Chapter 23
COMMUNICATIONS / ELECTRONIC SYSTEMS

SECTION 2301 - GENERAL

2301.1 Scope: Communications and Electronic Systems addressed in this section include:

1. Fire Alarm System
2. Telecommunication and Data Network System
3. Card Access System
4. Presentation Media Systems (AV)

Prior to submitting the professional design proposal, the Consultant shall confer with the CSU Project Manager and the University departments having primary authority over specific systems to determine the scope of work. Unless otherwise directed in writing by the University Representative, the Consultant shall provide complete design for the planning, procurement, coordination, construction, evaluation, recording and/or use of all communication and electronic systems in the Project.

2301.2 System Authority: Engineers and Consultants shall be responsible for coordinating their design with the requirements of the University Departments having primary authority over specific systems or sharing authority with Facilities Management:

1. Fire Alarm System
   a. Office of Risk Management and Insurance – Fire / Life Safety Administrator
   b. Facilities Access Services - Alarm Shop

2. Telecommunication and Data Network System
   a. CSU Telecommunications for physical infrastructure
   b. Academic Computing and Networking Services (ACNS) for network equipment
   c. Office of Instructional Services (OIS) for video infrastructure

3. Card Access System
   a. Facilities Access Services - Alarm Shop
   a. Facilities Lock Shop

4. Presentation Media Systems (AV)
   a. Office of Instructional Services
   b. Telecommunications

SECTION 2302 DRAWINGS

2302.1 Completeness: Communications and electronic systems drawings and specifications, shall:

1. Furnish sufficient information to permit installation of manufactured equipment that satisfies the design requirements.
2. Furnish sufficient information to manufacture equipment of special design made exclusively to meet the requirement of the project. Components, assemblies and systems shall be UL listed.
3. Describe items so that they may be procured.
4. Furnish sufficient information to permit planning, construction, evaluation, recording, repair, and maintenance of facilities.
5. Furnish the above in sufficient completeness for accomplishment without the need of assistance from the Consultant.
2302.2 **Drawing Sequence:** Telecommunications Drawings are divided into specific groups. Drawings within a group are numbered consecutively, i.e. T2.01, T2.02, etc. The group designation shall always remain the same, regardless of the size or scope of the individual project. If specific projects do not include work related to a group, that group shall be eliminated from the drawings. When appropriate, the Consultant shall obtain written permission from the Project Manager to vary the sequence.

- **T0.xx** General Notes, Drawing Index, Symbols & Abbreviations
- **T1.xx** Site Plan
- **T2.xx** Floor Plans / Roof Plans
- **T3.xx** Equipment Rooms and Layouts
- **T5.xx** Functional Block Interconnection Diagrams
- **T6.xx** Point-to-Point wiring Diagrams
- **T7.xx** Electronic and Communications Systems Riser Diagrams
- **T8.xx** Conduit / Raceway Riser Diagrams
- **T9.xx** System Details


2302.3 **Site Plan:** The site plan shall identify all utilities and facilities required in support of the specified Communications and Electronic Systems including: conduits, ductbanks, copper / optical fiber cable resources, devices, antennas and other equipment. Drawings shall indicate all required connections to the grounding system.

2302.4 **Floor Plans / Roof Plans:** Plan drawings shall all device and equipment locations and their conduit interconnections. All device locations shall be coordinated with all disciplines including architectural finishes and features. When more than one system is shown on a plan, each shall be clearly distinguished from other systems. Conduit routes shall be drawn to their specific termination equipment or terminal cabinet location or the termination location shall be indicated by schedule. All conduits shall be coordinated with the conduit riser and point-to-point diagrams.

2302.5 **Equipment Rooms and Layouts and Elevations:** Equipment rooms shall comply with CSU Telecommunications and Facilities Management Standards. Plans and wall elevations shall indicate scaled layout of the space, all communications and electronic systems and other equipment co-located in the room and plenum space above. Equipment room layouts shall provide sufficient detail for coordinated construction and include the following elements:

1. Interconnection between equipment
2. Conduit termination’s
3. Grounding connections
4. Electrical connections and grounding bars
5. Floor mounted and wall hung equipment placement
6. Cable tray configurations
7. All penetration, fire sealant and safing details
8. Clearance zones for servicing equipment
9. Locations and sizing of cooling equipment required.

Where new equipment is required for installation in an existing room, layouts shall coordinate placement of the new equipment with existing equipment. New equipment shall be drawn with a different line type from existing equipment to assure positive identification between new and existing equipment.

2302.6 **Functional Block Interconnection Diagrams:** When required for general arrangement studies, functional explanations or for design discussion, the Consultant shall provide a block diagram of functions or groups of functions to describe the concepts and/or organization of the system. Interconnecting lines shall establish the relationships between blocks and indicate the direction of information flow.

1. Diagrams:
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a. A block diagram shall be presented in as simple a form as possible, using rectangles to represent functional electrical systems, parts and/or major elements of an electrical system or circuit. Various other symbols may be used as supplementary information to increase the utility of the diagram.
b. Identifying nomenclature shall be included within the blocks.
c. Block diagrams may be made for any level of project activity.
d. Related mechanical and other apparatus may be included as rectangular blocks.
e. Mechanical connections between such elements shall be illustrated with dashed lines connecting the applicable blocks.
f. Tabulations may be used when the form of the circuit involves multiple sources and common or similar circuits.
g. If a block diagram must be divided and placed on more than one drawing, the division of the circuit should be made at a point of minimum information transfer in a logical manner that will eliminate confusion.
h. Provide a keynote, abbreviation and symbol legend on the drawing.

2. Connecting Lines:

a. Lines connecting blocks shall indicate relationships, direction of flow of the system, sequence of operation, etc. The arrangement of lines and blocks shall show action or energy flow in functional sequence from top to bottom and/or left to right of the diagram, starting at the top left or top center and ending at the bottom right of the diagram.
b. Connection lines shall be labeled, where necessary, to make the meaning clear and unmistakable. When dashed lines are used for more than one purpose on a block diagram, these purposes shall be made clear by label, legend, or note.
c. Connecting lines shall include arrows to further define the circuit flow.

2302.10 Point-to-Point Wiring Diagrams: Point-to-Point wiring diagrams shall be provided for systems where interconnection to existing equipment is required at a specific interface location and configuration. For new systems that do not require interconnection to existing systems, system concepts and intent shall be conveyed through the Functional Block diagram, riser diagrams, floor plans, elevations and the project specifications. Point-to-Point wiring diagrams describe detailed wiring configuration and arrangement of the specific system showing the system color coded connections at the component level.

1. All wiring by type and size required between all system components
2. Indicate wire color coding
3. Indicate terminal strip numbers and positions
4. Indicate current, signal and data flow

2302.11 - Systems Riser Diagrams: The Consultant shall provide Riser Diagrams for all cabling systems and indicate the distribution of major systems components, wiring systems and their interconnection requirements:

1. Equipment rooms
2. Cable quantities
3. Cable types
4. Termination locations
5. Keyed reference to related details
6. In multi-floor facilities, riser diagrams shall be organized by level.

For simpler designs not containing cabling distribution systems, specific riser diagram information (e.g. major component location) may be incorporated into the Functional Block Diagram).

2302.12 - Conduit / Cable Tray Riser Diagrams: The Consultant shall provide conduit riser diagrams to indicate the configuration, location, quantity and size of the conduit / cable tray infrastructure by the
communications system. In multi-level facilities, conduit riser diagrams shall be organized by level. All conduit riser diagrams shall indicate the following information:

A. Equipment rooms (or conduit termination locations)
B. Conduit quantities
C. Conduit sizes
D. Conduit identification schemes
E. Interfaces to cable trays.
F. Grounding and bonding requirements
G. Cable Tray systems

Conduits specified or scheduled for installation of fiber optic cables shall be configured with appropriate bending radii and bend requirements. All conduit and cable tray systems shall be installed in compliance with applicable codes and CSU Telecommunication Standards. Conduit shall have not more than 270 degrees of bend between pull locations and shall have a minimum of 1” size. Review sizing and bends with CSU Telecommunications Department and the Project Manager at Design Development Phase.

Terminal cabinets, equipment back boards and other conduit termination facilities and locations are considered part of an integrated conduit riser diagram and shall be shown on the conduit riser diagram. Branch conduits installed in support of devices need not be shown on the conduit riser diagram.

The conduit riser diagram shall be coordinated with the system riser diagram with effective cross reference between systems cables and conduit / tray infrastructure.

2302.13 - Systems Details: Provide system details indicating specific installation techniques and systems configurations to call attention to specific conditions and requirements required to assure the installed system configuration is compliant with the design intent. Details shall be provided for all conditions where specific direction cannot be properly conveyed or is indicated on other sheets.

2302.14 Communication and Electronic Systems Symbols: Communications and Electronic Systems and electronic symbols shall be coordinated with the CSU department having system authority. If not otherwise indicated, symbols shall be in accordance with American National Standards Institute standards in accordance with Section 1912 - Symbols for Communications and Electronic Systems Drawings. Other symbols, if devised by the Consultant, shall be explained in the legend with indication "FOR THIS PROJECT ONLY."

2302.15 Drawings: Subject to Project Manager acceptance, the drawings for projects need not contain all delineation types. For example, projects consisting only of a single building and a relatively simple Communications and Electronic Systems may not need a block diagram(s) or single-line diagram(s) if the information normally found in them is effectively conveyed by other delineation types. Each delineation shall be identified by its type below the area where it is displayed, e.g., SCHEMATIC DIAGRAM. These delineations shall not be included on architectural, structural, civil, mechanical or electrical drawings.

2302.19 Specifications: Specifications shall include technical sections to describe all the Communications and Electronic Systems design requirements of the project. Vendor information drawings may be included as reference drawings subject to written approval from the Manufacturer. Purchase specification drawings may be included as reference drawings. Prior written acceptance is required for any design-build component.

SECTION 2303 Fire Alarm System (FAS)

2303.1 Standard System: Sole Source, point addressable system by NOTIFIER.

2303.2 System Compatibility: All equipment shall be manufactured by Notifier unless otherwise directed by the Project Manager. This is considered the main system at CSU. Some buildings located
throughout the CSU Campus still use equipment by other manufacturers. New equipment shall be UL listed and compatible with both existing equipment and Notifier systems.

2303.3 Quality Assurance Review: The Consultant is responsible for procuring written acceptance by all quality assurance review authorities. Submit all system designs developed for implementation on the CSU Campus to the Project Manager for distribution to:

1. **CSU Facility Management Access Services - Alarm Shop** is responsible for the maintenance of all fire alarm systems on the CSU campus.

2. **CSU Office of Risk Management and Insurance – Fire / Life Safety Administrator** is responsible for integration of all building fire alarm systems to the campus-wide network.

3. **Poudre Fire Authority**, whose review and approval is required for all fire safety systems.

2303.4 Additions to the Main Fire Alarm System: When additions to the main fire alarm system are required the Consultant shall perform a comprehensive site investigation, review CSU record documents and conduct interviews to determine the configuration of the existing system in the area to be modified or constructed. The Consultant shall determine:

1. Signaling line capacity within the construction area.
2. Capacity of initiating circuit within the construction area.
3. Required device locations
4. Interface point for both signaling and initiating circuits.
5. Determine the impact on the existing smoke zone(s) within the construction area.
6. Determine the impact on the sprinkler zone(s) within the construction area.

The Consultant shall be responsible for the complete expansion to the existing Fire Alarm system. Plans shall comply with the design standards and include all devices and their locations. All conduit shall be indicated with interconnection to the existing system, all cable shall be specified and sequence of operation shall be defined. The specification shall require the Contractor to notify CSU Maintenance 2 weeks in advance before connection to the existing system so that CSU Access Services - Alarm Shop and the Fire / Life Safety Administrator can review all required software graphical, control and point definition and coordinate activation with the existing campus network.

2303.6 New Facility: The Consultant shall design a complete system using approved sole source branded Notifier equipment. The new building system will be tied into the campus-wide Notifier network by the CSU Office of Risk Management Fire Life Safety Systems Administrator. The Consultant shall meet with this department for specification of conduit, equipment and monitoring requirements.

2303.7 Code Compliance: All fire alarm systems designs shall be compliant with State of Colorado adopted building and fire codes. The specification and project requirements shall require the Contractor to notify, cooperate and coordinate with CSU Access Services - Alarm Shop and the Fire / Life Safety Administrator before activating the fire alarm system or making any connection to the campus network.

SECTION 2304 TELECOMMUNICATIONS AND DATA NETWORK

2304.1 Consultant Design and Contract Document Requirements: The Consultant shall study and comply with CSU Telecommunication Design Standards, currently posted online at:

[http://www.colostate.edu/~pburns/Standards/TelecomStandards.htm](http://www.colostate.edu/~pburns/Standards/TelecomStandards.htm)

Whenever a Consultant’s design scope includes telecommunications and data network systems, or connections to any University electronic infrastructure, the Consultant shall initiate a meeting with the
CSU Facilities Management Project Manager and the CSU Telecommunications Department to review the specific requirements. The Consultant shall be responsible for coordinating, specifying and drawing a complete system, unless otherwise determined by the Project Manager and CSU Telecommunications.

All cabling, equipment, installation, configuration, termination and connection to the existing infrastructure must be coordinated with and supervised by the CSU Telecommunications Department, which may provide these services and materials to the project as determined by the University Representative.

2304.2 System Description: The Telecommunications and Data Network System at Colorado State University is a structured cabling system consisting of multiple cable types. All cables are supported and extended to their end locations via conduit, cable trays or J-hooks. All structured wiring system cables are terminated on universal wall plates which support modular connectivity of specific cable types.

2304.3 Addition of Telecommunications facilities: Where a Consultants scope requires the addition of telecommunications outlets as part of a design, the Consultants scope shall include the following elements.

1. Locating and specifying the outlet locations and quantities.
2. Specification of conduit and outlet box size with pull string
3. Extension of outlet conduit to the nearest communications room or cable tray providing access to the nearest communications room. The Consultant is required to coordinate with CSU Telecommunications Department and Facilities Management to establish the proper conduit termination location.
4. Proper sealing of all openings (penetrations) created or resulting from the installation of telecommunications conduits.
5. Layout of new communications rooms or modifications to existing communications rooms.
6. Support systems for communications rooms, including power, cooling and environmental control.

2304.4 Modular Furniture: The Consultant shall initiate a coordination meeting with CSU Telecommunications when designing and specifying spaces which contain modular furniture.

2304.5 Building Service Conduits and Ductbank Systems: The Consultant shall initiate a coordination meeting with CSU Facilities Utilities Department and CSU Telecommunications when designing and specifying buried telecommunications and network service conduits and ductbanks.

SECTION 2305 CARD ACCESS SYSTEM (CAS)

2305.1 System Description: Sole Source: Software House International C-Cure.

2305.2 Consultant Design and Contract Document Requirements: Whenever a Consultant’s design scope includes security access, the Consultant shall initiate a meeting with the CSU Facilities Management Project Manager, Locksmith and Access Services - Alarm Shop to review the specific access requirements. The Consultant shall be responsible for coordinating, specifying and drawing security door conduit rough-in details, door frame details, door hardware, card readers, cabling and interconnecting conduits / raceways or cable tray routing as required to tie the new access control door to the existing system. Card Access Control System electronic interfaces and software shall be installed by CSU Facilities Management Access Services - Alarm Shop unless the Project Manager requires the Consultant to design and specify this work. Verify with the Project Manager the scope requirements during the Programming Phase of Design. The Consultant shall specify a commissioning test of all CAS doors installed as part of the work by the Contractor and CSU Facilities Maintenance Locksmith and Access Services - Alarm Shop.
SECTION 2306 SECURITY CAMERA SYSTEM

2306.1 System Description: Internet Protocol (IP) cameras connected to the campus data network.

2306.2 Design Requirements: The Consultant and University Representative shall determine the need for security cameras in the programming or schematic phase. Quantity and general location of security cameras shall be provided by the CSU Project Manager. The Consultant shall be responsible for the design of camera view, and providing drawings and specifications for camera hardware, location, mounting, cabling and conduit / cable tray routing to the communications room and layout of equipment in the communications room as needed by the system. Final system connection and system software programming shall be completed by the CSU Access Services - Alarm Shop. The design specifications shall require a system test by the installing Contractor and the CSU Access Services - Alarm Shop to ensure proper operation of Contractor supplied and installed equipment and work performed by CSU.

SECTION 2307 – TELECOMMUNICATIONS DESIGN

2307.1 Telecommunications Standards: Prior to commencing design, the Consultant shall study in depth and be thoroughly familiar with the CSU Telecommunications Standards, current edition, as posted on the CSU Department of Telecommunications website.

2307.2 Construction Standards: Prior to commencing design, the Consultant shall study and be familiar with the CSU Construction Standards, Part III, Divisions 25 Electrical, 26 Telecommunications and 33 Utilities, along with all other parts of the CSU Construction Standards (Administrative, Design and Construction Standards), current edition, as posted on the Facilities Management website.

END OF CHAPTER 23