50% SCHEMATIC DESIGN PACKAGE

Design Team:

Architectural: ..................................................................................................... orcutt | winslow
Civil: ........................................................................................................ Barge Cauthen & Associates
Landscape: ................................................................................................................................. HDLA
Structural: ................................................................................................................ ARUP
Mechanical: ........................................................................................................ I.C. Thomasson and Associates
Electrical: ........................................................................................................ I.C. Thomasson and Associates
Plumbing/Fire Protection: ................................................................................ I.C. Thomasson and Associates
Acoustics: ........................................................................................................ Arpeggio
Audio/Visual: ........................................................................................................ Arpeggio
Laboratory: .......................................................................................................................... HERA laboratory planners
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### ATTACHED DRAWINGS & SKETCHES:

- **A-1** architectural floor plans
- **A-2** architectural axonometric drawings
- **C-0** existing utility site plan
- **C-1** civil site sketch
- **L-1** landscape site sketch
- **S-1** structural sketch
- **MPE-1** steam & chilled water sketch
- **MPE-2** electrical site sketch
- **MPE-3** satellite plant expansion sketch
- **LAB** laboratory sketches (7 pages)
ARCHITECTURAL SCHEMATIC DESIGN NARRATIVE

PROJECT DESCRIPTION:
The overall scope of this project contains three major components; the demolition of two residences halls on site, a new building for the School of Concrete and Construction Management programs, and the expansion of the Satellite Chiller Plant to accommodate the new building and future development in this area of campus. The project site is located along the existing south edge of the campus at the corner of Alumni Drive and Blue Raider Drive.

DEMOLITION OF EZELL AND ABERNATHY HOUSING UNITS:
Ezell and Abernathy are two existing, three-story residence halls that shall be demolished as part of this project. An important aspect of the demolition includes an effort to save and protect select trees around the existing buildings. Utilities serving these halls will also be part of the demolition.

SCHOOL OF CONCRETE AND CONSTRUCTION MANAGEMENT:
Located on the north side of the site, the new two-story, 54,000 square foot, School of Concrete and Construction Management (SCCM) building is being designed to serve the needs of the School of Concrete and Construction Management department as well as providing classrooms for the general student body. The building will terminate a future East Quad extension with the main entrance/lobby that interconnects the two levels facing the quadrangle. The general design of the building has a two-story bar running east to west with a one-story section extending to the south separating the two major outdoor elements – the working yard and courtyard. The two-story bar’s first floor will house the laboratory spaces to the west, and the department office, conference center, multi-media showcase classroom to the east. The second floor includes a distributed mix of classrooms, computer labs, individual faculty offices, graduate/tutor center, and collaborative/gathering areas. The one-story bar that extends south is a single loaded corridor that includes a portion of the laboratory spaces, a covered amphitheater space, and the 200-seat lecture hall. We envision this section of the building having the possibility to connect to a future building to the south of the site and/or a future second floor. The corridor would serve as a backdrop to the east courtyard. The two bars intersect at a shared lobby, service core, and communicating staircase.

There are outdoor areas designed around the building that are essential to the success of this project. A working yard on the west side, will provide an area where students can extend their work and projects outside of confines of the laboratories and classrooms. It will include material storage, trailer parking, a concrete batch plant, dumpsters, and space for constructing larger projects. The covered amphitheater has direct connection to the student projects lab and working yard. Here students will observe particular construction methods, or product demonstrations. In addition to the working yard, the building also includes a courtyard that will serve as a secondary entrance into the building and provides a space to support the department offices and program’s community and industry events. The courtyard will likely contain concrete walks highlighting a variety of decorative finishes and techniques.
There will be a mechanical penthouse on top of the main bar to house equipment serving this building. The penthouse will be accessible by a stair and elevator. The building is envisioned to have a structural steel frame with concrete hollow core planks with a finished concrete topping. The steel frame will allow for special moments where concrete and other building materials can be showcased. These moments will include multiple casting techniques, textures, colors, and mix designs. The intent is to showcase the possibilities with concrete. The building’s cladding will be a mix of brick veneer, exposed concrete, and aluminum storefront/curtainwall with insulated glazing units. The roofing material is anticipated to be EPDM. Interior flooring is expected to be a mix of concrete, LVT, ceramic tile, and carpeting. The interior partitions will be metal stud framing with painted drywall and CMU. The building is intended to be fully sprinklered. A geotechnical report will be completed once the structural grid is set.

Another critical piece of this project includes moments where the design process, construction, and building will serve as a teaching tool for students. Data collection related to concrete maturity, movement monitoring, and energy usage may also be incorporated into the design. The design will also incorporate more literal teaching movements with windows into walls, foundations, and structural and mechanical systems, as well as integral sample panels that showcase multiple construction types.

The project will be required to meet the State of Tennessee High Performance Building Requirements. (HPBr)

**EXPANSION OF THE SATELLITE CHILLER PLANT:**
In addition to the new building we are tying the expansion of the Satellite Chiller Plant into this project in order to provide the necessary capacity for future development at the southeast corner of campus including the School of Concrete and Construction Management. This project plans to include additional infrastructure improvements to the following utilities: chilled water, steam, natural gas, domestic water, sanitary sewer, electrical service, telecommunication, and fiber network.

The existing structural system appears to be load-bearing CMU with steel roof framing supporting a metal deck with an EPDM roof system. The new expansion will be one new bay, expanded to the south, consisting of a similar construction to the original structure to contain a new chiller for this project and an additional chiller in the future.

**CURRENT PROJECT STATUS:**
The design team is currently in the Schematic Design Phase.
**SCHEDULE:**
The tentative schedule dates for the following phases are:

**SCHEMATIC DESIGN PHASE**

- NOTICE TO PROCEED: 1 12/06/2019
- 50% SDP: 0 01/30/2020
- COMPLETE: 97 03/12/2020
- REVIEW / APPROVAL: 10 03/22/2020

**DESIGN DEVELOPMENT PHASE**

- NOTICE TO PROCEED: 1 03/23/2020
- 50% DDP: 0 06/01/2020
- SBC MEETING: 0 06/11/2020
- COMPLETE: 119 07/21/2020
- REVIEW / APPROVAL: 14 08/04/2020

**CONSTRUCTION DOCUMENTS PHASE**

- NOTICE TO PROCEED: 1 08/05/2020
- 50% CDP (100% CDP Utility & Demolition Package): 0 10/01/2020
- COMPLETE: 125 12/08/2020
- FIRE MARSHAL APPROVAL: 14 12/22/2020
- REVIEW / APPROVAL: 14 01/05/2021

**BID PHASE**

- SET BID DATE: 7 01/12/2021
- RELEASE FOR BID: 7 01/19/2021
- RECEIVE BID: 28 02/16/2021
- CONSTRUCTION CONTRACT COMPLETE: 21 03/09/2021

**PROJECT BUDGET:**

<table>
<thead>
<tr>
<th>Bid Target</th>
<th>$30,395,000.00</th>
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<td>$31,600,000.00</td>
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CIVIL SCHEMATIC DESIGN NARRATIVE

The subject site is located at the northeast corner of the intersection of Blue Raider Drive and Alumni Drive. The proposed development would disturb approximately 3.5-4.0 acres.

Demolition and Protection
Two existing buildings (Ezell and Abernathy Halls) and approximately 0.75 acres of existing asphalt parking area are to be demolished to make way for the proposed School of Concrete & Construction Management (SCCM) building and a future engineering building.

A significant amount of utilities are located in the general area of the proposed demolition and construction. It is anticipated all existing utility services feeding the two existing buildings will be demolished back to the mainline taps near the perimeter of the work area. A portion of the public sewer main on the east side of the existing buildings will be demolished. The existing public water main feeding an existing fire hydrant on the north side of the existing buildings will be demolished.

Care should be taken to protect the existing sidewalk along Blue Raider and Alumni Drives throughout the duration of the project, as well as any other paving, curbs, utilities, etc. outside the development limits. However, the existing bus shelter on Blue Raider will be carefully dismantled and reconstructed at a location north of its current location.

Site Access and Parking Requirements
The proposed development is located adjacent to an existing asphalt parking lot which provides parking for Nicks Residential Hall and access to the parking lot west of the Library. A new access drive from this parking lot to the working courtyard of the SCCM building will be constructed and it is anticipated the drive will include some faculty parking spaces.

New parking spaces will be 9’Wx18’L light duty asphalt pavement while new drive aisles will be 24’W with heavy duty asphalt pavement. Concrete paving is proposed at the dumpster pad. The pavement sections noted shall consist of the following:

<table>
<thead>
<tr>
<th>Pavement Type</th>
<th>Description</th>
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</thead>
<tbody>
<tr>
<td>Light Duty Asphalt</td>
<td>1 ½” surface (Type “E”), 2” binder, 6” aggregate base</td>
</tr>
<tr>
<td>Heavy Duty Asphalt</td>
<td>2” surface (Type “E”), 3” binder, 10” aggregate base</td>
</tr>
<tr>
<td>Concrete</td>
<td>8” (4,000 psi) concrete, 8” aggregate base</td>
</tr>
</tbody>
</table>

An east west pedestrian connection north of the SCCM building and a new formal entrance plaza on the west side of the building are anticipated. Refer to landscape architecture for hardscape and paving concepts.

Erosion Control
A stone construction entrance and silt fencing will be installed prior to any grading operations. During grading operations, maintenance of the construction entrance is critical to ensure debris is not tracked off site and into roads. Site erosion should be maintained through a series of
best management practices including silt fence, check dams, inlet and outlet protection. Graded areas should be stabilized within 14 days of achieving subgrade. Temporary seed and straw in disturbed areas will likely be warranted until final grading is completed. Erosion control matting should be utilized on all slopes 5:1 and steeper. A concrete wash out area should be designated on site during construction and the area should be protected with silt fence.

The proposed development will disturb more than one (1) acre and will therefore be required to file a Stormwater Pollution Prevention Plan (SWPPP) and Notice of Intent (NOI) with the state for coverage under the TDEC NPDES construction general permit.

Site Grading and Drainage
The proposed building addition generally sits at the high point of the property. Roof runoff is anticipated to spill to grade where possible and an underdrain system where not possible, allowing the runoff to enter a Bioretention or infiltration areas west of the proposed buildings. Additionally, site runoff will be directed to the Bioretention or infiltration zones via a combination of surface and piped conveyances prior to discharging to the storm sewer system located to the south along Alumni Drive.

Each Bioretention/infiltration area will consist of 3”-4” of river stone, 36” of engineered soil media, a 6” underdrain in a 9” no. 57 stone layer, and an 24-36” stone sump.

The existing campus detention pond will require excavation to offset the additional Stormwater volume imposed by the proposed development.

Site Utilities
The proposed development will require new fire, domestic, and irrigation water services. The project will require a water main extension, which would run from the main on the west side of Blue Raider Drive, around the north and west sides of the of the proposed SCCM building, and then reconnect to the water main located in Alumni Drive. New domestic and irrigation water meters and backflow preventers and a new fire double detector check valve assembly are proposed on the west side of the new building adjacent to the working courtyard. Additionally, new fire hydrants are anticipated along the new water main to provide adequate fire protection. At this time, the proposed water main is assumed as 10” CL 52 DIP, the fire service as 8” CL 52 DIP, the water service as 6” CL 52 DIP, and the irrigation as 2” PVC.

The closest existing sanitary main is located east and south of the existing residence halls to be demolished. These mains will have to remain in service until a new sanitary sewer main can be constructed around the north and west side of the proposed SCCM building. The existing 8” sewer main will be intercepted close to its crossing of Blue Raider Drive and then reconnect to the existing 12” sewer main north of Alumni Drive. The propose main is anticipated to be a 12” SDR 26 and the building sewer service which is anticipated to be an 8” SDR 35 service.

Refer to MPE narrative and drawings for information on chilled water, steam, electric, etc.
LANDSCAPE SCHEMATIC DESIGN NARRATIVE

Proposed Tree Preservation
Desire to preserve identified existing trees will be coordinated with the MTSU Facilities Services. The process will entail showing site and building impact before determining final preservation plan.

Existing Parking to Remain
Parking locations to the West and North of the project site will be retained Proposed Building 1 and 2. The use of the loop parking at Alumni Drive and second west bay of parking will be studied as end intention to be removed as phased parts of the project and expansion.

Future Roundabout
Project site will maintain developable space for the installation of a roundabout at the intersection of Alumni Drive and Blue Raider Drive.

Bioretention / Water Quality
Bioretention is planned on the west side of the site where parking is proposed to be removed. Trees within the bioretention area will double as screening for the working yard between proposed buildings.

Working Yard / Storage / Flexible Space
Provide screening of the area by use of Evergreen trees and shrubs that are in accordance of use by MTSU Facilities Services. No fences are needed to enclose the courtyard unless locked equipment is moved to an exterior location as the project develops.

Formal Entrance Plaza
Formal Entrance plazas will be developed to complement the building entrance features. The plaza material will be concrete in different finishes to represent the major theme of Proposed Building 1.

Proposed Shelter Location
Relocate existing bus shelter to reflect future pedestrian pathways.

Evergreen Tree Screen
Provide screening of the area by use of Evergreen trees and shrubs that are in accordance of use by MTSU Facilities Services. Trees along Alumni Drive will be laid out in a manner to avoid permanent and temporary feature of both proposed buildings and parking needs.

Enhanced Bioretention Features
Additional bioretention features such as BMP displays, concrete weirs, stone and edging will be coordinated and meet the standard of care set by MTSU Facilities Services.
Working Yard Teaching / Presentation
Additional seating expansion from the covered demonstration area is possible in the working courtyard. If possible, use these elements as screening elements that layer along with evergreen plantings.

Future / Current Use Focal Point
Exterior circulation at main view/pedestrian pathways will be designed to meet both current and future site layouts.

Projected Major Pedestrian Path
Provide a major east/west circulation pathway aligned with the MTSU masterplan that meet current building needs.

Proposed Enhanced Plaza
Enhance the pedestrian experience at the northwestern corner of proposed building 1. Complement proposed building architecture and pedestrian access.

Future Plaza Expansion / Building Entrance
Provide the ability for the Blue Raider Drive entrance plaza to expand and share use and importance to proposed building 2.

Future Development
Verify throughout the design process that designed spaces will align with future element of the MTSU Masterplan.
STRUCTURAL SCHEMATIC DESIGN NARRATIVE

Introduction:
The new School of Concrete and Construction Management consists of a new building to be located on the Middle Tennessee State University campus where two existing dormitory buildings will be demolished. The new building will likely be a two-story building of approximately 54,000 square feet. There will also be an expansion of an existing Chiller Plant building as part of this project.

Structural System:
Structural steel column/beam frame. Composite concrete slab-on-deck on steel beams for the 2nd floor, and metal roof deck over beams/joists for the roof.

Foundations:
1. Pending a geotechnical investigation, with soil boring, and a report recommending foundation types.
2. Likely on spread footings (existing building is a bearing wall structure supported by continuous wall footings, with a crawlspace).
3. Imported fill will be likely to fill-in existing crawlspace, and bring grade up to desired elevation of the first floor. Will want feedback from the Geotechnical Engineer on this.
4. Existing foundations will need to be removed, or designed around, or used if they work with the new design. Will want feedback from the Geotechnical Engineer on this.

Chiller Plant Expansion:
1. Existing structural system appears to be load-bearing CMU with steel roof framing supporting a metal deck roof. Structural drawings for the original structure have not yet been located.
2. New expansion will be one new bay, expanded to the south, consisting of a similar construction to the original structure. New foundation design is pending the completion of a new geotechnical report.

Possible learning opportunities for MTSU students during design and construction:
1. Monitoring of the new school’s building structure
   a. Vertical floor displacement (floor deflection / vibration)
   b. Horizontal building displacement (story drift) + wind speed
   c. Foundation settlement
   d. Concrete maturity / strength vs time
   e. Steel material testing – oxidation
2. Visual expression of structural elements
   a. Exposed concrete / structural steel / CMU / metal deck
   b. Exposed steel connections, showing bolts / welds
   c. “Windows” into concrete, showing reinforcing, aggregate, etc.
   d. Concrete columns with ‘layers’ peeled back, showing ties, rebar
   e. Unfinished wall/floor penetrations, showing true cross-sections
   f. Exposed parts of the building’s foundation
g. Exposed options for concrete finishes, colors, texture, forms
h. Use of super-high-strength concrete for main (exposed) stair or canopy

3. During design
   a. Attending meetings
   b. Reviewing drawings and project correspondence (emails, sketches)
   c. Site visits before construction starts
      i. site location, building location on site, grading, demolition

4. During Construction
   a. Attending OAC meetings
   b. Reviewing RFIs and shop drawings (before and after responses)
   c. Site visits with Engineer, Architect, Contractor, Subcontractors
   d. Shadowing Contractor
      i. Procuring/awarding bids, construction, permits, Cos
      ii. Technical and management
      iii. Safety measures
   e. Making extra concrete testing cylinders for students to test/break
PLUMBING AND FIRE PROTECTION SCHEMATIC DESIGN NARRATIVE

Sanitary, Waste, and Vent Systems:
Provide a complete sanitary waste and vent system utilizing Schedule 40 cast iron pipe and fittings or PVC. Floor- or wall-mounted cleanouts will be provided every 80 feet within the building. All new waste and vent piping shall connect to existing sanitary system outside the building.

Stormwater Systems:
The building will be provided with an internal drainage system. The internal system shall utilize Schedule 40 cast iron pipe and fittings. PVC is acceptable underground. The roof will be provided with cast iron roof drains to collect rainwater from the roof. The roof drains will be collected into stormwater systems throughout the building and piped to the exterior. Emergency overflow will be provided by a scupper system. Cleanouts will be provided every 50 feet on underground systems and at the base of all rainwater risers. All rainwater leaders and roof drain bodies to be insulated.

Domestic Cold Water Systems:
The facility will be provided with a potable and non-potable domestic cold water system utilizing Type “L” copper pipe and fittings. The domestic water service to the new building will be a 4” main. Potable domestic cold water will be distributed throughout the new building to service plumbing fixtures and equipment. Non-potable system will supply all lab spaces. Shutoff valves will be provided to isolate fixtures and equipment. Backflow preventers will be provided at all mechanical equipment connections. Shock absorbers will be provided at all flush valve fixtures.

Domestic Hot Water Systems:
Hot water for the entire building will be generated by two new steam water heaters equal to AERCO B+03/.00/EC water heater. One heater shall serve the potable water system and the other serve the non-potable system. Domestic hot water will be delivered at 120 degrees F to all public rest rooms and lab areas. The domestic hot water systems shall be totally recirculated. Shutoff valves will be provided to isolate plumbing fixtures. All domestic hot water and recirculation piping to be insulated.

Natural Gas System:
The facility will be provided with a new natural gas service feed from the site. Coordinate with local gas company for any additional meter work. The gas main will route from the gas regulator throughout the building. Gas shutoff valves, dirtleg, and unions will be provided.

Lab Air System:
Provide a new packaged lab air compressor system. Actual air compressor size shall be determined when number of lab outlets is known. Unit shall be manufactured by Powerex or equal. All air piping shall be Type “L” hard drawn, copper, precleaned, and capped.
FIRE PROTECTION SYSTEMS:

A. A fire and jockey pump will be utilized to obtain the required pressure for the standpipe and sprinkler system. Fire pump will be a 750 gpm pump that will provide 100 psi at the top of each standpipe. Pump size to be selected as the design is further developed.

B. The building shall be provided with a complete automatic sprinkler system for all areas. All sprinklers shall be installed according to their listing. The sprinkler system shall be a wet and/or dry system hydraulically calculated using the following criteria:

C. Classrooms, office areas and like occupancies well subdivided shall be hydraulically balanced on a light hazard basis to produce .1 GPM density over the most remote 1,500 sq. ft. and head coverage of 225 sq. ft./head maximum using 165 degree F quick response heads.

D. Supply rooms, incidental storage rooms, and like occupancies shall be hydraulically balanced on an ordinary hazard Group 1 basis to produce .15 GPM density over the most remote 1,500 sq. ft. and head coverage of 130 sq. ft./head maximum using 165 degree F quick response heads.

E. Equipment rooms, power and telephone switchgear rooms, and like occupancies shall be hydraulically balanced on an ordinary hazard Group 2 basis to produce .2 GPM density over the most remote 1,500 sq. ft. and head coverage 130 sq. ft./head maximum using 165 degree F heads.

F. Calculations for above densities to include hose streams of 100 GPM for light hazard, 250 GPM for ordinary hazard, and 500 GPM for extra hazard occupancies.

G. All sprinkler heads in areas with finished ceiling shall be quick response, white, recessed type except as noted below with temperature rating as conditions dictate. Associated sprinkler piping shall be run in furred spaces, chases, etc., to completely conceal all piping.

H. All sprinkler heads in areas without finished ceilings shall be quick response, brass upright heads with temperature ratings as conditions dictate. Associated sprinkler piping shall be run exposed and painted to match adjoining areas.

I. Sprinklers are to be supplied from automatic sprinkler riser assemblies which shall be furnished complete with standard trim and the necessary components (a flapper type flow switch) to interlock with the building fire alarm system. Switch by sprinkler contractor. Wiring by electrical contractor.

J. The sprinkler contractor shall coordinate the location of piping and heads with light fixtures, diffusers, ductwork, plumbing lines, etc., and make minor adjustments in the sprinkler layout where required or deemed necessary by the architect.

K. All sprinkler heads shall be located symmetrically in all areas and centered in ceiling tiles.
L. Fire protection system to conform to all requirements of NFPA 10, 13 and 14, all local, county and state regulations, as well as the insurance underwriter. Sprinklers are to be supplied from horizontal fire mains in the various building fire zones. Coordinate with electrical contractor for wiring of the various zone tamper and flow switches.

M. All sprinkler piping shall be installed by a registered sprinkler contractor.

**Maintainable Design:**
All new systems and equipment shall be designed and installed to optimize maintainability as listed in the OPR and the MTSU Campus standards document.
MECHANICAL SCHEMATIC DESIGN NARRATIVE

Chilled Water Site Distribution:
Extend new 16” underground chilled water piping from the existing 20” piping located on the east side of the Library to the new building. The underground piping will include provisions to extend 6” piping to the new building as well as 12” piping to future campus developments across Blue Raider Drive.

Satellite Chilled Water Plant Expansion:
Add a 1,500 ton centrifugal chiller in the plant expansion. Add a cooling tower and condenser water pump to serve the new chiller. The cooling tower will be mounted at grade on the east side of the plant expansion and will in line with the existing cooling towers.

Building Chilled Water:
The estimated peak cooling load of the new facility is 350 tons / 600 gpm.

Approximately 600 GPM of chilled water shall be provided from the existing underground campus chilled water distribution system. Chilled water piping (CHWS&R) shall enter the building in a pit near the southeast (NW) corner of the building. From this location, chilled water piping will be routed to each air-handling unit (AHU) and fan coil unit (FCU).

Building chilled water distribution system will not require building distribution pumps but will require an air dirt separator and chilled water meter on incoming lines.

Heating Hot Water and Steam:
125 PSI high-pressure steam (HPS) and condensate return (CR) shall be fed from the existing campus system.

Extend 6” underground steam and 3” condensate return piping from an existing steam vault located at the south side of the Mass Communication building to a new manhole on site of the new proposed building. Manhole shall have valved and capped connections for future expansion to the campus with 4” steam / 2” condensate extending to the new building.

Steam piping shall enter the building in a pit near the northwest (NW) corner of the building. After entering the building, the HPS shall be reduced through a 2-stage pressure reducing station. Stage 1 shall reduce steam to 60 PSI medium-pressure steam (MPS). Stage 2 shall reduce the steam from 60 PSI to 15 PSI low-pressure steam (LPS). The 15 PSI LPS shall then feed one 3,700 mbh convertor (2,700 mbh for building heating / 1,000 mbh allowance for domestic water heating)

Steam piping shall slope to traps for condensate removal. Provide drip stations every change in elevation and a minimum of every 100 feet of straight run. Each steam trap shall be routed back to condensate return pump/receiver in main mechanical space. Condensate receivers/pump shall then pump condensate back to the cogeneration plant. Route vents from
condensate receiver and relief valve up to roof. Condensate pump shall be duplex pump system with mechanical alternator and cast iron receiver with 20 year warranty.

From the converter, 180 degree hot water shall be distributed by two 370 GPM in-line pumps (one pump operating / one pump standby) through hot water supply and returns mains (HWS&R) to the designated air-handling units, fan coil units and VAV boxes in the building. Provide hot water feed to feed domestic hot waters/ heat exchangers for domestic hot water heating.

Each pump shall be sized to handle entire load if the other pump should fail. Each pump shall have a VFD to control speed based on a remote pressure sensor in the building piping. The converter shall have a bypass valve and two control valves (one sized at 1/3 capacity the other at 2/3 capacity). Building hot water loop shall also have expansion tank, and air dirt separator.

Provide condensate flow meter for energy monitoring.

The chilled water, steam, and condensate return service will require a pit at the entrance into the Level 1 mechanical room. The pit will allow access to traps, valves, etc.

**Back up Hot Water Boilers:**
Provide (2) Lochinvar PBN2500 high efficiency hot water boilers for building heating as backup for campus steam system. Provide each boiler with 150 gpm in-line circulation pump. Tie into heating hot water loop, downstream of steam heat exchanger.

**Air Handling Unit Systems:**
Central air-handling units (AHU) shall be provided for space conditioning. These units shall be located in penthouse mechanical rooms on the roof.

Air-handling unit systems shall be double wall central station air-handling units equal to the Trane MCC type air-handling unit. Each unit shall have the following features:

- Prefilter section with 30% efficient, 2” thick cartridge type filters (MERV 8)
- Air blender section
- Return fan section (provide gravity damper on all fan arrays)
- Hot water preheat coils (where indicated)
- Access section
- Chilled water coil section with stainless steel coil track and drain pan
- Supply fan section (provide gravity damper on all fan arrays)
- Final filter section with 80% bag filters (Viledon - MERV 13)
- Economizer section with outside air, return and relief damper sections
- Discharge plenum
- Run-around coil with pump (for energy recovery where applicable)
- Airflow monitoring stations on supply, return, and outside air
The design conditions for each AHU shall be as follows:

- **Space Design Temperature**
  - 75 degrees F summer
  - 68 degrees F winter
- **Space Design Max Humidity** – 55% RH
- **Space Design Min Humidity** – N/A currently no humidification is planned for this building including lab spaces
- **Outside Air Design Temperature**
  - Summer – 95 degrees F DB / 78 degrees F WB
  - Winter – 10 degrees F
- **Chilled water**
  - 45 degree entering water temperature
  - Minimum 59 degree leaving water temperature
- **Hot Water**
  - 180 degree entering hot water temperature
  - 150 degree leaving hot water temperature

**Air-Handling Units (AHU) are summarized below:**

**AHU-1** Serves First floor all NON-lab spaces
- Located in Penthouse on high roof
- VAV system
- Supply fan 12,000 CFM, multiple direct drive fans with VFD for each
- Return fan 10,000 CFM, multiple direct drive fans with VFD for each
- CO2 sensors for ventilation air
- Hot water preheat coil

**AHU-LAB**
- Serves Lab classrooms on first floor
- Located in Penthouse on high roof
- VAV system
- Supply fan (100% outside air) 13,000 CFM
- Hot water preheat coil
- Glycol Heat recovery Coil and associated pumps

**LAB-HR**
- Provide heat recovery AHU with Exhaust fan section filter and glycol heat recovery coil. Glycol recovery loop shall have circulation pump, air separator and expansion tank. Provide piping between LAB-HR and AHU-LAB.

**AHU-2**
- Serves Second Level
- Located in Penthouse on high roof
- VAV system
- Supply fan 40,000 CFM, multiple direct drive fans with VFD for each
- Return fan 30,000 CFM, multiple direct drive fans with VFD for each
CO2 sensors for ventilation air
Hot water preheat coil

Supply and return air shafts will be coordinated as required to serve the Main Level and the Second Level spaces.

**Lab Exhaust and Dust Collection Systems:**
Each lab space is currently assumed as 100% outside air. Currently the space programming identified only one lab hood. The remainder of spaces will be provided with exhaust ventilation to maintain 100% outside airflow to each lab space.

Route 12” welded stainless steel exhaust duct from lab hood to laboratory exhaust fan on the roof. Lab exhaust fan shall be fully corrosion resistant with discharge nozzle to discharge 10ft above roof level. Fan to be equal to Greenheck Vector or equal.

Each lab space shall have venturi exhaust valves to maintain space pressure relationships and track exhaust airflow based on supply from VAV system. Each lab shall have exhaust valves and galvanized steel ductwork routed to heat recovery AHU at penthouse level.

Labs shall be designed to maintain a minimum of 8 air changes per hour of outside airflow during occupied hours and 4 air changes per hour during unoccupied hours.

Provide vent hood and airflow control valve for all kilns and ovens.

Provide dust collection system for Mixing Laboratory for collection of concrete dust. Provide ducted dust collection system with drops for connections to various grinders and laboratory equipment. Dust collector to be located in remote mechanical space. Size and location of the mechanical equipment space TBD.

Provide dust collection system for Construction Materials Laboratory. Provide ducted dust collection system with drops for connections to various wood working and laboratory equipment. Dust collector to be located in remote mechanical space. Size and location of the mechanical equipment space TBD.

**Smoke Control System:**
For this narrative we are assuming the two story lobby space will meet exception 405.4 of the 2018 IBC not requiring smoke control for atriums only connecting two stories. Thus there will NOT be smoke control system for this building. To meet this exception other egress and separation requirements may be required based on the IBC and will require some coordination with the local AHJ as well as the State FM.

**Controls:**
All HVAC systems and components shall have Direct Digital Controls (DDC) networked back to existing Siemens campus energy management system and workstation. The mechanical system controls shall include (but not limited to) the following control features:
• Economizer
• Outside airflow monitoring
• Demand control ventilation based on measured CO2 level in designated spaces
• Time-of-Day schedules and night setback
• 2-way Pressure Independent Control Valve on all AHU chilled water coils (Belimo or Flow Design)
• Humidity monitoring and dehumidification controls (as required)
• 2-way control valves on all hot water coils
• All control valves to be 2-way with local manual override capability
• Provide local readout on AHU control panels
• Provide supply air sensor on VAV boxes
• Provide BACnet interface for all third party systems
• Damper actuators to have local manual override capability
• Provide graphical screens for all new equipment and systems, including floor plans
• Floor plans to show color gradient changes to match space temperature conditions
• Provide for standard Internet web-browser interface access
• Provide submeters and controls to monitor utilities for new facility as follows:
  o Steam Condensate
  o Heating Water
  o Domestic Water
  o Electrical Utilities – Network interface to new electrical switchgear
  o Chilled water

Sound and Vibration Control:
The following sound control measures shall be implemented to mitigate the mechanical system noise.
Vibration isolation:
• 2” internal spring isolated fan sections in all air-handling units
• Flexible pipe connections for hot water pumps
• 1” deflection isolators for all suspended fans and fan coils
Ductwork:
• First 25 feet of supply duct from each unit shall be double wall with perforated liner
• Lined ductwork is not permitted
Acoustical coordination:
• All acoustical issues will be coordinated based on recommendations from the acoustical consultant

Fan Coil Units:
Provide new chilled water/hot water fan coil units to serve all computer, communication, data, AV, electrical room spaces, mechanical room spaces (including penthouse), and stairwells.

Miscellaneous:
Supply ductwork shall be medium-pressure round, flat oval or rectangular from the air-handling unit to the variable/constant volume reheat terminal units. Supply downstream of the terminal units, return, and exhaust air shall be well sealed low-pressure galvanized steel. All concealed
supply and return ductwork shall be externally insulated with 2” thick, foil-backed, duct wrap. All exposed supply and return ductwork shall be double wall with perforated liner.

Provide pressure independent air terminal units with 120V/24V transformers mounted to each unit.

Provide fire, smoke, and/or combination fire/smoke dampers in all 2-hour, 1-hour fire/smoke, and 2-hour fire/smoke walls as required by International Building Code. Damper actuators for combination fire/smoke and smoke dampers shall be 120V.

All fire dampers in systems designated to have smoke evacuation shall be “dynamic” type and shall be rated as such in accordance with UL 555.

Mechanical systems shall be seismically braced and restrained according to the International Building Code.

Air Distribution Devices:
• In general, spaces will have standard louver face aluminum construction, off-white ceiling diffusers similar to Titus Model TDC-AA.
• Provide linear slot diffusers similar to Titus ML-38 in the following areas:
  o Main Entrance Lobby
  o Elevator Lobbies
  o Conference Rooms
  o All areas with “covered” drywall ceilings
• Ceiling return/exhaust registers to be standard eggcrate, aluminum similar to Titus 50R
• Atrium/Lobby Area – use Titus Flow Bar Linear Diffuser

Thrust restraints shall be provided for supply and return ductwork penetrations of penthouse floors and/or other areas where elimination of vibration within the duct system is critical.

Provide smoke detectors in the supply and return ductwork of each air-handling unit.

Roof-mounted centrifugal exhaust fans shall be ducted to each toilet and janitor closet for code required exhaust. Exhaust shafts will be coordinated to serve the Main Level and the Second Level. Copy areas will require exhaust to meet HPBr requirements.

Commissioning:
Third party commissioning agent shall be secured for the project. The basic intent is to verify and ensure that fundamental building elements and mechanical and HVAC systems are designed, installed and calibrated to operate the design documents.
• The commissioning team shall not include individuals directly responsible for project design or construction management
• Incorporate commissioning requirements into the construction documents
• Develop and utilize a commissioning plan
• Verify installation, functional performance, training and operation and maintenance documentation

Test and Balance:
Provide AABC independent contractor to perform complete test and balance services including preconstruction reviews, construction administration and testing and balancing as identified in the AABC National Standards Manual. Provide reports in AABC format to the architect/engineer.

Sustainable Design:
All new systems and equipment shall be designed to achieve performance equal to or greater than ASHRAE 90.1 – 2010 and the State of TN High Performance Building Requirements (HPBr). All new sealants and adhesives shall be low VOC type.

Maintainable Design:
All new systems and equipment shall be designed and installed to optimize maintainability as listed in the MTSU Maintainability Issues document.
ELECTRICAL SYSTEMS SCHEMATIC DESIGN NARRATIVE

This narrative is intended to encompass the electrical scope of work for the new School of Concrete and Construction Management Building located on the campus of Middle Tennessee State University in Murfreesboro, Tennessee.

Provide all labor, materials, tools and services for a complete installation of equipment and systems specified herein. Principal features of work included are:

• Primary Electrical Service
• Main Service Distribution Equipment
• Power Wiring and Secondary Distribution
• Interior Lighting Fixtures and Lighting Control Equipment
• Convenience Outlets
• Electrical Control and Interlock Wiring as required by Mechanical Drawings, Specifications, or Manufacturer’s Schematics
• Heating, Ventilating and Air-Conditioning Equipment Power
• Plumbing Equipment Power
• Fire Alarm, Fire Voice Evacuation, and Smoke Detection Systems
• Electrical Connections to Owner-Furnished Equipment
• Fire Alarm Interface at AV Equipment Racks
• Information Technology Room Grounding Systems
• Audio Visual Equipment
• Elevator Equipment Connections
• Surge Suppression Devices
• MDF, IDF, and Server Room Equipment Power Connections

Comply with applicable local, state, and federal codes.

Comply with applicable requirements of recognized industry associations which promulgate standards for the various trades.

Employ only qualified journeymen for this work. Employ a competent qualified mechanic to supervise the work.

Perform work specified in Division 26 in accordance with standards listed below including amendments or revisions:

NFPA-72A  Local Protective Signaling Systems.
ANSI-A17.1  Elevators, Dumbwaiters, Escalators and Moving Walks.  

Reference Architectural Narrative for Additional Code Requirements. Reference Communications Narrative for additional requirements.  

All materials and equipment used in carrying out these specifications to be American made unless approved otherwise by the Engineer and to be new and have U.L. listing, or listing by other recognized testing laboratory when such listings are available. Construction materials shall meet Factory Mutual guidelines.  

Properly identify all starters, contactors, relays, safety switches, and panels with permanently attached black phenolic plates with 1/4 white engraved lettering on the face of each attached, with two sheet metal screws. Starters and relays connected by the electrical tradesman to be identified by him whether furnished by him or others.  

A new pad-mounted transformer shall be provided and fed from existing manhole VE3 via a new primary ductbank. The secondary of the pad-mount transformer shall feed a new 1600A, 480/277V, 3 phase, 4 wire, 65kAIC rated main switchboard 'MSB' located in the main electric room. The electrical contractor shall be responsible for providing the primary electrical ductbank and the pad for the transformer. Murfreesboro Electric Department shall provide and install the primary conductors and pad-mounted transformer.  

Electrical service for the facility shall include 25 percent spare capacity for future growth.  

Buildings' main power distribution panel shall be provided with a multi-function meter with communication and I/O capable of measuring Volts, Amps, Watts, Vars, VA, PF, Frequency, Watt-hour, VA/hour, VAR/hour and shall be connected to the Building Automation System.  

Panelboards shall be specified for sequence phase connection to evenly balance electrical loads on each phase. Bus bars shall be copper. All panelboards shall be fully bussed. Loads up to 400 amperes shall utilize panelboards. Loads 400 to 1200 amperes shall utilize distribution boards. Provide 50 percent spare breaker space in each distribution panel in all new buildings. Provide 20 percent spare breaker space in each panelboard. Loads above 1200 amperes shall utilize switchboards. Circuit breakers to be molded case, bolt-on type. A detailed short-circuit analysis shall be prepared during the design phase, and all overcurrent devices shall be coordinated so that downstream devices will trip to clear any fault. The anticipated available fault current at the utility secondary is 65,000 amps.  

Provide 3PH, 4W transient voltage protection devices at the main service switchboards and panelboards indicated. TVSS devices shall be listed per U.L. 1449 Revision 7/2/87, comply with ANSI/IEEE C62.1, C62.41, and C62.45 test procedures, and comply with NFPA 70 Article 280. Provide the owner with 20 percent spare devices for all 3PH suppressors, but not less than three spares for each voltage level.
The mechanical contractor shall be required to furnish all starters and disconnects for his portion of the project to the electrical contractor for installation.

Install starters as shown on mechanical drawings and scheduled on electrical drawings. Division 23 to furnish and install starters, line- and low-voltage control wiring including conduit, conductors, and terminations for same. Starters used inside to have NEMA-1 enclosures, starters used in damp locations or exposed to weather to have NEMA-3R enclosures.

Conductors shall be copper. Temperature rating of conductors shall be 90 degrees C. Insulation shall be THHN, THHW, or XHHW, 600 volt rated, 90 degrees C.

The entire system of raceways and equipment shall be grounded in accordance with Article 250 of the NEC. The main service switchboard shall be bonded to the street side of first flange or coupling of the incoming water line in accordance with Article 250-80 of the NEC, sized in accordance with Article 250-94 of the NEC. An additional ground wire shall be run to a tripod grounding rod system outside the building foundation. Building steel shall be connected to the building switchboard. Separate green grounding conductors shall be installed in all feeder and branch circuits in accordance with Table 250-95 of the NEC. Each IT room shall include a ground bar tied to the facility grounding system.

Exit and emergency lighting shall be provided throughout the facility. All egress doors and paths to egress doors shall be marked with “LED” exit signs. All areas of the facility shall be provided with emergency lighting (approximately 20 percent of light fixtures are to be on emergency). Exit signs and emergency lighting shall comply with NFPA 101 and shall utilize integral battery backup.

Owner requires the use of light emitting diode (LED) lighted exit signs with diffused lenses. Only red lettered exit signs will be used.

Typical locations for occupancy sensors include small rooms such as individual rest rooms, one person offices, and small storage rooms like closets, supply rooms or recycling rooms, and conference/classrooms when possible. Ceiling-mounted occupancy sensors shall be provided in conference rooms and classrooms. Wall switches also be provided in conference rooms and classrooms such that lights may be controlled by switches when space is occupied. Occupancy sensors shall be dual technology type. Daylight sensors shall be provided per IECC Requirements.

Provide a new campus standard Simplex fire alarm system as described herein, to be wired, connected and left in first class operating condition. Where installed above accessible ceiling space, fire alarm cabling shall be plenum rated. Include sufficient control panels, annunciators, manual stations, automatic fire detectors, smoke detectors, alarm indicating appliances, wiring, terminations, electrical boxes, conduit and all other necessary material for a complete operating system. Provide duct smoke detectors in supply and return ducts of all air-handling
units. The system shall be capable of on-site programming to accommodate system expansion and facilities changes in operation. The system shall be capable of recalling alarms and trouble conditions in chronological order for the purpose of recreating an event history. All devices shall be addressable, shall be supervised, and the capability of being disabled or enabled individually. The system shall be capable of operating remote CRTs and/or printers; output shall be ASCII from an EIA-RS-232-C connection with an adjustable baud rate. The system shall have one-way voice communication and tone-generating capabilities with three prerecorded digitized voice messages, one for alarm, one for testing, and a standard evacuation message. The system alarm operation subsequent to the alarm activation of any manual station, automatic detection device or sprinkler flow shall be as follows:

- All audible alarm indicating appliances shall notify occupants with the prerecorded evacuation message.
- All visual alarm indicating appliances shall flash continuously until the system is reset.
- Release all doors held open by door control devices.
- Recall all elevators.
- Activate mechanical control schemes in accordance with NFPA 90.
- Notify monitoring station.
- Shunt AV rack equipment.

Middle Tennessee Police Department (MTPD) remotely monitors essentially all of the University buildings. MTPD monitors all of these fire alarm systems, 24 hours a day. The connection from the building to MTPD shall be by the University network.

As part of the project the Satellite Chiller Plant shall be expanded. All new equipment shall be powered from the existing electrical distribution equipment in the building.

Convenience outlets shall be provided throughout the facility as specified herein. Convenience outlets shall be specification grade with a #12 ground wire from the device grounding terminal back to the grounding bus in the panelboard and bonded to the outlet box. Convenience outlets shall be provided with stainless steel device plates. Convenience outlets provided for outdoor use shall be mounted vertically and be the “GFI” type and equipped with “Taymac” covers. Convenience outlets provided in rest rooms shall be “GFI” type. Convenience outlets provide for PC power shall be the isolated ground type. Convenience outlets on individual circuits shall be rated at 20 ampere. Convenience outlets in corridors, prefunction areas, etc., are to be rated at 20 amperes. Provide convenience outlets in offices at one outlet per wall with an additional isolated ground for PC power. Provide one duplex grounded outlet at each stair landing for cleaning purposes. Stairwell outlets and corridor wall outlets shall be circuited separately from office or classroom receptacles.

Provide hardwired connection to all auto flush valves and faucets.

Provide equipment connections for owner-furnished equipment.
Minimum conduit size shall be 3/4". Flexible metal conduit shall be used only for whips to lighting fixtures and equipment. All empty conduits shall have a 65-pound test polymer (or equivalent) pull string tied off at both ends.

**Maintainable Design:**
All new systems and equipment shall be designed and installed to optimize maintainability as listed in the MTSU Maintainability Issues document.
MECHANICAL PENTHOUSE

CANTILEVERED AREA

CAST-IN-PLACE CONCRETE WALLS, PLANTERS, SIGNAGE, ETC.

ALUMINUM STOREFRONT / CURTAINWALL WITH INSULATED GLAZING, TYPICAL

CONCRETE WINDOW SURROUND AND PANELS

CONCRETE ROOF OVER CORRIDOR

CANTILEVERED WINDOW SURROUND AND PANELS

EPDM ROOFING ON METAL DECK

COURTYARD / PLAZA WORKING YARD

LOADING DOCK

SECTIONAL OVERHEAD DOOR WITH GLASS

CONCRETE 35%

BRICK 50%

GLAZING 15%
Middle Tennessee State University
SCHOOL OF CONCRETE AND CONSTRUCTION MANAGEMENT
Middle Tennessee State University
SCHOOL OF CONCRETE AND CONSTRUCTION MANAGEMENT

- Existing Steam Vault
- New 6" Steam / 3" Cond.
- Existing 20" CHWS&R
- 12" CHWS&R Stubbed for Future Connection
- New 16" CHWS&R
- 6" CHWS&R Stubbed for Future Building
- 4" Steam / 2" Cond Stubbed for Future Building
- FUTURE BUILDING
- SC/CM
LABORATORY DESIGN
MTSU SCCM
New Building
Murfreesboro, Tennessee
2020 January 29

HERA laboratory planners
SYMBOLEGEND

- Mobile lab bench
- Mobile instructor lab bench
- Mobile heavy duty open shelf unit
- Wall cabinet
- Cylinder restraint
- Tall cabinet
- Tall open shelf storage
- Fixed lab bench worktop
- Utility sink
- Lab sink with drying rack
- Concrete pit
- Floor pit drain
- Equipment space - 4' square foot print

- Mobile base cabinet below
- Mobile base cabinet below
- Mobile base cabinet below
- Open wall shelf above
- No shelves above
- Heavy duty Unistrut supports
- Heavy duty Unistrut supports
- For Owner furnished inert cylinder gases
- Welded chain link restraint
- 12 gauge welded tube steel
- Adjustable height
- Adjustable height
- Adjustable shelves
- Lockable doors
- 45 square foot storage per cabinet
- 31" W x 18" D x 10" H
- Heavy duty lockable casters
- 2 rows shelves above (1 shelf at Sollis/Cement Lab)
- Sediment trap
- Epoxy resin
- Sediment trap
- Sediment trap
- 12" W x 12" L x 12" D

- 6' chemical fume hood
- Variable Air Volume
- 800 cfm

- Utility sink
- Stainless steel
- 27" W x 62" L x 36" H
- One sink bowl 24" x 24" x 12" D
- Sediment trap

- Unistrut frame at 9' above floor
- P10001 horizontal unistrut
- P10001 vertical unistrut at 48" on center
- 115V fixtures at 48" on center
- Power reest at each mobile bench below
- 500 lb. point load capacity

- Overhead crane
- 2000 lb. capacity
- Flat plate monitor
- 72" diagonal
- Electrical panel
- 200 amp 42 circuit

- Safety Shower/Emer. Eyewash Unit
- Eyewash recessed in wall
- Floor drain below at floor
- Tempered water

- 12" W x 6" D x 64" H
- Sediment trap

- Sediment trap
**Materials Laboratory**

**Room 200**

**Program Requirements**

**Architectural**

- **Function:** Research laboratory for construction materials research/testing
- **Centerline dimensions:** 36’x48’
- **Program minimum clear floor area:** 1600 sf, not including walls, columns, recessed doors
- **Occupancy:** B
- **Number of students:** 12-18
- **Floor:** Sealed concrete
- **Walls:** Metal stud with gypsum board
- **Ceiling:** Open to structure - High bay
- **Doors:** 3’-0’x8’-0” pair with view window
- **Sound attenuation:** NC 45 or less - Sound attenuation at walls
- **Security:** Digital access

**Structural**

- Concrete columns to be incorporated into design
- Consider construction motif patterns in concrete surface

**Mechanical**

- **Temperature:** 68-72 deg F +/- 2 deg F
- **Humidity:** Ambient
- Dust Collection system
- **Equipment heat gain:** 25 btuh/sf

**Plumbing**

- **Domestic:** Hot/Cold water at sink
- Tepid water at safety shower with floor drain

**Electrical**

- 115v20a1ph outlets at walls
- 208v power at equipment space
- Hardwire and wireless data (WAP)
- **Lighting:** Direct/Indirect LED at 500 LUX

**Contractor Furnished Equipment**

- Casework
- Mobile lab bench work station
- Utility sink
- Equipment space shelving
- Cylinder restraint
- Unistrut frame at ceiling
- Open shelf units
- Window Marker board
- Monitor
- Safety shower/eyewash

**MTSU Furnished Equipment**

- Construction equipment, tools
- Benchtop equipment
- Temperature/humidity chambers
  - “43 linear feet equipment space required per equipment spreadsheet”
  - “50 linear feet equipment space provided in design”
- 500 square feet shelf storage space provide at tall cabinets and equipment spaces
SOILS LABORATORY
Room 201

Program Requirements

ARCHITECTURAL
Function: Teaching laboratory for chemical analysis of construction materials
Centerline dimensions: 36’ x 60’
Program minimum clear floor area: 2000 sf, not including walls, columns, recessed doors
Occupancy: 8
Number of students: 24
Floor: sealed concrete
Walls: metal stud with gypsum board
Ceiling: open to structure
Doors: 3'-0" x 8'-0" pair with view window
Sound attenuation: NC 45 or less
Security: digital access

STRUCTURAL
Concrete columns to be incorporated into design
Consider construction motif patterns in concrete surface
Slab on grade

MECHANICAL
Temperature: 68-72 deg F +/- 2 deg F
100% exhaust: no recirculation of exhaust air
8 air changes per hour occupied
4 air changes per hour unoccupied
Humidity: Ambient
Equipment heat gain: 25 btuh/sf

PLUMBING
Hot/Cold water at sinks
Specialty gases (inert) at cylinder restraints
Domestic tepid water at safety shower with floor drain

ELECTRICAL
115v/20a 1ph outlets at walls
208v power at equipment space
Hardwire and wireless data (WAP)
Lighting: direct/indirect LED at 500 LUX.

CONTRACTOR FURNISHED EQUIPMENT
Casework
Mobile lab bench work station
Utility sinks
Equipment space shelving
Unistrut frame at ceiling
Open shelf units
Chemical fume hood
Marker board
Monitor
Safety shower/eyewash

MTSU FURNISHED EQUIPMENT
Analysis equipment
Benchtop equipment
Noisy, dirty, vibration equipment in Equipment Room
*~20 linear feet equipment space required per equipment spreadsheet
*~67 linear feet equipment space provided in design
626 square feet shelf storage space provided at tall cabinets, base cabinets, wall cabinets, metro shelf units, and equipment space shelves
**MIXING LABORATORY**

**Room 205/206**

**Program Requirements**

**ARCHITECTURAL**

- **Function:** Teaching laboratory for concrete design, mixing, and testing
- **Centerline dimensions:** 36' x 48'
- **Program minimum clear floor area:** 1600 sf, not including walls, columns, recessed doors
- **Occupancy:**
  - **Number of students:** 18-24
- **Floor:** sealed concrete
- **Walls:** metal stud with gypsum board
- **Ceiling:** open to structure - high bay
- **Doors:** 3'-0" x 8'-0" pair with view window
- **12’ roll-up door at exterior**

**Sound attenuation:** NC 45 or less - sound attenuation at walls

**Security:** digital access

**Adjacency:** Student Projects Laboratory

**STRUCTURAL**

- **Concrete columns** to be incorporated into design
- **Consider construction motif patterns in concrete surface**
- **Slab on grade** - capacity for fork lift operation

**MECHANICAL**

- **Temperature:** 68-72 deg F +/- 2 deg F
- **Humidity:** Ambient
- **Dust Collection system**
- **Equipment heat gain:** 25 btuh/sf

**PLUMBING**

- **Hot/Cold water at sink**
- **Specialty gases (inert) at cylinder restraints**
- **Domestic tepid water at safety shower with floor drain**

**ELECTRICAL**

- **115v/20a 1ph outlets at walls**
- **208v power at equipment space**
- **Hardware and wireless data (WAP)**
- **Lighting:** direct/indirect LED at 500 LUX.

**CONTRACTOR FURNISHED EQUIPMENT**

- Casework
  - 6’ chemical fume hood - on/off control
  - Utility sink
  - Unistrut frame at ceiling
  - Open shelf units
  - Tall shelf units at walls
  - Window marker board
  - Monitor
  - Safety shower/eyewash

**MTSU FURNISHED EQUIPMENT**

- Construction equipment, tools
- Concrete molds; Equipment bins
- Wheelbarrows; Concrete mears
- Concrete saw
  - ~60 linear feet equipment space required per equipment spreadsheet
  - ~76 linear feet equipment space provided in design
- 448 square feet shelf storage space provide at tall cabinets and equipment spaces
**ARCHITECTURAL**

Function: Teaching laboratory for building systems technology
Centerline dimensions: 36’x60’
Program minimum clear-floor area: 2000 asf, not including walls, columns, recessed doors
Occupancy: 8
Number of students: 18-24
Floor: sealed concrete
Walls: metal stud with gypsum board
Ceiling: open to structure - high bay
Doors: 3'-0"x8'-0" pair with view window
12’ roll-up door at exterior
Sound attenuation: NC 45 or less - sound attenuation at walls
Security: digital access
Adjacency: Student Projects Laboratory

**STRUCTURAL**

Concrete columns to be incorporated into design
Consider construction motif patterns in concrete surface
Slab on grade - capacity for fork lift operation

**MECHANICAL**

Temperature: 68-72 deg F +/- 2 deg F
Humidity: Ambient
Dust Collection system
Equipment heat gain: 25 btuh/sf

**PLUMBING**

Hot/Cold water at sinks
Specialty gases (inert) at cylinder restraints
Domestic tepid water at safety shower with floor drain

**ELECTRICAL**

115v/20a outlets at walls
208v power at equipment space
Hardware and wireless data (WAP)
Lighting: direct/indirect LED at 500 LUX

**CONTRACTOR FURNISHED EQUIPMENT**

Casework
Mobile lab bench work station
Utility sink
Cylinder restraint
Unistrut frame at ceiling
Open shelf units
Crane - 2000 lb capacity
Window Marker board
Monitors
Safety shower/eyewash

**MTSU FURNISHED EQUIPMENT**

Construction equipment, tools
Benchtop equipment
+/- linear feet equipment space required per equipment spreadsheet
+/- linear feet equipment space provided in design
604 square feet shelf storage space provide at tall cabinets and equipment spaces

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**BUILDING SYSTEMS LABORATORY**

**Room 207**

**Program Requirements**
**STUDENT PROJECTS LABORATORY**

**Room 208**

**Program Requirements**

**ARCHITECTURAL**
- Function: Laboratory for student construction projects
- Centerline dimensions: 36'x48'
- Program minimum clear floor area: 1600 sf, not including walls, columns, recessed doors
- Occupancy: 8
- Number of students: 12-18
- Floor: sealed concrete
- Walls: metal stud with gypsum board
- Ceiling: open to structure-high bay
- Doors: 3'-0"x8'-0" pair with view window
- 12' roll-up door at exterior
- Sound attenuation: NC 45 or less
- Sound attenuation at walls
- Security: digital access
- Adjacency: Building Systems Laboratory

**STRUCTURAL**
- Concrete columns to be incorporated into design
- Consider construction motif patterns in concrete surface
- Slab on grade

**MECHANICAL**
- Temperature: 68-72 deg F +/- 2 deg F
- Humidity: Ambient
- Dust Collection system
- Equipment heat gain: 25 btuh/sf

**PLUMBING**
- Hot/Cold water at sink
- Specialty gases (inert) at cylinder restraints
- Domestic tepid water at safety shower with floor drain

**ELECTRICAL**
- 115v/20a 1ph outlets at walls
- 208v power at equipment space
- Hardwire and wireless data (WAP)
- Lighting: direct/indirect LED at 500 LUX

**CONTRACTOR FURNISHED EQUIPMENT**
- Casework
- Mobile lab bench work station
- Utility sinks
- Equipment space shelving
- Cylinder restraint
- Unistrut frame at ceiling
- Open shelf units
- Marker board
- Monitor
- Safety shower/eyewash

**MTSU FURNISHED EQUIPMENT**
- Construction equipment, tools
- Benchtop equipment
- ~30 linear feet equipment space required per equipment spreadsheet
- ~28 linear feet equipment space provided in design
- 434 square feet shelf storage space provide at tall cabinets and equipment spaces