SECTION 27 05 00 - COMMON WORK RESULTS FOR COMMUNICATIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes: General communications requirements for Division 27 work and is supplemental to the requirements in Division 1.

B. The purpose of these division 27 specifications is to provide clear direction to consultants and installers performing communications work for Portland State University in regards to design, installation, and testing of a fully operational communications system.

C. OTHER IT equipment such as switches, routers, servers, access points, voice gateways and telephones - All purchasing and deployment of data and voice network equipment must be coordinated with and approved by PSU's Office of Information Technology. These components are NOT included in the Summary of work for these Division 27 specifications.

D. The telecommunications network transport system shall provide a cost effective standards based infrastructure that is capable of supporting current and future voice, video, and data applications over a common system. The system shall support, at a minimum:
1. 1000Base-T, horizontal
2. 1000Base-TX, horizontal
3. 10GBase-x, backbone

1.3 DEFINITIONS

A. ARC: Aluminum rigid conduit.

B. BCT: Bonding conductor for telecommunications.

C. BICSI: Building Industry Consulting Service International.

D. Consolidation Point: A location for interconnection between horizontal cables extending from building pathways and horizontal cables extending into furniture pathways.

E. Cross-Connect: A facility enabling the termination of cable elements and their interconnection or cross-connection.

F. EMI: Electromagnetic interference.

G. EMT: Electrical metallic tubing.

H. GRC: Galvanized rigid steel conduit.

I. IDC: Insulation displacement connector.

J. IMC: Intermediate metal conduit.

K. Inter-building Backbone cable: UTP, optical fiber, and coaxial cable that connects telecommunications rooms that are in separate buildings.

L. Intra-building Backbone cable: UTP, optical fiber, and coaxial cable that connects telecommunications rooms that are within the same buildings.

M. LAN: Local area network.

N. MUTOA: Multiuser telecommunications outlet assembly, a grouping in one location of several telecommunications outlet/connectors.

O. OIT: Office of Information Technology. A PSU entity.

P. Outlet/Connectors: A connecting device in the work area on which horizontal cable or outlet cable terminates.

Q. Owner: Portland State University

R. PSU: Portland State University. Also referred to and used synonymously with the “owner”.

S. RCDD: Registered Communications Distribution Designer.

T. TBB: Telecommunications Bonding Backbone

U. TC: Telecommunications Closet. Term generally used by PSU. Synonymous with and can be used interchangeably with TR.

V. TGB: Telecommunications grounding busbar. Term used synonymously with BCT.

W. TMGB: Telecommunications main grounding busbar.

X. TR: Telecommunications Room. Synonymous with and can be used interchangeably with TC.

Y. UTP: Unshielded twisted pair.

1.4 STANDARDS AND CODES

A. Telecommunications design and installations shall adhere with industry standards, including but not limited to:
1. NFPA-70, National Electrical Code
2. NFPA-72, National Fire Alarm and Signaling Code
3. BICSI Telecommunications Distribution Methods Manual (TDMM), 13th Edition
4. ANSI/TIA/568-C: Generic Telecommunications Cabling for Customer Premises
5. ANSI/TIA/568-C: Commercial Building Telecommunications Cabling Standard
6. ANSI/TIA/568-C: Commercial Building Telecommunications Cabling Standard, Part 2: Balanced Twisted Pair Cabling
7. ANSI/TIA/568-C: Family of Standards, , June 2008
8. TIA-569-B: Commercial Building Standard for Telecommunications Pathways and Spaces
9. ANSI/TIA/EIA-598: Color Coding of Fiber Optic Cables
10. ANSI/TIA/EIA-606-A: The Administration Standard for the Telecommunications Infrastructure of Commercial Building
11. ANSI-J-STD-607-A-2002: Commercial Building Grounding and Bonding Requirements for Telecommunications
12. ANSI/TIA/EIA-758: Customer Owned Outside Plant Telecommunications Cabling Standard
13. ANSI/TIA/EIA-526-14-A-1998: Optical Power Loss Measurements of Installed Multimode Fiber Cable Plant-OFSTP-14A.

B. Comply with local AHJ codes and requirements in addition to these listed.

C. Above referenced standards are to be most current version published at the time specifications are issued, including addendums, and technical services bulletins.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.
1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for equipment racks and cabinets.
2. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

B. Shop Drawings:
   1. System Labeling Schedules: Electronic copy of labeling schedules, in software and format selected by PSU.
   2. System Labeling Schedules: Electronic copy of labeling schedules that are part of the cabling and asset identification system of the software.
   3. Cabling administration drawings and printouts.
   4. Wiring diagrams to show typical wiring schematics of each specified system.

C. Samples: Per specified system including but not limited to: Workstation outlets, jacks, jack assemblies, etc.

1.6 INFORMATION SUBMITTALS

A. Qualification Data: For Designer, Installer, qualified layout technician, installation supervisor, and field inspector.

B. Source quality-control reports.

C. Field quality-control reports.
   1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
   2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
   3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

D. Coordination Drawings: Floor plans and sections, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:
   1. Include scaled cable tray layout and relationships between components and adjacent structural, electrical, and mechanical elements.
   2. Vertical and horizontal offsets and transitions.
   3. Clearances for access above and to side of cable trays.
   4. Vertical elevation of cable trays above the floor or below bottom of ceiling structure.
   5. Structural members in paths of pathway groups with common supports.
   6. HVAC and plumbing items and architectural features in paths of conduit groups with common supports.

E. Seismic Qualification Certificates: For cable trays, accessories, and components, from manufacturer.
   1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
   2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
   3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

F. Delegated-Design Submittal, for seismic restraints:
   1. Seismic-Restraint Details: Signed and sealed by a qualified professional engineer, licensed in the state where Project is located, who is responsible for their preparation.
   2. Design Calculations: Calculate requirements for selecting seismic restraints.
   3. Detail fabrication, including anchorages and attachments to structure and to supported cable trays.

1.7 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For systems specified in each section.

B. Software and Firmware Operational Documentation:
   1. Software operating and upgrade manuals.
   2. Program Software Backup: On compact disk or posted to PSU Project Management application, complete with data files.
   3. Device address list.
   4. Printout of software application and graphic screens.

1.8 QUALITY ASSURANCE

A. Samples Installer Qualifications: Designer and Cabling Installer must have personnel certified by BICSI on staff.
   1. Layout Responsibility: Preparation of Design OR Shop Drawings and Cabling Administration Drawings by an RCDD.
   2. Installation Supervision: Installation shall be under the direct supervision of Registered Technician or Level 2 Installer, who shall be present at all times when Work of this Division is performed at Project site.
   3. Testing Supervisor: Currently certified by BICSI as an RCDD to supervise on-site testing.

B. Testing Agency Qualifications: An NRTL.
   1. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. Comply with NFPA 70.

1.9 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install cables and connecting materials until wet work in spaces is complete and dry, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

1.10 COORDINATION

A. Coordinate layout and installation of telecommunications pathways and cabling with PSU's telecom department prior to installing and terminating.

1.11 SOFTWARE SERVICE AGREEMENT

A. Technical Support: Beginning with Substantial Completion, provide software support for two years.

B. Upgrade Service: Update software to latest version at Project completion. Install and program software upgrades that become available within two years from date of Substantial Completion. Upgrading software shall include operating system. Upgrade shall include new or revised licenses for use of software.
   1. Provide 30 days' notice to PSU to allow scheduling and access to system and to allow PSU to upgrade computer equipment if necessary.

PART 2 - PRODUCTS

2.1 SUBSTITUTION OF MATERIALS

A. Substitutions will not be considered except for products for which are specifically identified with an “or equal” following their description and/or part number.

B. Prior to bid opening: For those products where an or equal will be considered, acceptance will be determined through following process:
   1. Substitution Request form filled out in its entirety with reference to specific section and signature stating it meets or exceeds all performance requirements of originally specified product.
   2. Samples shall be submitted when requested.
   3. Requests shall be received 10 days prior to bid opening/due time.
   4. Requests containing insufficient information to confirm compliance with contract documents will not be considered.

C. Upon Award of Contract: Substitution of products will be considered after award of contract only under the following conditions:
   1. The contractor placed order for specified materials promptly after contract award and the specified products cannot be delivered to the project to meet PSU’s construction schedule.

2. The reason for the unavailability is beyond the contractor's control, i.e. due to strikes, bankruptcy, discontinuance of manufacturer, acts of God.
3. The specified product is no longer manufactured.
4. There is compelling economic advantage to PSU.
5. There is compelling sustainable or environmental advantage to PSU.

D. In all cases, should a substituted material result in communication system or building modifications, the contractor shall alone pay all cost to provide these modifications including all costs to the PSU's Representative and Architect for redesign, and updated of record drawings required to accommodate the required modifications.

PART 3 - EXECUTION

3.1 IDENTIFICATION

A. A note about e911: Oregon Senate Bill 598, implemented January 1 of 2014, requires organizations to report the physical street address of a 911 call to a Public Safety Answering Point (PSAP). PSU OIT must have accurate information on jack locations and labels in order to enter this physical information in our database to report for e911.

B. Identify system components, wiring, and cabling complying with TIA/EIA-606-A. Comply with requirements for identification specified in Section 270500, Common Work Results for Communications.
1. Administration Class: 2.
2. Color-code cross-connect fields. Apply colors to voice and data service backboards, connections, covers, and labels.

C. Using cable management system software specified in Part 2, develop Cabling Administration Drawings for system identification, testing, and management. Use unique, alphanumeric designation for each cable and label cable, jacks, connectors, and terminals to which it connects with same designation. At completion, cable and asset management software shall reflect as-built conditions.

D. Paint and label colors for equipment identification shall comply with TIA/EIA-606-A for Class 2 level of administration, including optional identification requirements of this standard.

E. Cable Schedule: Post in prominent location in each equipment room and wiring closet. List incoming and outgoing cables and their designations, origins, and destinations. Protect with rigid frame and clear plastic cover. Furnish an electronic copy of final comprehensive schedules for Project.

F. Cabling Administration Drawings: Show building floor plans with cabling administration-point labeling. Identify labeling convention and show labels for telecommunications closets, terminal hardware and positions, horizontal cables, work areas and workstation terminal positions, grounding buses and pathways, and equipment grounding conductors. Follow convention of TIA/EIA-606-A. Furnish electronic record of all drawings, in software and format selected by PSU.

G. Cable and Wire Identification:
1. Label each cable within 4 inches of each termination and tap, where it is accessible in a cabinet or junction or outlet box, and elsewhere as indicated.
2. Each wire connected to building-mounted devices is not required to be numbered at device if color of wire is consistent with associated wire connected and numbered within panel or cabinet.
3. Label each terminal strip and screw terminal in each cabinet, rack, or panel.
   a. Individually number wire conductors connected to terminal strips, and identify each cable or wiring group being extended from a panel or cabinet to a building-mounted device shall be identified with name and number of particular device as shown.
   b. Label each unit and field within distribution racks and frames.
4. Uniquely identify and label work area cables extending from the MUTOA to the work area. These cables may not exceed the length stated on the MUTOA label.

H. Labels shall be preprinted or computer-printed type with printing area and font color that contrasts with cable jacket color but still complies with requirements in TIA/EIA-606-A.
1. Cables use flexible vinyl or polyester that flex as cables are bent.

3.2 ACCESSIBILITY AND INSTALLATION

A. Confirm Accessibility and Installation requirements in Division 00, Division 01, and individual Division 27 sections.

B. Install equipment requiring access (i.e., amplifiers, taps, zone controllers, volume controls, and storage devices) so that they may be serviced, reset, replaced or recalibrated by service people with normal service tools and equipment. Do not install equipment in obvious passageways, doorways, scuttles or crawl spaces which would impede or block intended usage.

C. Install equipment and products complete as directed by manufacturer's installation instructions. Obtain installation instructions from manufacturer prior to rough-in of equipment and examine instructions thoroughly. When requirements of installation instructions conflict with Contract Documents, request clarification from PSU prior to proceeding with installation. This includes proper installation methods, sequencing and coordination with other trades and disciplines.

D. Confirm Firestopping requirements in Division 07. In absence of specific requirements, comply with individual Division 27 sections and the following:
   1. Firestopping:
      a. Coordinate location and protection level of fire and/or smoke rated walls, ceilings, and floors. When these assemblies are penetrated, seal around piping, ductwork and equipment with approved firestopping material. Install firestopping material complete as directed by manufacturer's installation instructions. Meet requirements of ASTM E814, Standard Test Method for Fire Tests of Through-Penetration Fire Stops.
      b. New or retrofitted firestop sleeves: Install re-enterable fire stop sleeves at all fire-rated wall penetrations.STI EZ-Path Series 44+, or approved equivalent.

E. Plenums:
   1. In plenums, provide plenum rated materials that meet the requirements to be installed in plenums. Immediately notify responsible party (PSU; Architect, or Engineer) of discrepancy.

3.3 REVIEW AND OBSERVATION

A. Confirm Review and Observation requirements in Division 00 and Division 01, and individual Division 27 sections.

B. Notify responsible party, in writing, at following stages of construction so that the responsible party may, at their option, visit site for review and construction observation:
   1. Underground conduit installation prior to backfilling.
   2. Prior to ceiling cover/installation.
   3. When main systems, or portions of, are being tested and ready for inspection by AHJ.
   4. Final Punch: Costs incurred by additional trips required due to incomplete systems will be the responsibility of the Contractor.

3.4 CONTINUITY OF SERVICE

A. Confirm requirements in Division 00 and Division 01. In absence of specific requirements, comply with individual Division 27 sections and the following:
   1. During remodeling or addition to existing structures, or addition of a structure to existing structure, while existing structure is occupied, current services to remain intact until new construction, facilities or equipment is installed.
   2. Prior to changing over to new service, verify that every item is thoroughly prepared. Install new wiring to point of connection.
   3. Coordinate transfer time to new service with PSU. If required, perform transfer during off peak hours. Once changeover is started, pursue to its completion to keep interference to a minimum.
      a. If overtime is necessary, there will be no allowance made by PSU for extra expense for such overtime or shift work.
   4. Organize work to minimize duration of power interruption.

3.5 CUTTING AND PATCHING

A. Confirm Cutting and Patching Requirements in Division 00 and Division 01. In absence of specific requirements, comply with individual Division 27 sections and the following:
   1. Proposed floor cutting/core drilling/sleeve locations to be approved by project Structural Engineer. Submit proposed locations to Architect/Project Structural Engineer. Where slabs are of post tension construction, perform x-ray scan of proposed penetration locations and submit scan results including proposed penetration locations to Project Structural Engineer/Architect for approval. Where slabs are of waffle type construction, show column cap extent and cell locations relative to proposed penetration(s).
   2. Cutting, patching and repairing for work specified in this Division including plastering, masonry work, concrete work, carpentry work, and painting included under this Section and will be performed by skilled craftsmen of each respective trade in conformance with appropriate Division of Work.
   3. Additional openings required in building construction to be made by drilling or cutting. Use of jack hammer is specifically prohibited. Patch openings in and through concrete and masonry with grout.
   4. Restore new or existing work that is cut and/or damaged to original condition. Where alterations disturb lawns, paving, and walks, surfaces to be repaired, refinished and left in condition matching existing prior to commencement of work.
   5. Additional work required by lack of proper coordination will be provided at no additional cost to PSU.

3.6 EQUIPMENT SELECTION AND SERVICEABILITY

A. Replace or reposition equipment which is too large or located incorrectly to permit servicing, at no additional cost to PSU.

3.7 DELIVERY, STORAGE AND HANDLING

A. Confirm requirements in Division 00 and Division 01. In absence of specific requirements, comply with individual Division 27 sections and the following:
   1. Handle materials delivered to project site with care to avoid damage. Store materials on site inside building or protected from weather, dirt and construction dust. Insulation and lining that becomes wet from improper storage and handling to be replaced before installation. Products and/or materials that become damaged due to water, dirt and/or dust as a result of improper storage must be replaced before installation.
   2. Protect all equipment and conduit to avoid damage. Close conduit openings with caps or plugs. Keep motors and bearings in watertight and dustproof covers during entire course of installation.

3.8 DEMONSTRATION

A. Confirm Demonstration requirements in Division 00 and Division 01, and individual Division 27 Sections.

B. Upon completion of work and adjustment of equipment and test systems, demonstrate to PSU's Representative, Architect and Engineer that equipment furnished and installed or connected under provisions of these Specifications functions in manner required. Provide field instruction to PSU's Maintenance Staff as specified in Division 01, Section 27 00 00 and individual Division 27 sections.

C. Manufacturer's Field Services: Furnish services of a qualified person at time approved by PSU, to instruct maintenance personnel, correct defects or deficiencies, and demonstrate to satisfaction of PSU that entire system is operating in satisfactory manner and complies with requirements of other trades that may be required to complete work. Complete instruction and demonstration prior to final job site observations.

3.9 CLEANING

A. Confirm Cleaning requirements in Division 01, and individual Division 27 Sections.

B. Upon completion of installation, thoroughly clean exposed portions of equipment, removing temporary labels and traces of foreign substances. Throughout work, remove construction debris and surplus materials accumulated during work.

3.10 INSTALLATION

A. Confirm Installation requirements in Division 00 and Division 01, and individual Division 27 sections.

B. Install equipment and devices in accordance with manufacturer's installation instructions, plumb and level and firmly secured to mounting surfaces. Maintain manufacturer's recommended clearances.

C. Start up equipment, in accordance with manufacturer's start-up instructions, and in presence of manufacturer's representative. Test operation and demonstrate compliance with requirements. Replace damaged or malfunctioning equipment.

D. Provide miscellaneous supports/metals required for installation of equipment.

3.11 PAINTING

A. Confirm Painting requirements in Division 01 and Division 09. In absence of specific requirements, comply with individual Division 27 sections and the following:
1. Ferrous Metal: After completion of communications work, thoroughly clean and paint exposed supports constructed of ferrous metal surfaces in telecommunications rooms, i.e., hangers, hanger rods, equipment stands, with one coat of black asphalt varnish for exterior or black enamel for interior suitable for hot surfaces.
2. In a telecommunications room, on roof or other exposed areas, equipment not painted with enamel to receive two coats of primer and one coat of rustproof enamel, colors as selected by Architect.
3. See individual equipment Specifications for other painting.
4. Structural Steel: Repair damage to structural steel finishes or finishes of other materials damaged by cutting, welding or patching to match original.
5. Conduit: Clean, primer coat and paint interior conduit exposed in finished areas with two coats paint suitable for metallic surfaces. Color selected by Architect.
6. Covers: Covers such as manholes, vaults and the like will be furnished with finishes which resist corrosion and rust.
7. For fire-resistant plywood, do not paint over manufacturer's label.

3.12 ACCESS PANELS

A. Confirm Access Panel requirements in Division 01. In absence of specific requirements, comply with individual Division 27 sections and the following:
1. Coordinate locations/sizes of access panels with Architect prior to work.

3.13 DEMOLITION

A. Confirm requirements in Division 01 and Division 02. In absence of specific requirements, comply with individual Division 27 sections and the following:
1. Scope:
   a. It is the intent of these documents to provide necessary information and adjustments to communications systems required to meet code and accommodate installation of new work.
   b. Coordinate with PSU so that work can be scheduled not to interrupt operations, normal activities, building access or access to different areas.
   c. Existing Conditions: Determine exact location of existing utilities and equipment before commencing work. Compensate PSU for damages caused by failure to exactly locate and preserve underground utilities. Replace damaged items with new material to match existing. Promptly notify PSU if utilities are found which are not shown on Drawings.
2. Equipment: Unless otherwise directed, equipment, fixtures, or fittings being removed as part of demolition process are PSU's property. Remove other items not scheduled to be reused or relocated from job site as directed by PSU.
3. Unless specifically indicated on Drawings, remove exposed, unused raceways behind finished surfaces (floor, walls, ceilings, etc.). Cap raceways and patch surfaces to match surrounding finish.
4. Unless specifically indicated on Drawings, remove unused equipment, electrical boxes, fittings and connectors. Removal is to be to a point behind finished surfaces (floors, walls, and ceilings).
5. Examination:
   a. Determine exact location of existing utilities and equipment before commencing work, compensate PSU for damages caused by failure to locate and preserve utilities. Replace damaged items with new material to match existing.
   b. Verify that abandoned wiring and equipment serve only abandoned facilities.

c. Demolition Drawings are based on casual field observation and existing record documents.
   1) Verify accuracy of information shown prior to bidding and provide such labor and material as is necessary to accomplish work.
   2) Verify location and number of communications outlets, racks, panels, etc. in field.
d. Report discrepancies to Architect before disturbing existing installation.

6. Promptly notify PSU if utilities are found which are not shown on Drawings.
7. Execution:
   a. Remove existing connectors, back boxes, wall plates and other communications equipment and devices and associated wiring from walls, ceilings, floors, and other surfaces scheduled for remodeling, relocation, or demolition unless shown as retained or relocated on Drawings.
   b. Provide temporary wiring and connections to maintain communications continuity of existing systems during construction. Remove or relocate communications boxes, conduit, wiring, equipment, and the like, as encountered in removed or remodeled areas in existing construction affected by this work.
   c. Remove and restore cable which serves usable existing outlets clear of construction or demolition.
   d. If existing junction boxes will be made inaccessible, or if abandoned outlets serve as feed through boxes for other existing communications equipment which is being retained, provide new conduit and cable to bypass abandoned outlets.
   e. If existing conduits pass through partitions or ceiling which are being removed or remodeled, provide new conduit and cable to reroute clear of construction or demolition and maintain service to existing equipment. If these are conduits which require a new cable home run, e.g. telecom cable, request clarification from Architect or Engineer prior to proceeding with demo.
   f. Extend cable slack and devices in existing walls to be furred out.
   g. Remove abandoned cable to originating telecom room.
   h. Remove exposed abandoned conduit, including abandoned conduit above accessible ceiling finishes. Cut conduit flush with walls and floors, and patch surfaces.
   i. Disconnect abandoned outlets and remove devices. Remove abandoned outlets if conduit servicing them is abandoned and removed. Provide blank cover for abandoned outlets which are not removed.
   j. Disconnect and remove abandoned panelboards and distribution equipment.
   k. Maintain access to existing communications installations which remain active. Modify installation or provide access panel as appropriate.
   l. Existing communications outlets and devices are indicated on technology demolition plans. Verify exact location and number of existing communications outlets and devices in field. Only partial existing communications shown. Locations of items shown on Drawings as existing are partially based on Record and other Drawings which may contain errors. Verify accuracy of information shown prior to bidding and provide such labor and material as is necessary to accomplish intent of Contract Documents.
   m. Remove abandoned cable to leave site clean.

B. Protection of Existing Equipment: Maintain existing system in service until new system is complete and ready for service. Existing and active networking and telecommunications hardware installed in PSU campus buildings shall be protected prior to the start of any construction. It shall be Contractor's responsibility to effectively protect the owner's network and telecommunications facilities, equipment, and materials from dust, dirt and any other damage during construction. Contractor shall take no action that will interfere with, or interrupt, existing building network and telecommunications services unless previous arrangements have been made with PSU's Telecom Department (oit-ts-requests@pdx.edu) or the appropriate building owner's representative. If any shutdown of network or telecommunications services or systems is required for Contractor to perform work, Owner's personnel will perform shutdown of affected systems. Contractor must provide Owner with a minimum of three (3) days' advance notice for such system shutdowns. Should Contractor cause network or telecommunications services or systems to be interrupted in any way, Contractor shall be solely responsible for all costs associated with satisfactorily restoring or replacing services or systems to include all labor and materials required to restore or replace services or systems. All service or system restoration or replacement by Contractor must be approved by PSU OIT.

3.14 ACCEPTANCE

A. Confirm requirements in Division 00 and Division 01. In absence of specific requirements, comply with individual Division 27 sections and the following:
   1. System cannot be considered for acceptance until work is completed and demonstrated to Architect that installation is in strict compliance with Specifications, Drawings and manufacturer's installation instructions, particularly in reference to following:
      a. Testing Reports

b. Cleaning
c. Operation and Maintenance Manuals
d. Training of Operating Personnel
e. Record Drawings
f. Warranty and Guaranty Certificates, including extended manufacturer's warranties.
g. Start-up/test Documents and Commissioning Reports

3.15 FIELD QUALITY CONTROL

A. Confirm Field Quality Control requirements in Division 00 and Division 01, Section 270000 and individual Division 27 sections.

B. Tests:
1. Conduct tests of equipment and systems to demonstrate compliance with requirements specified. Reference individual Specification Sections for required tests. Document tests and include in Operation and Maintenance Manuals.
2. During site evaluations by Architect or Engineer, provide an electrician with tools to remove and replace trims, covers, and devices so that proper evaluation of installation can be performed.

3.16 LETTER OF CONFORMANCE

A. Provide Letter of Conformance and copies of manufacturers' warranties and extended warranties with a statement that fire suppression items were installed in accordance with manufacturer's recommendations, UL listings and FM Global approvals. Include Letter of Conformance and copies of manufacturers' warranties and extended warranties in Operation and Maintenance Manuals.

END OF SECTION 270500