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SECTION 27 51 19

SOUND MASKING SYSTEMS

Display hidden notes to specifier. (Don't know how? [Click Here](http://www.arcat.com/sd/display_hidden_notes.shtml))

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\*\* NOTE TO SPECIFIER \*\* Lencore Acoustics Corp.; Sound Masking, Paging, Mass Notification and Emergency Communications.  
This section is based on the products of Lencore Acoustics Corp., which is located at:  
1 Crossways Park Dr. W.  
Woodbury, NY 11797  
Tel: 516-682-9292  
Fax: 516-682-4785  
Email: [request info (info@lencore.com)](http://admin.arcat.com/users.pl?action=UserEmail&company=Lencore+Acoustics+Corp&coid=42534&rep=&fax=516-682-4785&message=RE:%20Spec%20Question%20(16820lac):%20%20&mf=)  
Web: <http://www.lencore.com>   
 [ [Click Here](http://www.arcat.com/arcatcos/cos42/arc42534.html) ] for additional information.  
Lencore transforms environments that change people's lives. We create more privacy, greater comfort and better safety.  
Today, at Lencore, we engineer and build system solutions for Sound Masking, Paging, Audio and Mass Notification and Emergency Communications (MNEC) with applications in a variety of industries including:  
Corporate, Healthcare, Finance, Legal, Government, Hospitality, Education, Security, Vision.  
We see a world where the workplace is safer, more productive and privacy matters; a world where communication is instantaneous and clear; a world where the environment is as ideal for an individual as it is for group collaboration.

1. GENERAL
   1. SECTION INCLUDES
      1. Sound Masking Systems: Performance based specification for networked based systems including but not limited to the following.
         1. Digital signal processors.
         2. Noise generators.
         3. Paging interfaces.
         4. Amplifiers.
         5. Loudspeakers.
         6. Associated wiring, controls, supervised signals, lines and components.
   2. RELATED SECTIONS

\*\* NOTE TO SPECIFIER \*\* Delete any sections below not relevant to this project; add others as required.

* + 1. Section 09 51 23 - Acoustical Tile Ceilings.
    2. Section 09 84 36 - Sound-Absorbing Ceiling Units.
    3. Section 26 05 48 - Vibration and Seismic Controls for Electrical Systems.
    4. Section 26 05 00 - Common Work Results for Electrical.
    5. Section 26 27 16 - Electrical Cabinets and Enclosures.
    6. Section 25 15 16 - Integrated Automation Software for Control and Monitoring Networks.
    7. Section 28 44 00 - Refrigerant Detection and Alarm.
  1. REFERENCES

\*\* NOTE TO SPECIFIER \*\* Delete references from the list below that are not actually required by the text of the edited section.

* + 1. American Disabilities Act (ADA):
    2. American National Standards Institute (ANSI):
       1. ANSI S1.4 - American National Standard Specification for Sound Level Meters.
       2. ANSI S1.6 - American National Standard Specification for Preferred Frequencies and Band Numbers for Acoustical Measurements.
       3. ANSI S1.11 - American National Standard Specification for Octave-Band and Fractional-Octave-Band Analog and Digital Filters.
       4. ANSI 709.1 - ISO / IEC Standards for Open Platform.
    3. ASTM International (ASTM):
       1. ASTM E1374 - Standard Guide for Open Office Acoustics and Applicable ASTM Standards.
       2. ASTM E1573 - Standard Test Method for Evaluating Masking Sound in Open Office Using A-Weighted and One-Third Octave Band Sound Pressure Levels.
       3. ASTM E1130 - Standard Test Method for Objective Measurement of Speech Privacy in Open Offices Using Articulation Index.
       4. ASTM E1041 - Standard Guide for Measurement of Masking Sound in Open Offices.
    4. European Standard (EN):
       1. EN 55024 - Information technology equipment - Immunity characteristics - Limits and methods of measurement.
       2. EN 60950 - Information Technology Equipment.
       3. EN 61000 - Electromagnetic Compatibility.
       4. ENV50204 - Radiated electromagnetic field from digital radio telephones - Immunity test.
    5. National Fire Protection Association (NFPA):
       1. NFPA 101 - Life Safety Code.
       2. NFPA 72 - Fire Alarm and Signaling Code.
    6. Underwriters Laboratories (UL):
       1. UL 1310 - Standard for Class 2 Power Units.
       2. UL 1480 - Speakers for Fire Alarm and Signaling Systems, Including Accessories.
       3. UL 2043 - Standard for Fire Test for Heat and Visible Smoke Release for Discrete Products and Their Accessories Installed in Air-Handling Spaces.
       4. UL 2572 - Standard for Mass Notification Systems.
       5. UL 6500 - Standard for Audio/Video and Musical Instrument Apparatus for Household, Commercial, and Similar General Use.
       6. UL 60065 - Standard for Audio, Video and Similar Electronic Apparatus - Safety Requirements.
       7. UL 60950 - Information Technology Equipment - Safety.
    7. US Army Corp.'s Unified Facilities Guide Specifications(UFGS):
       1. UFGS 25 10 10 - Utilities Monitoring and Control System.
       2. UFGS 23 09 23 - Direct Digital Control for HVAC and Other Local Building Controls.
  1. SUBMITTALS
     1. Submit under provisions of Section 01 30 00 - Administrative Requirements.
     2. Proposal:
        1. A preliminary listing of proposed major components, in the order and format listed in the products section of these performance specifications, along with the manufacturer's detailed technical data sheets. Advertising literature shall not be accepted.
     3. Product Data:
        1. Manufacturer's data sheets on each product to be used.
           1. Submit in PDF format.
           2. Equipment data sheets will be identified with device IDs that reference drawings and equipment used.
        2. Preparation instructions and recommendations.
        3. Storage and handling requirements and recommendations.
        4. Typical installation methods.
     4. Layouts shall be submitted for approval on the following:
        1. Loudspeaker system locations.
        2. Plenum mounted networked masking noise components.
        3. Equipment rack layouts.
        4. Connection between the rack headend and the Fire Alarm Control Unit.
     5. Test results shall be submitted for approval of the following, as specified herein:
        1. Performance tests on completed component sub-assemblies.
        2. Performance tests on the complete system assemblies.
     6. Shop Drawings: Include details of materials, construction and finish. Include relationship with adjacent construction.
        1. Submit in DWG format for approval on all items that require assembly by the Design-Builder, including, but not limited to:
           1. Headend Rack panel layouts.
           2. Loudspeaker enclosures.
           3. Supporting brackets for the suspension and/or support of loudspeaker enclosure and equipment enclosure.
           4. Wiring and installation diagrams showing quantity and location of system components and related cabling and accessories.
     7. Within the scheduled amount of days after receipt of Notice to Proceed, the Design-Builder will submit the following for approval.
        1. Complete components list, in order and format in the contract documents. For proposed substitutions to components listed in this performance specification, manufacturer's independent test data to demonstrate performance specification compliance will be provided.
        2. Complete and final list of components to be furnished, in the same order and format as the specifications, with conforming manufacturers' independent test data for each specified item. Furnish a brochure and photograph (unless included in the brochure) of each item.
  2. SYSTEM DESCRIPTION
     1. Broad band (65 Hz to 20 kHz) background noise in open plan and partitioned work areas.
     2. When Used in Conjunction with Proper Ceiling and Partition Construction:
        1. Limits Speech Intelligibility: Providing privacy between work areas.
        2. Reduces disturbing effects of noise caused by other common office activities i.e. keyboards, printers, etc.
     3. Octave Band Sound Pressure Level Spectrum:
        1. Octave Band (Hz): 200.
           1. Level (dB) Open Areas: 2.5.
           2. Level (dB) Enclosed Office: 2.
        2. Octave Band (Hz): 250.
           1. Level (dB) Open Areas: 3.
           2. Level (dB) Enclosed Office: 2.
        3. Octave Band (Hz): 315.
           1. Level (dB) Open Areas: 2.
           2. Level (dB) Enclosed Office: 1.5.
        4. Octave Band (Hz): 400.
           1. Level (dB) Open Areas: 1.
           2. Level (dB) Enclosed Office: 1.
        5. Octave Band (Hz): 500.
           1. Level (dB) Open Areas: 0.
           2. Level (dB) Enclosed Office: 0.
        6. Octave Band (Hz): 630.
           1. Level (dB) Open Areas: Minus 1.
           2. Level (dB) Enclosed Office: Minus 1.
        7. Octave Band (Hz): 800.
           1. Level (dB) Open Areas: Minus 2.
           2. Level (dB) Enclosed Office: Minus 2.
        8. Octave Band (Hz): 1000.
           1. Level (dB) Open Areas: Minus 3.
           2. Level (dB) Enclosed Office: Minus 3.
        9. Octave Band (Hz): 1250.
           1. Level (dB) Open Areas: Minus 4.
           2. Level (dB) Enclosed Office: Minus 4.5.
        10. Octave Band (Hz): 1600.
            1. Level (dB) Open Areas: Minus 5.
            2. Level (dB) Enclosed Office: Minus 5.
        11. Octave Band (Hz): 2000.
            1. Level (dB) Open Areas: Minus 6.
            2. Level (dB) Enclosed Office: Minus 6.
     4. Spectrum: Will have relative 1/3 octave band levels which form a smooth spectrum within the constraint of the above octave band values and are within 2 dB in the 400 to 2000 Hz bands and to within a slowly increasing limit for higher and lower bands to a maximum variance of 6 dB in the 63 Hz and 8000 Hz bands.
     5. Nominal Sound Level in dBA for Each Area:
        1. Conference Rooms: 42 dBA.
        2. Enclosed Offices: 44 dBA.
        3. Semi-Enclosed Workstations: 45 dBA.
        4. Open Office Areas: 47 dBA.
     6. Background Noise Level Must Exhibit Temporal Uniformity. The short-term time-average level of each 1/3 octave band over any selected 2 second interval is to vary no more than 3 dB with respect to the long-term average.
     7. In Open Areas and Larger Enclosed Spaces: Overall sound level produced to have spacial uniformity of plus or minus 1 dB between any two sound generating units.
     8. Interface with Fire Alarm Control Unit (FACU): During a fire emergency, sound masking must be muted or turned off per the sound masking shutdown sequence. System must have ability to assist in creating a safer, more intelligible environment in a life safety situation.
  3. SCOPE:
     1. The terms 'Masking Noise System Design-Builder' or 'Design-Builder' refer to the organization providing and installing the masking noise system.
     2. Masking Noise System Design-Builder will be Responsible for the Following:
        1. Make system operational.
        2. Furnish and install system components within space provided by others.
        3. Demonstrate by appropriate test data system meets performance specifications.
     3. Design-Builder Responsibilities:
        1. Obtain and be familiar with drawings and details for the masking noise system.
        2. Furnish and Install the following:
           1. Wiring and cabling.
           2. Masking noise equipment and materials per contract documents.
           3. Support brackets for suspension of loudspeakers.
           4. Seismic bracing per applicable building codes.
           5. Furnish items for mounting, terminating, matching and connecting elements per the contract documents. Additional items required to meet system performance requirements including installation labor, to be supplied by the Design-Builder.
           6. Furnish and install equipment, solid state devices, power supplies, transformers, matching networks, signal indicators, controls, mounting brackets, painting, devices, and other materials even though not specifically mentioned herein, which are necessary for the proper integration of the system, so that the system performs the functions listed herein in compliance with the contract documents.
  4. QUALITY ASSURANCE
     1. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with a minimum ten years documented experience.
     2. Design-Builder:
        1. Qualifications:
           1. Experienced in design, fabrication, installation, checkout, and warranty contract management of systems such as is described in this section.
           2. Must be factory qualified and certified to install the products listed in this performance specification.
        2. Responsibilities:
           1. Responsible for system specified and be the single contact point for the Architect, Consultant, Fire Protection Engineer (FPE) and/or the Owner with respect to sound masking Work specified.
           2. Coordinate with Fire Protection Engineer in order to assemble / connect the sound masking system to the Fire Alarm Control Unit (FACU). Provide connection but NOT make the connection. It is the responsibility of the installation company of the FACU to make the connection with the FACU and then, in conjunction with the Design-Builder, test the system.
           3. Submit as a part of its bid submittal, a detailed brochure describing its capabilities in terms of facilities, personnel, experience background examples of similar installations (at least two projects within the past two years), distribution arrangements with manufacturers, and financial capability (includes satisfaction of the project bonding requirements). This submittal must justify in the judgment of the Consultant and the Architect, that the Design-Builder is capable of the necessary business and technical arrangements for this installation and the pursuant warranty service.
     3. Manufacturer's Project Engineer:
        1. Qualifications: Five years' experience with similar electronic specialty systems, or other educational experience background as approved by Architect and Consultant.
        2. Responsibilities: Obtain and be totally familiar with drawings that have a bearing on the location and installation of electronic equipment, loudspeakers, or any special components.
           1. Technical liaison between the Design-Builder, the Architect, the General Contractor, Fire Protection Engineer (FPE), and Consultant.
           2. Participate in meetings and conferences.
           3. Be present at job site for final inspection.
           4. Approve operating and maintenance manuals.
           5. Provide the specified instruction to designated members of Owner's staff.
           6. Supervise the technical Work which is part of the contract which includes:

Preparation of construction drawings from information within performance specifications.

Approve and sign shop drawings.

Shop fabrication and field installation Work assuring conformance with the performance specifications, and approved shop drawings.

Oversee testing of assemblies and sub-assemblies prior to job site delivery.

Specified testing of completed installation assuring performance specifications are met.

Final testing for approval and acceptance of the system.

* + 1. Source Limitations: Provide each type of product from a single manufacturing source to ensure uniformity.
    2. Equipment and associated hardware to be fabricated and installed in accordance with the manufacturer's specified recommendations.
    3. Unless otherwise stated, electrical and electronic equipment will be products of established manufacturers with a minimum of 10 years manufacturing sound masking systems. Use the latest models or types which meet the applicable specifications at the time of submittal.
    4. Quality of workmanship and fabrication of equipment and components which are custom fabricated to be comparable to professional audio equipment as produced by specialized manufacturers of electronic apparatus. Only skilled craftsmen of the profession required are to be utilized for all aspects of system fabrication and installation.
    5. Materials and Products: New and of the finest quality. No used materials to be installed.
    6. System Design: By an approved manufacturer representative.
       1. Designed so that individual speaker or component failure will have no impact on the balance of the system.
    7. System Adjustment: Completed by an approved manufacturer representative or trained contractor.

\*\* NOTE TO SPECIFIER \*\* Include mock-up if the project size or quality warrant the expense. The following is one example of how a mock-up might be specified. When deciding on the extent of the mock-up, consider all the major different types of Work on the project.

* + 1. Mock-Up: Construct a mock-up with actual materials in sufficient time for Architect's review and to not delay construction progress. Locate mock-up as acceptable to Architect and provide temporary foundations and support.
       1. Intent of mock-up is to demonstrate quality of workmanship and visual appearance.
       2. If mock-up is not acceptable, rebuild mock-up until satisfactory results are achieved.
       3. Retain mock-up during construction as a standard for comparison with completed Work.
       4. Do not alter or remove mock-up until Work is completed or removal is authorized.
  1. PRE-INSTALLATION CONFERENCE
     1. Convene a conference approximately two weeks before scheduled commencement of the Work. Attendees shall include Architect, Contractor and trades involved. Agenda shall include schedule, responsibilities, critical path items and approvals.
  2. DELIVERY, STORAGE, AND HANDLING
     1. Deliver in manufacturer's original unopened and undamaged packages with manufacturer's labels legible and intact.
     2. Store and handle in strict compliance with manufacturer's written instructions and recommendations. Protect from moisture during shipping, storage and handling.
     3. Protect from damage due to weather, excessive temperature, and construction operations.
     4. Inspect manufacturer's packages upon receipt.
  3. WARRANTIES: ALL EQUIPMENT
     1. Warranted to be free from defects in materials, workmanship, and performance for minimum of 1 year from date of installation.
        1. At Closeout, provide to Owner an executed copy of manufacturer's standard limited warranty against manufacturing defects, outlining terms, conditions, and exclusions from coverage.
     2. System Components for Sound Masking: Must carry a minimum of a 10 year warranty. Warranty statements must be submitted prior to notice to proceed.
  4. PROJECT CONDITIONS
     1. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's recommended limits.

1. PRODUCTS
   1. MANUFACTURERS
      1. Acceptable Manufacturer: Lencore Acoustics LLC., which is located at: 839 New York Avenue, Suite 21, Huntington, NY 11743; Tel: 516-682-9292; Fax: 516-682-4785; Email: [request info (info@lencore.com)](http://admin.arcat.com/users.pl?action=UserEmail&company=Lencore+Acoustics+Corp&coid=42534&rep=&fax=516-682-4785&message=RE:%20Spec%20Question%20(16820lac):%20%20&mf=); Web: <http://www.lencore.com>

\*\* NOTE TO SPECIFIER \*\* Delete one of the following three paragraphs; coordinate with requirements of Division 1 section on product options and substitutions.

* + 1. Substitutions: Not permitted.
    2. Requests for substitutions will be considered in accordance with provisions of Section 01 60 00 - Product Requirements.
    3. This specification for system components is written as performance specifications intended to promote competition and development of superior new components for high quality sound systems.
  1. SOUND MASKING SYSTEMS

\*\* NOTE TO SPECIFIER \*\* Delete paragraphs in this article that are not required.

* + 1. Basis of design: Classic as manufactured and supplied by Lencore Acoustic LLC. Masking, music, and paging.
    2. Basis of Design: i.Net non-network as manufactured and supplied by Lencore Acoustic LLC. Masking, music, and paging.
    3. Basis of Design: i.Net network as manufactured and supplied by Lencore Acoustic LLC. Masking, music, paging, and network.
    4. Design of the sound masking system will be customized and supplied as required to meet the performance and design requirements per this specification.
  1. PROPOSAL REQUIREMENTS
     1. Quote Request:
        1. Company Requesting Quote: \_\_\_\_\_\_\_\_.
           1. Address: \_\_\_\_\_\_\_\_.
           2. Contact: \_\_\_\_\_\_\_\_.
           3. Phone: \_\_\_\_\_\_\_\_.
           4. Email: \_\_\_\_\_\_\_\_.
        2. Address of Project Location: \_\_\_\_\_\_\_\_.
        3. Target Date for Completion: \_\_\_\_\_\_\_\_.
        4. Address of Project Location: \_\_\_\_\_\_\_\_.
        5. Scope of Work: \_\_\_\_\_\_\_\_.

\*\* NOTE TO SPECIFIER \*\* Delete paragraph below if project is not quoted on a GSA contract.

* + 1. Project is quoted on GSA contract.

\*\* NOTE TO SPECIFIER \*\* Delete paragraph for manufacturer installation services if not required. Otherwise edit subparagraph options as required.

* + 1. Manufacturer to Provide Installation Services.
       1. Permits: Required.
       2. Permits: Not required.
       3. Project site Labor Requirements:
          1. Normal Hours: Non-union.
          2. Normal Hours: Union.
          3. Normal Hours: Prevailing wage.
          4. After Hours: Non-union.
          5. After Hours: Union.
          6. After Hours: Prevailing wage.
    2. Project Specifics; Building Information:

\*\* NOTE TO SPECIFIER \*\* Delete construction type option not required.

* + - 1. Construction Type: New Construction.
      2. Construction Type: Existing Retrofit.
      3. Description of Building Type: \_\_\_\_\_\_\_\_.

\*\* NOTE TO SPECIFIER \*\* Delete ceiling type options not required.

* + - 1. Ceiling Type: Tiles in place.
      2. Ceiling Type: Drop tile.
      3. Ceiling Type: Cement.
      4. Ceiling Type: Sheetrock.
      5. Ceiling Type: Steel truss.
      6. Ceiling Type: Open.

\*\* NOTE TO SPECIFIER \*\* For open ceiling type please specify how the speakers are to be painted. Delete if not required.

* + - * 1. Speakers: Painted.

Color: White.

Color: Black.

Color: \_\_\_\_\_\_\_\_.

Paint Brand: Sherwin Williams.

Paint Brand: Benjamin Moore.

* + - 1. Ceiling Type: Wooden beam.
      2. Ceiling Type: \_\_\_\_\_\_\_\_.

\*\* NOTE TO SPECIFIER \*\* Delete insulation options not required.

* + - 1. Insulation Above Ceiling: None.
      2. Insulation Above Ceiling: Sprayed on beams/deck.
      3. Insulation Above Ceiling: Laying on the ceiling tiles.
      4. Insulation Above Ceiling: Unknown.

\*\* NOTE TO SPECIFIER \*\* Delete approximate area options not required.

* + - 1. Approximate Area of Sound Masking (sq ft / sq m): \_\_\_\_\_\_\_\_.
      2. Approximate Area of Sound Masking: As determined by the Architect.
      3. Approximate Area of Sound Masking: As designated on the Drawings.
      4. Height; Floor to Finished Ceiling (in/mm): \_\_\_\_\_\_\_\_.
      5. Height; Finished Ceiling to Underside of Deck (in/mm): \_\_\_\_\_\_\_\_.
      6. Height: Floor to Underside of Deck (in/mm): \_\_\_\_\_\_\_\_.
      7. Private Office Walls: Constructed floor to slab.
      8. Drawing Data to be supplied to Manufacturer: DWG or PDF files.
         1. Floor plans.
         2. Reflected ceiling plans.

\*\* NOTE TO SPECIFIER \*\* Delete any locations or requirement options not required. Add locations as needed.

* + 1. Sound Masking Requirements:
       1. Open Office Workstations:
          1. Sound masking.
          2. Notification / paging.
          3. Music.
       2. Private Offices:
          1. Sound masking.
          2. Notification / paging.
          3. Music.
       3. Hallways:
          1. Sound masking.
          2. Notification / paging.
          3. Music.
       4. Conference Rooms:
          1. Sound masking.
          2. Notification / paging.
          3. Music.
       5. Other: \_\_\_\_\_\_\_\_.
          1. Sound masking.
          2. Notification / paging.
          3. Music.
    2. Control Interface Requirements:
       1. None.
       2. Creston.
       3. AMX
       4. Other: \_\_\_\_\_\_\_\_.
  1. PERFORMANCE REQUIREMENTS
     1. Compliance Listings or Approvals from a Nationally Recognized Testing Laboratory (NRTL):
        1. UL - Underwriters Laboratories, Inc.
        2. ULC - Underwriters Laboratories Canada.
        3. ETL - Intertek.
     2. System Architecture: Networked decentralized with addressable masking devices distributed throughout the installation area.
        1. Tied to Fire Alarm Control Unit (FACU) in event of a fire emergency with the purpose of being shut down for safety notification purposes.
     3. Regulatory Testing and Certifications:
        1. Relevant System Components Conforming to Following:
           1. Safety and Electrical: UL 6500 - Standard for Audio/Video and Musical Instrument Apparatus for Household, Commercial and Similar General Use. Products shall be labelled accordingly.
           2. Air-Handling Plenum Installation: UL 2043 - Standard for Fire Test for Heat and Visible Smoke Release for Discrete Products and Their Accessories Installed in Air-Handling Spaces; 1996. Products shall be labeled accordingly.
           3. Plenum Rated Cabling: CSA CMP 75C FT6. Products shall be labelled accordingly.
           4. Electromagnetic Interference (EMI): FCC - Part 15, Subpart B, Class A - Unintentional Radiators.
           5. Heavy Metals: RoHS - Restriction of Hazardous Substances.
           6. Low Voltage Power Supplies: UL1310 - Standard for Class 2 Power Units. Products shall be labeled accordingly.
           7. UL 2572 - Standard for Mass Notification Systems.
     4. Sound Masking Performance: Digital signal processing (DSP) technology for masking sound generation and output adjustment of masking signals.
        1. Masking Sound: Generated via a truly-random, non-deterministic digital process with no repeat cycle within a 24 hour period.
        2. System Requirements:
           1. Single control unit/panel (SMCP): Capable of addressing entire system. Multiple control units not acceptable.
           2. Integrated Sound Masking Digital Signal Processors (DSP's): Utilize an open platform network technology, meeting open control standards with web appliances, browser interfaces, infrared remote controls and internet access capable.
           3. Capable of separately and independently configuring zones for sound masking via the network zoned through its singular central control.
           4. Sound Masking System Shutdown: Through interface with Fire Alarm Control Unit (FACU) as described in Section 28 31 00 (Fire Alarm and Detection Systems, meeting a minimum of UL 2572).
           5. Control System: Capable of using RS232 for intelligent building integration.
           6. Standards for Open Platform: Meet ANSI 709.1 / ISO / IEC.
           7. US Army Corp.'s Unified Facilities Guide Specifications:

UFGS 25 10 10, "Utilities Monitoring and Control System."

UFGS 23 09 23, "Direct Digital Control for HVAC and Other Local Building Controls."

* + - * 1. Multi-drop network system, point to point systems are unacceptable; no exceptions.
        2. System Tuning: Through a network or hand-held remote or keypad switches.
        3. Complete diagnostics capabilty of entire system functions including diagnostics of network, hubs, nodes, routers, DSP, Relays, memory, circuitry, amplifiers and power.
        4. Report entire settings for each zone indicating at a minimum the volume, contour, equalization, diagnostics, and zones and channel groupings.
        5. Diagnostics and remote administration via a standard web browser.
        6. Capable of naming network nodes, channels, zones, and external audio sources via its integrated Graphical User Interface.
        7. Equalizer: 30 band parametric or 30 band third-octave compilable via DSP.
        8. Speakers: 4 to 6-1/2 inch (102 to 165 mm) diameter ensuring delivery of a broad frequency spectrum.
        9. Line Interfacing with Fire Alarm Control Unit (FACU) and Sound Masking Control Unit (SMCU): Monitor as defined by UL 2572.
      1. Programmable function to gradually ramp up masking volume at a predetermined schedule.
    1. System Control: Control Panel Component Provide Controls for:
       1. Networked device addressing.
       2. IP setup for controller.
       3. Administration for User Profiles:
          1. Controller must capture and report all changes any user makes to the system.
          2. Password Protection: Admin and user profiles.
       4. System compatible with third party controllers.
       5. Work with BACnet or Modbus systems.
       6. Setup and Configuration:
          1. Initialization.
          2. Harvesting and uploading all settings.
          3. Masking volume and contour adjustment.
          4. Masking equalizer adjustement.
          5. Audio Source equalizer adjustment.
          6. Labeling all nodes, channels, zones, and custom EQ settings.
          7. System independent zoning for masking.
          8. System independent zoning for paging.
          9. System independent zoning for audio input.
          10. Masking timer programming.
          11. Security functions.
          12. System diagnostics and monitoring.
          13. Graphical User Interface address books for multiple buildings on a campus.
          14. Interfacing with the Fire Alarm Control Unit (FACU).
       7. System control for the entire building or buildings by providing operation of multiple system components from a single central location.
       8. Lockouts preventing simultaneous adjustment of system from multiple users.
       9. Defer control to Fire Alarm Control Unit (FACU) in event of a fire emergency for muting the masking through the Sound Masking Shutdown Sequence.
    2. Network Device Discovery:
       1. Identify networked masking devices via an automatic addressing process such that devices that are numbered in sequence based on their location in the network on each floor.
       2. Identified Masking Device: LCD screen display in addition to labels for ID of devices.
          1. Work with network controller ensuring proper display of ID.
          2. Work real time to display any changes.
          3. LCD display for error messages.
       3. System should leverage analytic software, working in real time, to manage and monitor system performance.
    3. Scheduler: Control components providing and integrated masking timer function:
       1. Automatic masking volume adjustments per custom user-programmed schedules.
       2. Ability to digitally assign any group of masking zones to a selected timer zone.
       3. Calendar-based operation.
       4. Automatic and user-defined daylight savings adjustment.
    4. Zoning: Networked masking devices zone capable for masking, paging, and external audio.
       1. Zoning of networked masking devices performed digitally.
       2. Zone assignments to each type to be independent of each other.
       3. Networked masking devices capable of individual rezoning without rewiring.
       4. Each zone capable of holding, at a minimum 10 programmable zone assignments.
    5. Cabling: Single category-based cable providing, control signals for connections between:
       1. Control panel components and networked masking devices.
       2. Networked masking devices.
       3. Nodes and speakers, and speaker to speaker connections.
       4. Monitored and Supervised Line per UL 2572.
          1. Connection to Fire Alarm Control Unit (FACU) from a single Sound Masking Control Unit (SMCU).
       5. System Power: Run on a separate dedicated cable.
       6. Cabling: Rated for air-handling plenums.
       7. Cabling Connections: Made using connectors with positive locking mechanisms.
       8. Cables: Non-proprietary off the shelf cables. Single source cables are unacceptable.
    6. Diagnostic: Upon initial configuration.
       1. Automatically detect number and type of networked devices connected.
       2. Verify networked devices are communicating with other devices on the network.
       3. Verify networked devices are initialized.
       4. Identify networked devices not communicating.
       5. Verify system design integrity.
    7. General Requirements:
       1. Masking Noise Equipment: UL listed.
       2. Equipment Installed Above Ceiling: UL listed plenum rated.
       3. Electrical Equipment: Products of established manufacturers.
          1. Sustained proper operation at a nominal 120 VAC plus or minus 10 percent, 60 Hz, plus or minus 10 percent power source.
          2. No exposed, unprotected 120 VAC potential inside or outside any enclosure. Exterior metal surfaces to be grounded.
          3. Sustained proper operation within temperature range of 32 to 104 degrees F (0 to 40 degrees C).
          4. Quality of workmanship and fabrication of custom fabricated equipment to be comparable to professional audio equipment as produced by specialized manufacturers of electronic apparatus.
          5. Designed or adaptable for standard front panel rack mounting.
          6. Manufacturers' stock equipment and component labeling and console designations to be in English. Systems nomenclature, signage and custom labeling pertaining to routine system operation shall be on the equipment itself and on descriptive drawings, charts or diagrams.
       4. Equipment to be selected with the criteria of operational simplicity and ease of maintenance.
    8. Masking Noise Processor:
       1. DSP-Based Masking Sound Generator: Provides noise generation, equalization and level control for the system.
       2. Global and Local Level Sound Zoning: Designed per space plan for areas requiring special attention; i.e. patient rooms, exam rooms, reception areas, provider offices, clerical work areas, open areas, patient check in areas, special work areas, executive areas. Zoning must allow both volume and frequency adjustments.
       3. Software Configurable and Controllable: Programming sound pressure level at predetermined times.
       4. Control Unit:
          1. LON or BACNET capable.
          2. Digital input/output relays.
          3. TCP IP and RS-232 port.
          4. Control entire building without any additional controllers.
          5. Browsed using off the shelf software.
          6. Email reports.
          7. Programming alarms, alarm triggers.
          8. Data logs creation.
          9. Listed UL 2572 by a nationally recognized testing laboratory (NRTL).
       5. Noise Generator: Octave bands from 20 Hz to 20 KHz.
          1. Voltage: 48 Volts DC, 60 Hz.
          2. Contour adjustments.
          3. Spectrum Adjustment: Meet acoustical preferred curve.
          4. Octave Band: 1/3 band EQ for entire spectrum (20 Hz to 20 KHz). Meets ANSI specification for bands.
          5. Parametric EQ for entire spectrum: 20 Hz to 20 KHz.
          6. Central volume control, contour control and EQ control for zones for sound masking.
          7. Central volume control, and EQ control for zones and units for paging and audio.
       6. Power Supply:
          1. Output:

Voltage: 48 VDC.

Rated Current: 3.2 A.

Current Range: 0 to 3.2 A.

Rate Power: 150, 320, 500 W.

Output Voltage Adjustment Range: 45.6 to 52.8 V.

Line Regulation: Plus or minus 0.5 percent.

Load Regulation: Plus or minus 0.5 percent.

Setup, Rise Time: 600 ms, 30 ms at full load.

Hold Up Time: : 20 ms at full load.

* + - * 1. Input:

Voltage Range: 85 to 264 VAC. 120 to 370 VDC.

Frequency Range: 47 to 63 Hz.

Power Factor: Greater than 0.93/230 VAC. At Full Load: Greater Than 0.98/115 VAC.

AC Current: 2.5 A at 115 VAC and 1.2 A at 230 VAC.

Inrush Current: Cold Start 40 A at 230 VAC.

* + - * 1. Safety and EMC:

Safety Standards: UL60950-1, TUV EN60950-1 and S-Mark J60950 Approved.

Harmonic Current per EN61000-3-2,-3.

EMS Immunity per EN61000-4-2,3,4,5,6,8,11; ENV50204, and EN55024.

* + - * 1. Environment:

Working Humidity: 20 to 90 percent RH non-condensing.

Working Temperature: Minus 10 to 60 degrees F (minus 12 to 15.5 degrees C). Refer to output load derating curve.

Storage Temperature and Humidity: Minus 20 to 85 degrees F (), 10 to 95 percent relative humidity.

Temperature Coefficient: 0.05 percent at (0 to 50 degrees C).

Vibration: 10 to 500 Hz, 2G 10 min per cycle, 60 min each along X, Y, Z axes.

* + - * 1. Others:

MTBF: 191.2K hrs. min. per MIL-HDBK-217F 77 degrees F (25 degrees C).

Dimensions: 7-27/32 x 3-29/32 x 1-15/16 inches (199 x 99 x 49 mm).

* + - * 1. Protection:

Overload: 105 to 150 percent rated output power.

Protection Type : Constant current limiting, recovers automatically after fault condition is removed.

Over Voltage: 52.8 to 64.8 V.

Over Temperature: 194 to 212 degrees F (90 to 100 degrees C).

TSW1: Detect on heat sink of power transistor.

Protection Type: Shut down o/p voltage, recovers automatically after temperature goes down.

* + 1. Loudspeaker Systems:
       1. Product Specifications: Meet or exceed.
          1. Size: 5-1/4 inch (133 mm) wide dispersion.
          2. Power Rating: 10 Watts Root Mean Squared (RMS).
          3. Frequency Response: 65 to 12,000 Hz.
          4. Pressure Sensitivity: SPL at 1 Watt per m: 90 dB.
          5. Impedance: 32 Ohms.
          6. Magnet Weight: 10 oz (283.5 grams) minimum.
          7. Sound Volume from 1 Watt Input at Meter: 86 dB
          8. Impedance: 32 Ohms.
          9. Listed: UL1480.
    2. Remote Central Volume Control:
       1. Generation and integration of multiple random sound masking sources. Channel outputs with three levels of global and independent control.
          1. Contour Control: At source using infra-red technology for each independent channel, quad-pod and global control or via a centralized control.
          2. Parametric Equalization Control: For one to 6,400 speakers.
          3. Third Band Octave Controls: Same as parametric controls for groups.
          4. Volume Control: For entire spaces, to channels, to individual speakers.
    3. Programmable Audio Level Control:
       1. Standard Applications: Scheduling, data logging, alarm detection and dispatch, meter reading, analog functions, and type translation.
          1. Scheduling Application: Permits events and exceptions to be initiated based on time and date schedules configured by the user.
          2. Astronomical Position Calculator: Permits scheduling to be done based on calculated position of sun.
          3. Data Logging Application: Collects network activity for use by trending, reporting, and analysis applications.
          4. New DIME Support: Enables data log upload to a Web services application to occur through a firewall.
          5. Alarming Application: Provides a means to identify, annunciate, and log alarm conditions.
          6. Meter Reading Application: Supervises impulse meters and provides suitable conversion values for energy, gas, and water metering.
          7. Automatic Sound Power Level Changes: Two system channel changes, four times per day, and capable of different time settings for each day of the week.
          8. Programmable Attenuation Range: Minus 24 to 24 dB (48 dB).
          9. Slide Control Attenuation Range: Minus 24 to 24 dB.
          10. Minutes per dB Change: User programmable.
          11. Acclimation Attenuation Range: Minus 24 to 24 dB.
          12. Acclimate Days per dB Change: 1 to 5 days.
          13. Programmable Events: 24 events per day for each zone.
       2. Sound Masking, Audio and Paging Shutdown Sequence:
          1. Connect Fire Alarm Control Unit (FACU) to the SMCU (Sound Masking Control Unit) utilizing a supervised line and addressable relays, per NFPA 72, to shut down and effectively mute all sound masking, audio and paging systems.
          2. The FACU and associated supervised lines to meet UL 2572 ensuring the shutdown mechanism is properly supervised and is reliable and will in no way damage the FACU or SMCU.
          3. The FACU and associated relays must not introduce any noise into the sound masking, audio or paging system.
          4. Muting ambient sound during an emergency is necessary to meet ADA suggested guidelines and NFPA acoustic requirements.
          5. Non-UL listed SMCU is not acceptable.
          6. Refer to Section 28 31 00.
       3. Program Memory: Nonvolatile for one year, minimum, without power. When re-energized after a power outage, control starts at zero level and automatically advances system sound level at same rate used for programmed level changes.
    4. Miscellaneous Equipment:
       1. Wiring and Cables:
          1. Use manufacture recommended cable.
          2. Grounding Wire per NEC 800-31 (1984) and NEC 250.
          3. Lacing and Clamping: No intermediate splices are permitted.
          4. Connections: Soldered. No solderless connectors or "wire-nuts" for splicing or connections.
       2. Equipment Racks: By others. Coordinate with IT.
       3. Conduit System: Meet requirements of metallic conduit system described in electrical specifications, Division 26.
    5. Aids-To-Use:
       1. One Durable Single Line Block Diagram: Drawn for the purpose of facilitating the operator's use of the system.
          1. A simplified block diagram mounted inside the front of equipment enclosure panel.
          2. Equipment, controls, etc., to be identified as they are designated or engraved.
          3. No superfluous information such as wire designations, voltages, levels, construction information, etc., is to appear.

1. EXECUTION
   1. EXAMINATION
      1. Do not begin installation until substrates have been properly constructed and prepared.
      2. If substrate preparation is the responsibility of another installer, notify Architect in writing of unsatisfactory preparation before proceeding.
   2. PREPARATION
      1. Clean surfaces thoroughly prior to installation.
      2. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
      3. Obtain necessary permits for installation Work.
   3. INSTALLATION
      1. General: Install in accordance with manufacturer's instructions approved submittals and in proper relationship with adjacent construction.
         1. The following installation requirements govern the installation of systems specified. In cases of discrepancy between overall system standards and individual equipment item specifications, the latter will govern.
            1. Workmanship on the installed system shall be of professional quality, best commercial practice and accomplished by persons experienced in the techniques and standards of the particular crafts involved.
         2. Equipment items shall be provided and installed to allow fully normal operation in the anticipated ambient temperature range of 60 degree-90 degree F.
         3. Any Work called for on the Drawings and not mentioned in the specifications, or vice versa, will be performed as though fully set forth in both.
            1. In Case, of Differences Between the Drawings and Specifications: The decision of the Sound Masking Professional responsible for the Sound masking equipment and installation will govern.
            2. Work not Particularly Detailed, Marked, or Specified: Will be construed to be the same as similar parts or areas that are detailed, marked, or specified.
      2. General Contractor: Responsible for supplying any conduit, which may be required to complete the system installation in accordance with the specifications.
         1. Requirements for the metallic conduit specified in the electrical specifications and Division 16 shall apply to the Work described herein.
      3. Equipment Enclosure Layout and Assembly:
         1. Equipment Enclosure: Installed in the equipment room. Install as shown in the drawings.
            1. Constructed to easily accommodate interconnecting cables entering from above or below.
            2. Provide approved terminal blocks. Other suitable means of terminating or connecting incoming and outgoing cables may be used if approved by the Sound Masking Professional responsible for the Sound masking equipment.
         2. Interconnecting Cabling: Will be led laterally from each component to the vertical rack member opposite from the AC power strip and then run vertically, remaining as exposed and accessible as possible. Wherever corners in cabling occur a strain relief spiral covering should be used. All cable clamps shall be non-conducting or have soft insulating covers.
         3. Keep low level signal lines separated from the AC power lines and high level signal lines. This must be observed in rack layout and mechanical support or passage within the equipment room.
         4. Connections of Lines at Terminal Strips: Mechanically secured and soldered. No unsoldered connections permitted. Lines approach enclosure and terminal strips to be mechanically anchored at enclosure with sufficient slack length to avoid strain, abrasion or wear.
      4. Wiring and Cabling:
         1. Wiring: Executed per equipment manufacturer's wiring recommendations. Variations from these requirements, require the prior approval of the Engineer.
         2. Wiring Method: Per local electrical codes. Conceal cable in accessible ceilings, walls and floors. No exposed cable is allowed.
         3. Pulling Cable: Do not exceed manufacturers recommended pulling tensions. Do not install bruised, kinked, scored, deformed, or abraded cable. Do not splice cable between normal termination points. Remove and discard cable where damaged during installation and replace it with new cable.
         4. Cables to be grouped and bundled by type and level and routed from source to termination in a uniform manner throughout equipment housings. Do not break the insulation or deform the cable by harness supports. Cables are not to change relative position in a cable group throughout a cable route.
         5. Power distribution wiring will not be installed adjacent to signal cables. Power distribution cabling will be on the opposite side from signal wiring in equipment enclosures and uniformly located throughout an installation.
         6. Edge protection material ("cat track") installed on the edges of holes, lips of ducts or any other point where cables or harnesses cross metallic edges.
         7. Audio and control cable ends to be neatly formed and shrinkable tubing applied where necessary to secure the insulation against graying or raveling.
         8. Conductors, including spare conductors, which are entering or leaving the above listed components, to be directly terminated on terminal blocks without intermediate splices. Terminals to be properly and completely labeled.
         9. Cable Shields: Terminated in the same manner as other conductors. The shields of cables shall be kept well separated from each other and from ground.
         10. Cable Installation: Responsibility of Design-Builder for the Sound Masking system.
         11. The connection to the Fire Alarm Control Unit (FACU) will be provided by the Design-Builder to the Fire Protection Engineer (FPE).
             1. The FPE will be responsible for the physical connection to the FACU.
      5. Plenum Loud Speakers:
         1. Mount loudspeakers at locations shown on approved shop drawing.
         2. Mountings and Loudspeakers:
            1. Concealed above the acoustical ceiling.
            2. Suspend from slab above by chain. Where possible, the bottom, of speakers to be 6 to 8 inches (150 to 200 mm) above the acoustical ceiling tile.
            3. Hang at a uniform height insuring sound uniformity when system is on.
            4. Safety cable attached to the deck above at each loudspeaker location.
            5. In the event that the alternate to furnish exposed loudspeaker cables in the ceiling plenum is exercised, locate cables approximately 12 inches below the metal deck and attach cables by approved J-Hook fasteners.
            6. Loudspeaker cables shall not be permitted to lay on ceiling suspension members or the ceiling tile.
      6. Power Distribution Throughout the System: Per applicable codes:
         1. Unless otherwise specified, Design-Builder will supply and install the rack mounted power distribution panel, specified elsewhere, in each equipment console/rack/enclosure.
         2. Power cords from individual equipment to power outlet strips to be shortened to proper length and neatly dressed into the rack or console. Use cradle clamps with removable rubber retainers to secure power cords to the side of the rack supports. Do not secure power cords using non-reusable supports.
      7. Labeling:
         1. Equipment Markings: Present only needed information and be readable from the operator's or service personnel's normal work position. Markings to be designed to avoid ambiguous interpretation.
         2. Networked devices must have an LCD screen that works directly with the network in real time displaying the correct node number.
         3. A descriptive title shall be assigned to each piece of equipment.
            1. Apply an engraved designation title plate to both the front and rear panels of rack-mounted equipment, and to the outside case or enclosure of equipment mounted within a rack.
            2. These same titles will also be indicated on block diagrams, wiring drawings, and installation drawings.
            3. Use plain English (example: Power Amplifier No. 2-1).
         4. Signal and Control Cabling: Individually identified. A unique number located approximately 1.5 inches (38 mm) from cable termination connector at both ends of a cable.
            1. Cable Identification Number: Impressed on a fixed length of white shrinkable tubing with a heat impression stamping machine.
            2. Lettering: Filled with a black filler and covered with a protective coating after shrinking that will not crack, peel or yellow.
            3. After installation, cover labels with clear heat shrinkable tubing.
            4. Letters to be 0.25 inches (6 mm) in height.
            5. These unique numbers to appear on "as built" documentation to be supplied at the completion of the project.
            6. Markers pre-shrunk to approximate size before installing.
            7. Orient for cable markers for ease in viewing before installation.
   4. FIELD QUALITY CONTROL
      1. Field Inspection: Coordinate field inspection in accordance with appropriate sections in Division 01.

\*\* NOTE TO SPECIFIER \*\* Include if manufacturer provides field quality control with onsite personnel for instruction or supervision of product installation, application, erection or construction. Delete if not required.

* + 1. Manufacturer's Services: Coordinate manufacturer's services in accordance with appropriate sections in Division 01.
    2. Overall system Performance Requirements and Qualifications:
       1. Validate System as Specified. Fully document Work performed with a neat copy presented for acceptance by sound masking consultant and included in the system manual. Costs for tests to be borne by the Design-Builder.
       2. Tests Required: To greatest extent possible, pre-assemble and test system component sub-assemblies, including consoles, rack assemblies, interconnections, and system assemblies (excluding, of course, input and output transducers) in Design Builder's own facility.
          1. By Design-Builder at Design-Builder's Facility:

Frequency Response: Overall frequency response of the complete electronic system (un-equalized) to be 65 to 15,000 Hz plus or minus 2 dB. Equalizing circuits shall be temporarily set in the indicated "flat" position. Other equalization devices shall be temporarily removed and replaced with equivalent loss networks.

Distortion: Total harmonic distortion at full power; less than 1.5 percent for frequencies of 50, 1000, 10,000 and 15,000 Hz.

* + - * 1. Equalization and Other Testing by Design-Builder at Job Site:

After the following has been installed at the job site, equalize and acoustically test.

Electronic equipment specified.

Ceiling speakers.

Ceiling system with relevant return air sound boots in place.

Tests to be performed with HVAC system and ultrasonic motion detectors, turned off. Carpeting, work stations, desks, chairs, acoustical wall panels, and other materials that may influence acoustical characteristics of the space to be installed prior to testing.

Equalize complete system in all zones to meet octave and third-octave sound spectrum requirements per Design Criteria.

After zones are equalized, set sound level, measured in dBA for each zone to meet Design Criteria. If variation in sound level in a particular zone or area exceeds the nominal value in excess of 2 decibels, adjust individual loudspeakers as required.

Set time clock as follows for all zones (verify with Owner):

Monday - Friday 7 am to 7 pm: 0 dB.

Monday - Friday 7 pm to 7 am: - 3 dB.

Saturday, Sunday: - 3 dB.

All these tests, and any others that the Design-Builder may wish for his own satisfaction, to be performed and successfully achieved before observation is requested for the sound masking consultant. The Consultant may request repetition and demonstration during observation of tests or other critical tests if problems become apparent. If specifications are met, acceptance of the system after this observation may be expected.

If specifications are not met, further observations by the Consultant will be at the Design-Builder's expense.

* 1. ACCEPTANCE DOCUMENTATION
     1. Acceptance: Official acceptance of the system covered by this specification will occur when the Design-Builder receives the following written documents:
        1. A letter from the Sound Masking Consultant to the Architect acknowledging Final Acceptance of the system stating compliance with all articles of the specifications.
        2. A letter from the Architect to the Design-Builder stating that all related Work has been completed to his satisfaction. Until these documents are received, the installation is not formally complete. The official date of acceptance shall be the date of the letter.
     2. Design-Builder will supply complete system documentation with installed system.
        1. Furnish a complete instruction manual as provided by the manufacturer containing an operation description, schematic diagrams, parts layout drawings, as-built drawings, and parts list with each component time supplied by the Design-Builder.
        2. A list of all instruments, including accessories by manufacturer and type number used by the Design-Builder to obtain test data to be submitted to the Owner with maintenance recommendations for equipment furnished under this contract.
        3. System geographical layout and block diagram under a plastic cover on the inside of the equipment enclosure front door.
        4. Record of final field tests and measurements include final adjustment of system.
     3. Design-Builder will supply complete manufacturers instruction manuals (operation and service) for each purchased system component.
        1. Instruction manuals to contain an operational description of components, schematic diagrams, parts layout, parts list, and maintenance instructions; preventive and corrective.
        2. Organize manuals by system and present in bound volumes, one volume for each system. Provide three copies of each volume.
  2. DEMONSTRATION AND TRAINING
     1. After required approvals have been issued, and at a time designated by the Owner, the Design-Builder will demonstrate to the Owner's maintenance personnel the operation and maintenance of items installed under the Work in this section.
     2. Instruction:
        1. After the system is totally installed and in proper operating condition as directed, the Design-Builder shall provide instruction sessions as necessary to describe and demonstrate the entire system to the Owner's engineering staff, and those others who will be in charge of or otherwise related to the system operation.
        2. The session shall be scheduled by the Owner and shall be held at a time convenient to the Owner, and shall be at least 4 man-hours.
        3. The operation manualsdescribed above shall be completed at the time of the instruction session and at this time supplied to the Owner to aid in the system description.
  3. CLEANING AND PROTECTION
     1. Clean products in accordance with the manufacturer's recommendations.
        1. Debris resulting from system's installation must be continuously removed during and after installation.
        2. Equipment shall be thoroughly dusted and cleaned after installation.
     2. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION