

<u>TABLE OF CONTENTS</u>	<u>1</u>
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<u>ELECTRICAL</u>	<u>2</u>
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- Summary
- Sustainability
- Electrical Distribution
- Lighting
- Detection and Alarm
- Communication Systems
- Lightning Protection
- Clock Systems
- Access Control
- Housekeeping Pad

ELECTRICAL DESIGN

1. SUMMARY

- A. This section contains information which serves as general requirements for electrical design.
- B. Refer to applicable codes and standards for further information on the criteria mentioned in this section.
- C. Refer to SPACE ALLOCATIONS AND DESCRIPTIONS in Design Guidelines - General for electrical space requirements and to appropriate sections MSU Construction Standards for additional design considerations.
- D. Departmental equipment requiring access by department personnel shall not be located in building electrical rooms or transformer vaults in order to maintain electrical room and transformer vault security.

2. SUSTAINABILITY AND LEED™

- A. The performance standard, LEED™ v3.0, shall be implemented to the extent feasible and practicable in all new buildings and major renovation projects in existing buildings. Refer to LEED™ in Design Guidelines – General Section for more information.

3. DESIGN PROCESS

A. System Voltage

- MSU's main distribution service is at 13,200 volts with two radial feeders forming a primary selective system. Both cables are energized continuously with an automatic transfer switch at each building to transfer that building in case of power failure.
- New facilities are to be served by the 13,200 volt primary selective system with each cable having a momentary symmetrical short circuit capacity of approximately 679MVA (X/R=52) at the T.B. Simon Power Plant.
- All new cable shall be rated 15,000 volts.
- Primary voltage to all new buildings shall be 13,200 volts delta. When major alterations or additions are made to buildings presently fed by the 4,160 volt system, they shall be upgraded to the 13,200 volt system.
- In all areas of the campus, (except outlying areas, farms, etc.), all primary, secondary, and communication cables will be installed in ducts with vaults at each change in direction.
- Incoming primary shall be two minimum size 2/0 AWG, 15,000 volt, three single conductor cables terminated with Class 1 Outdoor terminations on a selector switch unit.

B. Building Primary Service

- The building electrical service shall consist of primary switches with source transfer control in a common-bus-primary-selective configuration feeding a load break primary switch for each transformer on each of the double ended substation(s).
- The double ended substation shall have a full rated tie breaker and 25% spare minimum 600 amp feeder breakers in fully bussed and equipped compartments. All spare breaker compartments shall be completely bused and equipped for use by minimum 600 amp breakers. When emergency lighting or critical loads are connected to the substation, automatic transfer controls and breakers connected ahead of the main breakers shall be used.
- All primary switch units and unit substations shall be mounted on leveling channels in 4 inch concrete bases with angle iron or channel nosing.
- The arrangement of the primary switches, unit substations, and all other equipment in the transformer vault shall be such as to provide ample maintenance room and such that any piece of equipment can be removed without removing other pieces of equipment.

C. Transformer Vault

- Provide a six inch concrete curb across doorway.
- Installation of doors and locks on transformer room shall be required prior to energizing equipment. See Finish Hardware for type of lock.
- Provide a floor drain in transformer vault, if possible.
- Provide thermostatically operated louvers in areaway ventilator with frame for supporting inexpensive throwaway type pre-filters.
- Provide an Ethernet connection in the main metering compartment of one of the electrical substations. Ethernet shall be housed in a 3/4 inch conduit from the metering compartment to the wall of the Transformer Vault and then routed via conduit and communications cable tray to the Broadband Utility Room for network access outside of the building firewall.
- Provide a 1/4 inch x 2 inch copper ground bus around the perimeter of the vault including going around door and areaway openings.

D. Primary Switch Units

- The metal clad primary switch unit shall consist of two 15 kV primary selector switches with source transfer control for the incoming feeders and 15 kV fused transformer primary switches.
- The switch unit shall be front accessible only, capable of being installed back against a wall.
- Unit shall be free standing, consisting of cubicles arranged for bolting together in the electrical room. Cubicles shall be welded, reinforced sheet steel enclosures with hinged doors. Complete unit shall be rust proofed and painted two coats.
- Primary switches and source transfer control unit shall be mounted in one combination unit consisting of two cubicles.
- Interior barriers shall be provided to form a low voltage compartment completely isolated from the high voltage compartments.

E. Building Secondary Service

- In general, distribution is from drawout circuit breakers in the unit substation to fused or circuit breaker distribution panels to plug-in circuit breaker branch panels.
- Unit Substation
 - ◇ Unit substations shall be double ended, with main secondary breakers and tie breaker to allow manual transfer of load to keep building in service while maintenance is performed on transformer or 13,200 volt switch and fuse compartment.
 - ◇ Maximum size of any transformer shall be 2,000 KVA.
 - ◇ If the lighting load and power load is heavy and motors are fairly large, building service should be 277/480 volts using dry transformers to supply 120/208 volts for duplex receptacles and other 120/208 volt loads.
 - ◇ If the lighting load is heavy compared to the power load and no large motors are required, the building secondary service should be 120/208 volts.
 - ◇ When the total electric load in the building is 200 KVA or more, install two double ended unit substations, one for equipment at 120/208 volts and one for light and power at 277/480 volts.
 - ◇ Install a 3/4 inch conduit from each metering compartment to one of the metering compartments (named Main Metering Compartment) to network the watt-hour meters.

F. Voltage Drop

- The combined voltage drop of secondary feeders and branch circuits should not exceed 3% of the service voltage.

G. Arc Flash

- The electrical system shall be designed so that the Arc Flash Hazard at any point does not exceed Level 2.
- An arc flash analysis shall be performed on the completed system. The results shall be turned over to the Owner for the installation of appropriate labels.

H. Overcurrent Coordination

- A preliminary overcurrent coordination study shall be performed on the designed system to assure that overcurrent coordination is achieved throughout the system. This study will be used to determine the initial overcurrent settings of protective devices.
- A final overcurrent coordination study shall be performed on the installed system to assure that overcurrent coordination is achieved with the installed protective devices. This study will be used to determine the final overcurrent settings of protective devices.

I. Power Factor

- The power factor should not be less than 90%.

J. Emergency Power System

- A natural gas engine driven emergency generator shall be installed to feed emergency lights, EXIT lights, fire alarm system, basic telephone communications, one elevator serving all floors, Broadband Utility and Telephone Utility Rooms, Central Control system cabinets and communications, and other designated critical loads in the event electrical power to the building fails.
- The generator control shall also be interfaced with any feeders feeding auditorium or large assembly areas to sense any loss of voltage. Upon voltage loss, the generator will feed emergency lights in the Auditorium/Assembly area.
- The generator room outside air intake shall have thermostatically operated louvers with a frame for supporting inexpensive throwaway type pre-filters. Pre-filters shall be provided with the frame.

K. Low-Voltage Distribution

- ◇ Distribution Panels
 - ◇ In general, all power and lighting distribution panels shall be either switch and fuse type or circuit breaker if the circuits are 200 amps or smaller. For circuits larger than 200 amps, use circuit breaker type panel. Bus shall be copper. Each branch circuit panel and motor circuit shall be fused separately. On motor circuits, the size of the switch and fuse shall be based on using Fusetrons Class "R".
 - ◇ Distribution panels shall be installed in the electrical switch room, mechanical room, or other accessible location. These panels shall not be installed in plenum chambers. The panel areas should be adequately ventilated.
 - ◇ Lighting Panels
 - ◇ Branch circuit panels shall be installed in electrical switch rooms, mechanical rooms, corridors, or other accessible locations. These panels shall not be installed in plenum chambers, doorways, or custodial closets.
- If panels are in electric closet, door to closet should have a name plate.
 - ◇ Motors
 - ◇ Motors located remote from the combination starters should have a disconnect in the power feeders, not a lock-out stop in the control circuit.
 - ◇ Conventional combination motor starters shall be furnished by the Electrical Contractor for all equipment including that furnished by the Mechanical Contractor.
 - ◇ When supply and exhaust fans compose a system, the controls of paired supply and exhaust fans shall be arranged so that the exhaust fan shall start when the supply fan starts.
 - ◇ Special controls such as alternators on duplex pumps, pressure switches, etc., shall be furnished by the Contractor furnishing the equipment.
 - ◇ Where motors are grouped reasonably close together, motor control centers should be used.
 - ◇ Fire stats or smoke detectors should be connected into the motor control circuit in a manner that will not permit the motor to run when the device has been activated. This applies to hand as well as automatic position of selector switch. Pilot lights

shall be installed in a convenient location to show when interlocked fire stats have tripped the motor control circuit.

L. Circuiting

- In general all lighting branch circuits shall be separate from power and receptacle branch circuits.
- A shared neutral between branch circuits shall not be used for single phase, phase-to-neutral loads at either 120 volts or 277 volts.
- Light Switches
 - ◇ Three-way switches shall not be used in individual offices; use a single pole switch at the corridor entrance.
 - ◇ In large rooms with two or more doors to the corridor, use single pole, 3-way or 4-way switches as the use of the room dictates.
 - ◇ In classrooms, laboratories, conference rooms, office areas, or other large rooms with 3- or 4-lamp fluorescent fixtures, arrange switches so that 2 outer lamps in each fixture are on one switch and the remaining lamps are on another switch. If fixtures are 2-lamp, switch alternate fixtures. Locate the switch controlling the two outer lamps nearest the door.
 - ◇ In corridors, connect alternate fixtures to one switch and connect the remaining fixtures to a key switch. Keep total number of switches as low as practical.
- Receptacles
 - ◇ In general, only five to six receptacles should be installed on a 20 ampere circuit. This will allow for load growth and installing additional receptacles in the future.
 - ◇ For corridor receptacles, a maximum of two receptacles shall be installed on a 20 ampere circuit.
 - ◇ Receptacles located in toilet rooms, bathrooms, kitchens, wet laboratory benches, in general around wet and/or damp areas shall be GFCI type.
 - ◇ Install one duplex receptacle in each toilet room for an electric hand dryer. The mounting height of the outlet will depend on the intended use of the hand dryer.
 - ◇ In general there shall be two duplex receptacles located side-by-side (to form a quad outlet) at the desk location in offices.
 - ◇ Convenience outlets and special purpose outlets will normally be flush in the walls.
 - ◇ Floor outlets or under floor duct are used only in large office or secretarial areas where service is not practical using wall outlets. Their use is discouraged.
- Cover Plates
 - ◇ Switch and receptacle plates in laboratories shall be non-ferrous stainless steel.
 - ◇ Switch and receptacle plates for Residential and Hospitality Services residence hall buildings and in corrosion areas such as chemical laboratories, water treatment areas, etc. shall be Leviton unbreakable nylon, color brown.

4. LIGHTING

A. Interior

- General
 - ◇ Lighting levels shall be kept to the minimum acceptable for the use intended. Designers must keep in mind that excessive lighting levels are doubly detrimental. Not only do they use inordinate amounts of energy, but due to their visibility, also create a poor public image for MSU.
 - ◇ Electrical consumption can be reduced by installing lighting which provides the lowest acceptable illumination level for the expected room activity. By using less electricity for lighting, less heat is emitted, thereby reducing the cooling load.
 - ◇ Fluorescent lights shall be used wherever practical.
 - ◇ For high ceiling areas, fluorescent, metal halide, and/or high pressure sodium lighting should be evaluated and the most appropriate system utilized. Noise criteria of 30 shall be maintained when using HID lighting.
 - ◇ When dimming is required for video projection, incandescent lamps shall be used. The incandescent system shall be installed along with a fluorescent system and shall only be designed to meet the video projection requirements. The fluorescent system shall be used for normal illumination.
 - ◇ In general, light fixtures shall be mounted such that they can be maintained from an 8' to 10' step ladder.
 - ◇ All fluorescent tubes shall be F32, 32 watt, rapid start T8, 4100 degree Kelvin unless some special application makes this impractical.
 - ◇ LED lighting color temperature shall be 4000K. Limited usage of 3500K color temperature is allowed with PDC approval in the design development phase.
 - ◇ All LED lighting applications shall have a dimmer except corridors, restrooms and storage closets.
 - ◇ There shall be at least one accessible switch for each controlled area. Rooms with more than one means of entrance or egress will have switches at each door.
 - ◇ Areas which utilize three or four lamp fluorescent fixtures shall be double switched. The two outer lamps shall be switched from the switch nearest the door to the area, and the inner lamp(s) shall be switched from the second switch.
 - ◇ In general, specification grade fluorescent fixtures shall be 2' x 4' flush troffers or surface mounted, metal enclosed, modular fixtures. Lenses shall be flat in hinged metal frames and normally will be prismatic, transparent, .125" thick, acrylic plastic. Do not use fixtures with wrap around lenses.
- Light Pollution Reduction
 - ◇ Light trespass shall be eliminated from the building and site to improve night sky access and reduce development impact on nocturnal environments.
 - ◇ Comply with the LEED™ standard as required in the LEED™ section of the Design Guidelines – General.
- Controllability of Systems, Lighting

- ◇ Provide a high level of lighting system control by individual occupants or specific groups in multi-occupant spaces such as classrooms and conference areas to promote productivity, comfort and well being of building occupants.
- ◇ Design individual lighting system controls for 90% of occupants to enable lighting adjustments to suit individual task needs and preferences.
- ◇ Plan for lighting controls for multi-occupant spaces such as classrooms and conference areas to enable lighting adjustment that meets group needs and preferences.
- ◇ Comply with the LEED™ standard as required in the LEED™ section of the Design Guidelines – General.
- Lighting Levels
 - ◇ Interior average lighting levels recommended by MSU:

a. Offices	40 F.C.
b. Classrooms, laboratories	50 F.C.
c. Corridors, lobbies, stairs, toilets, locker rooms	15 F.C.
d. Storerooms	10 F.C.
e. Electrical and mechanical spaces	20 F.C.
f. Electronic control equipment in mechanical and electrical spaces, including both sides of the elevator machine space	50 F.C.
- Emergency Lighting
 - ◇ Emergency lighting shall be the corridor fluorescent night light system. Emergency lights shall also be installed in the transformer vault, main mechanical room, receiving room, auditoriums, theaters, large lecture halls, and dining rooms. These same lights shall be utilized as night lights.
 - ◇ Emergency lighting in spaces other than corridors, lobbies, and stairwells shall utilize a ballast-load-transfer-control unit to allow the lights to be turned off when the space is not occupied.
 - ◇ Exit lights will be connected to the emergency lighting system. These lights will be continuously illuminated.
- EXIT Lights
 - ◇ Exit lights shall be installed in accordance with the National Electric Codes and the recommendation of the MSU Public Safety Department.
 - ◇ Letters and direction arrows shall be green. In all situations, the signs shall be continuously illuminated. The power shall come from the building emergency power source - EXIT light circuit/emergency generator.

B. Exterior

- Exterior lighting shall be high pressure sodium or 4000K LED.
- Light Pollution Reduction

- ◇ Light trespass shall be eliminated from the building and site to improve night sky access and reduce development impact on nocturnal environments.
- ◇ Comply with the LEED™ standard as required in the LEED™ section of the Design Guidelines – General.
- ◇ The individual lighting power allowances for building exteriors shall be Zone 3.
- ◇ All building façade lighting, landscaping lighting and signage shall be controlled with an Intermatic ET8215C 7 day electronic time switch. This timer will automatically shut off the lighting & signage at close of business hours and will automatically turn the lighting & signage on at the start of business hours.
- Lighting Levels
 - ◇ Exterior average lighting levels recommended by MSU:
 - a. Building entrances, active parking and walkway areas 1/2 F.C.
 - b. Inactive parking, walkway areas, and roadways 1/3 F.C.
 - ◇ Each new street light distribution center shall be controlled from the building Central Control panel. Where this is impractical, an Intermatic ET8215C 7 day electronic time switch may be used.
 - ◇ Building entrance lights are considered a part of the campus lighting system and all entrance lights on a building should be served by one branch circuit panel. This panel should contain a contactor and be controlled by the building Central Control panel.
 - ◇ Exterior lights shall not be controlled by the interior lighting controls.

5. DETECTION AND ALARM

- A. The fire alarm control panel shall be located at the fire response personnel entrance. If panels will be subjected to abnormal temperatures, the panel will be designed to compensate for the added heat.
- B. All initiating devices shall be annunciated on the remote interactive graphic display. Initiating devices shall be devices such as manual pull stations, heat detectors, smoke detectors, duct smoke detectors, sprinkler water flow, and standpipe water flow. Sprinkler water flow and standpipe water flow shall also cause the fire alarm supervisory alarm to sound.
- C. Duct smoke detectors located in one room may be grouped for point annunciation on the interactive graphic display. A modular bullet type annunciator shall be located in the room showing each duct detector. The modular bullet annunciator shall be located so that it is visible when a person enters the room.
- D. Room smoke detectors located in one room may be grouped for point annunciation on the interactive graphic display. Smoke detectors shall be grouped for point annunciation by zone.
- E. Fire alarm manual pull stations shall be located at each building exit and elsewhere as indicated by the MSU Department of Police and Public Safety or applicable codes and regulations.

- F. Initiating devices such as kitchen fire protection panel, outside post indicator valve, fire pump, and other miscellaneous initiating devices, when required shall be point annunciated on the interactive graphic display and cause the fire alarm supervisory alarm to sound.
- G. Initiating circuits shall be arranged with maintenance in mind, i.e., one circuit per riser, one circuit per floor, group of duct detectors in a mechanical room on a circuit, etc., so that a trouble on a circuit can be easily traced. Circuits shall be shown on the design drawings.
- H. The maximum load on each initiating and signaling line circuit shall be 50%.
- I. Install strobes on separate circuits from speakers.
- J. Speaker circuits shall be wired for future voice communication.
- K. Speakers shall be installed so as to be heard throughout the building or as indicated by the Department of Public Safety. Visual strobe lights shall be installed in compliance with Americans with Disabilities Act, generally in the following area: auditoriums, classrooms, conference rooms, toilet rooms, and corridors.
- L. Activation of the fire alarm system evacuation alarm shall close all smoke dampers.
- M. The interactive graphic display needs to be configured so that fire response personnel can quickly determine the location of an alarm. Use prominent features such as, stairwells, major corridors, auditoriums, large classrooms, large mechanical rooms, etc. The interactive graphic display shall show each floor of a multi-story building.
- N. Interactive graphic display panels shall be located at the fire personnel response entrance. In large buildings or multiple winged buildings more than one display may be necessary. The exact location of the displays shall be determined by the MSU Department of Police and Public Safety.
- O. A fire alarm riser diagram showing the number of devices and wiring shall be included in the design drawings.
- P. In large buildings or when required by applicable codes, the voice paging (which was designated for future installation) shall be implemented.
- Q. The fire alarm control panel shall have RS232, RS485, and ethernet communication ports in the control panel. Full status monitoring, control, and programming of the fire alarm system shall be available remotely via a terminal connected to the RS232 port. The fire alarm panel shall also have a printer port card to allow the connection of a portable printer to download the fire alarm program and status information.
- R. Install a 1/2 inch conduit from the fire alarm control panel to the nearest Floor Communication Room for Ethernet connection.
- S. A smoke detection system shall be installed as part of the building fire alarm system. The smoke detection system shall meet the following requirements:
 - In buildings where 100% of the area is covered by a sprinkler system, a Partial Coverage smoke detection system shall be installed per NFPA 72 2-1.4.2.2 covering the following spaces: corridors, lobbies, storage rooms, equipment rooms, kitchens, and laboratories.

- In buildings with less than 100% of the area covered by a sprinkler system or no sprinkler system, a Total Coverage smoke detection system shall be installed per NFPA 72 2-1.4.2.1, except for spaces above suspended ceilings, enclosed stairways, and elevator and dumbwaiter shafts (smoke detection for elevator and dumbwaiter shafts is covered under the Elevator Code).

6. COMMUNICATION SYSTEMS

A. Telephone System

- AT&T shall install the main telephone service cable into the building and terminate on terminal blocks.
- There shall be one telephone outlet box provided at each desk location and laboratory. There shall be one broadband/computer outlet box at each desk location, and two in each classroom and laboratory.
- The Owner will provide the telephone cable and instrument installation within the building. The Contractor will make reasonable accommodations to allow the Owner's telephone contractor to install the system.

B. Fiber Optic/Broadband System

- The fiber optic system consists of a 72 glass fiber cable constructed in five interconnecting loops. In general, the basic design of the fiber optic system cable installation to a new building will be done by the Owner and given to the Architect/Engineer to be developed into construction drawings.
- The broadband system consists of three 450 MHz cables distributed in a radial configuration. One cable is used for video signal transport, another cable is used for data signal transport, and the third cable is spare. In general, the basic design of the broadband cable installation to a new building will be done by the Owner and given to the Architect/Engineer to be developed into construction drawings.

C. Communication Rooms

- Main Communication Rooms
 - ◇ The campus communication utilities will enter the building at the Main Communication Rooms, (the Broadband Utility Room, the Telephone Utility Room and the User Communication Room). Refer to Design Guidelines – General for space descriptions.
 - ◇ These rooms will have an 8"x 8" cable passage between each room and two 4" conduits from each Main Communication Room to each riser of Floor Communication Rooms and Floor User Communication Rooms.
 - ◇ Each of the main communication rooms shall have two double duplex receptacles. Each double duplex shall be on its own circuit.
- Floor Communication Rooms
 - ◇ The Floor Communication Rooms, (refer to Design Guidelines – General for space description), will house telephone switching equipment, and broadband/fiber optic

equipment. The Floor Communication Rooms will have four 4" conduits from floor to floor between each room.

- ◇ Each Floor Communication Room shall have two double duplex receptacles on their own circuit.
- ◇ These Floor Communication Rooms shall be stacked one above the other floor-to-floor.

D. Communications Raceway System and Cable

- A cable tray system shall be installed in the corridor consisting of 12" of tray space for telephone, 12" for Broadband, and 12" for user systems. The telephone outlet conduits and communication outlet (broadband and computer) conduits shall terminate just above the cable tray.
- Communication outlet boxes (used for telephone, broadband, and data) shall consist of an extra deep two gang steel box with a single gang plaster ring and a 1" conduit installed to the cable tray system or the nearest Floor Communication Room.
- Two communication outlet boxes shall be installed at all locations where communications is needed. The boxes shall be spaced approximately six inches apart.
- Any required floor poke-thru or floor box devices shall be Hubbell System One fire-rated devices. Consult with MSU Telecom Systems and IT Services AV group for design application.
- Wall mount telephone outlet boxes shall be an extra deep single gang steel box with a 3/4" conduit installed to the cable tray system or the closest Floor Communication Room. The wall space within 12" from the center of the outlet box in all directions shall be kept clear of all other devices, equipment, attachments, items, etc. to allow space for a wall mount telephone set.
- Communications outlets shall be installed in the Custodial Room, elevator machine rooms, the mechanical room with the main Central Control cabinet, to the fire alarm control panel, and the Transformer vault for Ethernet connection.
- All cable for data, video, or voice communications installed in ducts, plenums, spaces used for environmental air, and vertical runs shall be Teflon jacketed or installed in conduit or metal wireway.
- All cable for data, video, or voice communications installed in concealed building spaces shall have a low smoke producing characteristic jacket or installed in conduit or metal wireway.
- Ethernet cable may be installed in existing telephone conduit provided: the conduit is a minimum of 3/4", and the existing telephone cable is no larger than a single line cable.
- Audio-visual Requirements: Classrooms and auditoriums shall be configured for audio-visual presentations. In general, this includes: preparation for projection equipment and sound reinforcement, and communication raceway and power for computer and video equipment at the front of the room. It also includes communication raceway and power at each desk location for computer connections. The exact arrangement and what configuration to be installed in each room shall be worked out with the Owner.
- A 2" conduit shall be installed from the Broadband Utility Room to the penthouse roof with a weatherhead at the roof penetration for the Campus two-way radio system. The

project budget shall include the cost of installing a bidirectional amplification system in the building, mainly to cover the below grade spaces.

- Three 4” conduits shall be installed from the nearest Floor Communication Room to the penthouse roof with a weatherhead at the roof penetration for the installation of enhanced cellular coverage systems within the building.

7. UTILITY METERING NETWORK

- A. Review metering application and equipment with the MSU Power and Water Department at the T.B. Simon Power Plant and the Energy and Environment Office in the Infrastructure Planning and Facilities Building to determine if additional sub-metering equipment is required for utility billing or for measurement and verification of specific equipment prior to finalizing project specifications and drawings.
- B. At the unit substations, install a 1/2 inch conduit from each metering compartment to one of the metering compartments (designated Main Metering Compartment) to network the watt-hour meters.
- C. Install a 1-1/2 inch conduit from the Main Metering Compartment to pull box located on the transformer vault wall.
- D. Provide a communications outlet adjacent to the pull box for Ethernet connection.
- E. Install a 3/4 inch conduit from the communication outlet to the pull box and a one inch conduit from the pull box to the Broadband Utility Room.
- F. Install a 1/2 inch conduit from each water, natural gas, steam, and condensate meter to the pull box for networking the building utility meters.
- G. Install a Belden 9463 (single pair shielded) cable from each meter to the Main Metering Compartment.

8. LIGHTNING PROTECTION

- A. “Master Label” lightning protection systems shall be provided for all campus buildings including farm buildings.

9. CLOCK SYSTEMS

- A. Master clock systems will not be used.

10. ACCESS CONTROL

- A. Refer to SAFETY: ACCESS CONTROL in Design Guidelines – General for scope of work.

11. HOUSEKEEPING PAD

- A. All equipment mounted on the floor or resting on the floor shall be on a 4" housekeeping pad. The pad shall extend approximately 3" beyond the bottom edge of the equipment all the way around.

END OF SECTION