor simulant, entry/exit and pressurization testing on a wide range of Chemical Biological Radiological and Nuclear (CBRN) equipped shelters, vehicles, Heating Ventilation and Air Conditioning (HVAC) systems, and environmental control units.

Capabilities

- Static challenge testing
- Entry/exit testing
- Pressurization testing
- Purge testing
- Leakage testing
- Simulant Concentration: 1 to 100 mg/m^3
- Chamber Pressure: 0 to -0.5 inches water gauge (iwg)
- Air Flow: 0 to 1200 cfm Negative Pressure – 0 to 5,000 cfm Purge fan

Equipment

- Chamber - 11,000 ft3 test volume; 40' x 20' x 14 ' height
- Chamber - 48' L x 32' W x 20'
- Five-ton capacity A/C unit
- ATI aerosol generator TDA-4B
- ATI particulate detector TDA-2EL
- Air flow instrumentation and data acquisition

FIXED SITE SYSTEM AND IN-PLACE FILTER TESTING

ECBC Engineering performs systems testing in support of laboratory, fixed site facilities and vehicular platforms. Fixed site and in-place filter testing complies with ASME N510, ASME AG-1 requirements, and DOE-STD-3020-97 requirements.

Capabilities

- Facility and laboratory in-place CBRN filtration systems
- Facility/system certification and airlock tests
- Filtration systems performance requirements development
- Filtration systems concept development, design, prototype, integration, production, installation and testing
- Test protocol and standard operating procedure development

Equipment

- Mobile testing platform
- Aerosol generators and detectors
- Tracer gas monitor and Computer-aided Design (CAD)/SolidWorks

STANDOFF DETECTION TEST FACILITY

ECBC Engineering's vortex chamber is a unique facility that allows performance measurement of standoff detection systems at significant distances. The vortex chamber allows researchers to release a known amount of material and maintain a calibrated material scatter so that a standoff detector's ability to "see" can be accurately measured from up to several kilometers away.

Capabilities

- Up to 15 minutes of homogeneous aerosol suspension and up to 200 micrometers (diameter) of wet or dry aerosol generation
- Chambers capable of closed or open windows and aerosol clearing in minutes
- Ground Truth nephelometer data
- Homogeneous aerosol distribution
- Biological Level-II upgrade-capable
- 20' path, isokinetic sampling, air curtain technology and 4' x 4' aperture

Equipment

- Stainless steel lining, windowless vortex chamber and aerodynamic particle sizers

ENVIRONMENTAL, CLIMATIC AND HARSH ENVIRONMENT TESTING

ECBC Engineering personnel can simulate any environmental stress condition that today's Warfighter could experience. These tests help determine how products and materials perform under extreme environmental conditions. Climatic and harsh environmental testing complies with Military Standard 810G Test Standards and the American Society for Testing of Materials Test Standards.

Capabilities

- Extreme climatic and environmental condition simulation; MIL STD 810G
- Perform lifecycle environmental tests
- Perform accelerated aging tests
- Specialized test setups (e.g., video and test documentation)
- Computerized analog and digital data acquisition, and control development
- Data acquisition and analysis of environmental factors

Equipment

- Chambers – temperature/humidity, salt fog, sand/dust, solar radiation, altitude, hot environmental, cold environmental and rain
- Walk-in chambers - six temperature/humidity
- Mobile chambers - four mobile trailers/climatic

SHOCK, VIBRATION AND ROUGH HANDLING TESTING

ECBC Engineering's shock, vibration and rough handling tests are performed on various military and commercial products in a safe and environmentally-friendly manner. All testing complies with the American Society for Testing of Materials Test Standards and Military, Federal and Commercial Test Standards.

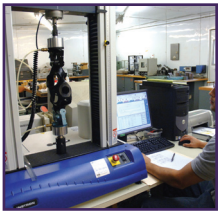
Capabilities

- Secured steady state or transient vibration and loose cargo transportation vibration
- Shock and packaging tests
- Specialized test setup development
- Computerized analog/digital acquisition and control development
- Video for test documentation
- Temperature conditioning

Equipment

- Unholtz Dickie vibration control systems
- Loose cargo transportation simulator
- 40', 6' and 5' drop tester, and compression and side impact testers

PHYSICAL PROPERTIES TESTING



ECBC Engineering's material evaluation testing is conducted to determine specific properties of test materials and products. Items range from High Efficiency Particulate Air (HEPA) media and butyl coated cloth to grenade pins and CBRN suits. ECBC Engineering conducts testing in accordance with (IAW) the American Society for Testing and Materials (ASTMs), Military, Federal, and Commercial test standards and also conducts custom testing.

Capabilities

- Test types: tensile, compression, hardness, abrasion, ash content, burst strength, water repellency, stiffness, brittleness, puncture propagation, tear resistance, cold crack, hydrostatic resistance, precision weight, colorfastness, blocking, specific gravity, etc.
- First article, production and surveillance testing of materials and products
- Customized test plans and test reports

Equipment

- Instron tensile testers
- Q-Test equipment

HAZARDOUS AND NON-HAZARDOUS PACKAGING TESTING

ECBC Engineering's hazardous and non-hazardous testing occurs on-site at the Edgewood and Rock Island test sites. ECBC Engineering's testing facilities are capable of testing for a large variety of packaging concerns, and tests are designed to subject packages to a sequence of anticipated hazard elements experienced during a military distribution cycle.

Capabilities

- Air and surface transport simulation
- Prototype and pre- and post-production testing
- Surveillance and re-design specification development
- Specialized test plan development
- Packaging, shock, manual/mechanical handling, and warehouse and vehicle stacking tests
- Loose and secured load transportation vibration
- Video for test documentation
- Temperature conditioning
- Package conformance testing

Equipment

- Low and high frequency vibration and multiple axis simulation tables
- Tension compression, hydrostatic, compression, helium mass spectrometer leak, package leak and USON vacuum leak testers
- Incline plane
- A-frame hoist with drop test release mechanism
- 6' and 5' drop tester and side impact and compression testers
- Temperature, rain and humidity environmental chambers
- Loose cargo transportation simulator

RESPIRATOR TESTING

ECBC Engineering performs first article, product qualification, production and surveillance work for commercial and government customers.

Capabilities

- Mask gas filter life testing with DMMP
- Mask filter aerosol penetration efficiency with Public Affairs Office (PAO)
- Mask leakage, breathing and drink resistance
- Dimensional inspection of craftsmanship
- Environmental and mechanical tests

Equipment

- Q223 DMMP gas life tester
- TDA 100P aerosol penetrometer
- Government approved mask leakage and Q-Testers such as M14, Q179, and Q213
- Environmental chambers
- Ozone chamber
- Oxygen vessels

PRODUCTION EVALUATION

ECBC Engineering conducts performance tests on various types of gas and HEPA filters and CBRN systems in compliance with MIL-STDs, ASME N510 and ASME AG-1 requirements.

Capabilities

- Perform gas filter life testing on: M12, M18, M48A1, M49, M98 filter set, HSFC, Type II Trays and Gas Phase Adsorber Cells using DMMP
- Perform HEPA filter aerosol penetration efficiency testing and resistance to pressure testing
- Perform ASME AG-1 Qualified Product List (QPL) qualification testing of HEPA filters and media
- Perform prototype evaluation, FAT, product lot acceptance, and surveillance testing IAW DoD MIL-STDs and Commercial specifications.
- Manage the QPL database for DoD, DOE and Commercial Customers

Equipment

- Q262/Q223 DMMP Gas Life Tester for CP and IP
- Q242 DMMP Gas Life Tester for Recirculation Filters
- Q233 Low Flow HEPA Filter Efficiency Tester
- High Flow Alternate Test System (HFATS) HEPA Filter Efficiency Tester
- Q160 Wet Overpressure Tester
- Q110 Filter Rough Handler
- Environmental Chambers

DIMENSIONAL ANALYSIS

ECBC Engineering conducts physical evaluations of a variety of products, ranging from mechanical parts and filters to installation housings. This work has been performed for agencies such as the DoD, NIST, and Occupational Safety & Health Administration (OSHA).

Capabilities

- Dimensional analysis of nearly any item
- Measurements in the Accuracy of 0.00001/inch

Equipment

- J&L optical comparator
- 4'x 8' grade "A" granite surface plate
- Trimos height gauge
- Nikon measuring microscope
- Nikon viewing scope
- Bore scope
- Material polishing station
- Compression and tensile testers
- Coordinate measuring machines
- Profilometer
- Paper micrometers
- Extensive library of calibrated hand tools and gages

EXPLOSIVE INTERFERENT SIMULANT AND GROUND TRANSPORTATION TESTING

ECBC Engineering's experienced personnel perform specialized environmental and field testing of military and commercial products on multiple test facilities at Edgewood and Rock Island test sites.

Capabilities

- Interferent, pre- and post-production testing
- Specialized test plan development
- Explosive, munitions, obscurants, and visual and infrared generation tests
- Simulation of ground transportation and collision of items, and Stevedore operations for lifting cargo into ships
- Prototype inspection and testing

Equipment

- Modern digital and analog data acquisitions systems
- Wash board course; Rail tie hazard course; Rail impact test area; 30-mile on-site road course; 40-foot drop test area; 300' x 300' concrete staging pad; weather station
- "L"-shaped vertical firing grid with one meter survey points and 20m x 15m sides
- Simulation of multi-road courses indoors
- Air and ground transport

RELIABILITY, AVAILABILITY AND MAINTAINABILITY ENGINEERING AND TESTING

ECBC Engineering provides Reliability, Availability and Maintainability (RAM) expertise in requirements, acquisition policy, system development, reliability testing and analysis for various Joint Service Acquisition Programs.

Capabilities

- Design and conduct reliability and reliability growth tests for Research and Development (R&D) prototypes or acquisitions systems
- Design and conduct reliability testing for DT, FAT and Production Qualification Test (PQT)
- Provide Joint independent Logistics Assessments (JILA) for RAM/Design Interface for PMs prior to Milestone Decision Reviews (MDRs)
- Develop reliability program plans, system hardware and software reliability modeling, Failure Mode Evaluation and Criticality Analysis
- Support the Joint Program Manager (JPM) in developing Failure Definition and Scoring Criteria (FDSCs) and RAM scoring conferences for critical Milestone tests
- Develop and evaluate Environmental Stress Screenings (ESS)
- Support the RDECOM Test and Evaluation (T&E) Managers Committee and Reliability Focus Committee in T&E and RAM acquisition policies

ENGINEERING DIRECTORATE

The Engineering Directorate operates under the auspices of the Edgewood Chemical Biological Center (ECBC). The Directorate has over 600 people with the main offices located on the Edgewood Area of Aberdeen Proving Ground, Md. with additional personnel stationed at Rock Island, Il. Additionally, Engineering Directorate personnel directly support the Joint Project Managers under the Joint Program Executive Office for Chemical and Biological Defense (JPEO CBD), as well as numerous other government organizations.

Our Engineering Team drives technology transition from research to engineering development and transitions materiel from engineering development through production, fielding and sustainment. Our highly trained workforce is committed to responsive customer service and is knowledgeable about current and evolving technology and capabilities worldwide. **We use our unique infrastructure, engineering expertise and lifecycle services to solve chemical and biological (CB) defense challenges for the Warfighter and Homeland.**

MISSION

Provide unique infrastructure, engineering expertise and lifecycle services to solve Chemical and Biological challenges for the Warfighter and the Homeland.

VISION

First Stop for Chemical and Biological Defense Solutions.

EDGEWOOD
CHEMICAL BIOLOGICAL CENTER
Since 1917–A Tradition of Solutions

ECBC is the principal research, development and engineering center for non-medical chemical and biological defense. ECBC is an organizational element of the Army's Research, Development and Engineering Command, which reports to the Army Materiel Command. ECBC develops technology in the areas of detection, protection and decontamination and provides support over the entire materiel lifecycle—from basic research through technology development, engineering design, equipment evaluation, product support, sustainment, field operations and disposal.

ECBC ENGINEERING
Design→Build→Test→Support

The Edgewood Chemical Biological Center Engineering Directorate is here and available to assist you with Design, Build, Test & Support Solutions for Chemical and Biological Defense Needs.

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