



STATE OF NEW YORK  
OFFICE OF GENERAL SERVICES  
DESIGN AND CONSTRUCTION GROUP  
THE GOVERNOR NELSON A. ROCKEFELLER  
EMPIRE STATE PLAZA  
ALBANY, NY 12242



---

---

**ADDENDUM NO. 2 TO PROJECT NO. 44573**

**CONSTRUCTION WORK, HVAC WORK  
PLUMBING WORK, ELECTRIC WORK  
PROVIDE READINESS CENTER  
ALTERNATION  
STATE ARMORY  
2366 5<sup>TH</sup> AVENUE  
NEW YORK, NY 10037**

August 28, 2014

**NOTE:** This Addendum forms a part of the Contract Documents. Insert it in the Project Manual. Acknowledge receipt of this Addendum in the space provided on the Bid Form.

**SPECIFICATIONS**

**CONSTRUCTION, HVAC, PLUMBING, ELECTRIC WORK SPECIFICATION**

1. SECTION 015213 STATE FIELD OFFICE: Discard the Section bound in the Project Manual and substitute the attached Section (pages 015213-1 through 015213-4) noted "Revised 8/27/14".
2. SECTION 013119 PROJECT MEETINGS: Discard the Section bound in the Project Manual and substitute the attached Section (pages 013119-1 through 013119-2) noted "Revised 8/27/14".
3. SECTION 013200 CONSTRUCTION PROGRESS DOCUMENTATION: Discard the Section bound in the Project Manual and substitute the attached Section (pages 013200-1 through 013200-7) noted "Revised 8/27/14".

**PLUMBING WORK SPECIFICATION**

1. SECTION 221100 PLUMBING PIPING: Discard the Section bound in the Project Manual and substitute the attached Section (pages 221100-1 through 221100-12) noted "Revised 8/27/14".

**ELECTRIC WORK SPECIFICATION**

1. SECTION 270544 COMMON WORK RESULTS FOR COMMUNICATIONS: Add the attached Section (pages 270544-1 through 270544-3) to the Project Manual.
2. SECTION 271100 COMMUNICATIONS EQUIPMENT ROOM FITTINGS: Add the attached Section (pages 271100-1 through 271100-5) to the Project Manual.
3. SECTION 271300 COMMUNICATIONS BACKBONE CABLING: Add the attached Section (pages 271300-1 through 271300-10) to the Project Manual.
4. SECTION 271500 COMMUNICATIONS HORIZONTAL CABLING: Add the attached Section (pages 271500-1 through 271500-12) to the Project Manual.

**SECTION 013119****PROJECT MEETINGS****PART 1 GENERAL****1.01 INITIAL JOB MEETING**

- A. The Director's Representative will notify all parties concerned of the time and place of the initial job meeting. The meeting will be conducted by the Director's Representative. The agenda will be based on the Format for Initial Job Meeting. All items on the format, as they apply, will be discussed.
1. A copy of the Facility's current Visitor Identification Policy will be distributed

**1.02 PROJECT SCHEDULE DEFINITION MEETING**

- A. The initial Project Schedule Definition meeting will be held within 15 calendar-days of Project award. The Director's Representative will notify all parties concerned of the time and place of the meeting. The meeting will be conducted by the Director's Representative for the purpose of providing information for the development of the Baseline Project Schedule, and the required reports and reporting formats to be submitted by the Schedule Preparer for the duration of the Project.
- B. The Schedule Preparer will develop the Baseline Project Schedule according the requirements in Section 013200 and based on the discussions and mutual agreements reached at the Project Schedule Definition meeting.
1. A monthly Project Schedule meeting will be held to update the Project Schedule. A qualified Contractor's Representative for each Contractor will be required to attend and provide updated information as outlined in Section 013200.

**1.03 BI-WEEKLY JOB MEETINGS**

- A. Unless otherwise directed, job meetings will be held bi-weekly at a time and place agreed upon by the Director's Representative, the Contractor, and the Facility Representative. Other interested parties may attend when needed, e.g., subcontractors and representatives from suppliers, public utilities, and local government. The meetings will be conducted by the Director's Representative for the following purposes:
1. Review job progress, quality of Work, and approval and delivery of materials.
  2. Identify and resolve problems which impede planned progress.
  3. Coordinate the efforts of all concerned so that the project progresses on schedule to on time completion.
  4. Maintain sound working relationships between the Contractors and the Director's Representative, and a mutual understanding of the project requirements.

5. Maintain sound working procedures.
6. Review of LEED documentation and compliance with anticipated goals.

#### **1.04 PRE-INSTALLATION MEETINGS**

- A. Pre-installation meetings will be held to review the specifications, Project Schedule, drawings and approved submittals in preparation for start of a particular activity.
- B. The meetings shall be attended by the Director's Representative, a Design Representative and the Contractor's Representative including installer and representatives of manufacturers & fabricators involved in or affected by the installation and its coordination with other materials/trades.
- C. The Director's Representative shall schedule the meetings prior to the start of the work. The goal of these meetings is to ensure the quality of construction and to maintain the schedule.

#### **1.05 ATTENDANCE**

- A. A Contractor's Representative shall be required to attend all meetings scheduled by the Director's Representative.
- B. The Contractor's Representative shall be a competent supervisor familiar with the work and have authority to act for the Contractor.
- C. If the Contractor's Representative fails to attend 2 scheduled meetings without prior approval, the contractor will be directed to replace the current Contractor Representative. Further incidents of non-attendance by the Contractor's Representative, will form the basis for review of the Contractor's responsible bidder status.

### **PART 2 PRODUCTS (Not Used)**

### **PART 3 EXECUTION (Not Used)**

**END OF SECTION**

## **SECTION 013200**

### **CONSTRUCTION PROGRESS DOCUMENTATION**

#### **PART 1 GENERAL**

##### **1.01 RELATED REQUIREMENTS AND INFORMATION SPECIFIED ELSEWHERE**

- A. Summary of Work: Section 011000.
- B. Administrative Requirements: Section 013000.
- C. Project Meetings: Section 013119.

##### **1.02 SUMMARY**

- A. Section includes administrative and procedural requirements to plan, schedule, and document the progress of the Project; realize boundaries and expectations for schedule development and management; and predict and prevent delays to established sequences and milestones during performance of the Work including the following:
  - 1. Critical Path Method schedule and reports.
  - 2. Material location and delivery reports.
  - 3. Field condition reports.
  - 4. Special reports.
  - 5. Change management.
  - 6. Time Impact and Time Impact Analysis.
  - 7. As-Planned vs. As-Updated

##### **1.03 SUBMITTALS**

- A. Waiver of Submittals: The “Waiver of Certain Submittal Requirements” in Section 013300 does not apply to this Section.
- B. Submittals Package: Submit required reporting, Scheduling Software files, and quality control submittals as indicated within this or related sections.
- C. Schedule Submittals:
  - 1. CMU 01 Agreement Form

##### **1.04 DEFINITIONS**

- A. Project: Work to be performed as part of one or more Contracts.
- B. Project Team: Persons acting on behalf of the State or Contractors in an effort to successfully plan, schedule, and coordinate the Work of the Project.

- C. **Schedule:** A comprehensive leveling of necessary procedural tasks, the sequencing of those tasks, and the resource allocation required to successfully complete the Work by the Project completion date.
- D. **Activity:** An intricate part of the Work that can be identified and measured for planning, coordinating, monitoring, and controlling the project.
- E. **Milestone:** A significant start or finish to Work on the Project defined by both the Director's Representative and the Contractors.
- F. **Bid Milestones:** Milestones or phases identified and included in the Contract Documents to be utilized by the Contractors in developing the Baseline Project Schedule.
- G. **CPM:** Critical Path Method is a scheduling process used to plan and coordinate the Project, arranging activities based on logical relationships in order to create a network diagram of interconnected procedures.
- H. **Preliminary Project Schedule:** The initial CPM schedule submission capturing, at a minimum, the anticipated Work for the first 90 calendar-days after Project Award, and to be initiated by the Schedule Preparer prior to the Project Schedule Definition Meeting.
- I. **Baseline Project Schedule:** The as-planned CPM schedule for completion of the Work of the Project in accordance with the Contract duration, approved by the Director's Representative and Contractors, and completed by the Schedule Preparer.
  - 1. Following the initial update to the Baseline Project Schedule, including but not limited to starts, finishes, activity percent complete, logic adjustments, or duration amendments, as agreed upon at the Project Schedule meeting by the Project team, the current updated schedule rendering will be defined as the Project Schedule.
  - 2. The Baseline Project Schedule will remain unaltered as a tool to measure progress outlined and anticipated during the Project Schedule Definition meeting and by the Schedule Basis document.
- J. **Project Schedule Update:** The as-updated contemporary view of the Project Schedule, as understood by the Project team at the time of the schedule status, which comprehends the accurate reflection of Work started, progressed, and completed on the Project and the intended path of progress for Work going forward.
- K. **Schedule Basis:** A well-organized, narrative rendering of the Project team's involvement in the development of the as-planned Baseline Project Schedule, documenting key understandings of the Project's scope, risks and threats to Substantial Completion, and the Schedule Management strategy.
- L. **Narrative Statement:** A narrative description of the Project Schedule Update.

- M. PDM: Precedence Diagram Method utilizes standard CPM calculations creating an interdependent logical relationship between activities and a dependent path from Project Award through Substantial and Physical Completion.
- N. Float: The measure of latitude in starting and/or completing an activity without impeding on the successful realization of Project milestones.
  1. Float time is not for the exclusive use or benefit of either the State or the Contractors, but is a jointly owned expiring Project resource; float is available as needed to meet scheduled milestones and Project completion.
  2. Recognizing float within an activity, or chain of activities, does not permit the Contractors to disrupt progress or delay completion of an activity.
- O. Critical Path: A progressing sequence of interdependent activities within the schedule network containing zero (0d) total float and establishing the minimum Project Substantial and Physical Completion duration.
- P. Resource: Any labor, material, or equipment, shared or exclusive, required for the completion of an Activity or the Work, which recognizes an associated cost.

#### **1.05 SCHEDULE PREPARER**

- A. The Director's Representative will provide a Schedule Preparer for the preparation and coordination of schedule related information for the Preliminary Project Schedule, the Baseline Project Schedule, and all required updates and reporting for the Project Schedule. The Schedule Preparer shall possess a minimum of five (5) years of construction related scheduling experience, shall have developed and maintained at least two (2) schedules for projects of similar size and scope utilizing the State's specified Scheduling Software.

#### **1.06 DEVELOPMENT OF THE PROJECT SCHEDULE**

- A. The Director's Representative will schedule the Project Schedule Definition Meeting as outlined in Section 013119. The meeting will include a review of the Schedule Preparer's initial project schedule. The discussions and mutual agreements reached at this and subsequent meetings by the Project team will form the basis for the CPM Preliminary Project Schedule and the development of the initial CPM Project Schedule, defined as the Baseline Project Schedule, and will be used for coordinating, scheduling, and monitoring the Work of all related contracts
- B. The Schedule Preparer is to complete the Preliminary Project Schedule after the Project Schedule Definition Meeting with input from the Project team and after review of the Contract documents and drawings.
- C. The Schedule Preparer is to complete the Baseline Project Schedule with information provided by the Project team after review of the Preliminary Project Schedule and after the Project Schedule Definition Meeting and submit for review and approval.

- D. The Contractors will sign the CMU 01 Agreement form (blank included at end of this Section) within five (5) calendar-days of final Baseline Project Schedule review and approval by the Director's Representative. Failure to develop and submit the Baseline Project Schedule and sign the CMU 01 Agreement form will not absolve the Contractors of the scheduling requirements. The Contractors will be required to provide the necessary resources, at no additional charge to the State, to complete the Project in the manner defined by a Schedule Preparer acting as a representative of the Project.
- E. A Preliminary or Baseline Project Schedule recognizing early completion will be reviewed prior to acceptance of the Preliminary or Baseline Project Schedule.
- F. Bid Milestones included in the Contract Documents are to be incorporated into the project schedule.
- G. During the period between Project Award and the execution of the CMU-01 Agreement by the Contractors and the Director's Representative, the Contractors will comply with the Preliminary Project Schedule and will be responsible for providing the necessary resources to complete the Work as defined by the Schedule Preparer.

#### **1.07 UPDATING THE PROJECT SCHEDULE**

- A. Monthly Project Schedule meetings will be held to review updates to the actual starts, actual finishes, percent completes, logic changes, sequencing alterations, duration amendments, time impact events, and scope change incorporation for the purpose of determining the status of construction progress on the updated Project Schedule.
  - 1. During the progress of Work on the Project, the Contractors are required to document actual start, actual finish, and activity percent complete on a daily basis, and provide the information to the Schedule Preparer in the manner defined by the Schedule Management strategy portion of the Schedule Basis.
  - 2. The Contractors and Director's Representative will review the updated progress at the Project Schedule meeting prior to acceptance of progress information and anticipated work as the Project Schedule Update.
    - i. Revisions and comments are to be incorporated within 2 days of the Project Schedule update meeting, and required reports are to be presented for review.
  - 3. Any Contractor failing to progress their Work as outlined in the updated Project Schedule will be informed of their deficiencies and, if required, be requested to provide a recovery option.
    - i. The Schedule Preparer is responsible for incorporating any recovery options as needed by the Contractors for the duration of the Project.
- B. The Contractors will furnish all schedule information requested by the Director's Representative and the Schedule Preparer, and as defined in the Schedule Management strategy outlined in the Schedule Basis. Any Contractor who fails to

furnish accurate information prior to Project Schedule meeting will be required to provide all resources necessary to execute the updated Project Schedule based on progress information documented and recorded by the Director's Representative and submitted to the Schedule Preparer.

- C. During the period between scheduled updates, any time impact event due to, but not limited to, a field condition or scope change, is to be noted by the Contractors; the impact is to be represented by the Schedule Preparer, at a minimum, with a milestone event, the time for resolution, and the impact to work.
- D. Project Schedule updates recognizing early completion will be reviewed prior to acceptance of the Project Schedule update.

### **1.08 MAINTAINING SCHEDULE**

- A. Perform the Work in accordance with the Project Schedule and provide resources necessary to maintain the progress of activities as scheduled so that no delays are caused to other Contractors engaged in the Work.
  - 1. Should any Contractor fail to maintain progress according to the Project Schedule, or cause delay to another Contractor, that Contractor shall provide such additional manpower, equipment, additional shifts, or other measures, at their own cost, to bring their operations back on schedule.
  - 2. Performing activities as part of the Work out of sequence with the Project Schedule is not permitted unless written approval is obtained prior to commencement.

### **1.09 RECOVERY SCHEDULE**

- A. CPM Recovery Schedule: When periodic updates indicate the Work is 15 or more calendar-days behind the approved Baseline Project Schedule's Substantial or Physical Completion dates, the Schedule Preparer will present recovery options to the Contractors and Director's Representative to be incorporated into an updated Project Schedule by the Schedule Preparer; these include, but are not limited to, allocating additional resources for activity duration reduction, modifying network logic, or revising activity sequences.
- B. Any Contractor failing to furnish information to assist in developing recovery options to the Director's Representative and Schedule Preparer, for a CPM Recovery Schedule, within 10 calendar-days subsequent to the monthly Project Schedule update, will be required to provide all resources necessary to execute an updated Project Schedule defined by a the Director's Representative and updated by the Schedule Preparer.
- C. Alterations to the Project Schedule by a CPM Recovery Schedule will require approval.
- D. Approved alterations to the Project Schedule by a CPM Recovery Schedule, will constitute the updated Project Schedule.

1. The updated Project Schedule following the implemented CPM Recovery Schedule will be recognized as the primary baseline schedule for reporting. The Baseline Project Schedule will be retained as a secondary baseline schedule and will be utilized to measure progress against the alterations.
- E. A CPM Recovery Schedule recognizing early completion will be reviewed by prior to acceptance of the Project Schedule update.

## **PART 2 PRODUCTS**

### **2.01 SCHEDULING SOFTWARE**

- A. Scheduling Software: Schedule is to be prepared and managed utilizing Oracle Primavera P6© PPM or EPPM operating system.

## **PART 3 EXECUTION (Not Used)**

**END OF SECTION**

NEW YORK STATE OFFICE OF GENERAL SERVICES  
DESIGN AND CONSTRUCTION GROUP

CMU-01 AGREEMENT

PROJECT NO. \_\_\_\_\_

PROJECT NAME: \_\_\_\_\_

REPORT DATE: \_\_\_\_\_

REPORT NAME(S): \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

It is agreed that the Baseline Project Schedule defined by the above listed computer reports has been reviewed and is accepted for use in coordinating, scheduling, and monitoring the work of all related contracts.

FOR THE CONSTRUCTION WORK CONTRACTOR: \_\_\_\_\_ DATE: \_\_\_\_\_

FOR THE HVAC WORK CONTRACTOR: \_\_\_\_\_ DATE: \_\_\_\_\_

FOR THE PLUMBING WORK CONTRACTOR: \_\_\_\_\_ DATE: \_\_\_\_\_

FOR THE ELECTRICAL WORK CONTRACTOR: \_\_\_\_\_ DATE: \_\_\_\_\_

THE DIRECTOR'S REPRESENTATIVE: \_\_\_\_\_ DATE: \_\_\_\_\_

**SECTION 015213**

**STATE FIELD OFFICE**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Provide and maintain a field office comprised of new furniture, and new equipment, for the sole use of the Director's Representative and staff. Include temporary services and accessories necessary for use of the items specified.
- B. Temporary indoor office space shall be located in the Drill Shed at the far west side of the garage area and shall be maintained for the duration of the construction. See drawing AD-112 for the location.

**1.02 SUBMITTALS**

- A. Waiver of Submittals: The "Waiver of Certain Submittal Requirements" in Section 013300 does not apply to this Section.
- B. Shop Drawings:
  - 1. Site Plan: Show location of field office where directed. Indicate holding tank, utility services, and connections.
- C. Product Data: Catalog sheets, specifications, and installation instructions, for all major items. Submit within 15 days after award of Contract.

**1.03 SCHEDULING**

- A. Provide units, ready for occupancy by the Director's Representative and staff, within 30 days after shop drawings specified above are approved.

**PART 2 PRODUCTS**

**2.01 TEMPORARY MOBILE TOILET / LAVATORY UNITS - Provided by PC (See dwg. P508 for specification)**

**2.02 FURNITURE AND EQUIPMENT - Provided by CC (NYS Office of the General Services and DMNA Use - See dwg. AD112 for further information)**

- A. Furniture:
  - 1. Four swivel type chairs with arms suitable for use at office desks.
  - 2. Ten straight back stackable chairs.
  - 3. Four lockable metal office desk, 30 x 60 inches, double pedestal type with keys.
  - 4. One drafting table, 37 x 60 inches.
  - 5. One conference table, 44 x 96 inches.

6. Two "Planhold" plan rack, adjustable height, floor supported cantilever type, with plan clamps or plan rack sticks.
7. Four lockable 4-drawer letter size file cabinets and One lockable 4 drawer legal sized file cabinet.
8. One 4' x 6' wall mounted dry erase board.

B. Office Equipment:

1. One multifunction Printer: Xerox Workcentre 7220T Copier/Printer/Scanner – 11x17 Color multifunction, w/ 4 trays, Fax Line, Scan-To-Email options.
  - a. Provide toner cartridges and paper for the duration of the project.
  - b. Provide full service maintenance agreement for the copier for the duration of the project.
2. One AT&T Voicemail system installed, with programming and maintenance for the duration of the project to handle 4 outside lines and 5 compatible instruments. Provide the instruments and all wiring.
  - a. System - AT&T 1080 – (1) main 4 line phone with answering machine; AT&T 1040 – rest of the system (1 per desk, total 4)
  - b. Provide all wiring between all stations, modem, equipment rack, etc. such that a complete system is installed and operates properly. Maintain the system for the life of the contract.
3. One refrigerated bottled water dispenser,(Hot & Cold Type) with cups, bottled water and necessary supplies. Provide water and cups for duration of contract.
4. One first aid kit.
5. One 15 cubic foot refrigerator, EnergyStar energy efficient model.
6. Two Fire Extinguishers: Multipurpose Dry-Chemical Type in Steel Container UL-rated 20-A:120-B:C, 20-lb nominal capacity, with monoammonium phosphate-based dry chemical in enameled-steel container.
7. Provide and install One bulletin board, mounted as directed.
8. Provide and install One dry erase marker board (pens and erasers) mount as directed.

**2.03 FURNITURE AND EQUIPMENT - Contractors (See dwg. AD112 for further information)**

- A. Temporary indoor office space will be made available by the owner for the: CC- Construction Contractor

HC - Mechanical Contractor

EC - Electrical Contractor

PC - Plumbing Contractor

Temporary indoor office space shall be located in the Drill Shed at the far west side of the garage area and shall be maintained for the duration of the construction. See drawing AD-112 for the location.

Approximately 250sf of space will be allocated.

- B. Each contractor shall provide their own services, furniture, and equipment and the security of the same via temporary wire partitions or metal stud and gyp partitions.
  - C. See Basement Office Area Layout and Temporary Cable Phone, Internet Service Layout with Addendum No.2 for further information.
- 2.05 Electrical Lighting - Provided by EC (NYS Office of the General Services and DMNA Use - See dwg. AD112 for further information)
- 2.06 Heat and Air Conditioning - Provided by HC (NYS Office of the General Services and DMNA Use - See dwg. AD112 for further information)
- A. Provide minimum six commercial portable air conditioning units with heat for the State Field Office. Frigidaire Model # FRA09E1, 9000 BTUH cooling, 4100 BTUH heating, 115 volt.

### **PART 3 EXECUTION**

#### **3.01 INSTALLATION**

- A. Install all services where directed.
- B. HVAC Contractor – Core existing wall and install ductwork as required to vent Heat and Air Conditioning units into existing garage area.
- C. Plumbing Contractor - Provide water service to Temporary Mobile Toilet / Lavatory Units. PC shall maintain entire system for the duration of the construction.
- D. Electrical Contractor - Provide electric power to all desk locations and other office equipment, including the temporary heat and air conditioning units. Provide teledata and communications to all desk and printer / copier locations shown in Exhibit A.

#### **3.02 MAINTENANCE AND CLEANING**

- A. Maintain and clean the office units for the duration of this Contract. Include the following:
  - 1. Daily removal of rubbish.
  - 2. Daily cleaning of toilet room, including the plumbing fixtures. Replenish toilet room supplies as needed.
  - 3. Weekly mopping of floors.

4. Weekly dusting of offices and other rooms.

**3.03 OWNERSHIP**

- A. Upon completion of this Project, furnish Bill of Sale and transfer of ownership of all items included in this Section to the State of New York, Office of General Services.
- B. Relocate temporary services / office space / temporary mobile toilet / lavatory units on facility property as directed. Extend electrical and plumbing services as required.

**3.04 REMOVALS**

- A. Remove the units, furniture, and equipment when directed. Restore permanent facilities used for or connected to field office to their original condition or better.

**END OF SECTION**

**SECTION 221100**  
**PLUMBING PIPING**

**PART 1 GENERAL**

**1.01 RELATED WORK SPECIFIED ELSEWHERE**

- A. Through Penetration Firestops: Section 078400.
- B. Sealants: Section 079200.

**1.02 REFERENCES**

- A. NFPA 13 - Standard for the Installation of Sprinkler Systems.

**1.03 SUBMITTALS**

- A. Product Data:
  - 1. Catalog sheets and specifications indicating manufacturer name, type, applicable reference standard, schedule, or class for specified pipe and fittings.
  - 2. Material Schedule: Itemize pipe and fitting materials for each specified application in Pipe and Fittings Schedule in Part 3 of this Section. Where optional materials are specified indicate option selected.
- B. Quality Control Submittals
  - 1. Copy of hydraulic press fitting manufacturer's printed field inspection procedures for hydraulic press joints in copper tubing.
  - 2. Brazer Qualification Data: Copies of certification; include names, home addresses and social security numbers of brazers.

**1.04 QUALITY ASSURANCE**

- A. Qualification of Brazers: Comply with the following:
  - 1. The persons performing the brazing and their supervisors shall be personally experienced in brazing procedures.

**PART 2 PRODUCTS**

**2.01 STEEL PIPE AND FITTINGS**

- A. Steel Pipe for Threading: Standard weight, Schedule 40, black or galvanized; ASTM A 53 or ASTM A 135.
- B. Malleable Iron, Steam Pattern Threaded Fittings:
  - 1. 150 lb Class: ASME B16.3.
  - 2. 300 lb Class: ASME B16.3.

- C. Cast Iron Fittings:
  - 1. Drainage Pattern, Threaded: ASME B16.12.
  - 2. Steam Pattern, Threaded: ASME B16.4.
    - a. Standard Weight: Class 125.
    - b. Extra Heavy Weight: Class 250.
  - 3. Flanged Fittings and Threaded Flanges: ASME B16.1.
    - a. Standard Weight: Class 125.
    - b. Extra Heavy: Class 250.
- D. Unions: Malleable iron, 250 lb class, brass to iron or brass to brass seats.
- E. Couplings: Same material and pressure rating as adjoining pipe, conforming to standards for fittings in such pipe. Use taper tapped threaded type in screwed pipe systems operating in excess of 15 psig.
- F. Nipples: Same material and strength as adjoining pipe, except nipples having a length of less than one inch between threads shall be extra heavy.

**2.02 COPPER TUBING AND FITTINGS**

- A. Copper Tube, Types L: ASTM B 88.
- B. Hard Copper Tube, Types K: ASTM B 88.
- C. Wrot Copper Tube Fittings, Solder Joint: ASME B16.22.
- D. Cast Copper Alloy Tube Fittings, Solder Joint: ASME B16.18.
- E. Drainage Tube, Type DWV: ASTM B 306.
- F. Wrot Copper Drainage Tube Fittings, Solder Joint: ASME B16.29.
- G. Cast Copper Alloy Drainage Fittings, Solder Joint: ASME B16.23.

**2.03 PEX TUBE AND FITTINGS**

- A. PEX Distribution System: ASTM F 877, SDR 9 tubing.
- B. Fittings for PEX Tube: ASTM F 1807, metal-insert type with copper or stainless-steel crimp rings and matching PEX tube dimensions.
- C. Manifold: Multiple-outlet, plastic or corrosion-resistant-metal assembly complying with ASTM F 877; with plastic or corrosion-resistant-metal valve for each outlet.

**2.04 PVC PIPE AND FITTINGS**

- A. Solid-Wall PVC Pipe: ASTM D 2665, drain, waste, and vent.

- B. Cellular-Core PVC Pipe: ASTM F 891, Schedule 40.
- C. PVC Socket Fittings: ASTM D 2665, made to ASTM D 3311, drain, waste, and vent patterns and to fit Schedule 40 pipe.
- D. Adhesive Primer: ASTM F 656.
  - 1. Adhesive primer shall have a VOC content of 550 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
  - 2. Adhesive primer shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- E. Solvent Cement: ASTM D 2564.
  - 1. PVC solvent cement shall have a VOC content of 510 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
  - 2. Solvent cement shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

**2.05 DUCTILE-IRON PIPE AND FITTINGS**

- A. Mechanical-Joint, Ductile-Iron Pipe: AWWA C151/A21.51, with mechanical-joint bell and plain spigot end unless grooved or flanged ends are indicated. Glands, Gaskets, and Bolts: AWWA C111/A21.11, ductile- or gray-iron glands, rubber gaskets, and steel bolts.
- B. Standard-Pattern, Mechanical-Joint Fittings: AWWA C110/A21.10, ductile or gray iron. Glands, Gaskets, and Bolts: AWWA C111/A21.11, ductile- or gray-iron glands, rubber gaskets, and steel bolts.
- C. Appurtenances for Grooved-End, Ductile-Iron Pipe: Fittings for Grooved-End, Ductile-Iron Pipe: ASTM A 47/A 47M, malleable-iron castings or ASTM A 536, ductile-iron castings with dimensions that match pipe.

**2.06 BOLTED MECHANICAL BRANCH CONNECTION**

- A. Victaulic Co.'s 920 Mechanical T.

**2.07 JOINING AND SEALANT MATERIALS**

- A. Thread Sealant:
  - 1. LA-CO Industries', Slic-Tite Paste with Teflon.
  - 2. Loctite Corp.'s No. 565 Thread Sealant.
  - 3. Thread sealants for potable water shall be NSF approved.
- B. Thread Sealant (Natural Gas Piping): Rectorseal Corp.'s T Plus 2 non-hardening pipe dope with teflon.

- C. Solder: Solid wire type conforming to the following:
  - 1. Type 3: Lead-free tin-silver solder (ASTM B 32 Alloy Grade E, AC, or HB); Engelhard Corp.'s Silvabrite 100, Federated Fry Metals' Aqua Clean, or J.W. Harris Co. Inc.'s Stay-Safe Bridgit.
- D. Soldering Flux for Soldered Joints: All-State Welding Products Inc.'s Duzall, Engelhard Corp.'s General Purpose Liquid or Paste, Federated Fry Metals' Water Flow 2000, or J.W. Harris Co. Inc.'s Stay-Clean.
- E. Gaskets For Use With Ductile Iron Water Pipe: Synthetic rubber rings (molded or tubular): Clow Corp.'s Belltite, Tyler Pipe Industries Inc.'s Ty-Seal, or U.S. Pipe and Foundry Co.'s Tyton.
- F. Gaskets For Use With Grooved End Pipes and Fittings: Type and materials as recommended and furnished by the fitting manufacturer, for the service of piping system in which installed.
- G. Corrosion Protective Tape System: By 3M Co., St. Paul, MN.
  - 1. Tape: Scotchrap 50 or 51.
  - 2. Primer: Scotchrap pipe primer.
  - 3. Putty (if required): Strip Caulk insulation putty.

**2.08 PACKING MATERIALS FOR BUILDING CONSTRUCTION PENETRATIONS**

- A. Oiled Oakum: Manufactured by Nupak of New Orleans, Inc., 931 Daniel St., Kenner, LA 70062, (504)466-1484.
- B. Mechanical Modular Seals: Thunderline Corp.'s Link Seal wall and floor seals designed for the service of piping system in which installed.

**2.09 DIELECTRIC CONNECTORS**

- A. Dielectric Fitting: Bronze ball valve with end connections and pressure rating to match associated piping.
  - 1. Nipples with inert non-corrosive thermoplastic linings are not acceptable.
- B. Flange Electrical Insulation Kit: Consisting of dielectric sleeves and washers, and dielectric gasket.
  - 1. Rated 150 psi at 250 degrees F: ANSI Class 150, full faced neoprene gasket with bolt holes, double phenolic washers, and mylar sleeves; Model 150 by APS, Lafayette, LA 70596, (337) 233-6116.

**2.10 PIPE SLEEVES**

- A. Type A: Schedule 40 steel pipe.
- B. Type B: No. 16 gage galvanized sheet steel.

- C. Type C: Schedule 40 steel pipe with 1/4 inch steel collar continuously welded to pipe sleeve. Size steel collars as required to span a minimum of one cell or corrugation, on all sides of the rough opening thru the metal deck.
- D. Type D: No. 16 gage galvanized sheet steel with 16 gage sheet steel metal collar rigidly secured to sleeve. Size metal collars as required to span a minimum of one cell or corrugation, on all sides of the rough opening thru the metal deck.

## 2.11 FLOOR, WALL AND CEILING PLATES

- A. Cast Brass: Solid type with polished chrome plated finish, and set screw.
  - 1. Series Z89 by Zurn, 929 Riverside Drive, Grosvendale, CT 06255, (800) 243-1830.
  - 2. Model 127XXXX by Maguire Mfg., Cheshire CT 06410, (203) 699-1801.
- B. Stamped Steel: Split type, polished chrome plated finish, with set screw.
  - a. Figures 2 and 13 by Anvil International, Portsmouth, NH 03802, (603) 422-8000.
- C. Cast Iron or Malleable Iron: Solid type, galvanized finish, with set screw:
  - 1. Model 395 by Anvil International, Portsmouth, NH 03802, (603) 422-8000.
  - 2. Model 900-016XX by Landsdale International, Westville, NJ 08093, (800) 908-0523.

## 2.12 FLEXIBLE CONNECTIONS

- A. Underground Application:
  - 1. Acceptable Companies:
    - a. Titeflex Inc., Springfield, MA.
    - b. Flex-ing, Sherman, TX.
  - 2. Features:
    - a. Construction: Stainless steel innercore covered with braided Type 304 stainless steel outer jacket.
    - b. UL listed for underground fuel storage tank systems.
    - c. Connections for unleaded gasoline systems shall be fire rated.
    - d. Permanently crimped stainless steel collars with one threaded end and one threaded swivel end.
- B. Underground or Above Ground Application:
  - 1. Acceptable Companies:
    - a. Titeflex Inc., Springfield, MA.
    - b. Flex-ing, Sherman, TX.
  - 2. Features:
    - a. Construction: Convoluted, Type 321 stainless steel inner core, minimum .012 inch wall thickness covered with braided Type 304 stainless steel outer jacket.
    - b. UL listed for above ground and underground use.
    - c. Connections for unleaded gasoline systems shall be fire rated.

- d. Factory installed male swivel on one end.

**2.13 FLEXIBLE CONNECTION ISOLATION JACKET**

- A. Type: High density polyethylene flexible tube with Buna-N rubber compression seals, air valve stem, and stainless steel clamps; Titeflex Inc.'s Model 111466-1, or Flexing Model Yellow Jacket.

**2.14 TEST BOOTS**

- A. Test boots complete with stainless steel clamps, and air valve stem for tightness testing.
  - 1. Flexible Nitrile Rubber: OPW TBA series, or APT STB or STB-SW series.
  - 2. Flexible Pelethane (Filled with Petroseal Paste): Blue-Line Model Quick Fit series.

**2.15 SPECIALTY PIPE FITTINGS**

- A. Transition Couplings:

General Requirements: Fitting or device for joining piping with small differences in OD's or of different materials. Include end connections same size as and compatible with pipes to be joined.

Fitting-Type Transition Couplings: Manufactured piping coupling or specified piping system fitting.

Unshielded, Nonpressure Transition Couplings:

- a. Standard: ASTM C 1173.
- b. Description: Elastomeric, sleeve-type, reducing or transition pattern. Include shear ring and corrosion-resistant-metal tension band and tightening mechanism on each end.
- c. Sleeve Materials:
  - 1) For Cast-Iron Soil Pipes: ASTM C 564, rubber.
  - 2) For Plastic Pipes: ASTM F 477, elastomeric seal or ASTM D 5926, PVC.
  - 3) For Dissimilar Pipes: ASTM D 5926, PVC or other material compatible with pipe materials being joined.

- B. Shielded, Nonpressure Transition Couplings:

- 1. Standard: ASTM C 1460.
- 2. Description: Elastomeric or rubber sleeve with full-length, corrosion-resistant outer shield and corrosion-resistant-metal tension band and tightening mechanism on each end.

Pressure Transition Couplings:

- 1. Standard: AWWA C219.

2. Description: Metal, sleeve-type same size as, with pressure rating at least equal to, and ends compatible with, pipes to be joined.
3. Center-Sleeve Material: Manufacturer's standard.
4. Gasket Material: Natural or synthetic rubber.
5. Metal Component Finish: Corrosion-resistant coating or material.

Dielectric Fittings:

General Requirements: Assembly of copper alloy and ferrous materials with separating nonconductive insulating material. Include end connections compatible with pipes to be joined.

Dielectric Unions: Standard: ASSE 1079. Pressure Rating: 150 psig. End Connections: Solder-joint copper alloy and threaded ferrous.

Dielectric Flanges: Standard: ASSE 1079. Factory-fabricated, bolted, companion-flange assembly. Pressure Rating: 150 psig. End Connections: Solder-joint copper alloy and threaded ferrous; threaded solder-joint copper alloy and threaded ferrous.

Dielectric-Flange Insulating Kits: Nonconducting materials for field assembly of companion flanges. Pressure Rating -150 psig. Gasket: Neoprene or phenolic. Bolt Sleeves: Phenolic or polyethylene. Washers: Phenolic with steel backing washers.

## **PART 3 EXECUTION**

### **3.01 INSTALLATION**

- A. Install piping at approximate locations indicated, and at maximum height.
- B. Install piping clear of door swings, and above sash heads.
- C. Make allowances for expansion and contraction.
- D. Allow for a minimum of one inch free air space around pipe or pipe covering, unless otherwise specified.
- E. Install horizontal piping with a constant pitch, and without sags or humps.
  1. Water Piping: Pitch 1/4 inch per 10 feet upward in direction of flow, unless otherwise noted. If it is not possible to maintain constant pitch, establish a new low point and continue. At the low point, provide a 1/2 inch drip leg and gate valve with a hose bibb end. Provide an air vent at the high point.
  2. Drainage Piping: Pitch 1/8 inch per foot downward, in direction of flow, unless otherwise noted.
  3. Vent Piping: Pitch 1/4 inch per foot upward, unless otherwise noted.
- F. Install vertical piping plumb.

- G. Use fittings for offsets and direction changes, except for Type K soft annealed copper temper water tube.
- H. Cut pipe and tubing ends square; ream before joining.
- I. Threading: Use American Standard Taper Pipe Thread Dies.
  - 1. Thread brass pipe with special brass threading dies.

**3.02 DRAINAGE SYSTEMS**

- A. Fittings:
  - 1. Use long turn drainage pattern fittings, unless space conditions prohibit their use; in such cases, short turn pattern fittings may be used.
  - 2. Vertical Offsets: Make vertical offsets with 45 degree elbows, or 1/8 bends.
  - 3. Tucker Fittings: Tucker fittings may only be installed in vertical piping.
- B. Cleanouts:
  - 1. Install cleanouts with sufficient side and end clearance to allow for the removal of the cleanout plug, and the use of cleaning tools.
  - 2. Lubricate cleanout plugs with anti-seize lubricant.

**3.03 DOMESTIC WATER PIPING SYSTEM**

- A. Connect runouts to the upper quadrant of the main, and run upward at not less than 45 degrees before extending laterally.
- B. Make final connections to plumbing fixtures and equipment with unions, or flanges:
  - 1. Do not use unions in ferrous piping larger than 3 inches.
  - 2. Do not use unions in brass or copper piping larger than 2 inches.

**3.04 NATURAL GAS PIPING SYSTEM**

- A. Install gas piping system in conformance with the National Fuel Gas Code, NFPA 54, or as required by the serving gas supplier.
- B. Use non-hardening pipe dope on threads. Do not use thread seal tape.

**3.05 FIRE SPRINKLER PIPING SYSTEM**

- A. Install piping to be completely drainable.

**3.06 PIPE JOINT MAKE-UP**

- A. Threaded Joint: Make up joint with a pipe thread compound applied in accordance with manufacturer's printed application instructions for the intended service.

1. Chrome Plated Brass Pipe: Tighten joint with a strap or Parmalee wrench; do not mar pipe finish. Install piping so that no threads are visible.
  
- B. Soldered Joint: Thoroughly clean tube end and inside of fitting with emery cloth, sand cloth, or wire brush. Apply flux to the pre-cleaned surfaces. Install fitting, heat to soldering temperature, and join the metals with type solder specified. Remove residue.
- C. Flanged Pipe Joint:
  1. Install threaded companion flanges on steel pipe; flanges on galvanized pipe are not required to be galvanized.
  2. Provide a gasket for each joint.
    - a. Hot Water Pipe Gasket: Coat with a thin film of oil before making up joint.
    - b. Air Pipe Gasket: Coat with a thin film of oil before making up joint.
  3. Coat bolt threads and nuts with anti-seize lubricant before making up joint.
  
- D. Grooved Pipe Joint: Roll groove pipe ends, make up joint with grooved end fittings and couplings, in conformance with the manufacturer's printed installation instructions.
  1. Cut grooved end piping is not acceptable.
  
- F. Mechanical Joint: Make up joint in conformance with the manufacturer's printed installation instructions, with particular reference to tightening of bolts.
  
- H. Dissimilar Pipe Joint:
  1. Joining Dissimilar Threaded Piping: Make up connection with a threaded coupling or with companion flanges.
  2. Joining Dissimilar Non-Threaded Piping: Make up connection with adapters recommended by the manufacturers of the piping to be joined.
  3. Joining Galvanized Steel Pipe and Copper Tubing: Make up connection with a dielectric connector.
  4. Joining FRP and Threaded Pipe: Make up connection with adapters as recommended by manufacturers of piping being joined.

**3.07 PIPING PENETRATIONS**

- A. Sleeve Schedule: Unless otherwise shown, comply with the following schedule for the type of sleeve to be used where piping penetrates wall or floor construction:

<b>CONSTRUCTION</b>	<b>SLEEVE TYPE</b>
1. Frame construction.	None Required
2. Foundation walls.	A*
3. Non-waterproof interior walls.	B*
4. Non-waterproof interior floors on metal decks.	D*
5. Non-waterproof interior floors not on metal decks.	B*

6.	Floors not on grade having a floor drain.	A
7.	Floors over mechanical equipment, steam service, machine, and boiler rooms.	A
8.	Floors finished or to be finished with latex composition or terrazzo, and on metal decks.	D*
9.	Floors finished or to be finished with latex composition or terrazzo, and not on metal decks.	A
10.	Earth supported concrete floors.	None Required
11.	Exterior concrete slabs on grade.	A
12.	Fixtures with floor outlet waste piping.	None Required
13.	Metal roof decks.	C
14.	Non-metal roof decks.	A
15.	Waterproof floors on metal decks.	D
16.	Waterproof floors not on metal decks.	A
17.	Waterproof walls.	A

\*Core drilling is permissible in lieu of sleeves where marked with asterisks.

**B. Diameter of Sleeves and Core Drilled Holes:**

1. Unless otherwise specified, size holes thru floors and walls in accordance with the through penetration fire stopping system being used.
2. Size holes thru exterior walls or waterproofed walls above inside earth or finished floors, and exterior concrete slabs in accordance with the following:
  - a. Uninsulated (Bare) Pipe: Inside diameter of sleeve or core drilled hole 1/2 inch greater than outside diameter of pipe, unless otherwise specified.
  - b. Insulated Pipe: Inside diameter of sleeve or core drilled hole 1/2 inch greater than outside diameter of insulation, unless otherwise specified.
  - c. Mechanical Modular Seals: Size holes in accordance with the manufacturer's recommendations.
3. Size holes for sprinkler and fire standpipe piping in accordance with NFPA 13.

**C. Length of Sleeves (except as shown otherwise on Drawings):**

1. Walls and Partitions: Equal in length to total finished thickness of wall or partition.
2. Floors with Finish: Equal in length to total finished thickness of floor and extending 1/2 inch above the finished floor level, except as follows:
  - a. In furred spaces at exterior walls, extend sleeve one inch above the finished floor level.
3. Exterior Concrete Slabs: Equal in length to total thickness of slab and extending 1/2 inch above the concrete slab.
4. Roofs: Equal in length to the total thickness of roof construction, including insulation and roofing materials, and extending one inch above the finished roof level.

- D. Packing of Sleeves and Core Drilled Holes:
1. Unless otherwise specified, pack sleeves or cored drilled holes in accordance with Section 078400 - FIRESTOPPING.
  2. Pack sleeves in exterior walls or waterproofed walls above inside earth or finished floors with oakum to within 1/2 inch of each wall face, and finish both sides with Type 1C (one part) sealant. See Section 079200.
    - a. Mechanical modular seals may be used in lieu of packing and sealant for sleeves and core drilled holes.
  3. Pack sleeves in exterior concrete slabs with oakum to full depth, and within 1/2 inch of top of sleeve and finish the remainder with sealant. See Section 079200.
    - a. Sealant Types:
      - 1) Piping Conveying Materials up to 140 degrees F other than Motor Fuel Dispensing System Piping: Type 1C (one part).
      - 2) Motor Fuel Dispensing System Piping: Type 1C (2 part).
    - b. Mechanical modular seals may be used in lieu of packing and sealant for sleeves and core drilled holes.
- E. Weld metal collars of Type C and D sleeves to the upper surface of the metal deck. Seal voids under the metal collar as recommended by the manufacturer of the metal deck.

### 3.08 FLOOR, WALL AND CEILING PLATES

- A. Install plates for exposed uninsulated piping passing thru floors, walls, ceilings, and exterior concrete slabs as follows:
1. In Finished Spaces:
    - a. Piping 4 Inch Size and Smaller: Solid or split, chrome plated cast brass.
    - b. Piping Over 4 Inch Size: Split, chrome plated cast brass.
  2. Unfinished Spaces (Including Exterior Concrete Slabs): Solid, unplated cast iron.
  3. Fasten plates with set screws.
  4. Plates are not required in pipe shafts or furred spaces.

### 3.09 PIPE AND FITTING SCHEDULE

- A. Domestic Cold Water:
1. Under-building-slab, domestic water, building-service piping: Soft copper tube, ASTM B 88, Type K; wrought-copper, solder-joint fittings; and brazed joints.
  2. Aboveground domestic water piping excluding Mechanical Areas, NPS 1" and smaller, and branches from header to plumbing fixture: Cross-linked polyethylene (PEX) plastic tubing, ASTM F 877, SDR 9 tubing. Fittings for PEX Tube: ASTM F 1807, metal-insert type with copper crimp rings and matching PEX tube dimensions.

3. Aboveground domestic water piping, NPS 1 1/4" to 6" and all Mechanical Areas: Hard copper tube, ASTM B 88, Type L; cast- or wrought-copper, solder-joint fittings; and soldered joints.
- B. Domestic Hot Water:
1. All sizes: Type L hard drawn copper tube, with cast copper alloy or wrought copper solder type fittings, and joints made up with Type 3 solder.
- C. Fire Sprinkler (Above Ground):
1. Option No. 1: Standard weight black steel pipe, with standard weight cast iron fittings, and threaded joints.
  2. Option No. 2: Standard weight black steel pipe, with roll grooved ends, grooved pipe fittings, and couplings.
- D. Fire Sprinkler (Below Ground): Coated ductile iron water pipe and fittings, with mechanical or push-on joints.
- E. Natural Gas Piping including associated vent:
1. For system pressure less than 0.5 psig, pipe all sizes: Schedule 40, black steel pipe, ASTM A 53, with 150 lb malleable iron fittings, and threaded joints.
  2. For system pressure more than 0.5 psig, pipe all sizes: Steel pipe with steel welding fittings and welded joints.
- F. Storm Drainage, Sanitary, Waste and Vent Piping: Schedule 40 PVC, ASTM D 2665. PVC Socket Fittings: ASTM D 2665, made to ASTM D 3311, drain, waste, and vent patterns and to fit Schedule 40 pipe.

**END OF SECTION**

## **ADDENDUM NO. 2 TO PROJECT NO. 44573-C,H,P,E**

5. SECTION 271525 OPTICAL FIBER CABLES: Add the attached Section (pages 271525-1 through 271525-7) to the Project Manual.

### **DRAWINGS**

#### **ELECTRIC WORK DRAWINGS**

Drawing No. E-001: ADD the following Telecommunications Scope Clarification Notes:

“In addition to the raceway and junction box infrastructure shown on the drawings, please note the following clarifications for telecommunications scope items:

1. Provide Cat 6 cabling in the quantities shown in the Cable Schedule on Drawing E503 between telecommunication outlet locations and the MDF or IDF rooms indicated in the IDF/WAP Zone identification on the Electrical drawings.
2. Racks, patch panels, and jacks are provided and installed by the electrical contractor. Equipment such as servers, UPS, routers, and WAP hardware is provided and installed by DMNA.
3. Terminations of cabling at outlets and patch panels will be by the Electrical Contractor. For modular furniture and tables fed from floor boxes, wall boxes, or poke-thru devices, coil enough cable to reach outlet locations in modular furniture, or seats for tables. Upon installation of furniture, it will be the responsibility of the electrical contractor to make final terminations.
4. Please note that the cable schedule indicates quantities of cables for hardwired outlets throughout the facility. Several areas are served by wireless only. For data outlets shown on the drawings that are not shown in the cable schedule, provide two Cat 6 cables terminated at two RJ-45 jacks.
5. At each seating location (chair) provide one voice and one data (both RJ-45) Cat 6e cables home run to appropriate IDF/MDF. EC to provide all final connections once the furniture is set into place.
6. The following Division 27 specification sections are provided with this clarification for material, installation, and testing requirements.
  - a. 270544 – Common Work Results for Communications
  - b. 271100 – Communications Equipment Room Fittings
  - c. 271300 – Communications Backbone Cabling
  - d. 271500 – Communications Horizontal Cabling
  - e. 271525 – Optical Fiber Cables
7. Provide a 2” conduit (EMT from MDF to underside of roof, then transition to RMC through roof) from the MDF to 3’ above the roof. Provide a weather head on the conduit. Conduit will be used by Time Warner to route their cable from the rooftop down into the MDF room.

## **ADDENDUM NO. 2 TO PROJECT NO. 44573-C,H,P,E**

### Security Scope Clarification

1. The access control system (specific exterior doors) is provided by another contract. The EC shall provide empty conduits and pull strings as noted. Security Scope is the conduit and junction box system shown on the drawings. The Alarm System specification provided in the construction documents should have been noted as “for reference only” and does not imply the electrical contractor is responsible for security equipment. Please note that junction box at vault locations will accommodate a PIN pad; not a card reader as indicated on the drawings.

### A/V Scope Clarification

2. AV equipment and low voltage wiring and associated wall plates to be provided by a separate contract. DMNA provided room by room design basis AV equipment schedule with design basis manufacture to DRG for AV planning purposes. Contractor shall provide for line voltage power to the design basis equipment. Low voltage cabling empty conduits (sized per the design basis cabling requirements), recessed wall/ceiling/floor boxes were to be coordinated with design basis equipment requirements. Empty “low voltage conduits” shall have a pull string.

**END OF ADDENDUM**

Margaret F. Larkin  
Acting Executive Director

## SECTION 270544

### COMMON WORK RESULTS FOR COMMUNICATIONS

#### PART 1 - GENERAL

##### 1.1 SUMMARY

###### A. Section Includes:

1. Sleeves for pathways and cables.
2. Sleeve seals.
3. Grout.
4. Common communications installation requirements.

##### 1.2 SUBMITTALS

- ###### A. Product Data: For sleeve seals.

#### PART 2 - PRODUCTS

##### 2.1 SLEEVES FOR PATHWAYS AND CABLES

- ###### A. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, galvanized steel, plain ends.

##### 2.2 SLEEVE SEALS

- ###### A. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and pathway or cable.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - a. Advance Products & Systems, Inc.
  - b. Calpico, Inc.
  - c. Metraflex Co.
  - d. Pipeline Seal and Insulator, Inc.
2. Sealing Elements: EPDM interlocking links shaped to fit surface of cable or conduit. Include type and number required for material and size of pathway or cable.
3. Pressure Plates: Plastic. Include two for each sealing element.

4. Connecting Bolts and Nuts: Carbon steel with corrosion-resistant coating of length required to secure pressure plates to sealing elements. Include one for each sealing element.

## 2.3 GROUT

- A. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107, factory-packaged, nonmetallic aggregate grout, noncorrosive, nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.

## PART 3 - EXECUTION

### 3.1 COMMON REQUIREMENTS FOR COMMUNICATIONS INSTALLATION

- A. Comply with NECA 1.
- B. Measure indicated mounting heights to bottom of unit for suspended items and to center of unit for wall-mounting items.
- C. Headroom Maintenance: If mounting heights or other location criteria are not indicated, arrange and install components and equipment to provide maximum possible headroom consistent with these requirements.
- D. Equipment: Install to facilitate service, maintenance, and repair or replacement of components of both communications equipment and other nearby installations. Connect in such a way as to facilitate future disconnecting with minimum interference with other items in the vicinity.
- E. Right of Way: Give to piping systems installed at a required slope.

### 3.2 SLEEVE INSTALLATION FOR COMMUNICATIONS PENETRATIONS

- A. Communications penetrations occur when pathways, cables, wireways, or cable trays penetrate concrete slabs, concrete or masonry walls, or fire-rated floor and wall assemblies.
- B. Concrete Slabs and Walls: Install sleeves for penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of slabs and walls.
- C. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.
- D. Fire-Rated Assemblies: Install sleeves for penetrations of fire-rated floor and wall assemblies unless openings compatible with firestop system used are fabricated during construction of floor or wall.
- E. Cut sleeves to length for mounting flush with both surfaces of walls.
- F. Extend sleeves installed in floors 2 inches above finished floor level.

- G. Size pipe sleeves to provide 1/4-inch annular clear space between sleeve and pathway or cable, unless indicated otherwise.
- H. Seal space outside of sleeves with grout for penetrations of concrete and masonry
  - 1. Promptly pack grout solidly between sleeve and wall so no voids remain. Tool exposed surfaces smooth; protect grout while curing.
- I. Interior Penetrations of Non-Fire-Rated Walls and Floors: Seal annular space between sleeve and pathway or cable, using joint sealant appropriate for size, depth, and location of joint. Comply with requirements in Division 07 Section "Joint Sealants."
- J. Fire-Rated-Assembly Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pathway and cable penetrations. Install sleeves and seal pathway and cable penetration sleeves with firestop materials. Comply with requirements in Division 07 Section "Penetration Firestopping."
- K. Roof-Penetration Sleeves: Seal penetration of individual pathways and cables with flexible boot-type flashing units applied in coordination with roofing work.
- L. Aboveground, Exterior-Wall Penetrations: Seal penetrations using steel pipe sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.
- M. Underground, Exterior-Wall Penetrations: Install cast-iron pipe sleeves. Size sleeves to allow for 1-inch annular clear space between pathway or cable and sleeve for installing mechanical sleeve seals.

### 3.3 SLEEVE-SEAL INSTALLATION

- A. Install to seal exterior wall penetrations.
- B. Use type and number of sealing elements recommended by manufacturer for pathway or cable material and size. Position pathway or cable in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pathway or cable and sleeve. Tighten bolts against pressure plates that cau sealing elements to expand and make watertight seal.

### 3.4 FIRESTOPPING

- A. Apply firestopping to penetrations of fire-rated floor and wall assemblies for communications installations to restore original fire-resistance rating of assembly. Firestopping materials and installation requirements are specified in Division 07 Section "Penetration Firestopping."

**END OF SECTION**

## SECTION 271100

### COMMUNICATIONS EQUIPMENT ROOM FITTINGS

#### PART 1 - GENERAL

##### 1.1 SUMMARY

###### A. Section Includes:

1. Telecommunications mounting elements.
2. Backboards.
3. Telecommunications service entrance pathways.
4. Grounding.

###### B. Related Sections:

1. Division 27 Section "Communications Backbone Cabling" for voice and data cabling associated with system panels and devices.
2. Division 27 Section "Communications Horizontal Cabling" for voice and data cabling associated with system panels and devices.

##### 1.2 SUBMITTALS

###### A. Product Data: For each type of product indicated.

###### B. Shop Drawings: For communications equipment room fittings. Include plans, elevations, sections, details, and attachments to other work.

1. Detail equipment assemblies, and location and size of each field connection.
2. Equipment racks and cabinets: Include workspace requirements and access for cable connections.
3. Grounding: Indicate location of grounding bus bar and its mounting detail.

###### C. Qualification Data: For Installer, qualified layout technician, installation supervisor, and field inspector.

##### 1.3 QUALITY ASSURANCE

###### A. Installer Qualifications: Cabling Installer must have personnel certified by BICSI on staff.

1. Layout Responsibility: Preparation of Shop Drawings shall be under the direct supervision of RCDD.
2. Installation Supervision: Installation shall be under the direct supervision of Registered Technician, who shall be present at all times when Work of this Section is performed at Project site.

3. Field Inspector: Currently registered by BICSI as RCDD to perform the on-site inspection.
- B. 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. Telecommunications Pathways and Spaces: Comply with TIA/EIA-569-A.
- D. Grounding: Comply with ANSI-J-STD-607-A.

#### 1.4 PROJECT CONDITIONS

- A. Environmental Limitations: Do not deliver or install equipment frames and cable trays until spaces are enclosed and weathertight, wet work in spaces is complete and dry, and work above ceilings is complete.

#### 1.5 COORDINATION

- A. Coordinate layout and installation of communications equipment with Owner's telecommunications and LAN equipment and service suppliers. Coordinate service entrance arrangement with local providers.

### PART 2 - PRODUCTS

#### 2.1 PATHWAYS

- A. Cable Support: NRTL labeled. Cable support brackets shall be designed to prevent degradation of cable performance and pinch points that could damage cable. Cable tie slots fasten cable ties to brackets.
  1. Comply with NFPA 70 and UL 2043 for fire-resistant and low-smoke-producing characteristics.
  2. Support brackets with cable tie slots for fastening cable ties to brackets.
  3. Lacing bars, spools, J-hooks, and D-rings.
  4. Straps and other devices.
- B. Cable Trays:
  1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
    - a. Cable Management Solutions, Inc.
    - b. Cablofil Inc.
    - c. Cooper B-Line, Inc.
    - d. Cope - Tyco/Allied Tube & Conduit.
    - e. GS Metals Corp.

2. Cable Tray Materials: Metal, suitable for indoors and protected against corrosion by electroplated zinc galvanizing, complying with ASTM B 633, Type 1, not less than 0.000472 inch thick.

- a. Basket Cable Trays: 24 inches wide and 6 inches deep. Wire mesh spacing shall not exceed 2 by 4 inches.

- C. Conduit and Boxes: Comply with requirements in Division 26 Section "Raceway and Boxes for Electrical Systems."

1. Outlet boxes shall be no smaller than 2 inches wide, 3 inches high, and 2-1/2 inches deep.

## 2.2 BACKBOARDS

- A. Backboards: Plywood, fire-retardant treated, 3/4 by 48 by 96 inches. Comply with requirements for plywood backing panels specified in Division 06 Section "Rough Carpentry."

## 2.3 GROUNDING

- A. Comply with requirements in Division 26 Section "Grounding and Bonding for Electrical Systems" for grounding conductors and connectors.

- B. Telecommunications Main Bus Bar:

1. Connectors: Mechanical type, cast silicon bronze, solderless compression-type wire terminals, and long-barrel, two-bolt connection to ground bus bar.
2. Ground Bus Bar: Copper, minimum 1/4 inch thick by 4 inches wide with 9/32-inch holes spaced 1-1/8 inches apart.
3. Stand-Off Insulators: Comply with UL 891 for use in switchboards, 600 V. Lexan or PVC, impulse tested at 5000 V.

- C. Comply with ANSI-J-STD-607-A.

## 2.4 LABELING

- A. Comply with TIA/EIA-606-A and UL 969 for a system of labeling materials, including label stocks, laminating adhesives, and inks used by label printers.

## PART 3 - EXECUTION

### 3.1 ENTRANCE FACILITIES

- A. Contact telecommunications service provider and arrange for installation of demarcation point, protected entrance terminals, and a housing when so directed by service provider.

- B. Install underground pathways complying with recommendations in TIA/EIA-569-A, "Entrance Facilities" Article.
- 3.2 Install entrance pathway complying with Division 26 Section "Raceway and Boxes for Electrical Systems."
- A. Comply with NECA 1.
  - B. Comply with BICSI TDMM for layout and installation of communications equipment rooms.
  - C. Cable Trays: Comply with NEMA VE 2 and TIA/EIA-569-A-7.
  - D. Bundle, lace, and train conductors and cables to terminal points without exceeding manufacturer's limitations on bending radii. Install lacing bars and distribution spools.
- 3.3 FIRESTOPPING
- A. Comply with requirements in Division 07 Section "Penetration Firestopping." Comply with TIA/EIA-569-A, Annex A, "Firestopping."
  - B. Comply with BICSI TDMM, "Firestopping Systems" Article.
- 3.4 GROUNDING
- A. Install grounding according to BICSI TDMM, "Grounding, Bonding, and Electrical Protection" Chapter.
  - B. Comply with ANSI-J-STD-607-A.
  - C. Locate grounding bus bar to minimize the length of bonding conductors. Fasten to wall allowing at least 2-inch clearance behind the grounding bus bar. Connect grounding bus bar with a minimum No. 4 AWG grounding electrode conductor from grounding bus bar to suitable electrical building ground.
  - D. Bond metallic equipment to the grounding bus bar, using not smaller than No. 6 AWG equipment grounding conductor.
- 3.5 IDENTIFICATION
- A. Identify system components, wiring, and cabling complying with TIA/EIA-606-A. Comply with requirements in Division 26 Section "Identification for Electrical Systems." Comply with requirements in Division 09 Section "Interior Painting" for painting backboards. For fire-resistant plywood, do not paint over manufacturer's label.
  - B. See Division 27 Section "Communications Horizontal Cabling" for additional identification requirements. See Evaluations for discussion of TIA/EIA standard as it applies to this

Section. Paint and label colors for equipment identification shall comply with TIA/EIA-606-A for Class 2 level of administration.

- C. Labels shall be preprinted or computer-printed type.

**END OF SECTION**

## SECTION 271300

### COMMUNICATIONS BACKBONE CABLING

#### PART 1 - GENERAL

##### 1.1 SUMMARY

###### A. Section Includes:

1. Pathways.
2. UTP cable.
3. Cable connecting hardware, patch panels, and cross-connects.
4. Cabling identification products.

##### 1.2 BACKBONE CABLING DESCRIPTION

- A. Backbone cabling system shall provide interconnections between communications equipment rooms, main terminal space, and entrance facilities in the telecommunications cabling system structure. Cabling system consists of backbone cables, intermediate and main cross-connects, mechanical terminations, and patch cords or jumpers used for backbone-to-backbone cross-connection.
- B. Backbone cabling cross-connects may be located in communications equipment rooms or at entrance facilities. Bridged taps and splitters shall not be used as part of backbone cabling.

##### 1.3 PERFORMANCE REQUIREMENTS

- A. General Performance: Backbone cabling system shall comply with transmission standards in TIA/EIA-568-B.1, when tested according to test procedures of this standard.

##### 1.4 SUBMITTALS

- A. Product Data: For each type of product indicated.

###### B. Shop Drawings:

1. System Labeling Schedules: Electronic copy of labeling schedules, in software and format selected by Owner.
2. Cabling administration drawings and printouts.
3. Wiring diagrams to show typical wiring schematics including the following:
  - a. Cross-connects.
  - b. Patch panels.
  - c. Patch cords.

4. Cross-connects and patch panels. Detail mounting assemblies, and show elevations and physical relationship between the installed components.
  5. Cable tray layout, showing cable tray route to scale, with relationship between the tray and adjacent structural, electrical, and mechanical elements.
- C. Qualification Data: For Installer, qualified layout technician, installation supervisor, and field inspector.
- D. Source quality-control reports.
- E. Field quality-control reports.
- F. Maintenance data.

## 1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Cabling Installer must have personnel certified by BICSI on staff.
1. Layout Responsibility: Preparation of Shop Drawings by an RCDD.
  2. Installation Supervision: Installation shall be under the direct supervision of Registered Technician, who shall be present at all times when Work of this Section is performed at Project site.
- B. Surface-Burning Characteristics: As determined by testing identical products according to ASTM E 84 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
1. Flame-Spread Index: 25 or less.
  2. Smoke-Developed Index: 50 or less.
- C. 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.
- D. Telecommunications Pathways and Spaces: Comply with TIA/EIA-569-A.
- E. Grounding: Comply with ANSI-J-STD-607-A.

## 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Test cables upon receipt at Project site. Test each pair of UTP cable for open and short circuits.

## PART 2 - PRODUCTS

### 2.1 PATHWAYS

- A. Cable Support: NRTL labeled for support of Category 6 cabling, designed to prevent degradation of cable performance and pinch points that could damage cable.

1. Support brackets with cable tie slots for fastening cable ties to brackets.
2. Lacing bars, spools, J-hooks, and D-rings.
3. Straps and other devices.

B. Cable Trays:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - a. Cable Management Solutions, Inc.
  - b. Cablofil Inc.
  - c. Cooper B-Line, Inc.
  - d. Cope - Tyco/Allied Tube & Conduit.
  - e. GS Metals Corp.
2. Cable Tray Material: Metal, suitable for indoors, and protected against corrosion by electroplated zinc galvanizing, complying with ASTM B 633, Type 1, not less than 0.000472 inches thick.
  - a. Basket Cable Trays: 24 inches wide and 6 inches deep. Wire mesh spacing shall not exceed 2 by 4 inches.

C. Conduit and Boxes: Comply with requirements in Division 26 Section "Raceway and Boxes for Electrical Systems."

1. Outlet boxes shall be no smaller than 2 inches wide, 3 inches high, and 2-1/2 inches deep.

2.2 BACKBOARDS

- A. Backboards: Plywood, fire-retardant treated, 3/4 by 48 by 96 inches. Comply with requirements in Division 06 Section "Rough Carpentry" for plywood backing panels.

2.3 UTP CABLE

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. Belden CDT Inc.; Electronics Division.
  2. Berk-Tek; a Nexans company.
  3. CommScope, Inc.
  4. Draka USA.
  5. Genesis Cable Products; Honeywell International, Inc.
  6. KRONE Incorporated.
  7. Mohawk; a division of Belden CDT.
  8. Nordex/CDT; a subsidiary of Cable Design Technologies.
  9. Superior Essex Inc.
  10. SYSTIMAX Solutions; a CommScope Inc. brand.
  11. 3M.

12. Tyco Electronics/AMP Netconnect; Tyco International Ltd.

B. Description: 100-ohm, 4-pair UTP, formed into 25-pair binder groups covered with a thermoplastic jacket.

1. Comply with ICEA S-90-661 for mechanical properties.
2. Comply with TIA/EIA-568-B.1 for performance specifications.
3. Comply with TIA/EIA-568-B.2, Category 6.
4. Listed and labeled by an NRTL acceptable to authorities having jurisdiction as complying with UL 444 and NFPA 70 for the following types:
  - a. Communications, General Purpose: Type CM or CMG
  - b. Communications, Plenum Rated: Type CMP, complying with NFPA 262.
  - c. Communications, Riser Rated: Type CMR, complying with UL 1666.
  - d. Communications, Limited Purpose: Type CMX.
  - e. Multipurpose: Type MP or MPG.
  - f. Multipurpose, Plenum Rated: Type MPP, complying with NFPA 262.
  - g. Multipurpose, Riser Rated: Type MPR, complying with UL 1666.

#### 2.4 UTP CABLE HARDWARE

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. American Technology Systems Industries, Inc.
2. Dynacom Corporation.
3. Hubbell Premise Wiring.
4. KRONE Incorporated.
5. Leviton Voice & Data Division.
6. Molex Premise Networks; a division of Molex, Inc.
7. Nordex/CDT; a subsidiary of Cable Design Technologies.
8. Panduit Corp.
9. Siemon Co. (The).
10. Tyco Electronics/AMP Netconnect; Tyco International Ltd.

B. General Requirements for Cable Connecting Hardware: Comply with TIA/EIA-568-B.2, IDC type, with modules designed for punch-down caps or tools. Cables shall be terminated with connecting hardware of same category or higher.

C. Connecting Blocks: 110-style IDC for Category 6. Provide blocks for the number of cables terminated on the block, plus 25 percent spare. Integral with connector bodies, including plugs and jacks where indicated.

D. Cross-Connect: Modular array of connecting blocks arranged to terminate building cables and permit interconnection between cables.

1. Number of Terminals per Field: One for each conductor in assigned cables.

- E. Patch Panel: Modular panels housing multiple-numbered jack units with IDC-type connectors at each jack for permanent termination of pair groups of installed cables.
  - 1. Number of Jacks per Field: One for each four-pair.
- F. Jacks and Jack Assemblies: Modular, color-coded, eight-position modular receptacle units with integral IDC-type terminals.
- G. Patch Cords: Factory-made, 4-pair cables in 48-inch lengths; terminated with 8-position modular plug at each end.
  - 1. Patch cords shall have bend-relief-compliant boots and color-coded icons to ensure Category 6 performance. Patch cords shall have latch guards to protect against snagging.
  - 2. Patch cords shall have color-coded boots for circuit identification.

## 2.5 GROUNDING

- A. Comply with requirements in Division 26 Section "Grounding and Bonding for Electrical Systems." for grounding conductors and connectors.
- B. Comply with ANSI-J-STD-607-A.

## 2.6 IDENTIFICATION PRODUCTS

- A. Comply with TIA/EIA-606-A and UL 969 for a system of labeling materials, including label stocks, laminating adhesives, and inks used by label printers.

## 2.7 SOURCE QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to evaluate cables.
- B. Factory test cables on reels according to TIA/EIA-568-B.1.
- C. Factory test UTP cables according to TIA/EIA-568-B.2.
- D. Cable will be considered defective if it does not pass tests and inspections.
- E. Prepare test and inspection reports.

## PART 3 - EXECUTION

### 3.1 ENTRANCE FACILITIES

- A. Coordinate backbone cabling with the protectors and demarcation point provided by communications service provider.

### 3.2 WIRING METHODS

- A. Wiring Method: Install cables in raceways and cable trays except within consoles, cabinets, desks, and counters. Conceal raceway and cables except in unfinished spaces.
  - 1. Install plenum cable in environmental air spaces, including plenum ceilings.
  - 2. Comply with requirements for raceways and boxes specified in Division 26 Section "Raceway and Boxes for Electrical Systems."
- B. Wiring Method: Conceal conductors and cables in accessible ceilings, walls, and floors where possible.
- C. Wiring within Enclosures: Bundle, lace, and train cables within enclosures. Connect to terminal points with no excess and without exceeding manufacturer's limitations on bending radii. Provide and use lacing bars and distribution spools.

### 3.3 INSTALLATION OF PATHWAYS

- A. Cable Trays: Comply with NEMA VE 2 and TIA/EIA-569-A.
- B. Comply with requirements for demarcation point, pathways, cabinets, and racks specified in Division 27 Section "Communications Equipment Room Fittings." Drawings indicate general arrangement of pathways and fittings.
- C. Comply with TIA/EIA-569-A for pull-box sizing and length of conduit and number of bends between pull points.
- D. Comply with requirements in Division 26 Section "Raceway and Boxes for Electrical Systems" for installation of conduits and wireways.
- E. Install manufactured conduit sweeps and long-radius elbows whenever possible.
- F. Pathway Installation in Communications Equipment Rooms:
  - 1. Position conduit ends adjacent to a corner on backboard where a single piece of plywood is installed, or in the corner of room where multiple sheets of plywood are installed around perimeter walls of room.
  - 2. Install cable trays to route cables if conduits cannot be located in these positions.
  - 3. Secure conduits to backboard when entering room from overhead.
  - 4. Extend conduits 3 inches above finished floor.
  - 5. Install metal conduits with grounding bushings and connect with grounding conductor to grounding system.
- G. Backboards: Install backboards with 96-inch dimension vertical. Butt adjacent sheets tightly, and form smooth gap-free corners and joints.

### 3.4 INSTALLATION OF CABLES

- A. Comply with NECA 1.

B. General Requirements for Cabling:

1. Comply with TIA/EIA-568-B.1.
2. Comply with BICSI ITSIM, Ch. 6, "Cable Termination Practices."
3. Install 110-style IDC termination hardware unless otherwise indicated.
4. Terminate all conductors; no cable shall contain unterminated elements. Make terminations only at indicated outlets, terminals, cross-connects, and patch panels.
5. Cables may not be spliced. Secure and support cables at intervals not exceeding 30 inches and not more than 6 inches from cabinets, boxes, fittings, outlets, racks, frames, and terminals.
6. Install lacing bars to restrain cables, to prevent straining connections, and to prevent bending cables to smaller radii than minimums recommended by manufacturer.
7. Bundle, lace, and train conductors to terminal points without exceeding manufacturer's limitations on bending radii, but not less than radii specified in BICSI ITSIM, "Cabling Termination Practices" Chapter. Use lacing bars and distribution spools.
8. Do not install bruised, kinked, scored, deformed, or abraded cable. Do not splice cable between termination, tap, or junction points. Remove and discard cable if damaged during installation and replace it with new cable.
9. Cold-Weather Installation: Bring cable to room temperature before dereeling. Heat lamps shall not be used for heating.
10. In the communications equipment room, install a 10-foot-long service loop on each end of cable.
11. Pulling Cable: Comply with BICSI ITSIM, Ch. 4, "Pulling Cable." Monitor cable pull tensions.

C. UTP Cable Installation:

1. Comply with TIA/EIA-568-B.2.
2. Do not untwist UTP cables more than 1/2 inch from the point of termination to maintain cable geometry.

D. Open-Cable Installation:

1. Install cabling with horizontal and vertical cable guides in telecommunications spaces with terminating hardware and interconnection equipment.
2. Suspend UTP cable not in a wireway or pathway, a minimum of 8 inches above ceilings by cable supports not more than 60 inches apart.
3. Cable shall not be run through structural members or in contact with pipes, ducts, or other potentially damaging items.

E. Installation of Cable Routed Exposed under Raised Floors:

1. Install plenum-rated cable only.
2. Install cabling after the flooring system has been installed in raised floor areas.
3. Coil cable long not less than 12 inches in diameter below each feed point.

F. Group connecting hardware for cables into separate logical fields.

### 3.5 FIRESTOPPING

- A. Comply with requirements in Division 07 Section "Penetration Firestopping." Comply with TIA/EIA-569-A, Annex A, "Firestopping."
- B. Comply with BICSI TDMM, "Firestopping Systems" Article.

### 3.6 GROUNDING

- A. Install grounding according to BICSI TDMM, "Grounding, Bonding, and Electrical Protection" Chapter.
- B. Comply with ANSI-J-STD-607-A.
- C. Locate grounding bus bar to minimize the length of bonding conductors. Fasten to wall allowing at least 2-inch clearance behind the grounding bus bar. Connect grounding bus bar with a minimum No. 4 AWG grounding electrode conductor from grounding bus bar to suitable electrical building ground.
- D. Bond metallic equipment to the grounding bus bar, using not smaller than No. 6 AWG equipment grounding conductor.

### 3.7 IDENTIFICATION

- A. Identify system components, wiring, and cabling complying with TIA/EIA-606-A. Comply with requirements for identification specified in Division 26 Section "Identification for Electrical Systems."
  - 1. Color-code cross-connect fields and apply colors to voice and data service backboards, connections, covers, and labels.
- B. Comply with requirements in Division 09 Section "Interior Painting" for painting backboards. For fire-resistant plywood, do not paint over manufacturer's label.
- C. See Evaluations for discussion about TIA/EIA standard as it applies to this Section. Paint and label colors for equipment identification shall comply with TIA/EIA-606-A for Class 2 level of administration.
- D. Cable Schedule: Install in a 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.
- E. 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.
- F. 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. Exposed Cables and Cables in Cable Trays and Wire Troughs: Label each cable at intervals not exceeding 15 feet.
  4. Label each terminal strip and screw terminal in each cabinet, rack, or panel.
    - a. Individually number wiring conductors connected to terminal strips and identify each cable or wiring group being extended from a panel or cabinet to a building-mounted device with name and number of particular device as shown.
    - b. Label each unit and field within distribution racks and frames.
  5. Identification within Connector Fields in Equipment Rooms and Wiring Closets: Label each connector and each discrete unit of cable-terminating and connecting hardware. Where similar jacks and plugs are used for both voice and data communication cabling, use a different color for jacks and plugs of each service.
- G. 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, for the following:
1. Cables use flexible vinyl or polyester that flexes as cables are bent.

### 3.8 FIELD QUALITY CONTROL

#### A. Tests and Inspections:

1. Visually inspect UTP jacket materials for NRTL certification markings. Inspect cabling terminations in communications equipment rooms for compliance with color-coding for pin assignments, and inspect cabling connections for compliance with TIA/EIA-568-B.1.
2. Visually inspect cable placement, cable termination, grounding and bonding, equipment and patch cords, and labeling of all components.
3. Test UTP copper cabling for DC loop resistance, shorts, opens, intermittent faults, and polarity between conductors. Test operation of shorting bars in connection blocks. Test cables after termination but not cross-connection.
  - a. Test instruments shall meet or exceed applicable requirements in TIA/EIA-568-B.2. Perform tests with a tester that complies with performance requirements in "Test Instruments (Normative)" Annex, complying with measurement accuracy specified in "Measurement Accuracy (Informative)" Annex. Use only test cords and adapters that are qualified by test equipment manufacturer for channel or link test configuration.

- B. Data for each measurement shall be documented. Data for submittals shall be printed in a summary report that is formatted similar to Table 10.1 in BICSI TDMM, or transferred from the instrument to the computer, saved as text files, and printed and submitted.

- C. Remove and replace cabling where test results indicate that they do not comply with specified requirements.
- D. Prepare test and inspection reports.

**END OF SECTION**

## SECTION 271500

### COMMUNICATIONS HORIZONTAL CABLING

#### PART 1 - GENERAL

##### 1.1 SUMMARY

###### A. Section Includes:

1. Pathways.
2. UTP cabling.
3. Multiuser telecommunications outlet assemblies.
4. Cable connecting hardware, patch panels, and cross-connects.
5. Telecommunications outlet/connectors.
6. Cabling identification products.
7. Cabling administration system

###### B. Related Sections:

1. Division 27 Section "Communications Backbone Cabling" for voice and data cabling associated with system panels and devices.

##### 1.2 HORIZONTAL CABLING DESCRIPTION

###### A. Horizontal cable and its connecting hardware provide the means of transporting signals between the telecommunications outlet/connector and the horizontal cross-connect located in the communications equipment room. This cabling and its connecting hardware are called "permanent link," a term that is used in the testing protocols.

1. TIA/EIA-568-B.1 requires that a minimum of two telecommunications outlet/connectors be installed for each work area. Note that some areas are served by wireless only.
2. Horizontal cabling shall contain no more than one transition point or consolidation point between the horizontal cross-connect and the telecommunications outlet/connector.
3. Bridged taps and splices shall not be installed in the horizontal cabling.

##### 1.3 PERFORMANCE REQUIREMENTS

###### A. General Performance: Horizontal cabling system shall comply with transmission standards in TIA/EIA-568-B.1, when tested according to test procedures of this standard.

##### 1.4 SUBMITTALS

###### A. Product Data: For each type of product indicated.

B. Shop Drawings:

1. System Labeling Schedules: Electronic copy of labeling schedules, in software and format selected by Owner.
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, including the following:
  - a. Cross-connects.
  - b. Patch panels.
  - c. Patch cords.
5. Cross-connects and patch panels. Detail mounting assemblies, and show elevations and physical relationship between the installed components.
6. Cable tray layout, showing cable tray route to scale, with relationship between the tray and adjacent structural, electrical, and mechanical elements. Include the following:

C. Samples: For workstation outlets, jacks, jack assemblies, in specified finish, one for each size and outlet configuration and faceplates for color selection and evaluation of technical features.

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

E. Source quality-control reports.

F. Field quality-control reports.

G. Maintenance data.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Cabling Installer must have personnel certified by BICSI on staff.

1. Layout Responsibility: Preparation of Shop Drawings by an RCDD.
2. Installation Supervision: Installation shall be under the direct supervision of Registered Technician, who shall be present at all times when Work of this Section is performed at Project site.

B. Surface-Burning Characteristics: As determined by testing identical products according to ASTM E 84 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Flame-Spread Index: 25 or less.
2. Smoke-Developed Index: 50 or less.

C. 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.

D. Telecommunications Pathways and Spaces: Comply with TIA/EIA-569-A.

- E. Grounding: Comply with ANSI-J-STD-607-A.

## 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Test cables upon receipt at Project site. Test each pair of UTP cable for open and short circuits.

## PART 2 - PRODUCTS

### 2.1 PATHWAYS

- A. Cable Support: NRTL labeled for support of Category 6 cabling, designed to prevent degradation of cable performance and pinch points that could damage cable.

1. Support brackets with cable tie slots for fastening cable ties to brackets.
2. Lacing bars, spools, J-hooks, and D-rings.
3. Straps and other devices.

- B. Cable Trays:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - a. Cable Management Solutions, Inc.
  - b. Cablofil Inc.
  - c. Cooper B-Line, Inc.
  - d. Cope - Tyco/Allied Tube & Conduit.
  - e. GS Metals Corp.
2. Cable Tray Materials: Metal, suitable for indoors, and protected against corrosion by electroplated zinc galvanizing, complying with ASTM B 633, Type 1, not less than 0.000472 inch thick.
  - a. Basket Cable Trays: 24 inches wide and 6 inches deep. Wire mesh spacing shall not exceed 2 by 4 inches.

- C. Conduit and Boxes: Comply with requirements in Division 26 Section "Raceway and Boxes for Electrical Systems."

1. Outlet boxes shall be no smaller than 2 inches wide, 3 inches high, and 2-1/2 inches deep.

### 2.2 BACKBOARDS

- A. Backboards: Plywood, fire-retardant treated, 3/4 by 48 by 96 inches. Comply with requirements in Division 06 Section "Rough Carpentry" for plywood backing panels.

## 2.3 UTP CABLE

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. Belden CDT Inc.; Electronics Division.
  2. Berk-Tek; a Nexans company.
  3. CommScope, Inc.
  4. Draka USA.
  5. Genesis Cable Products; Honeywell International, Inc.
  6. KRONE Incorporated.
  7. Mohawk; a division of Belden CDT.
  8. Nordex/CDT; a subsidiary of Cable Design Technologies.
  9. Superior Essex Inc.
  10. SYSTIMAX Solutions; a CommScope, Inc. brand.
  11. 3M.
  12. Tyco Electronics/AMP Netconnect; Tyco International Ltd.
- B. Description: 100-ohm, 4-pair UTP, covered with a blue thermoplastic jacket.
1. Comply with ICEA S-90-661 for mechanical properties.
  2. Comply with TIA/EIA-568-B.1 for performance specifications.
  3. Comply with TIA/EIA-568-B.2, Category 6.
  4. Listed and labeled by an NRTL acceptable to authorities having jurisdiction as complying with UL 444 and NFPA 70 for the following types:
    - a. Communications, General Purpose: Type CM or CMG.
    - b. Communications, Plenum Rated: Type CMP, complying with NFPA 262.
    - c. Communications, Riser Rated: Type CMR, complying with UL 1666.
    - d. Communications, Limited Purpose: Type CMX.
    - e. Multipurpose: Type MP or MPG.
    - f. Multipurpose, Plenum Rated: Type MPP, complying with NFPA 262.
    - g. Multipurpose, Riser Rated: Type MPR, complying with UL 1666.

## 2.4 UTP CABLE HARDWARE

- 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. American Technology Systems Industries, Inc.
  2. Dynacom Corporation.
  3. Hubbell Premise Wiring.
  4. KRONE Incorporated.
  5. Leviton Voice & Data Division.
  6. Molex Premise Networks; a division of Molex, Inc.
  7. Nordex/CDT; a subsidiary of Cable Design Technologies.
  8. Panduit Corp.
  9. Siemon Co. (The).
  10. Tyco Electronics/AMP Netconnect; Tyco International Ltd.

- B. General Requirements for Cable Connecting Hardware: Comply with TIA/EIA-568-B.2, IDC type, with modules designed for punch-down caps or tools. Cables shall be terminated with connecting hardware of same category or higher.
- C. Connecting Blocks: 110-style IDC for Category 6. Provide blocks for the number of cables terminated on the block, plus 25 percent spare. Integral with connector bodies, including plugs and jacks where indicated.
- D. Cross-Connect: Modular array of connecting blocks arranged to terminate building cables and permit interconnection between cables.
  - 1. Number of Terminals per Field: One for each conductor in assigned cables.
- E. Patch Panel: Modular panels housing multiple-numbered jack units with IDC-type connectors at each jack for permanent termination of pair groups of installed cables.
  - 1. Number of Jacks per Field: One for each four-pair UTP cable indicated.
- F. Jacks and Jack Assemblies: Modular, color-coded, eight-position modular receptacle units with integral IDC-type terminals.
- G. Patch Cords: Factory-made, four-pair cables in 48-inch lengths; terminated with eight-position modular plug at each end.
  - 1. Patch cords shall have bend-relief-compliant boots and color-coded icons to ensure Category 6 performance. Patch cords shall have latch guards to protect against snagging.
  - 2. Patch cords shall have color-coded boots for circuit identification.

## 2.5 CONSOLIDATION POINTS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - 1. American Technology Systems Industries, Inc.
  - 2. Chatsworth Products, Inc.
  - 3. Dynacom Corporation.
  - 4. Hubbell Premise Wiring.
  - 5. Molex Premise Networks; a division of Molex, Inc.
  - 6. Nordex/CDT; a subsidiary of Cable Design Technologies.
  - 7. Ortronics, Inc.
  - 8. Panduit Corp.
  - 9. Siemon Co. (The).
- B. Description: Consolidation points shall comply with requirements for cable connecting hardware.
  - 1. Number of Terminals per Field: One for each conductor in assigned cables.
  - 2. Number of Connectors per Field:
    - a. One for each four-pair UTP cable indicated.

- b. One for each four-pair conductor group of indicated cables, plus 25 percent spare positions.
- 3. Mounting: Recessed in ceiling, Wall, Desk, Table, Furniture, and modular furniture.
- 4. NRTL listed as complying with UL 50 and UL 1863.
- 5. When installed in plenums used for environmental air, NRTL listed as complying with UL 2043.

## 2.6 OUTLET/CONNECTORS

- A. Jacks: 100-ohm, balanced, twisted-pair connector; four-pair, eight-position modular. Comply with TIA/EIA-568-B.1.
- B. Outlets: Four-port-connector assemblies mounted in multigang faceplate.
  - 1. Metal Faceplate: Stainless steel, complying with requirements in Division 26 Section "Wiring Devices."
  - 2. For use with snap-in jacks accommodating any combination of UTP work area cords.
    - a. Flush mounting jacks, positioning the cord at a 45-degree angle.
  - 3. Legend: Machine printed, in the field, using adhesive-tape label.

## 2.7 GROUNDING

- A. Comply with requirements in Division 26 Section "Grounding and Bonding for Electrical Systems" for grounding conductors and connectors.
- B. Comply with ANSI-J-STD-607-A.

## 2.8 IDENTIFICATION PRODUCTS

- A. Comply with TIA/EIA-606-A and UL 969 for a system of labeling materials, including label stocks, laminating adhesives, and inks used by label printers.
- B. Comply with requirements in Division 26 Section "Identification for Electrical Systems."

## 2.9 SOURCE QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to evaluate cables.
- B. Factory test UTP cables on reels according to TIA/EIA-568-B.1.
- C. Factory test UTP cables according to TIA/EIA-568-B.2.
- D. Cable will be considered defective if it does not pass tests and inspections.
- E. Prepare test and inspection reports.

## PART 3 - EXECUTION

### 3.1 ENTRANCE FACILITIES

- A. Coordinate backbone cabling with the protectors and demarcation point provided by communications service provider.

### 3.2 WIRING METHODS

- A. Wiring Method: Install cables in raceways and cable trays except within consoles, cabinets, desks, and counters and except in accessible ceiling spaces, in attics, and in gypsum board partitions where unenclosed wiring method may be used. Conceal raceway and cables except in unfinished spaces.
  - 1. Install plenum cable in environmental air spaces, including plenum ceilings.
  - 2. Comply with requirements for raceways and boxes specified in Division 26 Section "Raceway and Boxes for Electrical Systems."
- B. Wiring Method: Conceal conductors and cables in accessible ceilings, walls, and floors where possible.
- C. Wiring within Enclosures: Bundle, lace, and train cables to terminal points with no excess and without exceeding manufacturer's limitations on bending radii. Provide and use lacing bars and distribution spools.

### 3.3 INSTALLATION OF PATHWAYS

- A. Cable Trays: Comply with NEMA VE 2 and TIA/EIA-569-A-7.
- B. Comply with requirements for demarcation point, pathways, cabinets, and racks specified in Division 27 Section "Communications Equipment Room Fittings." Drawings indicate general arrangement of pathways and fittings.
- C. Comply with TIA/EIA-569-A for pull-box sizing and length of conduit and number of bends between pull points.
- D. Comply with requirements in Division 26 Section "Raceway and Boxes for Electrical Systems" for installation of conduits and wireways.
- E. Install manufactured conduit sweeps and long-radius elbows whenever possible.
- F. Pathway Installation in Communications Equipment Rooms:
  - 1. Position conduit ends adjacent to a corner on backboard where a single piece of plywood is installed, or in the corner of room where multiple sheets of plywood are installed around perimeter walls of room.
  - 2. Install cable trays to route cables if conduits cannot be located in these positions.
  - 3. Secure conduits to backboard when entering room from overhead.

4. Extend conduits 3 inches above finished floor.
  5. Install metal conduits with grounding bushings and connect with grounding conductor to grounding system.
- G. Backboards: Install backboards with 96-inch dimension vertical. Butt adjacent sheets tightly, and form smooth gap-free corners and joints.

### 3.4 INSTALLATION OF CABLES

- A. Comply with NECA 1.

- B. General Requirements for Cabling:

1. Comply with TIA/EIA-568-B.1.
2. Comply with BICSI ITSIM, Ch. 6, "Cable Termination Practices."
3. Install 110-style IDC termination hardware unless otherwise indicated.
4. Terminate conductors; no cable shall contain unterminated elements. Make terminations only at indicated outlets, terminals, cross-connects, and patch panels.
5. Cables may not be spliced. Secure and support cables at intervals not exceeding 30 inches and not more than 6 inches from cabinets, boxes, fittings, outlets, racks, frames, and terminals.
6. Install lacing bars to restrain cables, to prevent straining connections, and to prevent bending cables to smaller radii than minimums recommended by manufacturer.
7. Bundle, lace, and train conductors to terminal points without exceeding manufacturer's limitations on bending radii, but not less than radii specified in BICSI ITSIM, "Cabling Termination Practices" Chapter. Install lacing bars and distribution spools.
8. Do not install bruised, kinked, scored, deformed, or abraded cable. Do not splice cable between termination, tap, or junction points. Remove and discard cable if damaged during installation and replace it with new cable.
9. Cold-Weather Installation: Bring cable to room temperature before dereeling. Heat lamps shall not be used for heating.
10. In the communications equipment room, install a 10-foot-long service loop on each end of cable.
11. Pulling Cable: Comply with BICSI ITSIM, Ch. 4, "Pulling Cable." Monitor cable pull tensions.

- C. UTP Cable Installation:

1. Comply with TIA/EIA-568-B.2.
2. Do not untwist UTP cables more than 1/2 inch from the point of termination to maintain cable geometry.

- D. Open-Cable Installation:

1. Install cabling with horizontal and vertical cable guides in telecommunications spaces with terminating hardware and interconnection equipment.
2. Suspend UTP cable not in a wireway or pathway a minimum of 8 inches above ceilings by cable supports not more than 60 inches apart.

3. Cable shall not be run through structural members or in contact with pipes, ducts, or other potentially damaging items.
- E. Installation of Cable Routed Exposed under Raised Floors:
1. Install plenum-rated cable only.
  2. Install cabling after the flooring system has been installed in raised floor areas.
  3. Coil cable 6 feet long not less than 12 inches in diameter below each feed point.
- F. Group connecting hardware for cables into separate logical fields.

### 3.5 FIRESTOPPING

- A. Comply with requirements in Division 07 Section "Penetration Firestopping."
- B. Comply with TIA/EIA-569-A, Annex A, "Firestopping."
- C. Comply with BICSI TDMM, "Firestopping Systems" Article.

### 3.6 GROUNDING

- A. Install grounding according to BICSI TDMM, "Grounding, Bonding, and Electrical Protection" Chapter.
- B. Comply with ANSI-J-STD-607-A.
- C. Locate grounding bus bar to minimize the length of bonding conductors. Fasten to wall allowing at least 2-inch clearance behind the grounding bus bar. Connect grounding bus bar with a minimum No. 4 AWG grounding electrode conductor from grounding bus bar to suitable electrical building ground.
- D. Bond metallic equipment to the grounding bus bar, using not smaller than No. 6 AWG equipment grounding conductor.

### 3.7 IDENTIFICATION

- A. Identify system components, wiring, and cabling complying with TIA/EIA-606-A. Comply with requirements for identification specified in Division 26 Section "Identification for Electrical Systems."
  1. Color-code cross-connect fields. Apply colors to voice and data service backboards, connections, covers, and labels.
- B. Comply with requirements in Division 09 Section "Interior Painting" for painting backboards. For fire-resistant plywood, do not paint over manufacturer's label.

- C. Paint and label colors for equipment identification shall comply with TIA/EIA-606-A for Class 2 level of administration.
- D. 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.
- E. Cabling Administration Drawings: Show building floor plans with cabling administration-point labeling. Identify labeling convention and show labels for telecommunications closets, backbone pathways and cables, entrance pathways and cables, 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 Owner.
- F. 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. Exposed Cables and Cables in Cable Trays and Wire Troughs: Label each cable at intervals not exceeding 15 feet.
  - 4. Label each terminal strip and screw terminal in each cabinet, rack, or panel.
    - a. Individually number wiring 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.
  - 5. Identification within Connector Fields in Equipment Rooms and Wiring Closets: Label each connector and each discrete unit of cable-terminating and connecting hardware. Where similar jacks and plugs are used for both voice and data communication cabling, use a different color for jacks and plugs of each service.
- G. 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.

### 3.8 FIELD QUALITY CONTROL

- A. Tests and Inspections:
  - 1. Visually inspect UTP cable jacket materials for NRTL certification markings. Inspect cabling terminations in communications equipment rooms for compliance with color-

- coding for pin assignments, and inspect cabling connections for compliance with TIA/EIA-568-B.1.
2. Visually confirm Category 6 marking of outlets, cover plates, outlet/connectors, and patch panels.
  3. Visually inspect cable placement, cable termination, grounding and bonding, equipment and patch cords, and labeling of all components.
  4. Test UTP backbone copper cabling for DC loop resistance, shorts, opens, intermittent faults, and polarity between conductors. Test operation of shorting bars in connection blocks. Test cables after termination but not cross-connection.
    - a. Test instruments shall meet or exceed applicable requirements in TIA/EIA-568-B.2. Perform tests with a tester that complies with performance requirements in "Test Instruments (Normative)" Annex, complying with measurement accuracy specified in "Measurement Accuracy (Informative)" Annex. Use only test cords and adapters that are qualified by test equipment manufacturer for channel or link test configuration.
  5. UTP Performance Tests:
    - a. Test for each outlet and MUTOA. Perform the following tests according to TIA/EIA-568-B.1 and TIA/EIA-568-B.2:
      - 1) Wire map.
      - 2) Length (physical vs. electrical, and length requirements).
      - 3) Insertion loss.
      - 4) Near-end crosstalk (NEXT) loss.
      - 5) Power sum near-end crosstalk (PSNEXT) loss.
      - 6) Equal-level far-end crosstalk (ELFEXT).
      - 7) Power sum equal-level far-end crosstalk (PSELFEXT).
      - 8) Return loss.
      - 9) Propagation delay.
      - 10) Delay skew.
  6. Final Verification Tests: Perform verification tests for UTP systems after the complete communications cabling and workstation outlet/connectors are installed.
    - a. Voice Tests: These tests assume that dial tone service has been installed. Connect to the network interface device at the demarcation point. Go off-hook and listen and receive a dial tone. If a test number is available, make and receive a local, long distance, and digital subscription line telephone call.
    - b. Data Tests: These tests assume the Information Technology Staff has a network installed and is available to assist with testing. Connect to the network interface device at the demarcation point. Log onto the network to ensure proper connection to the network.
- B. Document data for each measurement. Data for submittals shall be printed in a summary report that is formatted similar to Table 10.1 in BICSI TDMM, or transferred from the instrument to the computer, saved as text files, and printed and submitted.
- C. Prepare test and inspection reports.

3.9 DEMONSTRATION

- A. Train Owner's maintenance personnel in cable-plant management operations, including changing signal pathways for different workstations, rerouting signals in failed cables, and keeping records of cabling assignments and revisions when extending wiring to establish new workstation outlets.

**END OF SECTION**

**SECTION 271525**

**OPTICAL FIBER CABLES**

**PART 1 GENERAL**

**1.01 SUBMITTALS**

- A. Waiver of Submittals: The “Waiver of Certain Submittal Requirements” in Section 013300 does not apply to this Section.
- B. Submittals Package: Submit the shop drawings, product data, samples, and quality control submittals specified below at the same time as a package.
- C. Shop Drawings:
  - 1. Complete manufacturer’s construction details and specifications for the cables, including physical characteristics of optical fiber, strength members, and jackets.
  - 2. Overall dimension of cable.
  - 3. Termination data, including the following:
    - a. List of materials.
    - b. Method of terminating cables.
    - c. Details of cable preparation.
    - d. Method of applying materials (including quantities).
    - e. Precautionary measures.
    - f. Drawings showing method of termination, complete with dimensions.
    - g. Written statement from cable manufacturer that terminations submitted are acceptable.
    - h. Written statement from termination manufacturer that terminations submitted are suitable for the proposed application.
  - 4. Cable manufacturer’s certified test data (attenuation, bandwidth).
  - 5. Maximum pulling strain allowed for each type cable.
- D. Product Data:
  - 1. Catalog sheets, specifications and installation instructions for all products.
  - 2. Statement from the Company providing the system for which the optical fiber cables are proposed to be used, indicating that the optical characteristics meet the requirements of the Company.
  - 3. Written statement from cable manufacturer indicating recommended pulling compounds.
- E. Samples:
  - 1. Two 2-foot samples of each type cable.
  - 2. Samples of termination materials.
- F. Quality Control Submittals:

1. Installers' Qualifications Data: Include the following for each person who will be performing the Work:
    - a. Name.
    - b. Employers name, business address and telephone number.
    - c. Name and addresses of the required number of similar projects worked on which meet the experience criteria.
  2. Company Field Advisor Data: Include:
    - a. Name, business address and telephone number of Company Field Advisor secured for the required services.
    - b. Certified statement from the Company listing the qualifications of the Company Field Advisor.
    - c. Services and each product for which authorization is given by the Company, listed specifically for this project.
  3. Cable Terminator's Resume: Name and address of each person who will be performing cable terminations with resume of terminator's experience (include details of types of terminations, types of cable, job locations and number of years performing terminations).
- G. Contract Closeout Submittals:
1. After installation test report.

## **1.02 QUALITY ASSURANCE**

- A. Equipment Qualifications For Products Other Than Those Specified:
1. At the time of submission provide written notice to the Director of the intent to propose an "or equal" for products other than those specified. Make the "or equal" submission in a timely manner to allow the Director sufficient time to review the proposed product, perform inspections and witness test demonstrations.
  2. If products other than those specified are proposed for use furnish the name, address, and telephone numbers of at least 5 comparable installations that can prove the proposed products have performed satisfactorily for 3 years. Certify in writing that the owners of the 5 comparable installations will allow inspection of their installation by the Director's Representative and the Company Field Advisor.
    - a. Make arrangements with the owners of 2 installations (selected by the Director) for inspection of the installations by the Director's Representative. Also obtain the services of the Company Field Advisor for the proposed products to be present. Notify the Director a minimum of 3 weeks prior to the availability of the installations for the inspection, and provide at least one alternative date for each inspection.
    - b. Only references from the actual owner or owner's representative (Security Supervisor, Maintenance Supervisor, etc.) will be accepted. References from dealers, system installers or others, who are not the actual owners of the proposed products, are not acceptable.
      - 1) Verify the accuracy of all references submitted prior to submission and certify in writing that the accuracy of the information has been confirmed.

3. The product manufacturer shall have test facilities available that can demonstrate that the proposed products meet the contract requirements.
    - a. Make arrangements with the test facility for the Director's Representative to witness test demonstrations. Also obtain the services of the Company Field Advisor for the proposed product to be present at the test facility. Notify the Director a minimum of 3 weeks prior to the availability of the test facility, and provide at least one alternative date for the testing.
  4. Provide written certification from the manufacturer that the proposed products are compatible for use with all other equipment proposed for use for this system and meet all contract requirements.
- B. **Installers' Qualifications:** The persons installing the Work of this Section, and their supervisor, shall be personally experienced in optical fiber cable systems and shall have been engaged in the installation of optical fiber cable systems for a minimum of 3 years.
1. Furnish to the Director the names and addresses of 5 similar projects that the foregoing people have worked on during the past 3 years.
- C. **Company Field Advisor:** Secure the services of the cable manufacturer's Company Field Advisor for a minimum of 40 working hours at the contract site for the following:
1. Render advice regarding method of installing cable.
  2. Inspection of equipment for installing cable.
  3. Witness representative amount of cable pulling.
  4. Witness installation of at least one termination by each cable terminator who will be doing the actual cable termination.
    - a. If the terminations are other than the cable manufacturer's, secure the services of the termination manufacturer's Company Field Advisor to concurrently witness installation of the terminations and also certify with an affidavit that the terminations were installed in accordance with the termination manufacturer's recommendations.
  5. Witness after installation test.
  6. Certify with an affidavit that the aforementioned particulars are satisfactory and the cable is installed in accordance with cable manufacturer's recommendations.

### **1.03 DELIVERY, STORAGE AND HANDLING**

- A. **Cable Delivery:**
1. No cable over one year old when delivered to the site will be accepted.
  2. Keep ends of cables sealed at all times, except when making terminations. Use methods approved by cable manufacturer.
  3. Include the following data durably marked on each reel:
    - a. Facility name and address.
    - b. Contractor's name.
    - c. Project title and number.
    - d. Date of manufacture.
    - e. Manufacturer's name.

- f. Linear feet.
  - g. Location where cable is to be installed (Example: Between manholes No. \_\_\_\_\_ and \_\_\_\_\_).
- B. Cable Storage: Store where cable will be at temperature recommended by cable manufacturer for optimum workability.

## PART 2 PRODUCTS

### 2.01 62.5 MICRON/125 MICRON (CORE/CLAD) OPTICAL FIBER CABLES

- A. Type LAN-O: 2 optical fibers, each fiber in an individual gel filled loose tube, suitable for indoor use as OFNP plenum type cable and outdoors for aerial and underground applications. General Cable' CT0023MID.
1. 2 optical fibers.
    - a. Each fiber in an individual gel filled loose tube.
    - b. Fiber diameter (core/clad): 62.5 micron/125 micron.
    - c. Fiber type: Graded index multimode fiber.
    - d. Maximum Fiber Attenuation:
      - 1) 3.5 dB/km (@850nm).
      - 2) 1.0 dB/km(@1300nm).
    - e. Minimum Fiber Bandwidth:
      - 1) 160 MHZ-km (@850nm).
      - 2) 500 MHZ-km (@1300nm).
  2. Central strength member: Epoxy/fiber glass rod or equal.
  3. Inner Jacket: Polyvinyl chloride (PVC) or polyethylene (PE).
  4. Outer strength member: Aramid yarn.
  5. Outer Jacket: Ultraviolet and moisture resistant black high-density polyethylene.
  6. Suitable for direct burial.
  7. Breakout Kits: General Cable' BOKL-02/C.
- B. Type LAN-O: 6 optical fibers, each fiber in an individual gel filled loose tube, suitable for indoor use as OFNP plenum type cable and outdoors for aerial and underground applications. General Cable' CT0023MID.
1. 6 optical fibers.
    - a. Each fiber in an individual gel filled loose tube.
    - b. Fiber diameter (core/clad): 62.5 micron/125 micron.
    - c. Fiber type: Graded index multimode fiber.
    - d. Maximum Fiber Attenuation:
      - 1) 3.5 dB/km (@850nm).
      - 2) 1.0 dB/km(@1300nm).
    - e. Minimum Fiber Bandwidth:
      - 1) 160 MHZ-km (@850nm).
      - 2) 500 MHZ-km (@1300nm).
  2. Central strength member: Epoxy/fiber glass rod or equal.
  3. Inner Jacket: Polyvinyl chloride (PVC) or polyethylene (PE).
  4. Outer strength member: Aramid yarn.

- 5. Outer Jacket: Ultraviolet and moisture resistant black high-density polyethylene.
- 6. Suitable for direct burial.
- 7. Breakout Kits: General Cable' BOKL-06/C.
- C. Type LAN-I: 2 optical fiber, OFNP plenum type breakout cable; General Cable' CT0021B1U.

## 2.02 CONNECTORS

- A. General: Furnish connectors and components, and use specific tools and methods as recommended by connector manufacturer to form complete connector system:
  - 1. Terminations: To suit requirements of optical fiber video transmitter and receiver.
    - a. Body Material: Steel.
    - b. Ferrule Material: Stainless steel.

## 2.03 ACCESSORIES

- A. Pulling Compounds: As recommended by cable manufacturer.
- B. Tags: Precision engrave letters and numbers with uniform margins, character size minimum 3/16 inches high.
  - 1. Phenolic: Two color laminated engraver's stock, 1/16 inch minimum thickness, machine engraved to expose inner core color (white).
  - 2. Aluminum: Standard aluminum alloy plate stock, minimum .032 inches thick, engraved areas enamel filled or background enameled with natural aluminum engraved characters.
- C. Markers:
  - 1. Premarked self-adhesive; W. H. Brady Co.'s, B292, B708; Ideal Industries' Mylar/Cloth wire markers; or Markwick Corp.'s permanent wire markers; Plastic Extruded Parts, Inc.'s Flexible Sleeve or ID Band Markers; or Thomas and Betts Co.'s E-Z Code WSL self-laminating.
  - 2. Other Styles: To suit application by W. H. Brady Co., Ideal Industries, Marwick Corp., Plastic Extruded Parts, Inc., or Thomas and Betts Co.

## PART 3 EXECUTION

### 3.01 PREPARATION

- A. Before installing cable, test the cable on the reels to verify that the cables' parameters are in accordance with the manufacturers' certified test data.

### 3.02 INSTALLATION

- A. Installing Cables:
  - 1. Install cables in conduit after conduit system is completed.

2. Keep ends of cables sealed watertight at all times, except when making terminations.
  3. No grease, oil, lubricant other than approved pulling compound may be used to facilitate the pulling-in of cables.
  4. Use pulling attachment connected to the cable strength member for pulling in cables. Seal pulling attachment watertight.
  5. Incorporate into the pull line at the pulling attachment a tension-control swivel containing a shear pin designed to fail if the pre-determined maximum cable strain is applied.
  6. Pull cables with a dynamometer or strain gage incorporated into the pulling equipment. Do not pull cables unless the Director's Representative is present to observe readings on the dynamometer or strain gage during the time of actual pulling. Do not exceed cable manufacturer's recommended pulling strain.
- B. Terminations and Splices:
1. Terminate cable in accordance with manufacturer's approved installation instructions.
  2. No splicing of optical fiber cables will be allowed.
- C. Identification of Optical Fiber Cables: Identify cables in manholes, pullboxes and in equipment to which they connect:
1. Install tags on each cable indicating cable number, date installed (month, year), type of cable, and manufacturer. Attach tags to cables with non-ferrous metal wire or brass chain.
  2. Use markers to identify each optical fiber in equipment to which they connect.

### **3.03 FIELD QUALITY CONTROL**

- A. After Installation Test:
1. Perform test on each active and spare optical fiber after cable has been installed complete with connectors, and prior to placing cable into service.
    - a. Demonstrate that the amount of power coupled into each optical fiber by its transmitter, the attenuation and connector losses, and the power received at the detector in the receiver is no greater than 75 percent of the parameters required by the transmitter/receiver manufacturer.
  2. Perform test in the presence of the Director's Representative.
  3. Supply equipment necessary for performing test.
  4. Submit written report of test results signed by Company Field Advisor and Director's Representative. Mount a copy of the final report in a plexiglass enclosed frame assembly adjacent to the Fire Command Station.

### **3.04 OPTICAL FIBER CABLE SCHEDULE**

- A. Type LAN-O: Use for exterior underground or interior communication bus circuits.

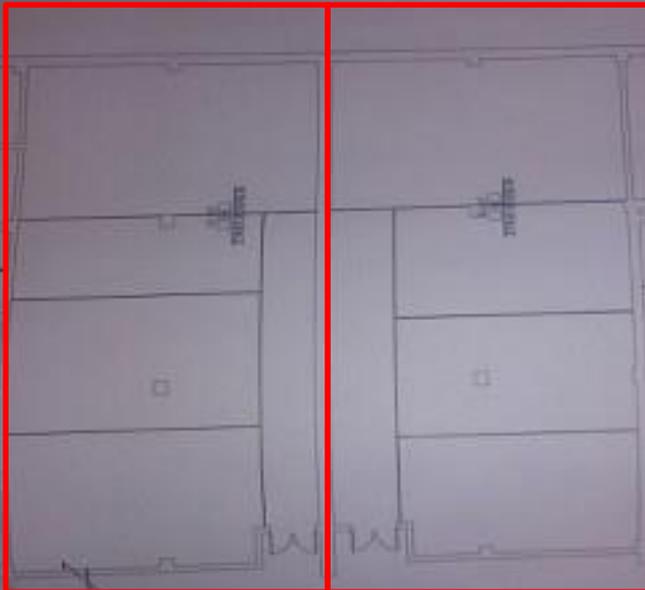
- B. Type LAN-I: Use for interior communication bus circuits.

**END OF SECTION**

# Basement Storage Area

Gov't Team

Contractors

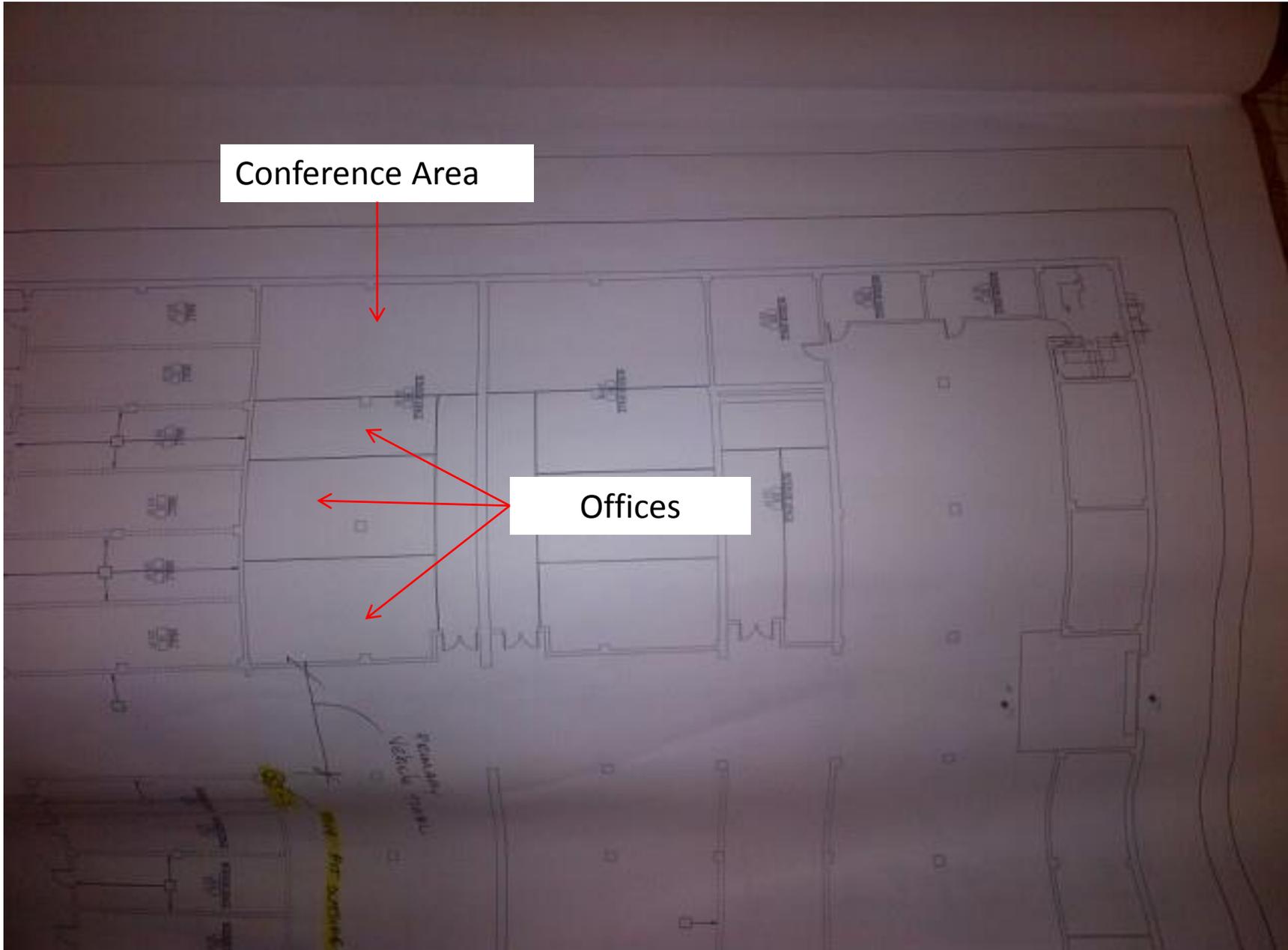


Remainder  
Vehicle area

See first drawing

Conference Area

Offices



Conference Area

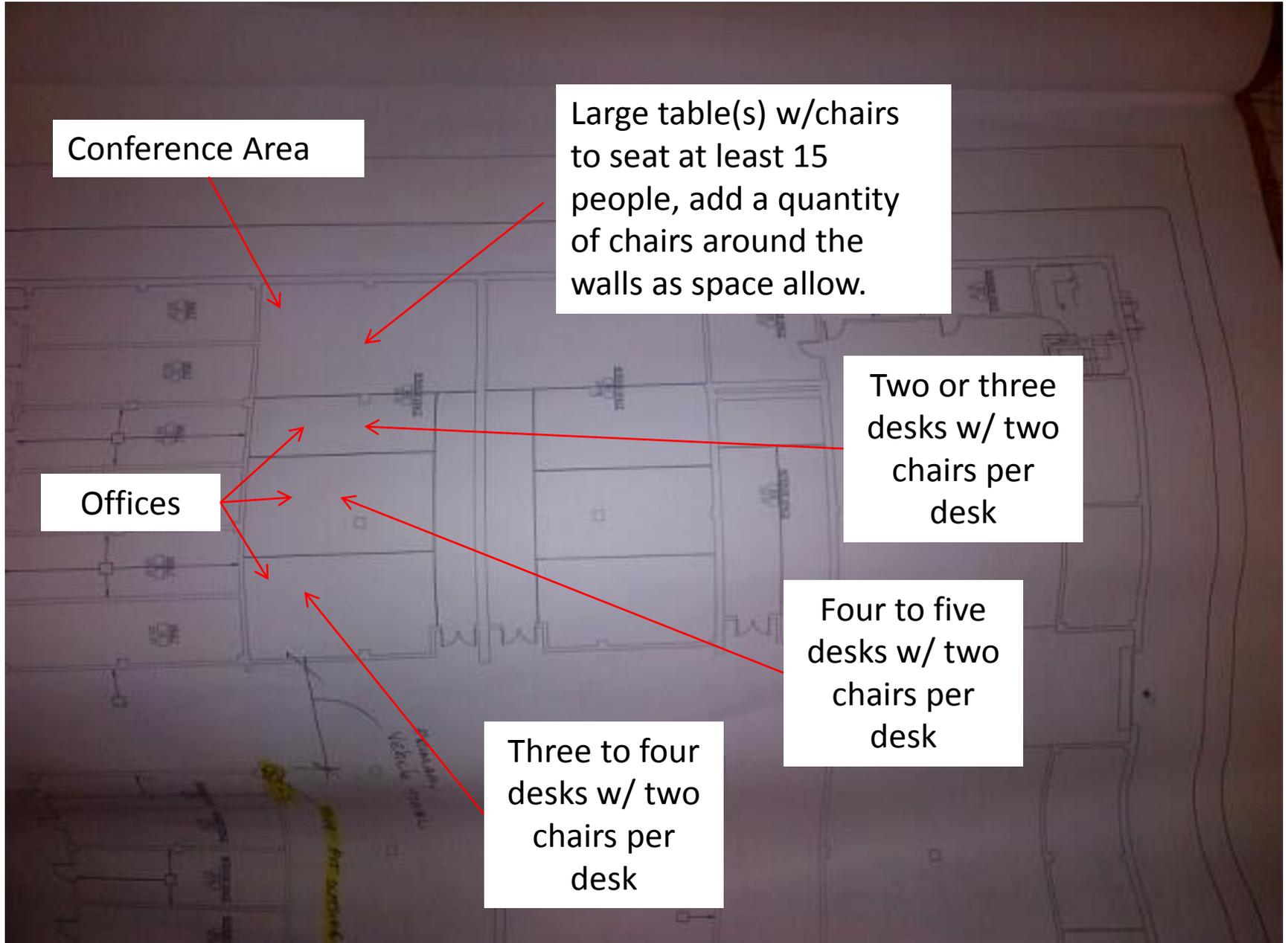
Large table(s) w/chairs to seat at least 15 people, add a quantity of chairs around the walls as space allow.

Offices

Two or three desks w/ two chairs per desk

Four to five desks w/ two chairs per desk

Three to four desks w/ two chairs per desk



Conference Area

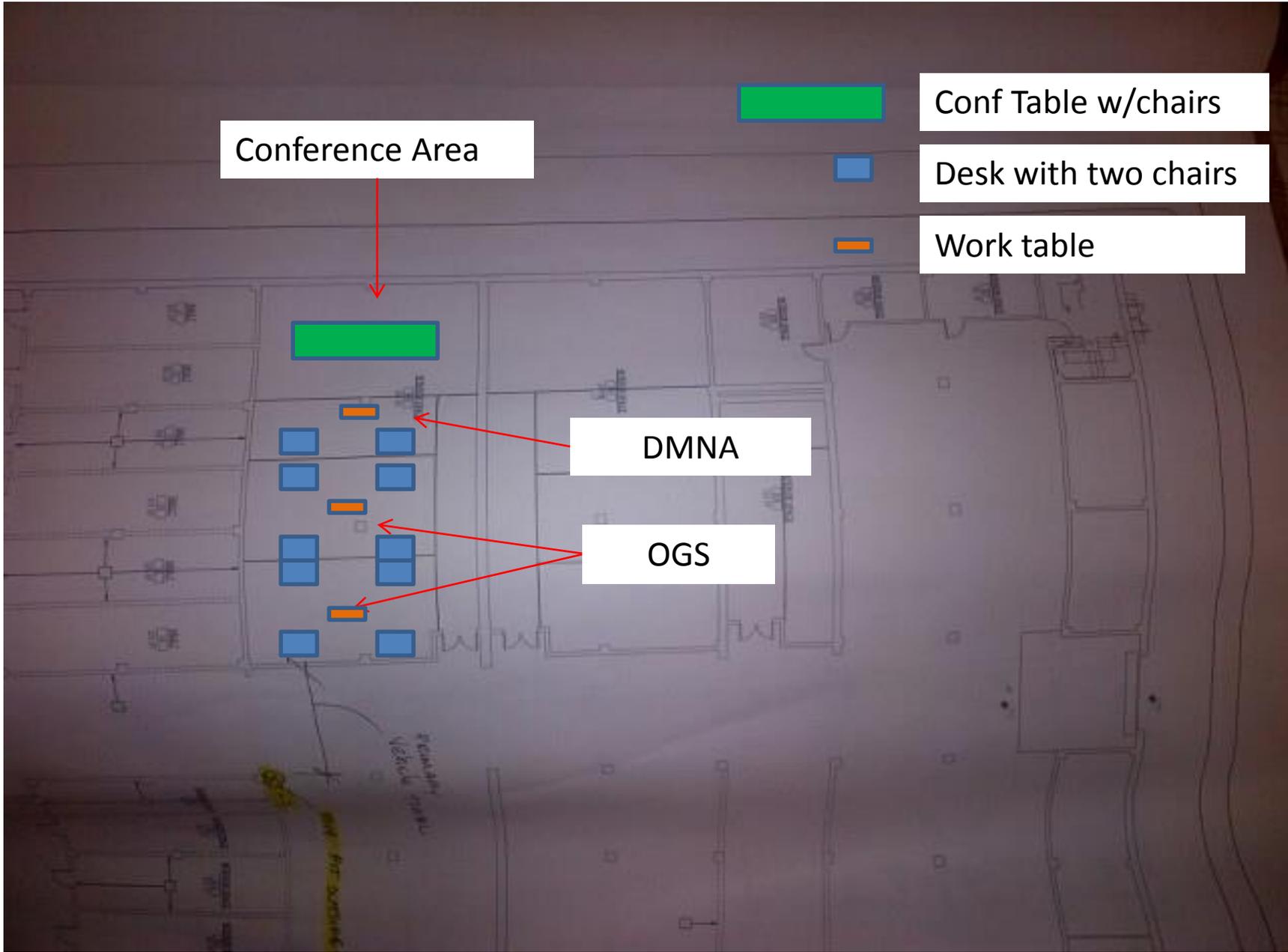
Conf Table w/chairs

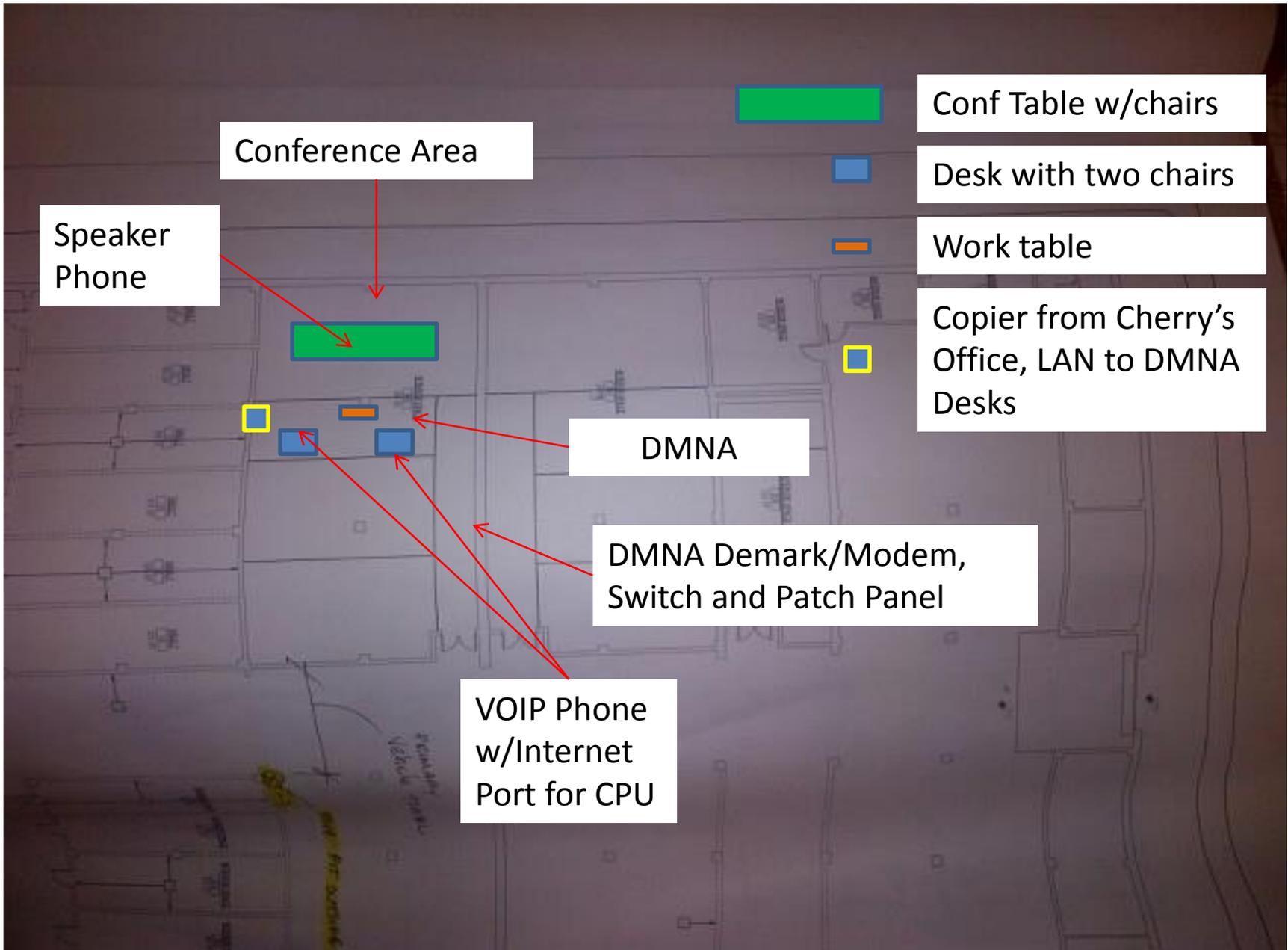
Desk with two chairs

Work table

DMNA

OGS





# Proposed Furniture Plan for Contractor Area

GC

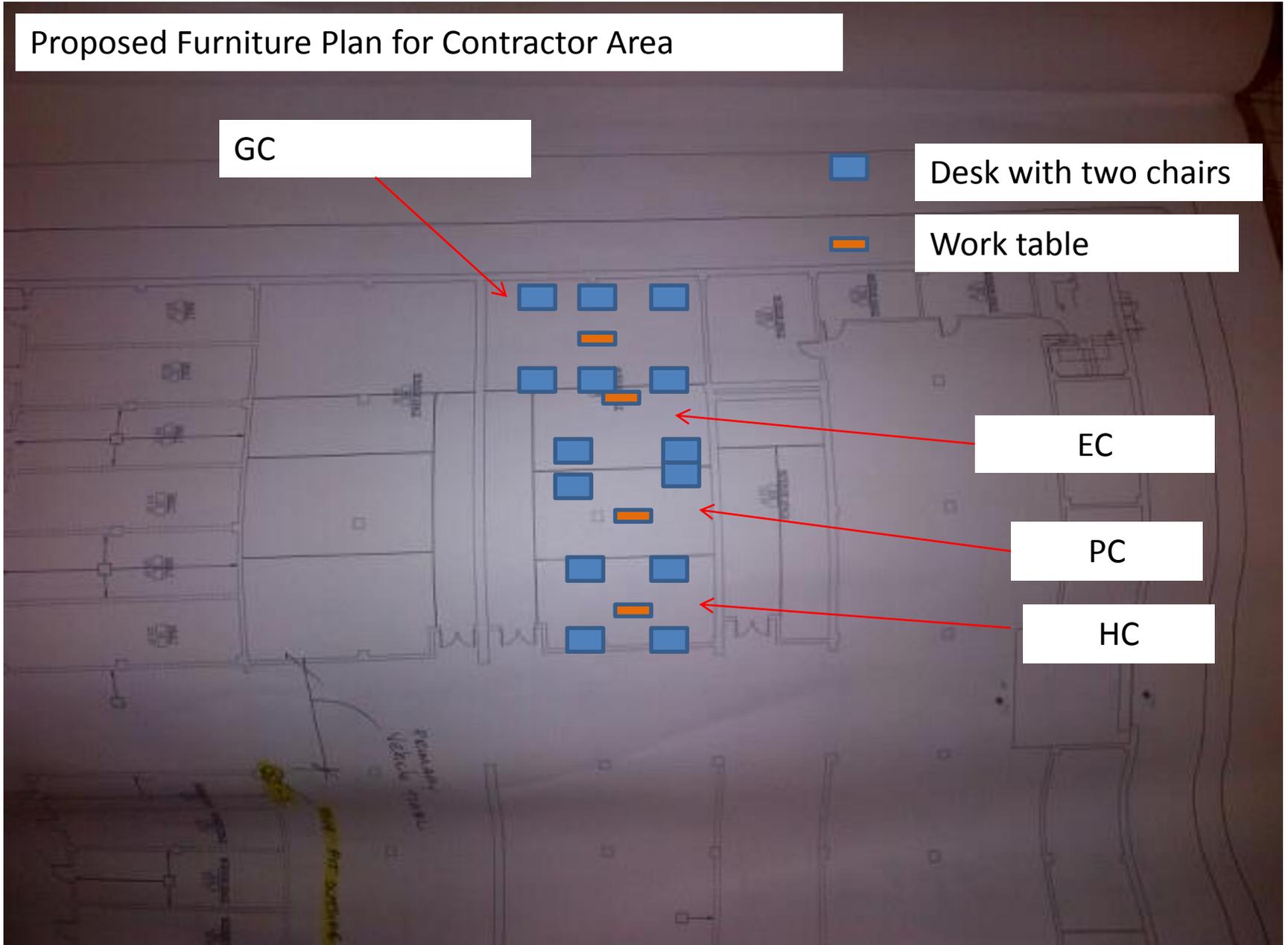
Desk with two chairs

Work table

EC

PC

HC



Provide Temporary (up to 36 months) Cable Service for Phone and Internet Service at 5<sup>th</sup> Ave Armory, West End Basement Storage, Room B-42

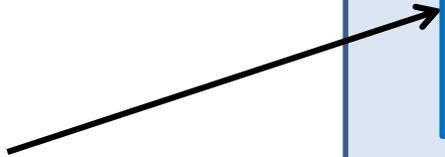
Privately  
Owned  
Building



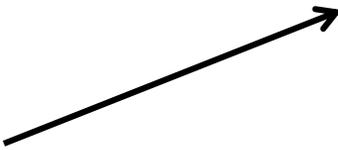
Harlem Children's  
Zone



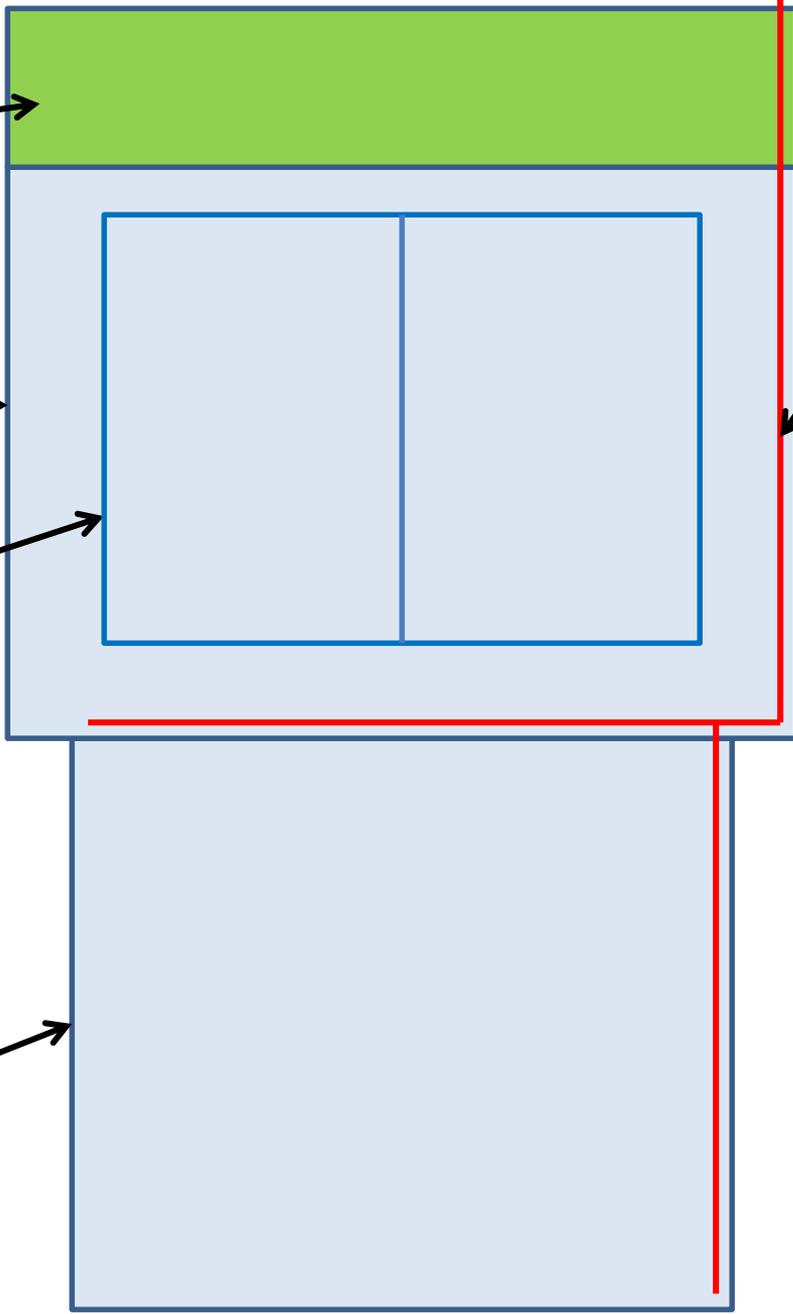
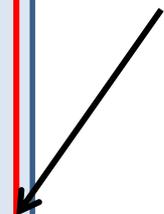
Drill  
Shed  
Roof



Armory



Existing TV  
Cable at Roof



View of Northwest corner of  
HCZ looking down on the  
Privately Owned Building



Existing TV  
Cable

142<sup>nd</sup>  
Street



New, Proposed,  
Temporary Cable  
Path, Connect to  
Existing Cable at  
Roof

Privately  
Owned  
Building

Drill  $\frac{3}{4}$ " Hole through  
Exterior Wall into 1<sup>st</sup>  
Floor Stair landing, 9'  
(+/-) AFG.

HCZ 142<sup>nd</sup>  
Street  
Entrance



Existing  
Splitter



Proposed drilled cable hole location

142<sup>nd</sup> Street HCZ Entrance Door

HCZ Entrance Stair  
Tower Area at the  
142<sup>nd</sup> Street Entrance

Using Existing Hole  
in wall to chase  
cable into  
basement area

Picture thru the  
Fence (and gate)  
system separating  
HCZ from the Armory  
Basement

