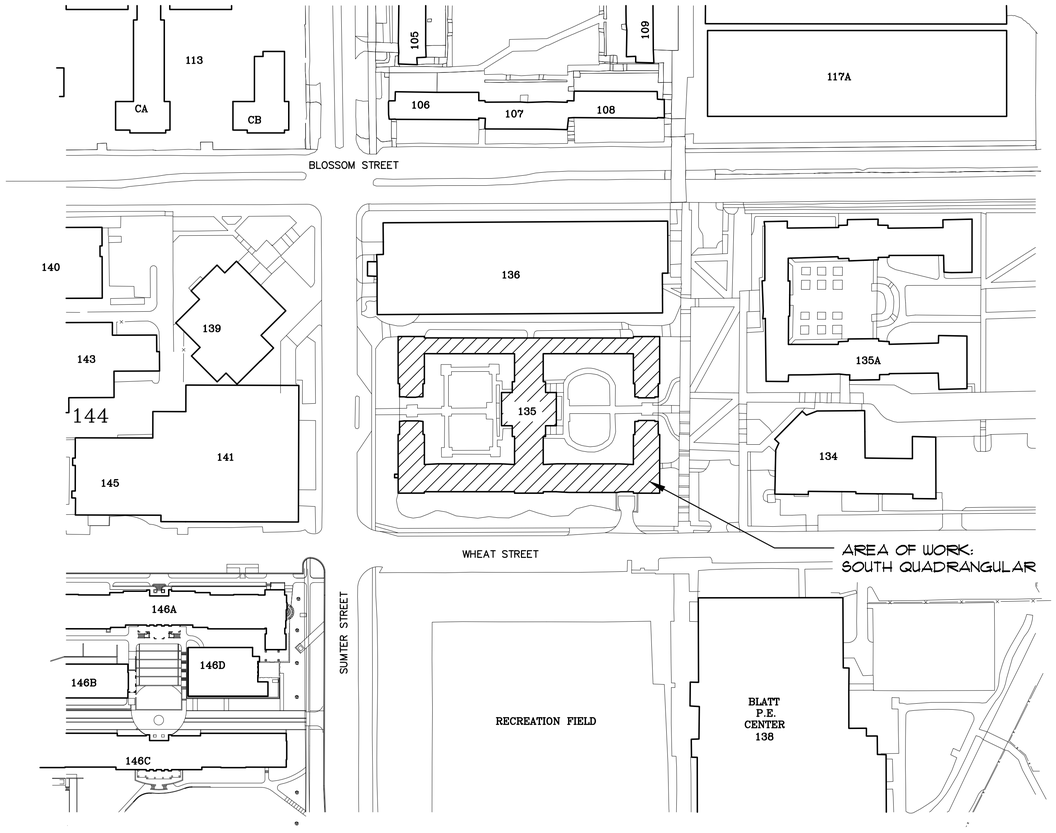
USC S. QUAD - MECHANICAL RM

COOLING UPGRADES

THE UNIVERSITY OF SOUTH CAROLINA
COLUMBIA, SOUTH CAROLINA

FACILITIES PLANNING AND CONSTRUCTION



NORTH

UNIVERSITY OF SOUTH CAROLINA

NOT TO SCALE

INDEX OF DRAWINGS

CODE REVIEW INFORMATION

PROJECT DESIGNED IS ACCORDANCE WITH:

1. International Building Code - 2012 Edition.
2. International Plumbing Code - 2012 Edition.
3. International Mechanical Code - 2012 Edition.
4. National Electric Code - 2011 Edition.

SPECIAL NOTE:
IT IS RECOMMENDED THAT THE CONTRACTOR VISIT THE PROJECT SITE PRIOR TO SUBMITTING BID AND THOROUGHLY FAMILIARIZE HIMSELF WITH ALL EXIST CONDITIONS RELATING TO THIS PROJECT. SUBMISSION OF A BID WILL BE CONSIDERED AS EVIDENCE THAT THE CONTRACTOR HAS VISITED THE SITE OF WORK.

SOUTH CAROLINA MECHANICAL DESIGN, INC. COLUMBIA, SC No. C00096 CERTIFICATE OF AUTHORIZATION

MECHANICAL DESIGN INC.
4403 Broad River Road
Columbia, S.C. 29210
(803) 731-9834
(803) 731-9837 FAX
CONTACT: JUSTIN VARCO

DATE: 03/04/16 COMM. NO. 153256

OFFICE OF
FACILITIES MANAGEMENT
COLUMBIA, SC 29208

SEAL: SOUTH CAROLINA REGISTERED PROFESSIONAL ENGINEER No. 11155 03-04-16 DANNY

CHECKED BY: CDW
DRAWN BY: JJV
DRAWING: S. QUAD C1
BUILDING: 35
REV:

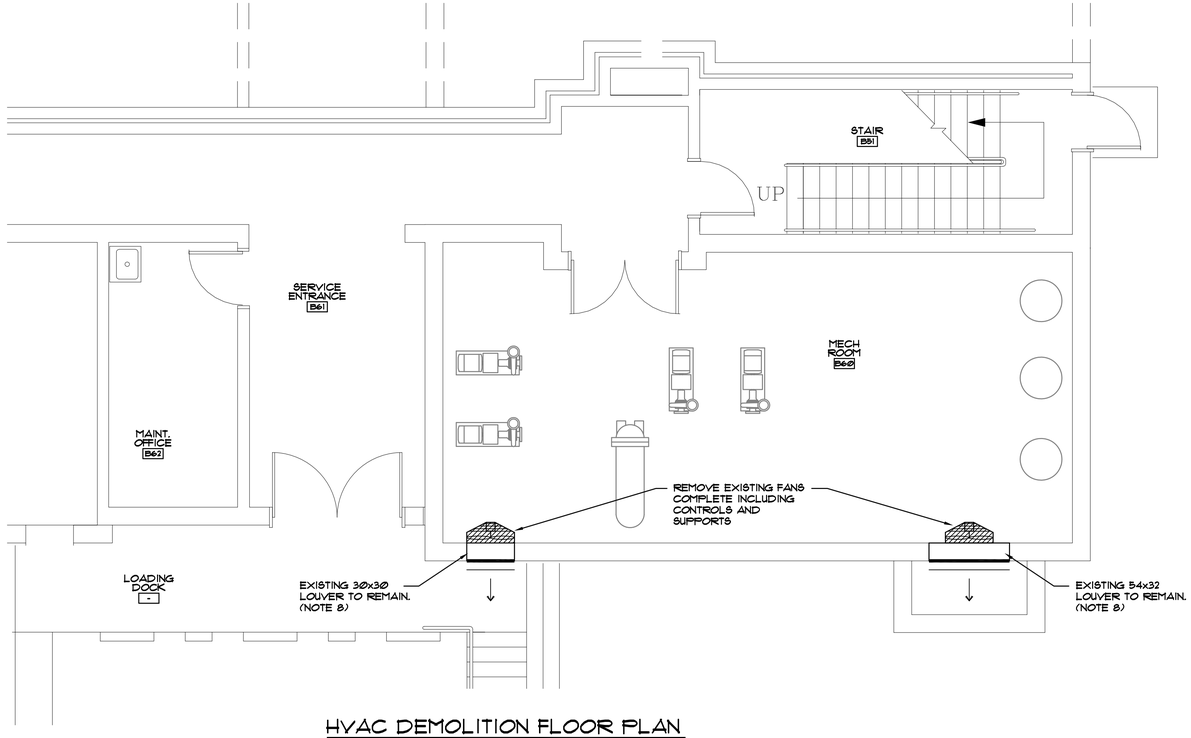
DATE	DESCRIPTION
03/04/16	

PROJECT TITLE: USC S. QUAD MECHANICAL ROOM COOLING UPGRADES

University of South Carolina

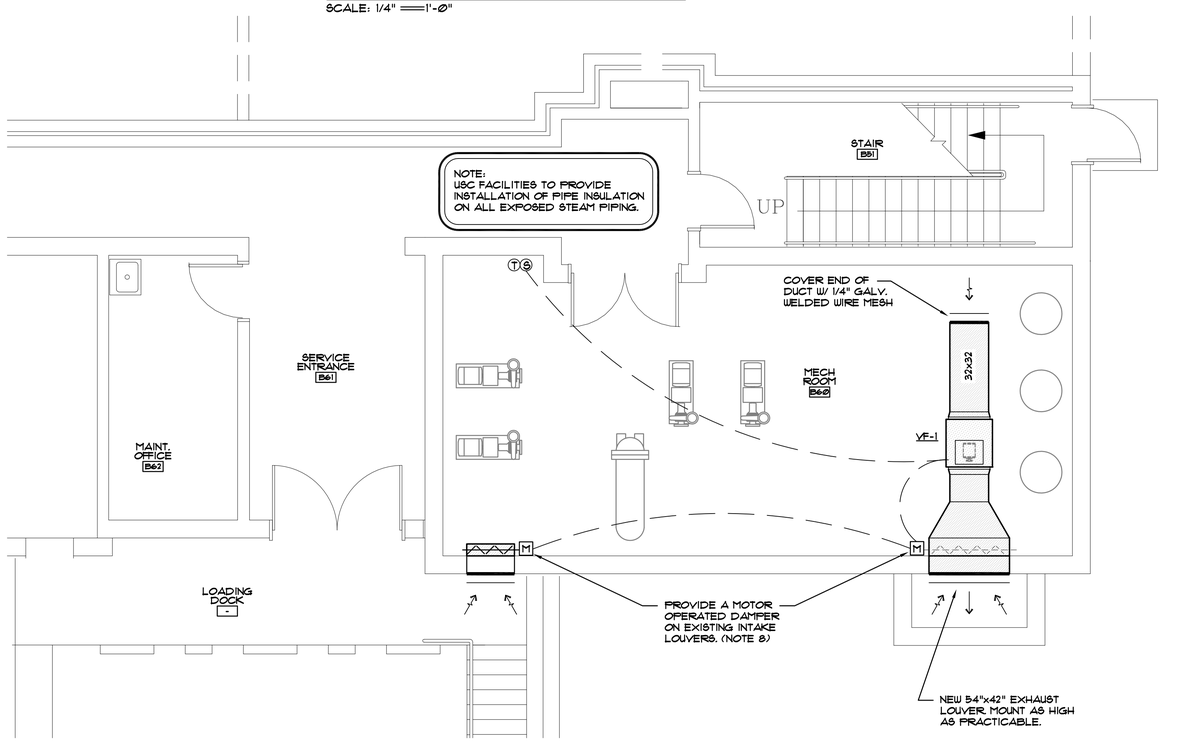
SHEET: C1 – OF 1

SHEET IN SET: 1 OF 5



HVAC DEMOLITION FLOOR PLAN

SCALE: 1/4" = 1'-0"



HVAC RENOVATION FLOOR PLAN

SCALE: 1/4" = 1'-0"

SYMBOLS

	NEW MATERIALS
	EXISTING TO BE REMOVED
CFM	AIR FLOWRATE, CUBIC FEET PER MINUTE
M	MOTOR OPERATED DAMPER
T	THERMOSTAT
S	MOTOR STARTER
CTE	CONNECT TO EXISTING

NOTES

1. DO NOT SCALE DRAWINGS. ROUGH FROM EQUIPMENT MANUFACTURER'S DRAWINGS AND EXISTING CONDITIONS.
2. DIMENSIONS ARE IN INCHES UNLESS OTHERWISE NOTED. DUCT SIZES SHOWN ON DRAWINGS ARE INTERIOR DIMENSIONS.
3. WHENEVER THE WORD "PROVIDE" IS USED IT SHALL MEAN FURNISH AND INSTALL COMPLETE AND READY FOR USE.
4. INSTALLATION OF EQUIPMENT, DUCTWORK, AND PIPING, INCLUDING VIBRATION ISOLATION SHALL COMPLY WITH 2012 INTERNATIONAL BUILDING CODE FOR SEISMIC PROTECTION.
5. ALL MATERIALS CALLED FOR TO BE REMOVED SHALL REMAIN THE PROPERTY OF THE OWNER. ANY ITEM THE OWNER DOES NOT WILL TO KEEP SHALL BE REMOVED FROM THE SITE.
6. PROVIDE ALL ITEMS OF MISCELLANEOUS STEEL AS REQUIRED FOR INSTALLATION OF WORK.
7. PROVIDE FOR ACCESS TO ALL MECHANICAL ITEMS REQUIRING CLEANING OR ADJUSTMENT.
8. FIELD VERIFY EXISTING FOR EXACT DIMENSIONS AND LOCATION.

VENTILATING FAN SCHEDULE (1)

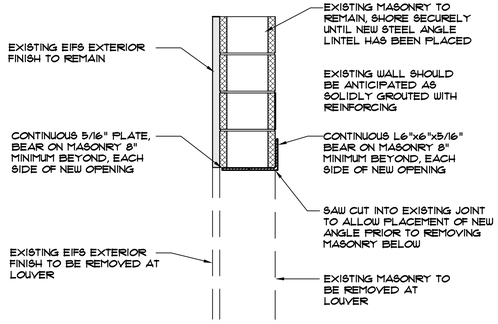
MARK	GREENHECK (2) MODEL	CFM (4)	RPM (4)	FAN S.P.	FAN H.P. OR WATTS	SONES	DRIVE	CONTROLLED BY
VF-1 (3)	BSQ-200-30	7,000/3,500	1,125/860	1/4"	3 HP	18	DIRECT	THERMOSTAT

(1) FANS TO MATCH AVAILABLE ELECTRICAL SERVICE, SEE ELECTRICAL.

(2) OR EQUAL BY COOK, TWIN CITY, CARNES PENN OR APPROVED EQUAL.

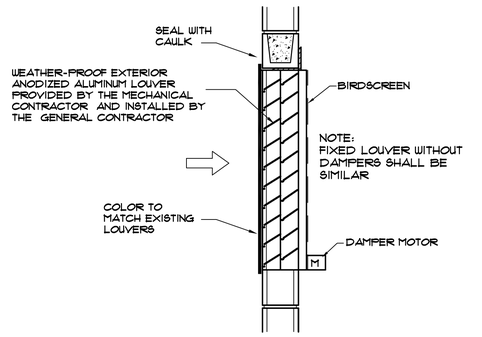
(3) PROVIDE WITH DISCONNECT, BACKDRAFT DAMPER, AND VIBRATION ISOLATION KIT.

(4) PROVIDE WITH 2 SPEED MOTOR, 2 STAGE THERMOSTAT AND 2 STAGE MOTOR STARTER.



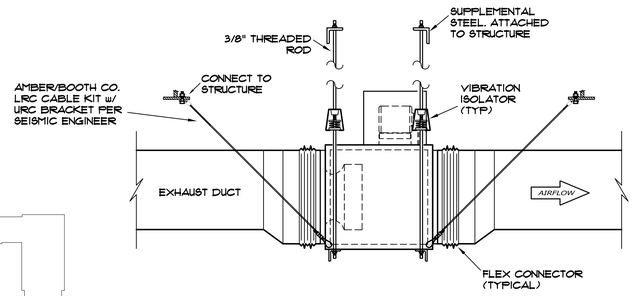
NEW STEEL LINTEL FOR LOUVER

NO SCALE



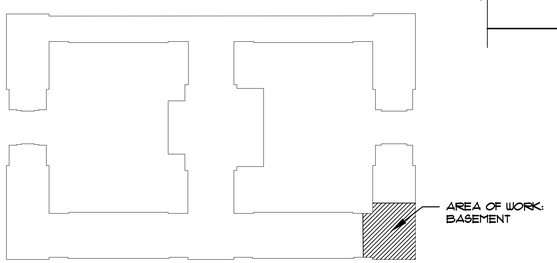
WALL MOUNTED LOUVER DETAIL

NOT TO SCALE



VENTILATION FAN DETAIL

NO SCALE



KEY PLAN

NO SCALE

SOUTH CAROLINA MECHANICAL DESIGN, INC. COLUMBIA, SC No. C00096 CERTIFICATE OF AUTHORIZATION

MECHANICAL DESIGN INC.
4403 Broad River Road
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CONTACT: JUSTIN VARCO

DATE: 03/04/16 COMM. NO. 153256

OFFICE OF FACILITIES MANAGEMENT
COLUMBIA, SC 29208

SEAL: NORTH CAROLINA REGISTERED PROFESSIONAL ENGINEER DANNY SCOTT No. 11155 03-04-16

DRAWING:	S. QUAD M1
BUILDING:	135
REV:	
DESCRIPTION	
DATE:	03/04/16
DRAWN BY:	JJV
DATE	
CHECKED BY:	CDW
ORIG. BY	
DRAWN BY	

PROJECT TITLE: USC S. QUAD MECHANICAL ROOM COOLING UPGRADES

University of South Carolina

SHEET: M1 OF 2

SHEET IN SET: 2 OF 5

MECHANICAL SPECIFICATIONS

1.0 GENERAL

1.1 All material and work shall comply with the National Fire Codes of the NFPA, National and local codes and the 2012 International Building Code and Mechanical Codes.

1.2 Drawings for work under Division 23 are diagrammatic and generally, indicate reasonable arrangements. Work under Division 23 includes all work necessary to make HVAC systems complete and fully operational.

1.3 SITE VISIT: It is highly recommended that all bidders visit the site of work and become familiar with existing conditions before submitting a bid. Submission of a bid will be considered as evidence that the Contractor has visited the site of work. No extra payments will be allowed the Contractor because of extra work made necessary by his/her failure to do so.

1.4 DEMOLITION ITEMS: The owner reserves the right to keep any items called for to be removed in the construction documents. Items not kept by the Owner shall be carried away from the site of work. Coordinate with Owner on each item to be removed.

1.5 SUBSTITUTIONS: For substitution requests made during the bidding of the project. All requests for substitutions shall be submitted in writing so as to be received by the Engineer at least ten (10) calendar days prior to final pricing and must be granted permission to quote before award of contract.

1.6 MATERIAL AND EQUIPMENT

SUBMITTALS: Submit for review detailed drawings of all equipment and all material listed in this section. All submittal data shall be submitted electronically as well as bound in a hardback binder. Furnish two (2) hard copies of equipment submittals. Partial submittals will not be reviewed by the Engineer. Review rendered on equipment submittals shall not be considered as a guarantee of measurements of building conditions. WHERE DRAWINGS ARE REVIEWED, SAID REVIEW DOES NOT MEAN THAT DRAWINGS HAVE BEEN CHECKED IN DETAIL; SAID REVIEW DOES NOT IN ANY WAY RELIEVE THE CONTRACTOR FROM HIS RESPONSIBILITY OR NECESSITY OF FURNISHING MATERIAL OR PERFORMING WORK AS REQUIRED BY THE CONTRACT DOCUMENTS. Submit for the following materials and equipment for review by the Engineer:

1. Test and Balance Firm
2. Ductwork & Duct Supports
3. Fans and Air Distribution
4. Controls

1.7 WORKMANSHIP: Work that is not of good quality will require removal and reinstallation.

1.8 COORDINATION: No work shall be performed on this project before thoroughly coordinating all space requirements for pipes, control panels, and control components with all trades concerned and existing conditions. Temperature and equipment control wiring is included under Division 23.

1.9 The responsibility for obtaining, cutting, and patching for work under Division 23 of the specifications is included Division 23.

1.10 DAMAGES DURING CONSTRUCTION: Contractor shall be responsible for any costs of repairing any damages caused by this contractor, to the building, building contents, and site during construction and warranty period.

1.11 WARRANTY: Warrant all control components, piping and any other materials specified under Division 23. Warrant all equipment, ductwork, piping and any other materials specified under Division 23 for a period of one (1) year from the date of project acceptance unless otherwise indicated. Upon failure of any part(s) of the system during the warranty period, the affected part(s) shall be repaired or replaced promptly by and at the expense of the Contractor.

1.12 IDENTIFICATION:

A. Identify each piece of equipment and control component. Items shall be identified by name and numerical sequence. Nameplates shall be 1/16" thick plates with 1/2" high white letters on black background. Nameplates shall be attached securely with screws,
not glued.

B. Provide standard bronze identification tags equal to Seton Nameplate Company for each valve to identify type of service as applicable. Bronze tags shall be attached to the valve by the use of brass S-hooks. Tag identification shall be by service and each valve shall be numbered.

1.13 PAINTING

A. Pipes in mechanical room shall be painted under Division 23. All pipes shall be color coded to match the USC color coding system. Color coding chart may obtained from the USC Project Manager.

B. Provide color stenciling of piping for identification of flow.

C. Provide two coats of black rust preventative on all exposed support metal and hangers
mounted in mechanical room.

D. Paint all new equipment and materials in Division 23 (except factory-painted equipment) exposed to view. Where factory paint has been scratched on new equipment, completely sand, prime and repaint scratched areas. Paint shall be as recommended by equipment manufacturer. Pipes shall be color coded with colors selected by the Engineer. Devoe, Sherwin Williams, Pittsburgh, Glidden or approved equal paints may be used.

1.14 ASBESTOS

A. At any time the contractor encounters asbestos containing materials, he shall immediately stop work and suspend any further work until asbestos containing materials are removed by others. Contractor shall, upon discovery of asbestos containing materials, notify Owner or Owner's representative, who shall be responsible for the removal of the asbestos containing materials, all in accordance with NESHAP (National Emission Standard for Hazardous Air Pollutants). Any form of asbestos removal or demolition shall be by owner. Engineer is not an "Owner or Operator" as defined under NESHAP.

B. Contractor is responsible for, and shall be aware of all state and federal laws pertaining to asbestos as well as NESHAP requirements.

C. At any time the Contractor encounters existing paint containing lead, he shall immediately suspend any further work in the affected area until lead paint is removed by others. Contractor shall, upon discovery of lead paint, notify Owner or Owner's representative, who shall be responsible for the removal of the lead paint.

1.14 SEISMIC REQUIREMENTS:

All materials shall comply with the 2012 International Building Code for seismic requirements.

1.15 MECHANICAL; HVAC, ADJUSTING, TESTING AND BALANCING

A. All work shall be performed by an independent Test and Balance Agency. Testing, adjusting and balancing work shall be the firm's sole source of income. All work shall be under the direct supervision of a project manager who is qualified for testing and balancing the hydronic and air performance of heating, air conditioning, and ventilating systems.

B. Testing and balancing of the HVAC system is defined as the optimization of the installed system. The equipment schedule is used for equipment selection only. Industry standards of +/-10% are considered to be benchmarks and will not be used as an absolute requirement for final acceptance of the project. Approval of the final report will be the sole responsibility of the design engineer.

C. Provide Testing and Balancing of the new exhaust fan.

D. Report shall include Total CFM, equipment nameplate information, amp draw of motor, final sheeves/sheeve position.

1.16 ACCESS DOORS: Provide heavy duty 16 ga. steel access door with primed finish, concealed hinge, and flush mounted keyed locking device. Install as directed to permit access. Provide doors as manufactured by Karp, Elmdoor, Mifab, or Bilco.

2.0 MECHANICAL; HVAC, DUCTWORK

2.1 All ductwork shall meet job conditions and after coordinating with all trades. Follow duct dimensions indicated on drawings as closely as possible. Provide offsets, vary shape or alter run if required to meet structural or other interferences. Where shape of duct is varied, alter dimensions to provide equal static pressure drop per unit length.

2.2 Obtain copies of applicable "Sheet Metal and Air Conditioning Contractors National Association, Inc." (SMACNA) Manuals, latest edition, and keep one copy of each on job

2.3 Ductwork shall be air tight, smooth on inside and neatly finished on outside. Details of support, construction and materials not specified herein to be in accordance with recommendations of SMACNA.

2.4 No ductwork shall be fabricated or installed until all space requirements have been thoroughly coordinated with all other trades (see shop drawings).

2.5 DUCTWORK:

A. All exhaust duct shall be low pressure sheet metal. Seal all joints and seams with high pressure sealant.

B. All turns greater than 45 degrees shall be made with turning vanes. Turning vanes shall be single vane type installed on runners.

C. Provide flexible duct connectors at inlet and discharge of in line fans. Flexible duct connectors shall conform to NFPA 90A.

4.0 FANS AND AIR DISTRIBUTION

4.1 FANS

A. Each fan shall bear the AMCA seal for rated sound and air.

B. Noise level indicated is maximum level in sones for fans and curb combination at 5'-0" distance in accordance with AMCA Standards 210 and 300.

C. Fans shall be Greenheck, Cook, Twin City Fan, Carnes, Penn or approved equal.

D. In-line fans shall be furnished complete with an insulated housing, backdraft damper. The fan housing shall be constructed of phosphatized steel with oven baked enamel finish. The housing interior shall be acoustically lined throughout with 1/2" thick insulation. Fans shall have discharge duct connections

E. Install each fan in accordance with manufacturer's written installation instructions.

F. Suspend inline exhaust fans from floor/roof structure with threaded rods and vibration isolators. Provide seismic sway cables at each support point and connect to building structure in accordance with 2012 International Building Code.

4.2 LOUVERS

A. Fixed louvers shall be Ruskin model ELF-6375D drainable blade louver or equal by Pottoroff, Greenheck, Arrow, American Warming or approved equal.

B. Louvers shall be box type and shall be 6" deep. Furnish louvers with expanded flattened aluminum insect screen, 3/4" X 0.51". Water penetration shall not exceed 0.02 ounces of water per square foot of free area at 1000 feet per minute free area velocity.

C. Louver shall be extruded aluminum with finish and color as selected by Owner. Price shall be based on Kynar finish. Submit color and finish sample chart to Owner for selection.

D. Field verify louver locations and sizes prior to releasing.

4.3 CONTROL DAMPERS

A. Dampers to Ruskin model CD-60, airfoil blade, low leakage or Air Balance, Inc. model AC-516 or equal by Dowco AWM or approved equal.

B. Damper frame and blades shall be 16 gauge galvanized steel. Bearings shall be molded synthetic. Finish shall be mill galvanized. Leakage on a 24" wide damper shall not exceed 5.8 CFM per square foot.

5.0 AUTOMATIC TEMPERATURE CONTROLS

5.1 SCOPE OF WORK:

1. Remove the existing thermostat and controls associated with existing fans.

2. Provide a labor and materials to install and wire new 2-stage thermostat and motor starter. Interlock operation of motor operated dampers with new exhaust fan. (Thermostat and starter provided by fan manufacturer)

5.2 WARRANTY: The entire control system shall be warrantied free of defects and shall include required servicing and maintenance for one year after final acceptance.

5.3 DEMOLITION: Remove all control devices, conduit, tubing, wire, and other items made obsolete but demolition of existing piping and coils.

5.4 CONTROL AND INTERLOCK WIRING:.

1. All electrical work required under this section of specifications shall comply with the 2011 National Electrical Code. Control system power supply shall be served by a separate breaker and fused in control center for secondary protection.

2. All control wiring located below grade or outdoors shall be installed in rigid conduit. All control wiring in walls or above the ceiling (or in equipment rooms) shall be run in galvanized EMT. PLENUM CABLE WILL NOT BE ACCEPTED.

3. Control wiring shall be color coded #16 TFF of TFFN wire with 600 volt insulation. Run all wiring between terminal points without changing color. Color code of control wiring shall be as indicated on control wiring diagram. Multi-conductor thermostat cable will not be acceptable.

5.5 Label all new controllers with engraved bakeolite plastic plates indicating control function and correct set point. Label shall clearly relate to controller by functional name as indicated on control wiring diagram.

5.6 Furnish to engineer two copies of certifications signed by authorized representative that:

1. Control system has been checked-out and operates according to drawings and specifications.

2. All controls are warrantied unconditionally for one year from date of acceptance and will be serviced for this period free of charge.

3. Maintenance personnel or responsible party has been instructed as to the operation of control system.

END OF DIVISION 23

SOUTH CAROLINA MECHANICAL DESIGN, INC. COLUMBIA, SC No. C00096 CERTIFICATE OF AUTHORIZATION

MECHANICAL DESIGN INC.
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CONTACT: JUSTIN VARCO

DATE: 03/04/16 COMM. NO. 153256

OFFICE OF
FACILITIES MANAGEMENT
COLUMBIA, SC 29208

SEAL: CAROLINA REGISTERED PROFESSIONAL ENGINEER No. 11155 03-04-16 SCOTT DANNY

	DRAWN BY: JJV	CHECKED BY: CDW
DESCRIPTION	DATE	ORIG. BY	DRAWN BY

DRAWING: S. QUAD M2 | DATE: 03/04/16

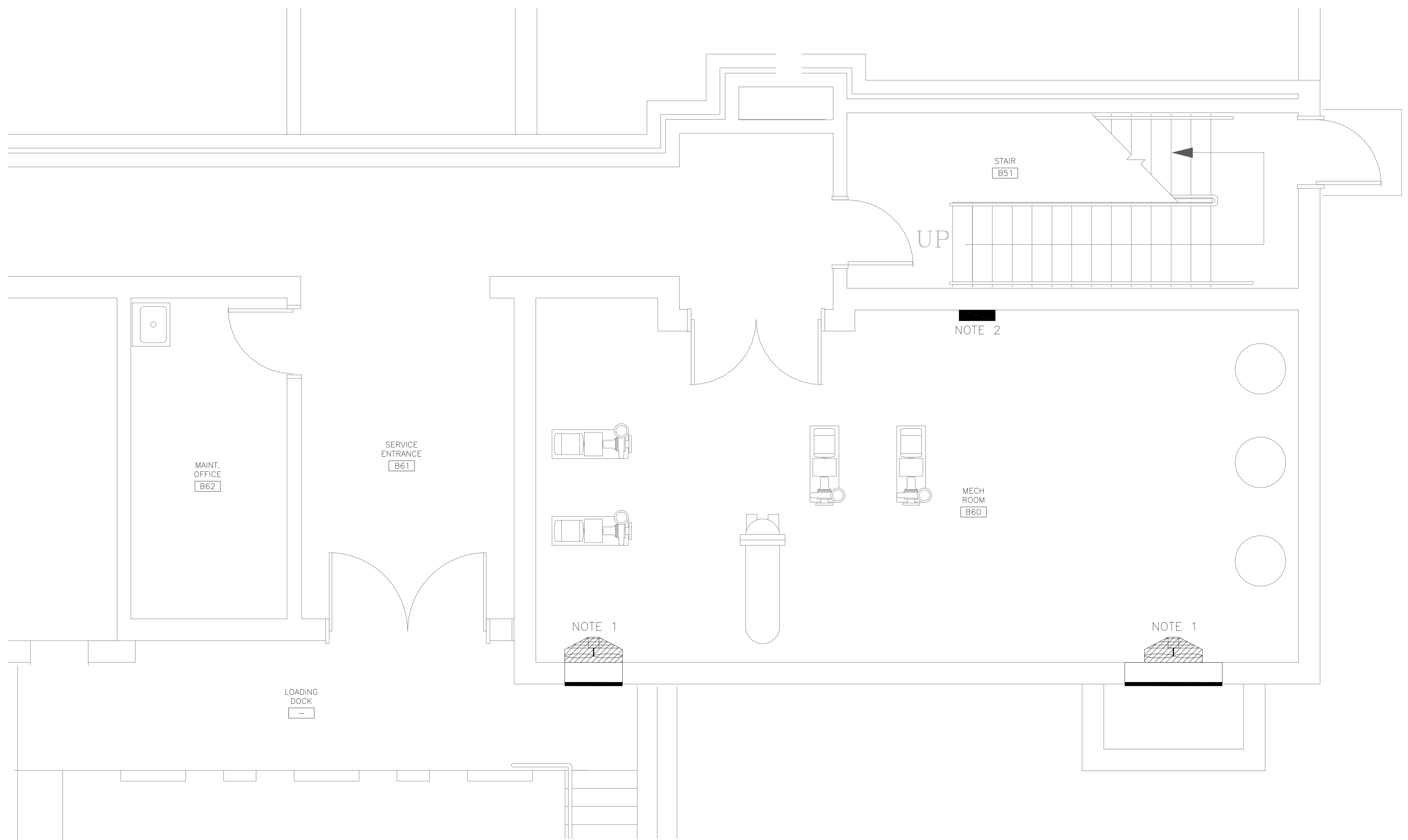
BUILDING: 135 | REV:

PROJECT TITLE: USC S. QUAD MECHANICAL ROOM COOLING UPGRADES

University of South Carolina

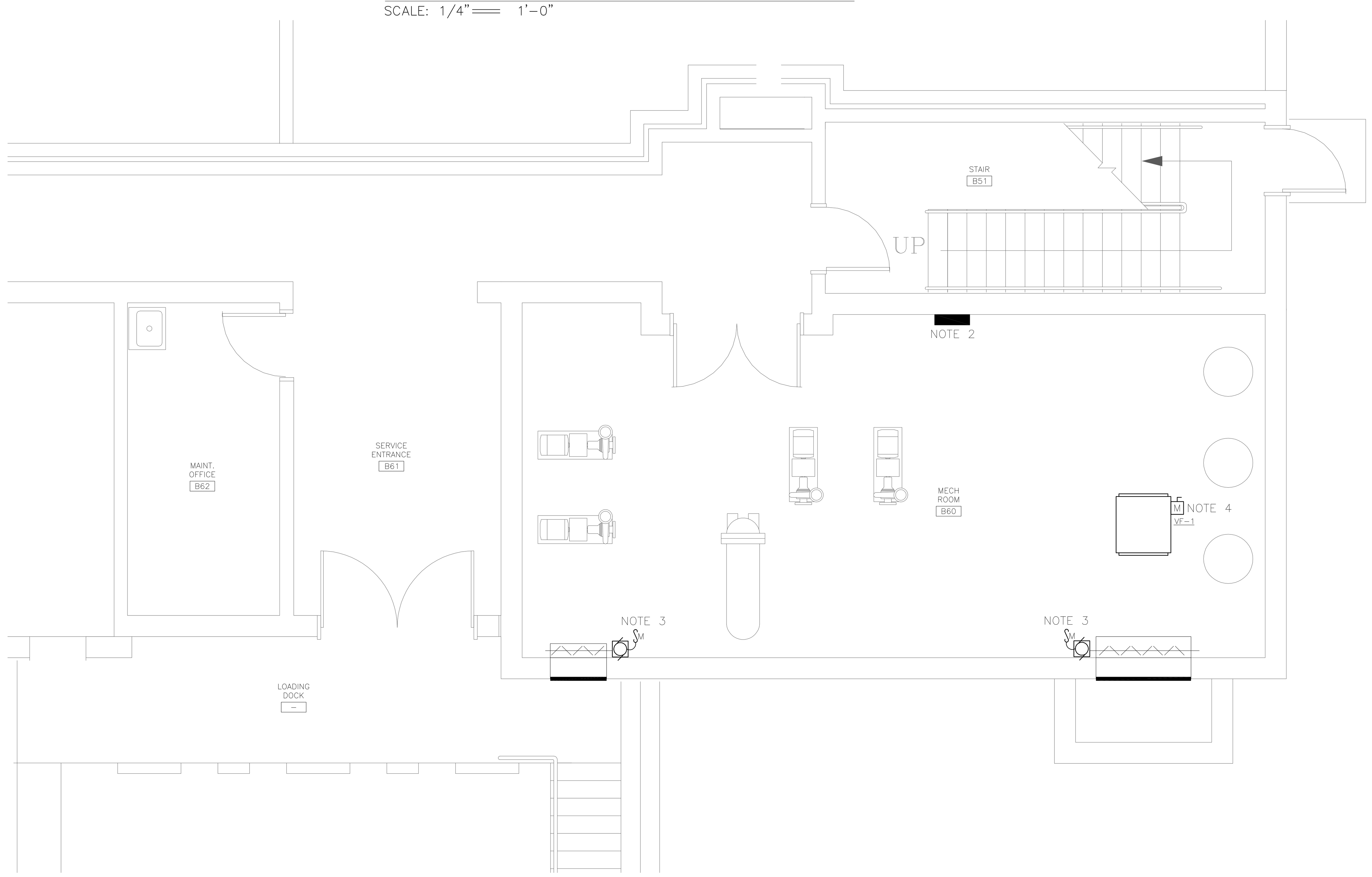
SHEET: M2 OF 2

SHEET IN SET: 3 OF 5



ELECTRICAL DEMOLITION FLOOR PLAN

SCALE: 1/4" = 1'-0"



ELECTRICAL RENOVATION FLOOR PLAN

SCALE: 1/4" = 1'-0"

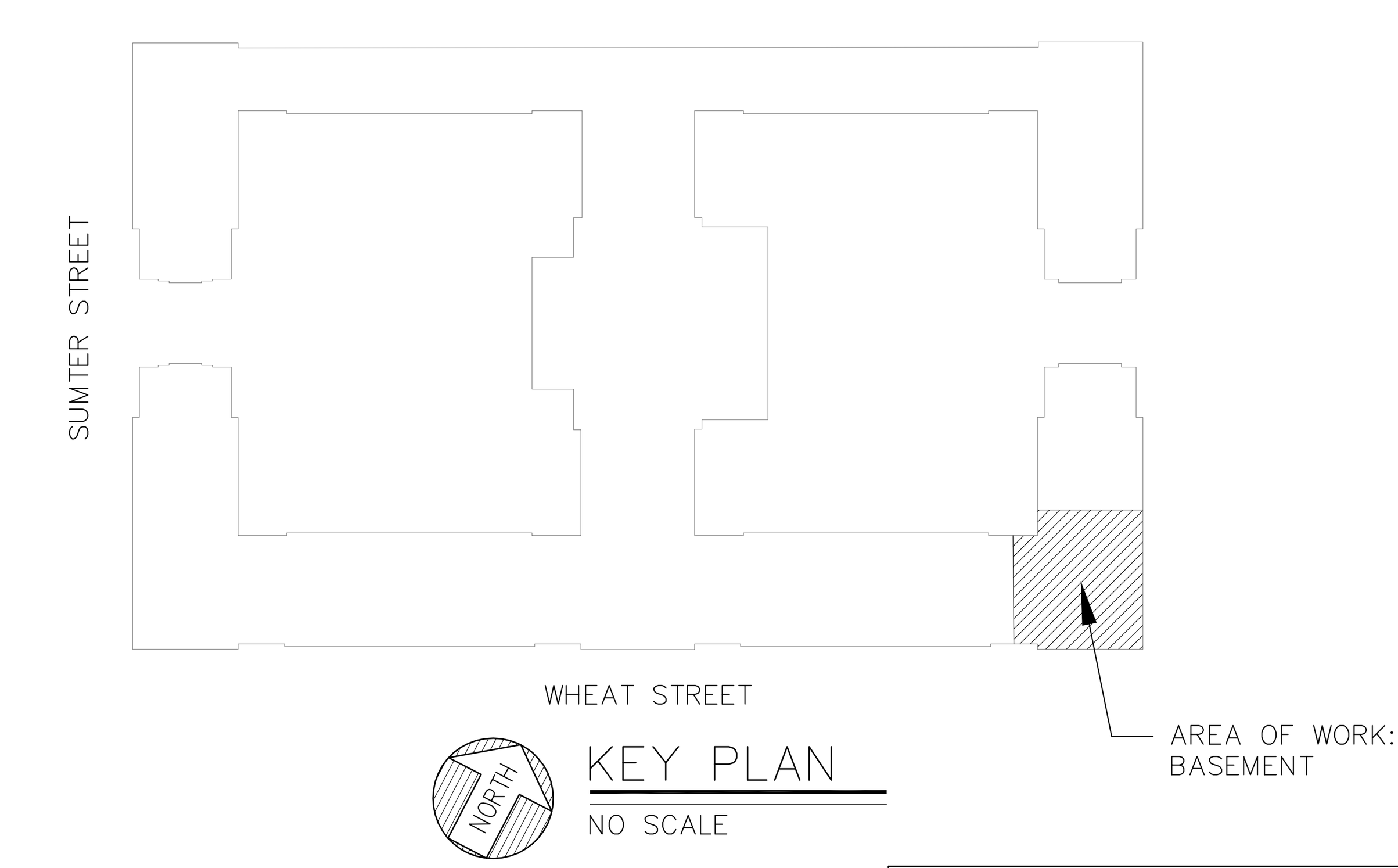
1/4"=1'-0" scale 2 0 2 4 8 feet

ELECTRICAL SYMBOL LEGEND

M (disconnect symbol)	ELECTRICAL SAFETY DISCONNECT SWITCH INTEGRAL WITH MECHANICAL EQUIPMENT
(motor connection symbol)	ELECTRICAL CONNECTION TO A MOTOR OR TO MOTOR–DRIVEN EQUIPMENT
SM	MOTOR RATED SNAP SWITCH IN NEMA 1 ENCLOSURE

ELECTRICAL NOTES

1. ELECTRICAL CONTRACTOR SHALL DISCONNECT ELECTRICAL BRANCH CIRCUIT TO MECHANICAL UNIT. DEMOLISH CIRCUIT IN ITS ENTIRETY.
2. EXISTING PANEL "M" IS A SQUARE D I–LINE PANELBOARD SERIES E1, 800A, 120/208V, 3 PHASE, 4 WIRE.
3. ELECTRICAL CONTRACTOR SHALL PROVIDE A 20A SINGLE POLE BREAKER IN EXISTING PANEL "M" FOR MOTOR OPERATED DAMPERS. PROVIDE 2–#12, 1#12 GROUND IN 3/4" CONDUIT FROM BREAKER TO MOTOR OPERATED DAMPERS.
4. ELECTRICAL CONTRACTOR SHALL PROVIDE A 20A THREE POLE BREAKER IN EXISTING PANEL "M" FOR VF–1. PROVIDE 3–#12, 1#12 GROUND IN 3/4" CONDUIT FROM BREAKER TO VF–1.



KEY PLAN

NO SCALE

ELECTRICAL DRAWING INDEX

E1 ELECTRICAL PLAN
E2 ELECTRICAL SPECIFICATIONS

SOUTH CAROLINA LICENSED PROFESSIONAL ENGINEER No. 26181 JASON L. AREHEART 3/4/16

US21602
BELKA ENGINEERING ASSOCIATES, INC.
CONTACT: CLIFF STRINGFIELD
7 CLUSTERS COURT, SUITE 201 | COLUMBIA, SC | 29210
(803) 731-0650 p | (803) 731-2880 f
CEStringfield@bellsouth.net

OFFICE OF FACILITIES MANAGEMENT
COLUMBIA, SC 29208

SEAL: SOUTH CAROLINA BELKA ENGINEERING ASSOC. INC. No. C00953 CERTIFICATE OF AUTHORIZATION

CHECKED BY: CES
DRAWN BY: JJS
DATE: 03/4/16
DRAWING: 50002897
BUILDING: 135

REV.	DESCRIPTION	DATE	ORIG. BY	DRAWN BY

PROJECT TITLE: USC S. QUAD MECHANICAL ROOM COOLING UPGRADES

University of South Carolina

SHEET: E1
1 OF 2

SHEET IN SET:
4 OF 5

SECTION 260500 - COMMON WORK RESULTS FOR ELECTRICAL

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. Provide all labor, materials, equipment and supervision to construct complete and operable electrical systems as indicated on the drawings and specified herein.

B. All materials and equipment used shall be new, undamaged and free from any defects.

1.2 RELATED DOCUMENTS AND OTHER INFORMATION

A. The general provisions of the Contract, including General and Supplementary Conditions and General Requirements, apply to the portions of work specified in each and every Section, individually and collectively.

1.3 PRODUCT WARRANTIES

A. Provide manufacturer's standard printed commitment in reference to a specific product and normal application, stating that certain acts of restitution will be performed for the Purchaser or Owner by the manufacturer, when and if the product fails within certain operational conditions and time limits. Where the warranty requirements of a specific specification section exceeds the manufacturer's standard warranty, the more stringent requirements will apply and modified manufacturer's warranty shall be provided. In no case shall the manufacturer's warranty be less than one (1) year.

1.4 PRODUCT SUBSTITUTIONS

A. General: Materials specified by manufacturer's name shall be used unless prior approval of an alternate is given by addenda. Requests for substitutions must be received in the office of the Architect at least 10 days prior to opening of bids.

1.5 ELECTRICAL DRAWINGS

A. Electrical contract drawings are diagrammatic and indicate the general arrangement of electrical equipment. Do not scale electrical plans. Obtain all dimensions from the Architect's dimensioned drawings and field measurements. The Contractor shall review Architectural plans for door swings and built-in equipment; conditions indicated on those plans shall govern for this work.

B. Coordinate installation of electrical equipment with the structural and mechanical equipment and access thereto. Coordinate exterior electrical work with civil and landscaping work.

C. Discrepancies shown on different drawings, between drawings and specifications or between documents and field conditions shall be installed to provide the better quality or greater quantity of work; or, comply with the more stringent requirement; either or both in accordance with the A/E's interpretation.

1.6 SYSTEMS REQUIRING ROUGH-IN

A. Rough-in shall consist of all outlet boxes/raceway systems/supports and sleeves required for the installation of cables/devices by other Divisions and by the Owner. It shall be the responsibility of this Contractor to determine the requirements by reviewing the contract documents and meeting with the Superintendent of the trade involved and Owner's representative to review submittal data, shop drawings, etc.

B. Sealing of all sleeves, to meet the fire rating of the assembly, whether active or not, is work of this Division.

1.7 EXISTING SERVICES AND FACILITIES

A. Damage to Existing Services: Existing services and facilities damaged by the Contractor through negligence or through use of faulty materials or workmanship shall be promptly repaired, replaced, or otherwise restored to previous conditions by the Contractor without additional cost to the Owner.

B. Interruption of Services: Interruptions of services necessary for connection to or modification of existing systems or facilities shall occur only at prearranged times approved by the Owner. Interruptions shall only occur after the provision of all temporary work and the availability of adequate labor and materials will assure that the duration of the interruption will not exceed the time agreed upon.

C. Removed Materials: Existing materials made unnecessary by the new installation shall be stored on site. They shall remain the property of the Owner and shall be stored at a location and in a manner as directed by the Owner. If classified by the Owner's authorized representative as unsuitable for further use, the material shall become the property of the Contractor and shall be removed from the site at no additional cost to the owner.

PART 2 - PRODUCTS

2.1 FIRESTOPPING:

A. Refer to section 078413 for additional requirements.

B. A firestop system shall be used to seal penetrations of electrical conduits and cables through fire-rated partitions per NEC 300.21, and NEC 800.26. The firestop system shall be qualified by formal performance testing in accordance with ASTM E-814, or UL 1479.

C. The firestop system shall consist of a fire-rated caulk type substance and a high temperature fiber Insulation. It shall be permanently flexible, waterproof, non-toxic, smoke and gas tight and have a high adhesion to all solids so damming is not required. Only metal conduit shall be used in conjunction with this system to penetrate fire rated partitions. Install in strict compliance with manufacturer's recommendations. 3M or approved equal.

PART 3 - EXECUTION

3.1 PRODUCT INSTALLATION, GENERAL

A. Except where more stringent requirements are indicated, comply with the product manufacturer's installation instructions and recommendations, including handling, anchorage, assembly, connections, cleaning and testing, charging, lubrication, startup, test operation and shut-down of operating equipment. Consult with manufacturer's technical experts, for specific instructions on unique product conditions and unforeseen problems.

B. Protection and Identification: Deliver products to project properly identified with names, models numbers, types, grades, compliance labels and similar information needed for distinct identifications; adequately packaged or protected to prevent deterioration during shipment, storage and handling. Store in a dry, well ventilated, indoor space, except where prepared and protected by the manufacturer specifically for exterior storage.

C. Permits and Tests: Provide labor, material and equipment to perform all tests required by the governing agencies and submit a record of all tests to the Owner or his representative. Notify the Architect five days in advance of any testing.

D. Install temporary protective covers over equipment enclosures, outlet boxes and similar items after interiors, conductors, devices, etc. are installed, to prevent the entry of construction debris and to protect the installation during finish work performed by others. Do not install device plates, equipment covers or trims until finish work is complete.

E. Clean all equipment, inside and out, upon completion of the work. Scratched or marred surfaces shall be touched-up with touch-up paint furnished by the equipment manufacturer.

F. Replace all equipment and materials that become damaged.

G. No more than three phase conductors, each of opposite phases for a three phase WYE system, shall be combined in a single raceway unless written approval is granted by the engineer or noted otherwise on the construction documents. 120 volt and 277 volt receptacle and lighting circuits are except from this requirement, but must meet the requirements of the NEC.

H. Shared neutrals shall not be utilized (including, but not limited to homeruns) unless written permission is obtained from the Engineer for a specific application.

3.2 EQUIPMENT PROTECTION

A. Equipment and materials shall be protected during shipment and storage against physical damage, vermin, dirt, corrosive substances, fumes, moisture, cold and rain.

B. Store equipment indoors in clean dry space with uniform temperature to prevent condensation. Equipment shall include but not be limited to circuit protective devices, cables, wire, light fixtures, electronic equipment, and accessories.

C. During installation, equipment shall be protected against entry of foreign matter; and be vacuum-cleaned both inside and outside before testing and operating. Compressed air shall not be used to clean equipment. Remove loose packing and flammable materials from inside equipment.

D. Damaged equipment shall be, as determined by the Engineer, placed in first class operating condition or be returned to the source of supply for repair or replacement.

E. Painted surfaces shall be protected with factory installed removable heavy kraft paper, sheet vinyl or equal.

F. Damaged paint on equipment and materials shall be refinished with the same quality of paint and workmanship as used by the manufacturer so repaired areas are not obvious.

3.3 ELECTRICAL WORK:

A. Electrical work shall be accomplished with all affected circuits or equipment de-energized. When an electrical outage cannot be accomplished in this manner for the required work, the following requirements are mandatory:

1. Electricians must use full protective equipment (i.e., certified and tested insulating material to cover exposed energized electrical components, certified and tested insulated tools, etc.) while working on energized systems in accordance with NFPA 70E.

2. Electricians must wear personal protective equipment while working on energized systems In accordance with NFPA 70E.

3. Before initiating any work, a job specific work plan must be developed by the contractor with a peer review conducted and documented by the Contractor. The work plan must include procedures to be used on and near the live electrical equipment, barriers to be installed, safety equipment to be used and exit pathways.

4. Work on energized circuits or equipment cannot begin until prior written approval is obtained from the Owner/ Architect.

SECTION 26 05 19 - LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 GENERAL

1.1 SUMMARY

A. Section includes building wire and cable; and wiring connectors and connections.

1.2 SYSTEM DESCRIPTION

A. Product Requirements: Provide products as follows:
1. Solid conductor for branch circuits 10 AWG and smaller.
2. Stranded conductors for control circuits.
3. Conductor not smaller than 12 AWG for power and lighting circuits.
4. Conductor not smaller than 14 AWG for control circuits.
5. Increase wire size in branch circuits to limit voltage drop to a maximum of 3 percent.

B. Wiring Methods: Provide the following wiring methods:
1. Use only building wire, Type THHN/THWN insulation, in raceway unless specifically noted otherwise.
2. Type MC Cable shall not be allowed without written permission from engineer.

1.3 QUALITY ASSURANCE

A. Provide wiring materials located in plenums with peak optical density not greater than 0.5, average optical density not greater than 0.15, and flame spread not greater than 5 feet (1.5 m) when tested in accordance with NFPA 262.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

C. Conform to requirements of NFPA 70.

1.4 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years experience.

1.5 FIELD MEASUREMENTS

A. Verify field measurements prior to work. Coordinate dimensions with architectural, structural, and civil drawings. Electrical Drawings are diagrammatic only and shall not be scaled.

1.6 COORDINATION

A. Where wire and cable destination is indicated and routing is not shown, determine routing and lengths required.

B. Wire and cable routing indicated is approximate unless dimensioned. Include wire and cable lengths within 10 ft of length shown.

PART 2 PRODUCTS

2.1 BUILDING WIRE

A. Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. Southwire
2. AETNA
3. American Insulated Wire Corp.
4. Colonial Wire
5. General Cable Co.
6. Substitutions: Section 01 60 00 - Product Requirements.

B. Product Description: Single conductor insulated wire.

C. Conductor: Copper.

D. Insulation Voltage Rating: 600 volts.

2.2 TERMINATIONS

A. Terminal Lugs for Wires 6 AWG and Smaller: Solderless, compression type copper.

B. Lugs for Wires 4 AWG and Larger: Color keyed, compression type copper, with insulating sealing collars.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.

B. Verify interior of building has been protected from weather.

C. Verify mechanical work likely to damage wire and cable has been completed.

D. Verify raceway installation is complete and supported.

3.2 PREPARATION

A. Completely and thoroughly swab raceway before installing wire.

3.3 EXISTING WORK

A. Remove exposed abandoned wire and cable, including abandoned wire and cable above accessible ceiling finishes. Patch surfaces where removed cables pass through building finishes.

B. Disconnect abandoned circuits and remove circuit wire and cable. Remove abandoned boxes when wire and cable servicing boxes is abandoned and removed. Install blank cover for abandoned boxes not removed.

C. Provide access to existing wiring connections remaining active and requiring access. Modify installation or install access panel.

D. Extend existing circuits using materials and methods compatible with existing electrical installations, or as specified.

E. Clean and repair existing wire and cable remaining or wire and cable to be reinstalled.

3.4 INSTALLATION

A. Route wire and cable to meet Project conditions.

B. Neatly train and lace wiring inside boxes, equipment, and panelboards.

C. Special Techniques--Building Wire in Raceway:
1. Pull conductors into raceway at same time.

D. Special Techniques - Wiring Connections:
1. Clean conductor surfaces before installing lugs and connectors.
2. Make splices, taps, and terminations to carry full ampacity of conductors with no perceptible temperature rise.
3. Tape uninsulated conductors and connectors with electrical tape to 150 percent of insulation rating of conductor.
4. Install split bolt connectors for copper conductor splices and taps, 6 AWG and larger.
5. Install solderless pressure connectors with insulating covers for copper conductor splices and taps, 8 AWG and smaller.
6. Install insulated spring wire connectors with plastic caps for copper conductor splices and taps, 10 AWG and smaller.

E. Install stranded conductors for branch circuits 10 AWG and smaller. Install crimp on fork terminals for device terminations. Do not place bare stranded conductors directly under screws.

F. Install terminal lugs on ends of 600 volt wires unless lugs are furnished on connected device, such as circuit breakers.

G. Size lugs in accordance with manufacturer's recommendations terminating wire sizes.

3.5 WIRE COLOR

A. General:
1. For wire sizes 10 AWG and smaller, install wire with insulation colors as designated below.
2. For wire sizes 8 AWG and larger, identify wire with colored tape at terminals, splices and boxes. Colors are as follows:

B. 120/208-volt systems: Phase A - Black
Phase B - Red
Phase C - Blue
Neutral - White

C. For 6 AWG and smaller:
1. Ground Conductors: Green.
2. Neutral: White.

3.6 FIELD QUALITY CONTROL

A. Inspect and test in accordance with NETA ATS, except Section 4.

B. Perform inspections and tests listed in NETA ATS, Section 7.3.1.

SECTION 26 05 26 - GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
1. Wire.

1.2 QUALITY ASSURANCE

A. Provide grounding materials conforming to requirements of NEC, IEEE 142, and UL labeled.

PART 2 PRODUCTS

2.1 WIRE

A. Material: Stranded copper.

B. Bonding Conductor: Copper conductor insulated.

PART 3 EXECUTION

3.1 INSTALLATION

A. Equipment Grounding Conductor: Install separate, insulated conductor within each feeder and branch circuit raceway. Terminate each end on suitable lug, bus, or bushing.

B. Permanently ground entire light and power system in accordance with NEC, including service equipment, distribution panels, lighting panelboards, switch and starter enclosures, motor frames, grounding type receptacles, and other exposed non-current carrying metal parts of electrical equipment.

C. Accomplish grounding of electrical system by using insulated grounding conductor installed with feeders and branch circuit conductors in conduits. Size grounding conductors in accordance with NEC. Install from grounding bus of serving panel to ground bus of served panel, grounding screw of receptacles, lighting fixture housing, light switch outlet boxes or metal enclosures of service equipment. Ground conduits by means of grounding bushings on terminations at panelboards with installed number 12 conductor to grounding bus.

D. Grounding electrical system using continuous metal raceway system enclosing circuit conductors in accordance with NEC.

E. Permanently attach equipment and grounding conductors prior to energizing equipment.

3.2 FIELD QUALITY CONTROL

A. Inspect and test in accordance with NETA ATS, except Section 4.

B. When improper grounding is found on receptacles, check receptacles in entire project and correct. Perform retest.

SECTION 26 05 29 - HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
1. Conduit supports.
2. Formed steel channel.
3. Spring steel clips.

PART 2 PRODUCTS

2.1 CONDUIT SUPPORTS

A. Hanger Rods: Threaded high tensile strength galvanized carbon steel with free running threads.

B. Beam Clamps: Malleable Iron, with tapered hole in base and back to accept either bolt or hanger rod. Set screw: hardened steel.

C. Conduit clamps for trapeze hangers: Galvanized steel, notched to fit trapeze with single bolt to tighten.

D. Conduit clamps - general purpose: One hole malleable iron for surface mounted conduits.

E. Cable Ties: High strength nylon temperature rated to 185 degrees F (85 degrees C). Self locking.

2.2 FORMED STEEL CHANNEL

A. Product Description: Galvanized 12 gage (2.8 mm) thick steel. With holes 1-1/2 inches (38 mm) on center.

2.3 SPRING STEEL CLIPS

A. Product Description: Mounting hole and screw closure.

PART 3 EXECUTION

3.1 PREPARATION

A. Do not use powder-actuated anchors.

B. Do not drill or cut structural members.

3.2 INSTALLATION - HANGERS AND SUPPORTS

A. Anchors and Fasteners:
1. Concrete Structural Elements: Provide expansion anchors.
2. Steel Structural Elements: Provide beam clamps, spring steel clips, and steel ramset fasteners.
3. Concrete Surfaces: Provide self-drilling anchors and expansion anchors.
4. Hollow Masonry, Plaster, and Gypsum Board Partitions: Provide toggle bolts and hollow wall fasteners.
5. Solid Masonry Walls: Provide expansion anchors.
6. Sheet Metal: Provide sheet metal screws.
7. Wood Elements: Provide wood screws.

B. Install conduit and raceway support and spacing in accordance with NEC.

C. Do not fasten supports to pipes, ducts, mechanical equipment, or conduit.

D. Install multiple conduit runs on common hangers.

SECTION 26 05 33 - RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 SUMMARY

A. Section includes conduit and tubing, wireways, outlet boxes, pull and junction boxes, and handholes.

1.2 SYSTEM DESCRIPTION

A. Raceway and boxes located as indicated on Drawings, and at other locations required for splices, taps, wire pulling, equipment connections, and compliance with regulatory requirements. Raceway and boxes are shown in approximate locations unless dimensioned. Provide raceway to complete wiring system.

B. Concealed Dry Locations: Provide electrical metallic tubing. Provide sheet-metal boxes. Provide flush mounting outlet box in finished areas. Provide hinged enclosure for large pull boxes.

C. Exposed Dry Locations in finished spaces (existing conditions only): Provide wiremold (or panduit, or prior approved equal) surface metal raceway. Provide surface metal boxes by same company as raceway. For Communications System, provide deep surface metal boxes.

D. Exposed Dry Locations in unfinished loactions: Provide rigid steel or intermediate metal conduit where subject to damage (see below for defined locations that are subject to damage), electrical metallic tubing. Provide sheet-metal boxes. Provide flush mounting outlet box in finished areas. Provide hinged enclosure for large pull boxes.
1. Spaces defined as subject to physical damage are as follows:
1.1. Mechanical Rooms below 10' above finished floor.
1.2. Loading Docks.
1.3. Any area with forklift traffic.

1.3 DESIGN REQUIREMENTS

A. Minimum Raceway Size: 3/4 inch (19 mm) unless otherwise specified.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Protect conduit from corrosion and entrance of debris by storing above grade. Provide appropriate covering.

B. Protect PVC conduit from sunlight.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers listed below are basis of design, or can provide products equal to basis of design.
1. Carlon Electrical Products.
2. Hubbell Wiring Devices.
3. Thomas & Betts Corp.
4. Walker Systems Inc.
5. The Wiremold Co.
6. Substitutions: Section 01 60 00 - Product Requirements.

2.2 METAL CONDUIT

A. Rigid Steel Conduit: ANSI C80.1.

B. Rigid Aluminum Conduit: ANSI C80.5.

C. Intermediate Metal Conduit (IMC): Rigid steel.

D. Fittings and Conduit Bodies: NEMA FB 1; material to match conduit.

2.3 FLEXIBLE METAL CONDUIT

A. Product Description: Interlocked steel construction.

B. Fittings: NEMA FB 1.

2.4 LIQUIDTIGHT FLEXIBLE METAL CONDUIT

A. Product Description: Interlocked steel construction with PVC jacket.

B. Fittings: NEMA FB 1.

2.5 ELECTRICAL METALLIC TUBING (EMT)

A. Product Description: ANSI C80.3; galvanized tubing.

B. Fittings and Conduit Bodies: NEMA FB 1; steel compression type.

C. All EMT conduit shall be Anodized with the following color coating:
1. Normal Power: Silver

2.6 OUTLET BOXES

A. Sheet Metal Outlet Boxes: NEMA OS 1, galvanized steel.
1. Luminaire and Equipment Supporting Boxes: Rated for weight of equipment supported; furnish 1/2 inch (13 mm) male fixture studs where required.
2. Concrete Ceiling Boxes: Concrete type.

B. Nonmetallic Outlet Boxes: NEMA OS 2.

C. Cast Boxes: NEMA FB 1, Type FD. Furnish gasketed cover by box manufacturer.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify outlet locations and routing and termination locations of raceway prior to rough-in.

3.2 EXISTING WORK

A. Remove exposed abandoned raceway, including abandoned raceway above accessible ceiling finishes. Cut raceway flush with walls and floors, and patch surfaces.

B. Remove concealed abandoned raceway to its source.

C. Disconnect abandoned outlets and remove devices. Remove abandoned outlets when raceway is abandoned and removed. Install blank cover for abandoned outlets not removed.

D. Maintain access to existing boxes and other installations remaining active and requiring access. Modify installation or provide access panel.

E. Extend existing raceway and box installations using materials and methods compatible with existing electrical installations, or as specified.

F. Clean and repair existing raceway and boxes to remain or to be reinstalled.

3.3 INSTALLATION

A. Ground and bond raceway and boxes in accordance with Section 26 05 26.

B. Fasten raceway and box supports to structure and finishes in accordance with Section 26 05 29.

C. Arrange raceway and boxes to maintain headroom and present neat appearance.

3.4 INSTALLATION - RACEWAY

A. Raceway routing is shown in approximate locations unless dimensioned. Route to complete wiring system.

B. Arrange raceway supports to prevent misalignment during wiring installation.

C. Support raceway using coated steel or malleable iron straps, lay-in adjustable hangers, clevis hangers, and split hangers.

D. Group related raceway; support using conduit rack. Construct rack using steel channel specified in Section 26 05 29; provide space on each for 25 percent additional raceways.

E. Do not support raceway with wire or perforated pipe straps. Remove wire used for temporary supports

F. Do not attach raceway to ceiling support wires or other piping systems.

G. Construct wireway supports from steel channel specified in Section 26 05 29.

H. Route exposed raceway parallel and perpendicular to walls.

I. Route raceway installed above accessible ceilings parallel and perpendicular to walls.

J. Maintain clearance between raceway and piping for maintenance purposes.

K. Maintain 12 inch (300 mm) clearance between raceway and surfaces with temperatures exceeding 104 degrees F (40 degrees C).

L. Cut conduit square using saw or pipe cutter; de-burr cut ends.

M. Bring conduit to shoulder of fittings; fasten securely.

N. Install conduit hubs or sealing locknuts to fasten conduit to cast boxes.

O. Install no more than equivalent of three 90 degree bends between boxes for power systems. Install conduit bodies to make sharp changes in direction, as around beams.

P. Avoid moisture traps; install junction box with drain fitting at low points in conduit system.

Q. Install fittings to accommodate expansion and deflection where raceway crosses seismic, control and expansion joints.

R. Install suitable pull string or cord in each empty raceway except sleeves and nipples.

S. Install suitable caps to protect installed conduit against entrance of dirt and moisture.

3.5 INSTALLATION - BOXES

A. Install wall mounted boxes at elevations to accommodate mounting heights as indicated on Drawings.

B. Adjust box location up to 10 feet (3 m) prior to rough-in to accommodate intended purpose.

C. Install pull boxes and junction boxes above accessible ceilings and in unfinished areas only.

D. Do not fasten boxes to ceiling support wires or other piping systems.

E. Support boxes independently of conduit.

3.6 INTERFACE WITH OTHER PRODUCTS

A. Install conduit to preserve fire resistance rating of partitions and other elements, using materials and methods in accordance with Section 07 84 00.

3.7 ADJUSTING

B. Install knockout closures in unused openings in boxes.

3.8 CLEANING

A. Clean interior of boxes to remove dust, debris, and other material.

B. Clean exposed surfaces and restore finish.

OFFICE OF
FACILITIES MANAGEMENT
COLUMBIA, SC 29208

SEAL: SOUTH CAROLINA BELKA ENGINEERING ASSOC. INC. No. C00953 CERTIFICATE OF AUTHORIZATION

CHECKED BY: CES
DRAWN BY: DRAWN BY
ORIG. BY
DRAWN BY: JJS
DATE

DATE: 03/4/16
DRAWING: 50002897
DESCRIPTION

BUILDING: 135
REV:

PROJECT TITLE: USC S. QUAD MECHANICAL ROOM COOLING UPGRADES

University of South Carolina

SHEET: E2
2 OF 2

SHEET IN SET: 5 OF 5

SOUTH CAROLINA REGISTERED PROFESSIONAL ENGINEER JASON L. ARENHART No. 26181 3/4/16

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