

ENGINEERING DIRECTORATE



ENGINEERING TESTING CAPABILITIES & SERVICES



MESSAGE FROM THE DIRECTOR



The U.S. Army Edgewood Chemical Biological Center (ECBC) Engineering Test Group makes crucial contributions to the Department of Defense (DoD). For years we have worked to protect our warfighters from Chemical Biological (CB) agents in combat, provide aid against the War on Terrorism and defend against weapons of mass destruction.

We are organized for full CB lifecycle support and perform testing for the detection, protection and decontamination of commodity areas. Execution of bench to large-scale testing for the DoD, other government agencies and the private industry is possible because of our unique hands-on subject matter expertise, infrastructure, equipment and instrumentation.

This handbook presents a summary of the many services that ECBC can offer to customers. Our wide range of capabilities are supported by over 10 facilities located both at Aberdeen Proving Ground-Edgewood Area in Maryland and Rock Island Arsenal in Illinois. The facilities house a wide variety of laboratories and test chambers which are run by engineering test teams comprised of personnel from an array of disciplines. Our teams cater to all test requests including those from the DoD, Department of Energy (DoE), NATO, the commercial sector and are International Organization for Standardization (ISO) 9000 and 17025 compliant. Moreover, our test program is operated under the terms of the ECBC Quality Assurance Policy, which ensures that we consistently deliver work of the highest caliber to our nation.

ECBC has been committed for over 90 years to discovery, innovation and responsiveness in the CB arena. The ECBC Engineering Test Group follows that tradition by working closely with clients and partners to design and deliver custom test programs that allow our customers to make knowledgeable decisions based on the best available test data.

A few of our recent accomplishments are described at the end of this handbook. Such accomplishments would not have been possible without the committed cooperative efforts between ECBC and our customers in the Joint Program Manager Offices, the Joint Program Executive Office for Chemical and Biological Defense, the Defense Threat Reduction Agency, the Joint Science Technology Office, the DoD and OGAs.

Our pledge is to bring the highest quality service and remain a reliable source of testing for the defense of our nation. At the ECBC Engineering Test Group, our commitment to leadership in the CB arena ensures that clients have access to industry-leading expertise and the latest technological advances. Our staff will work closely with you in order to provide you with efficient service to meet your needs and requirements. On behalf of the experienced and dedicated workforce in the Engineering Test Group, I hope you will allow us the opportunity to serve you as well.

Sincerely,

Alvin D. (AJay) Thornton
Director, Engineering Directorate

RDECOM and ECBC are key partners in the Joint Team to fulfill responsibilities to national security. We will continue to increase the relevance and readiness of our operating an institutional force through planning, preparation and execution of actions aimed at rapidly implementing necessary and positive change.



ECBC ENGINEERING
Design→Build→Test→Support

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BACKGROUND INFORMATION



BACKGROUND INFORMATION ABOUT ECBC ENGINEERING DIRECTORATE

ECBC is the nation's 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 (RDECOM), which reports to the Army Materiel Command (AMC). ECBC develops technology in the areas of detection, protection and decontamination, and provides support over the entire lifecycle – from basic research through technology development, engineering design, equipment evaluation, product support, sustainment, field operations and disposal.

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 entities under test agreements (TSA). These TSA's can be used to evaluate commercial and military equipment. Results from tests are provided to the design team for continuous product improvement.

ENGINEERING TEST GROUP

VISION

A recognized CB community resource for chemical agent and biological simulant lifecycle materiel testing.

MISSION

Provide chemical and biological testing services in support of the passive defense Joint Service technology and acquisition programs, and homeland security domestic agencies and the commercial sector. Provide integrated science, technology and engineering solutions to address chemical and biological vulnerabilities.

CORE COMPETENCE

Expertise in testing with chemical and biological agents at all stages of the materiel life cycle.

ORGANIZATION

Engineering Test Group Leader

- Test, Reliability & Evaluation Team
- Environmental & Field Test
- Protection Factor & Hazardous Materiel Testing
- Applied Test Team
- Protective Equipment Team

EMPLOYEES

100 engineers, scientists, technicians and specialists.

TEST INFRASTRUCTURE ASSETS

Square Footage — 200,000

Value of Physical Plant — \$80,000,000

CUSTOMER BASE

The Department of Defense, other Federal agencies and private sector.

LOCATION

Edgewood Area, Aberdeen Proving Ground, MD.

MAILING ADDRESS

Edgewood Chemical Biological Center
AMSRD-ECB-ENT
5183 Blackhawk Road
APG-EA, MD 21010 - 5424



Investment in new and modernization of existing ECBC Engineering infrastructure is vital to maintaining the capability to provide diverse and current testing services. Infrastructure acquisition highlights consist of:

- ▶ Stand-up of a toxic industrial chemical laboratory
- ▶ Vehicle static challenge simulant enclosure
- ▶ Dust chamber containment system upgrade
- ▶ Environmental climatic chamber
- ▶ Drop tester
- ▶ Loose-cargo system
- ▶ Compression tester
- ▶ Shaker displacement tester
- ▶ Data acquisition instrumentation

A 2006 facilities assessment of the chemical agent test facilities resulted in the identification and initiation of a broad scope of systems and building improvements, including:

- ▶ Toxic filtration systems for one of the unique 16,000 cubic foot toxic and explosives chemical agent chambers
- ▶ Laboratory upgrades from general chemistry to chemical agent testing
- ▶ Electrical, heating, ventilation and air conditioning maintenance and repairs
- ▶ General facilities maintenance and repairs



STANDOFF DETECTION TECHNOLOGY EVALUATION FACILITY



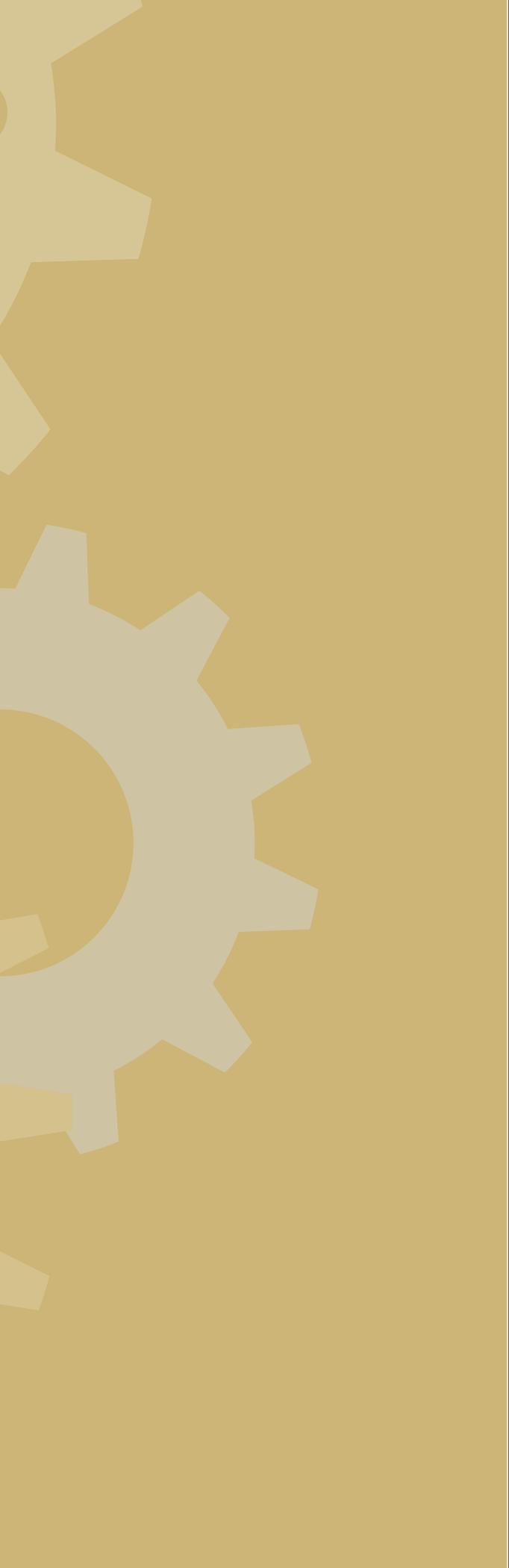
MOBILE LABORATORY



M12A1



WATER TEST LOOP



***CHEMICAL WARFARE AGENTS (CWAs),
NOVEL THREAT AGENTS, TOXIC
INDUSTRIAL CHEMICALS (TICS)***



APPLIED DETECTION TECHNOLOGY

ECBC Engineering is ISO 17025 accredited to perform detector evaluations using Chemical Warfare Agents (CWAs), Experimental Agent Compounds (EAs) and Toxic Industrial Chemicals (TICs) over a wide range of environmental conditions. ECBC Engineering is also certified by ECBC Rock Island to perform Lot Acceptance Testing (LAT) of M256A1, M18 and M34 detector kits.

Subject matter experts at ECBC Engineering have over 30 years experience with diverse chemical and surety testing in support of operational and developmental testing of military, commercial off-the-shelf and prototype detector systems. ECBC Engineering supports the national chemical defense mission by providing research and evaluation testing in our laboratory test facility to successfully complete programs and projects for the Army, Navy, Air Force and Marines individually as well as Joint Service Operational Requirements, the Department of Homeland Security, Domestic Preparedness and first responder requirements, U.S. Customs, Department of Justice, DTRA, NGIC, TSWG, PD-TESS, JPEO and other government agencies.

Our work is accomplished with a team of scientists, engineers and technicians who are focused on mission completion and customer satisfaction. ECBC Engineering holds patents for the Vapor Generation System (VGS) and various sampling techniques. Gas chromatographs and MINICAMS® are used to analyze and monitor vapor concentrations as part of vapor detector testing. Improvements to our vapor generation technology have produced our Chemical Agent Distribution Device Incorporating Electronics (CADDIE), which enables automated control of key parameters, computer generated changes to concentrations and continuous data storage of generator parameters. Liquid, vapor and aerosol testing have been explored, as requested, using CWAs, EAs and/or TICs to perform evaluations on portable and lab-based detection systems capable of ultra-trace to high level detections.

Testing can either be conducted in surety laboratory hoods or in 100 ft³ environmental chambers. The three environmental chambers enable performance of testing under various environmental conditions such as high and low temperatures. As required to meet different specifications, percent relative humidity (%RH) is a controlled parameter that can be changed at ambient, high or low temperatures. Our facilities also permit laboratory evaluations of detection systems against common battlefield, building and environmental interferences by blending agent with a potential interference under controlled conditions to observe the reactions. This allows evaluation of both false negative and false

FEATURES

CAPABILITIES

- Lab-based, portable and/or kits detection systems evaluations
- Liquid, aerosol, vapor & solids testing using chemical warfare agents, novel threat compounds, toxic industrial chemicals
- Military Life Cycle, COTS & prototype detection
- Environmental conditions -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 (FPD, FID, PFPD & XSD) including MINICAMS®
- UV/Vis Spectrophotometer
- Patented Vapor Generation System
- (3) 100-ft³ environmental chambers
- (16) surety-approved fume hoods, walk-in hoods and glove boxes

positive results. This unique feature is extremely valuable due to the restriction on open air testing of surety materials in the United States, since the ability of a detection item to perform under field operational conditions is vital to detection success. ECBC Engineering can also arrange to evaluate detectors in actual open air field tests within ECBC to supplement the laboratory findings.

Customers who conform to our visitor policy and lab requirements are permitted to witness testing during developmental evaluations of their detection systems, which can allow real-time adjustments to detector parameters and test conditions for a more flexible and beneficial test evaluation.



QUALITATIVE PERMEATION TESTING

ECBC Engineering conducts first article and production acceptance testing of chemically protective permeable and impermeable materials. ECBC Engineering also supports the Joint Service General Purpose Mask (JSGPM) and Joint Service Aircrew Mask (JSAM) development programs by testing swatches according to the National Institute for Occupational Safety and Health (NIOSH) and Technical Support Working Group testing and acceptance criteria. Samples submitted are tested with adherence to standard methods, primarily military specifications, as defined in Test Operating Procedures, American Society for Testing of Materials Test Standards and military standards such as MIL-STD-282.

The protective materials used for testing are sampled from: butyl cloth, butyl gloves, footwear, hoses, lenses, rubber slabs, gas-mask components, coveralls, Improved Toxicological Agent Protective (ITAP) suits, and chemical resistant materials and liners.

FEATURES

CAPABILITIES

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

EQUIPMENT

- Q170 System – Congo red paper (blister agents); M8 Paper (nerve agents)
- Q171 System – Glass cups/fruit flies (nerve agents)
- AVLAG cells & glass cups

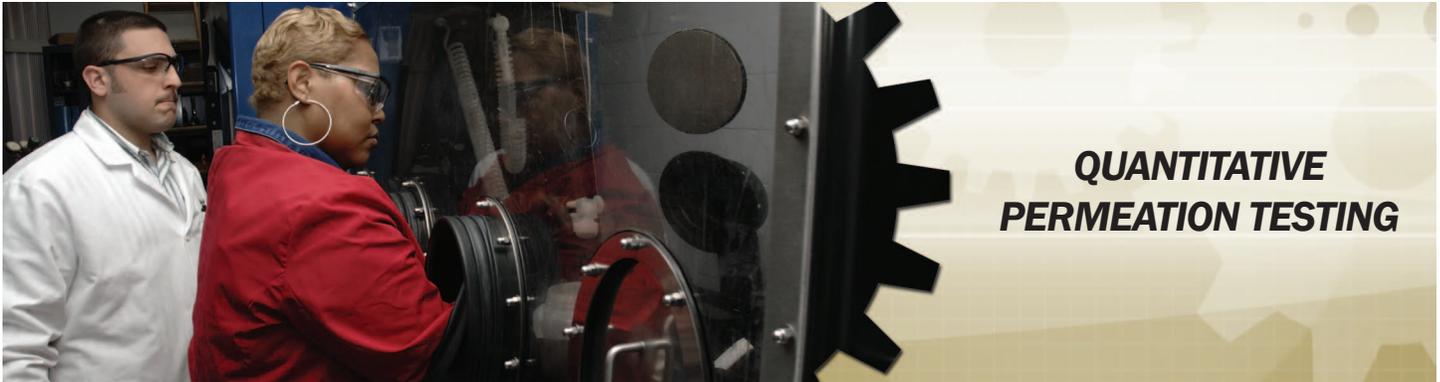
REQUIREMENTS

- Military Standards and Specifications
- ISO/IEC 17025 Accredited



PROTECTIVE MATERIALS



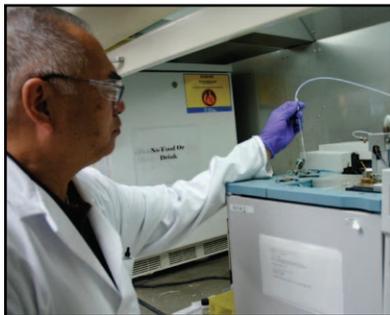


QUANTITATIVE PERMEATION TESTING



12 PORT PERMEATION MANIFOLDS

testing of commercial, military and unique protective materials. Operational testing is conducted in accordance with the TOP 8-2-501 and MIL-STD-282. Developmental testing includes more rigorous sensitivity limits, longer aspiration times, and elevated temperature and humidity. Near real-time detection of chemical agents is accomplished with a MINICAMS® or a gas chromatographic (GC) system. This unique capability minimizes agent carryover within the 12-port permeation manifold and the analytical system. The GC not only detects chemical agents in an accurate and precise manner, but it also automatically generates spreadsheet reports for easy archival and transmission to off-site customers. Temperature and humidity plots are monitored on the second scale with a computer and archived as part of the project's data package.



GAS CHROMATOGRAPH

ECBC Engineering is ISO 17025 accredited to perform permeation testing for chemical agents over a wide range of environmental conditions. Team members with over 20 years of experience conduct routine operational and developmental

FEATURES

CAPABILITIES

- Quantitative testing of materials against liquid & vapor challenges
- Permeating testing per TOPs 8-2-501, MIL-STD 282 and ASTM 739
- Novel method development to meet future/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
- (3) 12-port permeation manifolds
- Gas chromatographs
- MINICAMS®



ADSORBENT AND FILTER CHARCOAL TESTING



ECBC Engineering has been conducting charcoal testing at ECBC for over 75 years. Testing the integrity of charcoal for protective materials and filters has remained one of the primary missions of this center since the threat and use of chemical

agents debuted. The testing capabilities at ECBC Engineering has been expanded and renewed with the threat of global terrorism.

Charcoal samples and filters are analyzed using a variety of analytical techniques including: gas chromatography, infrared spectroscopy and inductively coupled argon plasma emission spectrometry. ASZM-TEDA carbon is regularly tested against military specifications and American Society for Testing of Materials Test Standards for the acceptance of product quality using toxic chemicals, chemical warfare agents and physical challenges. ECBC Engineering works jointly with other government agencies and contractors that produce charcoal filters for the United States military to certify the production process and end item integrity.

ECBC Engineering is also capable of providing production lot acceptance and service life surveillance of fielded items. Team members can support various Joint Service program and developmental program



needs. First article testing and canister certification are among ECBC Engineering's diversified capabilities. ECBC Engineering supports most of the nation's manufactured charcoal, protective materials and filter products for issuance to United States

FEATURES

CAPABILITIES

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

EQUIPMENT

- Gas Chromatographs with FID and FPD
- IR and ICP spectrometers

REQUIREMENTS

- ISO/IEC 17025 Accredited
- Military Certification Testing

soldiers and civilian personnel for protection against chemical threats. ECBC Engineering is an active and integral part of the U.S. military's protective equipment program and contributes to performance and specification publications and standards.



SIMULANT AGENT RESISTANT TEST MANIKIN (SMARTMAN) AGENT TESTING



SMARTMAN

ECBC Engineering conducts system chemical agent and toxic industrial chemical testing on complete mask systems utilizing the Simulant Agent Resistant Test Manikin (SMARTMAN®) headform. Items tested include air purifying respirators, self-contained breathing apparatus, powered air purifying respirators and escape hoods, Joint Service General Purpose Masks (JSGPM) and other aircrew masks. The Mask Testing Group works closely with customers to design and validate the certification tests and finalize the standard test protocols. Team members conduct certification tests for the NIOSH such as NIOSH certification on commercial mask systems.



SMARTMAN WITH MASK

ECBC Engineering is able to simulate human breathing under a variety of environmental conditions, such as heat and humidity, at a variety of breathing rates. ECBC Engineering also certifies that both foreign and domestic mask systems comply with current U.S. standards.

FEATURES

CAPABILITIES

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

EQUIPMENT

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

REQUIREMENTS

- NIOSH/CDC Certification Testing
- Homeland Security Certification Testing
- NIST certification testing
- ISO 17025 accredited



LARGE-SCALE AGENT & EXPLOSIVE CHAMBERS

ECBC Engineering maintains two explosive hazardous material test facilities, which are chambers uniquely designed for total containment in the testing of chemical (military and industrial) related equipment and explosive/toxic munitions/materials. The chambers have the capability for simultaneous tests of chemical warfare agents and explosives under various climatic conditions.

Each facility is equipped with an elementary neutralization system that can process up to 10,000 gallons of hazardous waste generated from testing. The facilities are currently approved to handle 170 gallons (equivalent to one-ton container) of military unique chemical material and industrial material. The facilities are also certified for one pound of explosives when combined with chemical material and two pounds of explosives without chemical material.

Explosive tests reveal the blast resistance of models and components such as motors, shields and other equipment. Tests also reveal the environmental impact of fuels and plastics should they explode, as well as the physical behavior of materials when they interact with and penetrate other objects. The on-site surety laboratory is equipped to handle all sample analysis generated from the testing. Personnel experience includes handling military unique chemicals, military munitions, hazardous industrial chemicals and hazardous waste.

FEATURES

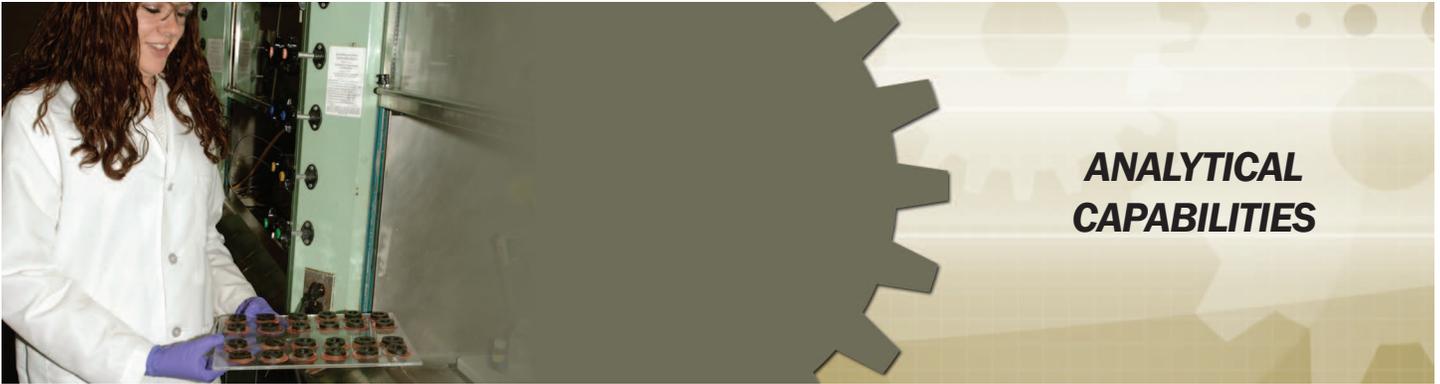
CAPABILITIES

- Chemical agent (CA) liquid, aerosol & vapor
- Explosively dissemination of CA; CONUS unique
- (2) 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) CBR filtration systems
- 10,000 gallon hazardous waste storage
- 500 gallon decontamination solution storage
- Operations control room
- Cadre controlled egress





ANALYTICAL CAPABILITIES



ECBC Engineering is ISO 17025 accredited to perform trace analyses in complex matrices. Analytes include chemical agents and toxic industrial compounds. Team members have performed trace-level analyses in caustic process residue

samples, landfill leachate samples, fuel oil, gas bag samples and soil samples. A team of chemists, engineers and technicians with over 20 years of experience routinely work with clients to develop and implement testing requirements for effective and efficient project execution. Project planning includes identifying and mitigating technical, schedule and cost risk elements early in the project. When applicable, test requirements are based upon or extrapolated from existing program requirements. This is prudent in order to foster defensibility and acceptance of project data that has unprecedented test requirements.



Analytical equipment is capable of measuring compounds of interest to pictogram levels with a variety of detectors. Robust sampling, sample clean-up, extraction and analytical protocols minimize sample matrix effects and result in accurate, precise and defensible data.

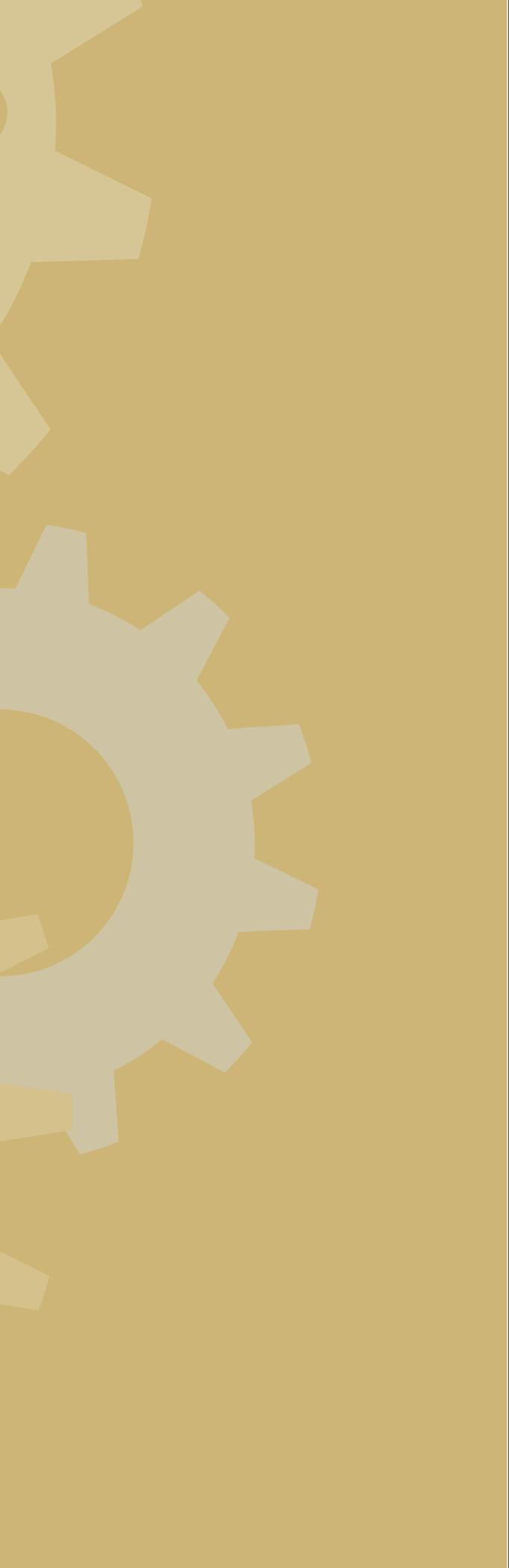
FEATURES

CAPABILITIES

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

EQUIPMENT

- LC-MS, gas chromatograph (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 gas chromatographs
- Zebron ZB-1 capillary column
- Parker-Hannifin nitrogen, hydrogen, and zero air generators



AGENT SIMULANT TESTING



RESPIRATOR & ENSEMBLE FIT



MASK FITTING

chamber containing a polydispersed corn oil aerosol challenge. The corn oil aerosol is between 0.4 and 0.6 micron in diameter and has an air concentration of 20-40 mg/m³. The air inside the protective equipment is sampled for challenge aerosol particles while the subject undergoes a series of exercises intended to evaluate worst-case operational conditions. Human performance testing is conducted to ensure comfort, fit, breathing resistance, vision and communication aptitude. There is a standard set of exercises or the customer may specify exercises

The Protection Factor/ Toxic Chambers Testing Facility is designed to evaluate chemical protective capabilities of respirator systems, such as masks and protective clothing. In order to simulate exposure to chemical agents, volunteers don test items and enter a test



TEST CHAMBER

pending approval by the Human Use Committee. Sampling is accomplished through a length of silicon tubing that is connected from the mask and/or suit to the laser photometers.

The results are graphically displayed, real-time, on a computer monitor. The facility comprises an entrance airlock and aerosol exposure chamber that can accommodate up to sixteen volunteers and is designed for flexible protocol setup.



MASK AND FILTER FIT

FEATURES

CAPABILITIES

- Protection factor/fit CB simulant testing with corn oil aerosol
- Volunteer human subjects
- User performance testing (evaluations and obstacle courses)
- Typically 8 individuals; 10 exercises; 2 trials

EQUIPMENT

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

REQUIREMENTS

- National Institute of Occupational Safety and Health—Chemical, Biological, Radiological and Nuclear Certification Testing
- Joint Service Standardization Agreement for Fit Factor Testing

Active vapor testing is used if additional testing is needed. Vapor testing, like aerosol testing, provides real-time active sampling. Methyl Salicylate is the primary substance used for vapor testing.



MAN IN SIMULANT TESTING (MIST)

ECBC Engineering is capable of MIST, which is the preferred method of determining the overall Protection Factor (PF) of Chemical, Biological, Radiological and Nuclear (CBRN) protection equipment to be used for protection against Chemical Warfare Agents (CWA). The results of these tests are evaluated with the Body Region Hazard Analysis (BRHA) to determine the overall PF of the suit. This method uses actual skin adsorption data on agents and simulants to predict the Medium Required Exposure Dosage (MRED) an individual must be exposed to while wearing the suit in order to produce end-point reactions in the body for systemic (nerve agent) and localized (mustard) exposure to agents.

MIST is performed by:

- ▶ Placing Passive Sampling Devices (PSDs) on the skin of test participants and donning a protective suit ensemble.
- ▶ Exposing the test participant to a high concentration of a non-toxic CWA simulant while performing routine exercise movements.
- ▶ Removing and analyzing the PSDs for simulant vapor that was adsorbed at the skin.
- ▶ Analyzing the PSD data with the BRHA to determine performance characteristics of the suit ensemble.
- ▶ Obtaining data through analysis at the laboratory.

FEATURES

CAPABILITIES

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

EQUIPMENT

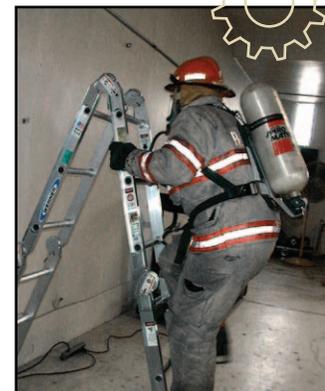
- Chamber - 40' L x 20' W x 14' H
- Five-stage clean room with overpressure
- Automated vapor generation system
- Foxboro miniature infra-red gas analyzer (MIRAN®)
- Automated gas chromatograph monitoring system (MINICAMS®)
- Data acquisition system
- Analytical lab utilizing gas chromatography (GC)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



WALKING PORTION OF MIST EXERCISE



MD STATE POLICE SWAT TEAM MIST



FIREFIGHTER IN SIMULANT TESTING



LARGE-SCALE SIMULANT CHAMBER

ECBC Engineering designed and built a large-scale aerosol and vapor chamber and supporting systems to meet diverse testing requirements. The flexibility of the chamber design accommodates modification to accept various generation, dissemination and sampling systems, and to optimize the test volume within any desired range up to 14,800 cubic feet.



FILTRATION SYSTEM

Chamber exhaust-air filtration provides a high efficiency particulate and gas 3,000 cubic feet per minute (cfm) system, controlled by a variable frequency drive. Ten mixing fans and a plenum system act as a simulant aerosol mixing box or baffle. Liquid decontamination waste is collected through a sump and piping system in a 2,500 gallon polyethylene holding tank. Multiple concentration and particle size measuring devices can be employed in accordance with the challenge specifications. Chamber conditions can be monitored in real-time to include temperature, humidity, air-flow and pressure. The aerosol chamber operates at ambient temperatures and humidity.

Features such as a large facility access door, operations control room, the availability of a hydraulic scissor lift and adequate working space surrounding the chamber provide for ease of operations and necessary infrastructure alterations.

FEATURES

CAPABILITIES

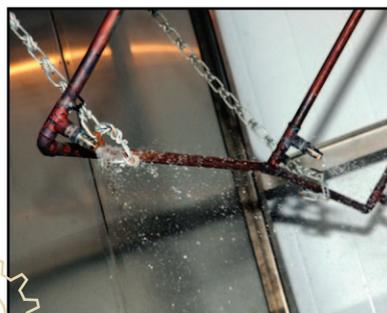
- CB agent simulant aerosol and aerosol countermeasure testing
- DMMP/Bacillus globigii
- Secondary contaminant

EQUIPMENT

- Chamber - 14,800 ft³ 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



CHAMBER



WASH DOWN SYSTEM



LARGE-SCALE WATER TEST LOOP SYSTEM

The Water Test Loop System (WTLS) maintained by ECBC Engineering is the result of a partnership with two Federal organizations: the U.S. Environmental Protection Agency National Homeland Security Research Center and the Army Corps of Engineers, Construction Engineering Research Laboratory. Concerned with water safety for civilians and military populations, they have been working to develop models and sensors to predict the behavior of and detect chemical and biological agents in various water systems.



SMALL LOOP

The WTLS consists of a large (approximately 1,300 gallons) and a small (approximately 250 gallons) re-circulating chlorinated polyvinyl chloride pipe loop with sample sensor and injection ports. The large WTLS was designed for experiments using non-hazardous or simulant compounds. The small WTLS was designed to conduct experiments with chemical warfare agents, toxic industrial chemicals and toxins.

The water loop's intricate conduit is intended to mimic the dynamics of a home or business water utility delivery system. One portion of the loop network is comprised of over 2,000 feet of piping. The entire loop network is constructed to allow for the replacement of individual or modular sections of pipe. This allows pipes of various material and age to be inserted into the test loop during studies. This, coupled with the system's ability to manipulate residence timing, lends itself to replicating a wide variety of water transport scenarios.

FEATURES

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



LARGE LOOP





COLLECTIVE PROTECTION EVALUATION



Full system collective protection testing is performed at ECBC Engineering's test facility. This facility is used to perform full system tests including: static challenge, purge, leakage, pressurization and entry/exit testing on collective protection equipment.

Throughout the development cycle, shelters, vehicles, heating, ventilation and air conditioning systems must meet several test requirements.

Static challenge, entry/exit and pressurization testing is performed in the static challenge test chamber. Once an item is set up in the chamber, a pressurization test is performed to ensure the shelter maintains proper overpressure. The item would then be exposed to three static challenge trials to determine its protection factor. Finally, an entry/exit test would be performed to determine the maximum number of people that could be processed into a shelter or vehicle within an hour.

Purge testing is performed to determine how long it takes for an airlock, shelter or vehicle to clear itself of a particulate cloud. The ATI Aerosol Generator TDA-4B uses Emory oil and compressed air to create a particulate cloud within the interior of an airlock, shelter or vehicle. The ATI Particulate Detector TDA-2EL provides real time monitoring of the system's concentration levels while recording purge log reduction levels.

Leakage testing of a vehicle or shelter is performed to identify and correct possible leakage points. The Improved Mobile Airflow Tester (IMAT) is used to isolate and quantify airflow leakage rates at various system operating pressures on vehicles and shelters. The IMAT operates at 0 - 3000 cubic feet per minute and 0 - 5 inches water gauge.

FEATURES

CAPABILITIES

- Static challenge testing
- Entry/exit testing
- Pressurization testing
- Purge testing
- Leakage testing
- Simulant Concentration: 1 – 100 mg/m3
- Chamber Pressure: 0 to -0.5 inches water gauge (iwg)
- Air Flow: 0 - 1200 CFM Negative Pressure
– 0 - 5000 CFM Purge fan

EQUIPMENT

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





FIXED SITE & FILTER-IN-PLACE SYSTEMS PERFORMANCE



MOBILE LABORATORY

ECBC Engineering has the ability to design CBRN filtration systems for fixed sites, operations buildings, vehicular platforms and facilities including: military dorms and chemistry labs both domestic and overseas. From systems initial design

and development to systems sustainment, ECBC offers a “cradle to grave” solution for the armed forces against CBRN attacks. Systems sustainment includes development of system/design requirements, Standard Operating Procedures and protocols, process validation, in-place certification testing and filter monitoring for CBRN filtration systems.

ECBC can perform in-place certification testing of installed CBRN filters for government laboratories, vehicles and fixed sites both home and abroad. This testing certifies that the entire filtration system is capable of protecting against a CBRN attack. These systems are evaluated in accordance with the American Society of Mechanical Engineers (ASME) N510 procedures for mechanical leaks using portable polydispersed polyalphaolefin aerosol generators/detectors, nondestructive gas simulants (non-ozone depleting fluorocarbons) and electron capture chromatographic detection methods. The in-place leak test is a leak test, not a life test, and is required to evaluate the CBRN filtration system for proper filter installation and carbon/particulate damage.

FEATURES

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, testing
- Test protocol and standard operating procedure development

EQUIPMENT

- Mobile testing platform
- Aerosol generators and detectors
- Tracer gas monitor and CAD/SolidWorks

REQUIREMENTS

- ASME N510
- ASME AG-1 Requirements
- DOE-STD-3020-97 Requirements



FIXED SITE



FACILITY DESIGN



SHIPBOARD



CP MOBILE SYSTEMS



Standoff Detection Technology Evaluation Facility

ECBC Engineering is home to a unique standoff detection technology evaluation facility that, for the first time ever, allows precise performance measurement of standoff detection systems at significant distances.

The only facility of its kind in the country, this facility is known as the Standoff Detection Technology Evaluation Facility and 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. This increased precision reduces uncertainty about the potential field performance of standoff detectors.

The Standoff Detection Technology Evaluation Facility was designed for use in the Artemis Chemical Standoff Detection Program to allow aerosol backscatter and vapor measurements with a frequency-agile carbon dioxide (CO₂) Light Detection and Ranging (LIDAR) standoff detector. The chamber utilizes curtains of air produced by an interior vortex and balanced by an exterior counter flow of air to contain the material cloud. This also prevents the backscatter off of conventional hard windows from corrupting the desired measurements on the cloud inside the chamber. The prevention of backscatter is critical because the CO₂ LIDAR has a long (1 microsecond) pulse and the backscatter off the window cannot be temporarily separated from the backscatter off of an aerosol in the chamber.

With known and modest modifications, this ECBC asset can be used with all passive and active, chemical and biological standoff technologies and systems at any stage of development. The chamber was designed for testing with a variety of CB simulants, interferents and selected toxic industrial chemicals in both vapor and aerosol form. ECBC is exploring the regulatory acceptability of extending the operations to include "kill" pathogens, which would produce a tremendous benefit for the CBDP if permitted. Using state-of-the-art ground truth instrumentation, the Standoff Detection Technology Evaluation Facility has been shown to successfully contain a homogenous aerosol cloud.

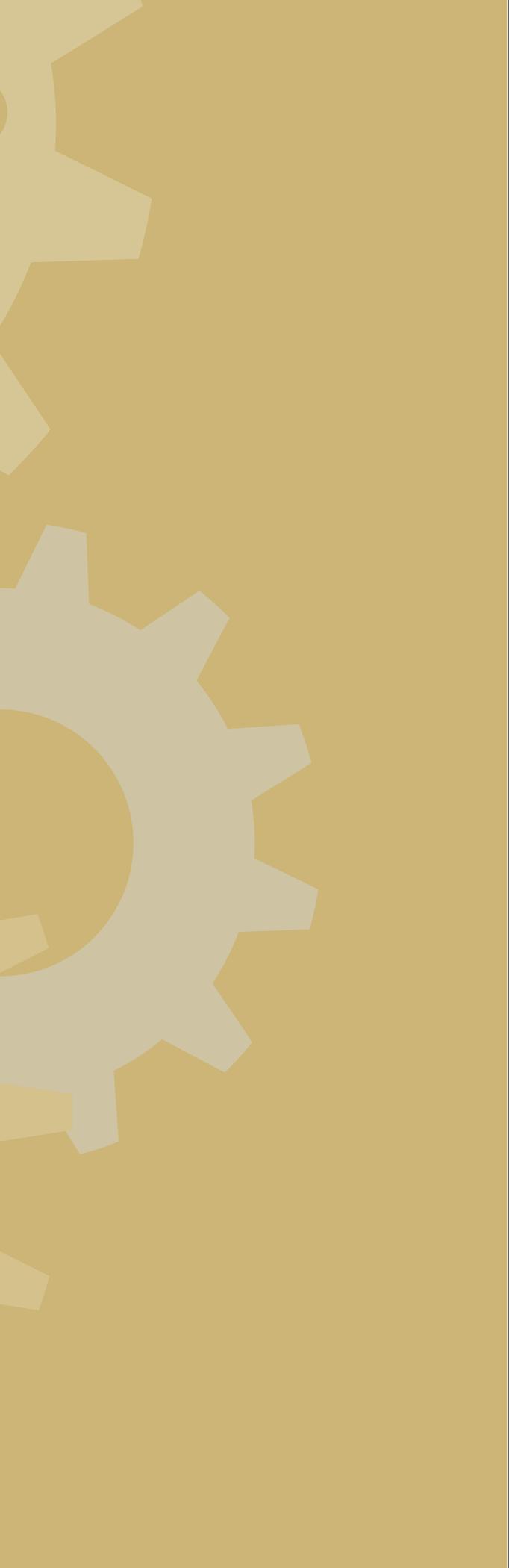
FEATURES

CAPABILITIES

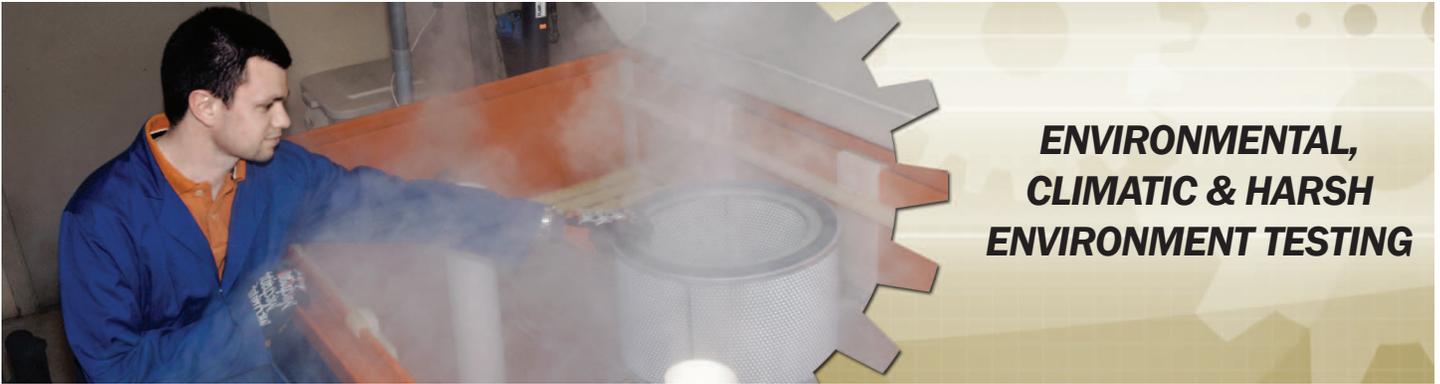
- Up to 15 minutes of homogeneous aerosol suspension and up to 200 micrometers (diameter) of wet or dry aerosol generation
- Chambers capable of closed or open windows and aerosol clearing in minutes
- Ground Truth nephelometer data
- Homogeneous aerosol distribution
- Biological Level-2 upgrade-capable
- 20' path, isokinetic sampling, air curtain technology, and 4' x 4' aperture

EQUIPMENT

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



MATERIALS TESTING



ENVIRONMENTAL, CLIMATIC & HARSH ENVIRONMENT TESTING



RESPIRATOR DUST TEST

ECBC Engineering can determine how products and materials perform under extreme environmental conditions. Team members can simulate any environmental stress condition that a Warfighter might experience in the field using laboratory test methods in accordance with the Military Standard 810F Test Standards. These methods include: low pressure (altitude), high and low temperatures, temperature shock, solar radiation, rain, icing/freezing rain, humidity, salt fog (corrosion), sand and dust and immersion. Testing conditions include: temperatures from minus 80 degrees farenheight to 350 degrees farenheight, humidity from 2 percent to 98 percent, blowing rain up to 6 inches of rain per hour with wind speeds up to 45 miles per hour, blowing sand at air velocities of 18 to 29 meters/second (3,540 to 5,700 feet/minute or 40.2 to 64.7 miles/hour), blowing dust at air velocities of 1.5 to 8.9 meters/second (300 to 1,750 feet/minute or 3.4 to 19.9 miles/hour), low pressure altitudes up to 30,480 meters (100,000 feet) and rapid decompression within 15 seconds. Personnel can perform on-line data acquisition and analysis of tested components using the Agilent VEE Pro® Graphical Instrumentation Programmer and Data Acquisition Program or National Instruments LabView Program. Products can be manipulated to operate while exposed to a threat representative test environment. Instrumentation and data acquisition equipment are used to control the product and capture data on its performance during environmental stress in a safe and environmentally friendly atmosphere. Design defects can be identified early, which results in robust designs and reliable products.



SALT FOG TEST

FEATURES

CAPABILITIES

- Extreme climatic and environmental condition simulation; MIL STD 810G
- Perform lifecycle environmental tests
- Perform accelerated aging tests
- Specialized test setups; 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 & rain
- Walk-in Chambers – (6) temperature/humidity
- Mobile Chambers - (4) mobile trailers/climatic

REQUIREMENTS

- American Society for Testing of Materials Test Standards
- Military Standard 810 G Test Standards



SHOCK, VIBRATION, & ROUGH HANDLING



TRANSPORTATION SIMULATOR

allow for a greater range of test items such as smoke and non-lethal riot control grenades. Team members can create simulated transportation test profiles for various modes of transportation including wheeled or track vehicles and helicopters. Test items are subjected to various temperature and humidity conditions during vibration simulations by utilizing two piggyback environmental chambers that provide a cost effective way to expose test items to most global transportation scenarios. Packaging tests are performed to ASTM D4169, Distribution Cycle 18. ECBC personnel use the Agilent VEE Pro® Graphical Instrumentation Programmer, National Instruments LabView Program and data acquisition equipment to develop



ROUGH HANDLER

ECBC Engineering operates specialized test equipment to perform shock, vibration and rough handling tests on military and commercial products in a safe and environmentally friendly atmosphere. A two-building setup provides remote control capabilities that

specialized test setups and capture required data. Test results are documented with photos and video tapes to enable identification of design defects early in development and ensure robust designs and reliable products.

FEATURES

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

REQUIREMENTS

- American Society for Testing of Materials Test Standards
- Military, Federal and Commercial Test Standards



PHYSICAL PROPERTIES TESTING



ECBC Engineering maintains a physical properties laboratory for the determination of various properties of test materials and products. Mask programs at ECBC come to this laboratory to determine the effects of battlefield contaminants such as oils, fuels and decontaminants on mask materials. Mask lens characteristics, light transmission, haze and distortion, are measured in accordance with ASTM D1003 using hazemeters and optical testers.

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The tensile compression tests on elastomers, plastics and metals are conducted with a tensile strength tester capable of performing tests with loads up to 44,000 pounds, and are performed in accordance with ASTM D412 and D624.

Spindle type and Ford cup type viscometers offer a variety of methods to determine the viscosity of fluids. The equipment can accurately weigh test samples from 0.0001 grams to 2,000 pounds with a variety of scales and balances. Accurate measurements can be taken with a collection of calipers, micrometers, veneer depth and bore gauges and gauge blocks.



FEATURES

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 and more
- First article, production and surveillance testing of materials and products
- Customized test plans and test reports

EQUIPMENT

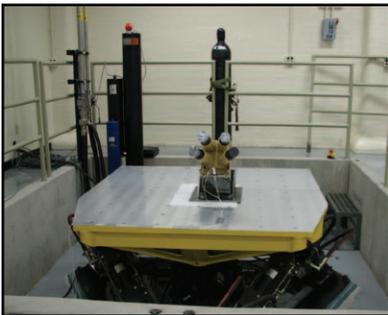
- Instron tensile testers
- Q-Test equipment

REQUIREMENTS

- American Society for Testing of Materials Test Standards
- Military, Federal and Commercial Test Standards

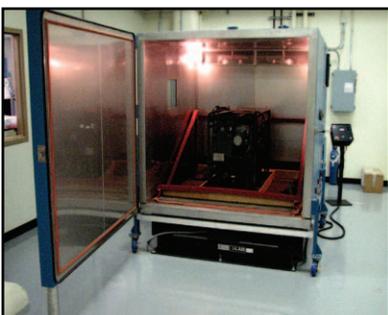


HAZARDOUS & NON-HAZARDOUS PACKAGE TESTING



HIGH FREQUENCY VIBRATION TABLE

ECBC Engineering handles hazardous and non-hazardous testing onsite at ECBC and Rock Island test sites. The 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. ECBC Engineering test facility is an ISO 9001-2000 registered state-of-the-art test facility capable of simulating all forms of air and surface transport through the use of three distinctively different vibration systems. In addition, the facility performs packaging testing, environmental testing and non-destructive testing. Tests are performed to customer specifications such as UN POP, Title 49, ASTM, MIL STD, ISTA, ISO, FED and DOT test requirements for the transportation of hazardous materials. ECBC Engineering laboratory personnel perform prototype, and pre- and post-production testing such as recertification inspection and testing of containers used in transport of lethal chemical agents. ECBC Engineering laboratory personnel can also assist in developing test plans to include specific testing requirements. Currently, ECBC-RI engineers are developing



TEST CHAMBER

surveillance and re-design specifications to address the impact of harsh environment on a wide range of equipment. All team members have experience and the ability to provide innovative solutions to solve customer specific needs. ECBC Engineering laboratory equipment is state-of-the-art and maintained in accordance with ISO 9001-2000 standards, which assures that all tests are performed on calibrated equipment to exact standards and specifications.

FEATURES

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



MASK FILTER INSPECTION

for Occupational Safety and Health Standards, as well as custom test plans. Test services include: Dimethylmethylphosphonate (DMMP) gas life testing, High Efficiency Particulate Air (HEPA) filter testing, mask and filter leakage and resistance testing. The team is also equipped to perform dimensional analysis and inspections related to craftsmanship.

ECBC Engineering maintains a respiratory mask and filter testing laboratory. The laboratory is equipped with government certified test equipment and GC analysis to perform a wide range of product qualification, first article and production lot testing. ECBC Engineering tests to common standards of product conformance such as military performance specifications, National Institute

In order to determine the durability of masks, filters and related materials, the laboratory has the capability to expose these products to adverse environmental conditions such as hot and cold temperatures, accelerated aging and ozone.

ECBC Engineering conducts work for both commercial and government customers. Common test items include the C2A1 canister and the Army M40 field mask. Other government products recently tested include the Joint Service Aircrew Mask (JSAM), Joint Service Chemical Environment Survivability Mask (JSCESM) and Joint Service General Purpose Mask (JSGPM).



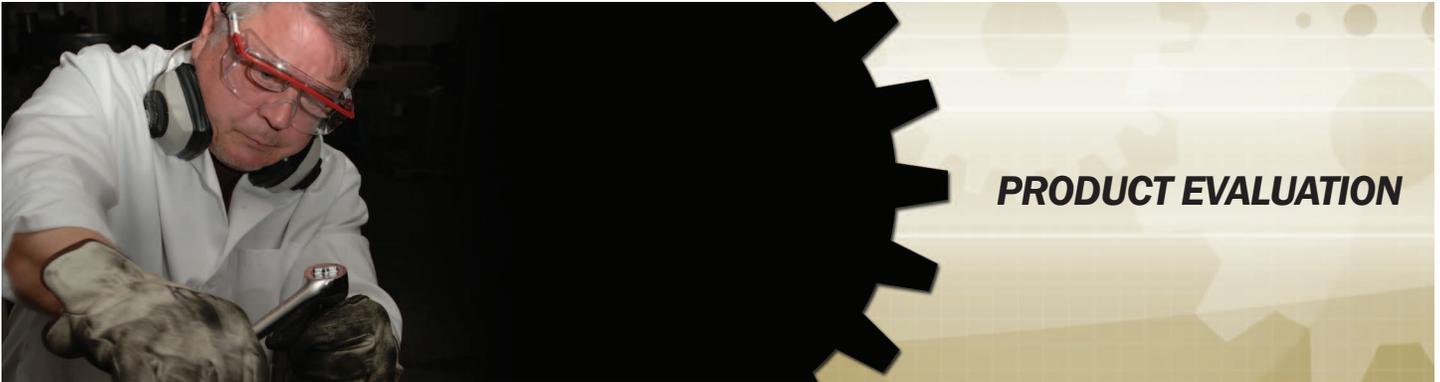
FEATURES

CAPABILITIES

- Mask gas filter life testing with DMMP
- Mask filter aerosol penetration efficiency with 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, & Q213
- Environmental chambers
- Ozone chamber
- Oxygen vessels



ECBC Engineering destructively evaluates gas filters for nerve agent and mustard life using the simulant, dimethylmethylphosphonate (DMMP), as a challenge. Filters are tested according to the test plan and are accepted or rejected based upon the results. The use of DMMP simulant allows for expanded testing with little risk at a fraction of the cost associated with agent testing. Gas filter DMMP life values can be correlated to agent life.

HEPA filters are evaluated for aerosol efficiency by challenging them with a 0.3 micrometer polyalphaolefin (PAO) aerosol, Durasyn 164. Upstream and downstream particles are laser sized and counted to determine filter efficiency. This is a nondestructive test; therefore, a 100 percent inspection of filters is possible. The High Flow Alternative Test System (HFATS) is utilized for filters in the 100 to 2000 cfm range and is capable of measuring particle sizes down to 0.10 micrometers. In addition, the Test, Reliability & Evaluation Team has other equipment for testing lower flow HEPA filters.

The durability and design performance of the gas and HEPA filters in rough terrain and transportation is tested by the rough handle test (Q110) and environmental testing.

FEATURES

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 & 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

REQUIREMENTS

- ASME N510
- MIL-STD Requirements
- ASME AG-1 Requirements



DIMENSIONAL ANALYSIS



MICRO-HARDNESS TESTER

and Technology and the Occupational Safety & Health Administration.

The dimensional analysis area has a vast array of optical and physical equipment for making and/or verifying dimensional measurements for FAT acceptance, production, surveillance and developmental efforts. Some of the equipment includes: a J&L Optical Comparator which measure: contours, silhouettes, surfaces, angles and radii; a Nikon Measuring Microscope which measures in the x, y and z vectors; and a Profilometer which gauges the quality of a surface.

Another possible aspect of a physical evaluation is material testing. Examples of tests include: tensile and compression on one of two Instrons, Rockwell hardness, micro-hardness, stiffness, colorfastness and accelerated weathering. These tests are critical to customers who wish to quantify the physical properties of their materials or products ranging from paper to metal.

FEATURES

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

REQUIREMENTS

- National Institute of Standards and Technology (NIST)
- Occupational Safety and Health Administration (OSHA)



EXPLOSIVE INTERFERENT SIMULANT & GROUND TRANSPORTATION TESTING

ECBC Engineering's test range, located on a 400 acre plot of land, is used for outdoor testing of military and commercial products in a safe and environmentally friendly atmosphere. Experienced team personnel develop specialized test setups using the Agilent VEE Pro© Graphical Instrumentation Programmer and Data Acquisition Program or National Instruments LabView Program to capture data and video cameras to document tests. This allows team members to manipulate test items while minimizing exposure to hostile test environments. The "L"-shaped vertical grid provides a three-dimensional reference for both visual observation and video documentation of munition detonations including burst heights and cloud characterizations. Engineering and investigative tests have included explosive operations, dissemination of different smoke materials, interferent trials for development of chemical and biological detectors, operation of unmanned aerial vehicles, as well as non-lethal equipment and smoke rounds used by law enforcement.

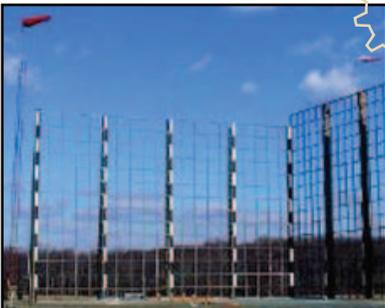
FEATURES

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

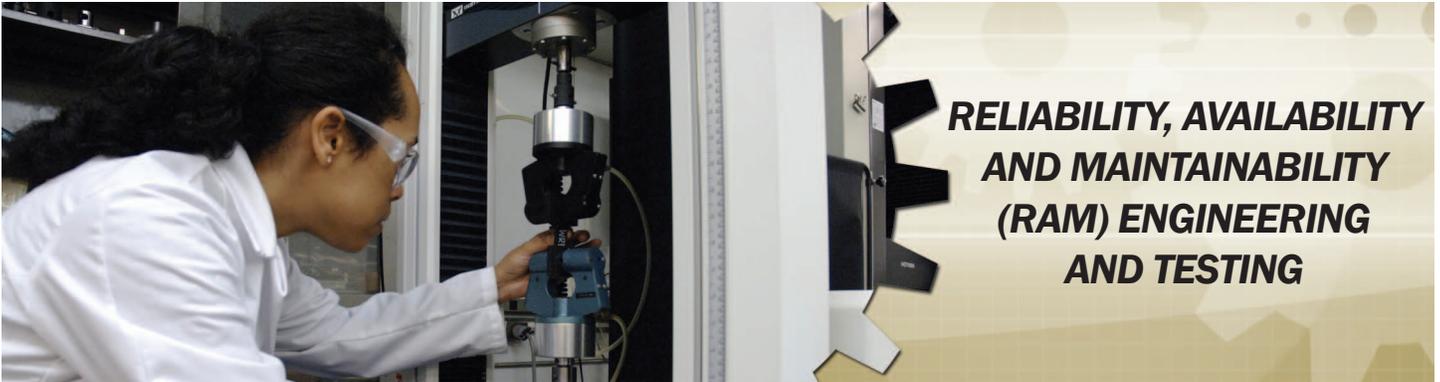
- Modern digital and analog data acquisitions systems
- Wash board course; Rail tie hazard course; Rail impact test area; 30-mile on-site road course; 40-foot drop test area; 300' x 300' concrete staging pad; weather station
- "L"-shaped vertical firing grid with 1 meter survey points and 20m x15m sides
- Simulation of multi-road courses indoors
- Air and ground transport



GRENADE GRID



RAIL TIE HAZARD COURSE



Reliability requirements are established by the Training & Doctrine Command (TRADOC) and are ultimately documented in the Capability Production Document (CPD), which serves as the system requirements document. The Test, Reliability & Evaluation Team (TRET) provides RAM expertise for RAM policies and requirements, data evaluation and assessments, Joint Independent Logistics Assessments (JILA), First Article Testing (FAT), Production acceptance testing, Environmental Stress Screening; to support detection systems, motion detectors, filtration systems, smoke systems, and other systems.

TRET can perform or assist in Production Qualification Testing (PQT) to demonstrate that the system meets the RAM requirements in the CPD. TRET also has the testing capability to conduct First Article Testing (FAT) on Low Rate Initial Production (LRIP) units to ensure RAM requirements are met before starting Full Rate Production (FRP).

FEATURES

CAPABILITIES

- Design and conduct reliability and Reliability Growth tests for R&D prototypes or acquisitions systems
- Design and conduct reliability testing for DT, FAT and PQT
- Provide JILA assessments 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 JPM in developing FDSCs and RAM scoring conferences for critical Milestone tests
- Develop and evaluate Environmental Stress Screenings (ESS)
- Support the RDECOM T&E Managers Committee and Reliability Focus Committee in T&E and RAM acquisition policies





RECENT ACCOMPLISHMENTS

“Recognizing the need to stay at the forefront of CB defense research, ECBC is modernizing its infrastructure. ECBC’s laboratories, chambers, computer systems and fabrication facilities are kept up-to-date. A life sciences research facility and a state-of-the-art biotechnology facility are the newest additions to the more than 25 facilities ECBC operates. These facilities give ECBC more than 1,500,000 square feet of space, approximately 57 percent of which is laboratory space.”

- ▶ The U.S. Army Edgewood Chemical Biological Center was named the 2007 Army Laboratory of the Year.
- ▶ In 2005, ECBC was proud to unveil the construction of a new Advanced Chemistry Laboratory, a facility for defense research of highly toxic chemical agents. This is the first new ECBC facility of the millennium and will counteract the continually evolving threat of chemical warfare.
- ▶ The Man In Simulant Test (MIST) gains continuing participation in Real-Time Sensor IPT in the development of Real-Time Sensors.
- ▶ The toxic chambers are the only facilities in the world that can handle up to 170 gallons of VX and up to 10lbs of C4. We also house the only facilities in the U.S. that have completed large scale NTA testing.
- ▶ The ETG conducted tests and performed contract negotiations to enable full-rate production of the Joint Service Mask Leakage Tester. The mask leakage tester will provide the warfighter increased mask safety and ensure its protective value.
- ▶ The new Joint Service General Purpose Mask, in support of the Joint Program Manager for Individual Protection, offers lower breathing resistance, higher filtration flow rates, increased protection against toxic industrial materials and improved system compatibility.
- ▶ Completed Defense Technology Objective project that resulted in the development of a low-cost, multi-agent End-of-Service-Life Indicator for protective mask filters. Assisted with transition to the Joint Service General Purpose Mask program. Also, validated the performance of a test system developed in-house to objectively monitor respirator lens fogging kinetics and to measure the impacts of lens misting on visual acuity in support of NIST and NIOSH CBRN respirator standards development and certification testing efforts.



HOW TO OBTAIN ETG SERVICES

The ETG provides testing services for Department of Defense, other Federal agencies, foreign governments as well for the private sector. The process for obtaining the services of the ETG consists of the development of a scope of testing to be performed, and the associated costs and schedule, agreeable to all parties. The agreement of cost, schedule and performance is formalized in various manners generally in accordance to the customer organizational affiliation as follows:

- ▶ Department of Defense: Agreements with other Department of Defense elements can be satisfied by a Military Interdepartmental Purchase Request (MIPR), DD FORM 448, Jun 72.
- ▶ Federal Agencies: Other federal agencies agreement vehicles may be in the form of Interagency Agreement (IAA), Memorandum of Agreement (MOA) or similar mechanism.
- ▶ Private Sector
 - The Test Services Agreement (TSA) is the method for the private sector to obtain ETG services. More information concerning the TSA process can be found at www.ecbc.army.mil. See TOP ECBC LINKS > Working with ECBC > Test Services Agreement > TSA Handbook.
 - A Cooperative Research and Development Agreement (CRADA) provides the mechanism for test services as a means for private industry to collaborate with Arm research and development activities. Parties to a CRADA may exchange intellectual property, expertise and data, or they may hire personnel or rent services or materials, equipment and facilities. Federal agencies can accept funding under a CRADA to perform research or development of benefit to the CRADA partner.



For additional information please call 410.436.5600 or e-mail ecbc.engineering.directorate@conus.army.mil

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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