Morgan State University  
“Growing the Future, Leading the World”™  

**CE STRUCTURES AREA LABORATORIES**

The facilities in the structures area include the following:

1) CE Materials Laboratory (CBEIS 124),
2) CE Structures Laboratory (CBEIS 125), and
3) CE Structures Research Laboratory (CBEIS 123).

The CE Materials and Structures Laboratories are for both teaching and research. Equipment in these labs support concrete and asphalt tests, universal tension and compression and torsion testing, fatigue and creep measurements, pendulum impact testing, hardness tests, structural mechanics experiments as well as load frame measurements of structural response. The CE Structures Research laboratory, which includes a 6DOF seismic simulator (CBEIS 121) and strong-floor, strong-wall facility, supports research and contracts in seismic testing and simulation, structural dynamics and control, materials characterization and behavior, and advanced macro- and micromechanics; with advanced displacement (including 3D noncontact) measurement tools, sensors and actuators of various types, and data acquisition and control systems. The structures area laboratories are also supported by a Student Projects Lab with welding, cutting, drilling, and various tools for fabrication of small and large articles, including a five-axis machining center.

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**CE Structures Research Lab………**

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INSTRON 1000HDX – Universal Testing Machine

The HDX Models are designed for high-capacity tension, compression, bending/flexure, and shear testing, and feature a dual test space and long test stroke. These frames incorporate high-quality materials, components, and craftsmanship, and are ideal for testing metals, wire, fasteners, concrete, and wood.

Features and Benefits

- 1000 kN (220,000 lbf) capacity
- Two test space design makes changing between tension and compression testing safer and more efficient: no need to remove heavy fixtures
- Optional open-front grip design improves operator safety and throughput, and allows a limited number of jaw faces to cover a large range of specimen sizes
- Long test stroke accommodates a variety of test fixtures and applications, such as rebar bending tests
- Productivity panel with multiple function keys and displays improves ergonomics and allows the operator to perform common testing functions and view key test information without returning to the computer
- Powerful, yet user-friendly materials testing software provides repeatable and reproducible results for simple to sophisticated testing requirements
High-Frequency Shaker MB Dynamics

The S&R (squeak and rattle) shaker by MB Dynamics is designed to perform well in environmental testing, durability, and S&R. The SILVER shaker works with a maximum payload of 1000 lb and frequency range of 2500 Hz.

SI Series Pendulum Impact Tester (INSTRON)

Ideal for Izod and Charpy metals impact testing, the SI Series is recognized for its rugged design, high accuracy, and low operating costs. The tester is anchored to the floor of the lab and is capable of delivering energy up to 300 ft-lb (406.7 J). It complies with requirements of ASTM E23. Accompanying Fracta™ Software is used for gathering, calculating, and storing impact test results.
INSTRON-CEAST 9350 Drop Tower Impact System

The CEAST 9350 is a floor standing impact system designed to deliver 0.59 - 757 J (0.44 - 558 ft-lb) of energy. As the premier model in the CEAST 9300 line, this model includes many time-saving features and supports a large variety of options – from chambers to extra energy. The CEAST 9350 works with our impact software and data acquisition system to make analysis simple. This versatile instrument can be used to test anything from composites to finished products and is suitable for a range of impact applications, including tensile impact, puncture, Izod, and Charpy.

Features

- High-performance test frames with powerful belt drive and motor system
- Easy-to-use operator control panel for precision manual control
- Protective doors and panels on all sides for operator safety
- Modular crossheads with interchangeable dropweights; change weights safely in seconds
- VisualIMPACT Software — for collecting, analyzing, and reporting detailed impact performance data
- High-speed data acquisition rates: up to 2 MHz simultaneous sampling — more data where you need it
- Optional features such as high-energy configuration, weighing system, automatic lubrication, anti-rebound, environmental chamber, pivoting specimen loader, and automatic specimen feeding system
A portion of the CE Structures Laboratory is dedicated to simple experiments that are used to enhance basic concepts, thereby transforming the classroom into a living laboratory. During the experiments, students apply principles of structural engineering, bridge engineering, and engineering mechanics to validate theory that is taught in class. Morgan State University has acquired about 14 modules from PA Hilton for these hands-on demonstrations varying from “Equilibrium of a Particle” to “Deflection of Beams.” The experiments also provide for evidence-based and experiential-based learning to create a more active and exciting learning environment. This lab also hosts the Vibrating Machine, where small vibration tests can be conducted for research and/or hands-on laboratory demonstrations to assist students with topics covered within dynamics.
The laboratory encompasses a six-degrees-of-freedom seismic simulator and strong-floor–strong-wall facility having a 3m x 3m shake table with 10,000 kg specimen mass capacity, a 10-20-6 inches x-y-z working displacement range, 0-60 Hz operating frequency and acceleration of up to 3G; and a 4.6 m L-shaped strong wall and included strong floor with seven double-ended fatigue-rated hydraulic actuators in the dynamic force range 15 to 500 kN.

Other equipment includes an Axial-Torsion Test Facility capable of simultaneous 250 kN axial, 2200 N.m torsion, and controlled heating in a 1200 °C split-tube two-zone furnace; a top-loading controlled atmosphere High-Temperature (2000 °C), High-Vacuum (10⁻⁵ - 10⁻⁶ torr) Oven; a Drop Tower tester with environmental thermostatic chamber, high-energy and high impact velocity capacity to 1800J and 24 m/s, and changeable tups and inserts for instrumented and non-instrumented tests on plates, films, and 3D components; Universal Hardness and Izod/Charpy V-Notch Testers; a 70 kg payload capacity Electrodynamic Shaker and Amplifier System with trunnion base and stinger kit, and frequency response DC to 2 kHz for Sine, PSD Random and Shock tests; an Atomic Force Microscope with 90 µm x 60 µm X-Y scan range and 8 µm Z range, an environmental chamber, and capable of open and closed loop operation and various other modes; sample preparation equipment; a multipurpose Active Vibration Isolation Table; and various actuation, measurement, and control devices.

Sensors cover strain gages, various LVDTs, load cells, accelerometers, a high-temperature axial-torsion extensometer system and a non-contact three-dimensional Scanning Laser Doppler Vibrometer system with integrated Geometry Scan unit. Actuators include various hydraulic, pneumatic, piezoelectric, and shape memory alloy (SMA) types. Other components for measurement and control include a 1-GHz Mixed Signal Oscilloscope, High Voltage Amplifier and Function Generator, and a High-Voltage, High-Bandwidth Power Amplifier.