

## The New York Times Building

### Executive Summary

Excerpt for Lighting Controls  
December 31, 2004

The lighting controls scope of work is based upon the philosophy that occupants of commercial office buildings prefer natural light to electric light. The lighting controls system specified by The New York Times for its new headquarters building is a DALI (Digital Addressable Lighting Interface) based system with dimmable fixtures throughout the interior space. This allows the system to dim down the electric lighting in response to daylight admittance. It also provides for variable target set points for illuminance levels at the work plane. The New York Times intends to establish and adjust target set points on a departmental basis. The lighting control sequences are described within the specification 16575. These sequences utilize occupancy sensors, photo sensors, switches and a time clock to control the lighting in the interior space on each floor. The emergency lighting system is also described within the specification. The lighting control sequences are tied to Control Intent Diagrams that divide up the space on each floor into its various control zones. The overall intent is to provide electric light only when the space is occupied and to provide as little electric light as is necessary to achieve the target set point for the work plane in a given department. A department usually occupies multiple floors.

This specification has been made public in order to assist design professionals by providing an example of a daylight harvesting, fully dimmable lighting controls system that has been market tested. This specification combined with reflected ceiling plans, lighting fixture layouts and DALI ballast specifications was competitively bid and led to the award of the lighting controls system contract on October 4, 2004. The DALI ballasts (refer to specification 16510) were awarded as an integral part of the lighting controls contract.

Glenn D. Hughes  
Director of Construction  
The New York Times

# SECTION 16510 LIGHTING FIXTURES AND BALLASTS

## PART 1 - GENERAL

### 1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to the Work of this Section.

### 1.02 SUMMARY

- A. This Section includes architectural lighting fixtures.
- B. Related Work Specified Elsewhere
  - 1. Related sections of electrical work.
  - 2. Air terminal units and air distribution accessories for air handling lighting fixtures.
  - 3. Lighting fixtures other than architectural lighting fixtures.

### 1.03 REFERENCES

- American National Standards Institute (ANSI)
- ANSI C 78.379 Electric Lamps – Incandescent and High-Intensity Discharge Reflector Lamps – Classification of Beam Patterns
  - ANSI C 82.1 Ballasts for Fluorescent Lamps- Specifications
  - ANSI C 82.4 Ballasts for High-Intensity Discharge and Low Sodium Lamps

Illuminating Engineering Society of North America (IESNA)

- National Electrical Manufacturers Association (NEMA)
- NEMA WD6 Wiring Devices – Dimensional Requirements
- National Fire Protection Association (NFPA)
- NFPA 70 National Electrical Code
  - NFPA 101 Life Safety Code

Underwriters Laboratories

- UL 57 Electric Lighting Fixtures
- UL 844 Electric Lighting Fixtures for use in Hazardous (Classified) Locations
- UL 924 Emergency Lighting and Power Equipment
- UL 935 Fluorescent Lamp Ballasts
- UL 1029 High Intensity Discharge Lamp Ballasts
- UL 1570 Fluorescent Lighting Fixtures
- UL 1571 Incandescent Lighting Fixtures
- UL 1572 High Intensity Discharge Lighting Fixtures

Occupation Safety and Health Administration (OSHA)

### 1.04 SUBMITTALS – to be submitted by the Lighting Fixtures and Ballasts Supplier(s)

#### A. Shop Drawings

- 1. Submit shop drawings showing details of all conditions, size and arrangement of parts, adjacent construction and other pertinent data. Clearly indicate the drawing number of fixture details used as reference in the development of the shop drawings. Indicate finished dimensions and required clearances, metal thicknesses and gauges, material finishes, electrical and mechanical connections, fasteners, weld locations, joint locations, relationship to ceiling supports and provisions for the work of others. For fixtures specified as “continuous runs”, provide scale drawings showing fixture and lamp layout for the actual length of run.
- 2. Provide listing on shop drawing containing the fixture type, manufacturer’s catalog number, applied voltage, and lamp and ballast types. Manufacturer’s catalog cuts may be submitted in lieu of shop drawings only if they contain sufficient detail and information to indicate compliance with the Contract Documents.
- 3. Coordinate lighting fixture shop drawings with details of the architectural, structural, electrical, mechanical and other related work.

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4. Indicate variations from the general arrangement and details shown on the Contract Documents required to suit actual conditions at the site.
  5. For air handling fixtures, submit CFM and total pressure data for end slots and side slots used for return air and/or supply air for review by mechanical engineer.
- B. Photometric Data – to be submitted by the Lighting Fixtures Supplier
1. When indicated on the fixture schedule or elsewhere, submit complete photometric data for the fixture, including optical performance rendered by independent testing laboratory developed according to methods of the Illuminating Engineering Society of North America (I.E.S.) as follows:
    - a. For Down and Semi-Down Lights Used for General Illumination
      1. Table of coefficients of utilization for room cavity ratios of 1, 2, 3... to 10, ceiling reflectances of 80, 70, 50 and 0 and wall reflectances of 70, 50, 30 and 10..
      2. Visual comfort probability data (fluorescent only for 100 footcandles), rooms with reflectances of 80% (ceiling), 50% (walls), and 20% (floor), including a 20 ft. x 20 ft. room with 10 ft. ceiling and luminaires lengthwise.
      3. Candlepower data, presented graphically and numerically, in 5 deg. increments (5 deg., 10 deg., 15 deg., etc.) for vertical planes. Data developed for up and down hemispheres in a singular azimuthal plane for fixtures with axially symmetric distributions and in 22-1/2 deg. increments for as many quadrants as required to completely describe fixtures with quadrilaterally symmetric, bilaterally symmetric and asymmetric distributions.
      4. Zonal lumens stated numerically in 10 deg. increments (5 deg., 15 deg., etc.).
      5. Zonal lumen summary table presenting the fixture lumens for the following angular zones: 0-30, 0-40, 0-60, 0-90, 90-180 and 0-180. For each of these angular zones also list the % of fixture lumens and % of lamp lumens.
      6. Luminance summary table, calculated from the candlepower data, giving the luminance of the lighting fixture at altitudes of 0, 45, 55, 65, 75 and 85 degrees from nadir for each measured azimuth plane as described in paragraph 1.04.B.1.a.3 of this specification. The luminances should be stated in SI units (candelas/square meter).
    2. Submit photometric data for any fixture offered in substitution for a specified fixture. Submission shall include above information plus I.E.S. formatted electronic photometric file on a CD.
- C. Samples
1. Lighting Fixtures Supplier shall submit a prototype sample of each fixture in the lighting fixture schedule in Part 4 of this specification, 16510, complete with specified lamp(s), ready for hanging and energizing. Samples are not returnable nor included in quantities listed for the Project. Where a fixture sample is submitted or requested, do not fabricate that fixture type until sample is reviewed and accepted. Prototype samples shall be sufficiently detailed and operational to allow evaluation of compliance with the salient features of the specification. Preliminary design or shop drawings shall not be accepted in place of prototype samples.
  2. The Architect and the Lighting Consultant shall be the sole judges in determining whether each prototype lighting fixture sample complies with the specifications.
  3. Submit samples of lenses, louvers or diffusers as requested.
  4. Submit sample for any fixture offered in substitution for a specified fixture, according to guidelines listed in item 1 above.
  5. Ballast Supplier shall submit a prototype sample of the DALI ballast for review. Prototype sample shall be sufficiently detailed and operational to allow evaluation of

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compliance with the salient features of the specification. Preliminary design or shop drawings shall not be accepted in place of prototype sample.

6. The Architect and the Lighting Consultant shall be the sole judges in determining whether the prototype DALI ballast sample complies with the specifications.

### D. Guarantees

1. Lighting Fixtures Supplier shall provide a written guarantee stating that each lighting fixture, finishes, and all component parts, except ballasts, shall be free from defects in materials or workmanship for a period of two (2) years from date of Final Acceptance. Upon notification of such defects, within the guarantee period, provide the necessary repairs or replacements (labor at prevailing NYC union rates and material) at the convenience of the Owner without any additional cost.
2. Lighting Fixture Supplier shall provide a written guarantee for ten (10) years stating that parabolic cones will be guaranteed against discoloration. Upon notification of such premature discoloration defects, within the guarantee period, provide the necessary replacements (labor and material) at the convenience of the Owner without any additional cost.
3. Fluorescent lamps in the F1 fixtures shall have a guaranteed lifetime of 15,000 hours based upon ten percent (10%) minimum level dimming and three (3) hours between on/off cycles.
4. Ballasts Supplier shall provide a written guarantee stating that each ballast shall be free from defects in materials or workmanship for a period of five (5) years from date of Final Acceptance. Upon notification of such defects, within the guarantee period, provide the necessary repairs or replacements (labor and material) at the convenience of the Owner without any additional cost.

### E. Maintenance Manuals:

1. Lighting fixtures manual - submit two hard copies of a bound Operations & Maintenance (O&M) manual and the same manual in electronic format on a CD, describing the materials, tools required, replacement parts identification list and procedures for cleaning and maintaining each type of lighting fixture. Include manufacturer's data describing the materials and finishes used in the work.

### F. Mock-up

1. If requested on the Contract Drawings, provide mock-up installation for review and approval by the Architect and Lighting Consultant. The mock-up shall simulate specified lighting system conditions as shown on the Contract Drawings.
2. For each substitution item which is not specified on the Contract Drawings provide mock-up installation at no cost to the Owner if requested, and as directed by the Architect and Lighting Consultant.
3. Lighting Fixtures Supplier shall provide one hundred (100) F1 fixtures for installation in the mock up at College Point in October 2004.
4. Ballast Supplier shall provide one hundred (100) F1 fixture ballasts for installation at the F1 lighting fixture manufacturer 's facility in early October 2004. The ballasts will be operated and tested in the mock up at College Point for at least three (3) months.

## 1.05 DESIGN AND PERFORMANCE REQUIREMENTS

- A. Lighting Fixtures Supplier shall manufacture, assemble, factory test, supply and deliver all lighting fixtures and ballasts, in accordance with this Section and as specified on the Contract Documents.
- B. Lighting fixtures and ballasts shall comply with requirements of NFPA 70, NFPA 101, all local codes, and requirements of OSHA.

## 1.06 QUALITY ASSURANCE

- A. Lighting fixtures

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1. Acceptable manufacturers for the lighting fixtures are described in Part 4 of this specification, 16510.
  2. Except as modified by governing codes and by the Contract Documents, manufacturer shall comply with the applicable provisions and recommendations of the following standards:
    - a. NEMA "Standard Publication No. LE-1 Fluorescent Luminaires"
    - b. National Electrical Code (NEC)
    - c. UL listed
    - d. Lighting equipment shall be manufactured and installed in compliance with applicable articles of NFPA 70, NFPA 101, and NEC with NYC Advisory Board amendments.
  3. Manufacturer shall provide listings for each fixture type, and the appropriate label or labels affixed to each fixture in a position concealed from normal view. Fixtures shall be approved for installation in New York City by IBEW.
- B. DALI Ballasts
1. Manufacturers for bidding are:
    - a. Advance Transformer
    - b. Green Earth
    - c. Osram
    - d. Tridonic
    - e. Universal Lighting Technologies
  2. Ballast manufacturing facilities shall be ISO 9001 approved. Manufacturer shall submit ISO 9001 certification with bid proposal.
  3. Except as modified by governing codes and by the Contract Documents, manufacturer shall comply with the applicable provisions and recommendations of the following standards:
    - a. UL listed 935
    - b. ANSI C82.11 ballast standard
    - c. ANSI 62.41 for surge protection
    - d. FCC 47CFR Part 18 for EMI and RFI
    - e. Annex E of IEC 60929

### 1.07 PRODUCT HANDLING

- A. Deliver lighting fixtures, components and assemblies in fully sealed protective cartons and identified as to contents. Protect fixtures from damage from any source. Each lighting fixture shall be sealed at the bottom with easily removable protective plastic to keep dust out during construction.
- B. Deliveries shall be coordinated with the Electrical Installation Contractor. These will be on a per floor basis, cellar to 28<sup>th</sup> floor. Deliveries may be required at anytime in the day or night.
- C. Each lighting fixture with a ballast shall have the ballast pre-mounted, pre-wired, pre-tailed and factory tested prior to packaging.
- D. Lighting fixture type, F1, shall have the 6 inch center plates pre-drilled in quantities per the Contract documents for sprinkler heads, occupancy sensors and photo sensors. The DALI address shall be included in the label on each light fixture carton.
- E. Each lighting fixture shall be packaged with complete instructions and illustrations indicating installation method.
- F. Store materials in accordance with manufacturer's instructions, properly protected from weather and construction activities.
- G. Handle in a manner to prevent damage to finished surfaces.

### 1.08 EXTRA STOCK

- A. Furnish extra stock of each type of lighting fixture type and lamp type supplied for the Project to the Owner and store at the site where directed. Lighting fixtures shall be packaged in manufacturer's unopened cartons and identified as to contents by fixture type.

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- B. Furnish items above with an appropriate quantity of ballast and/or transformer, lens and or diffuser, exposed trim, fastener, bracket and other items as required for a complete installation.
- C. The owner reserves the right to order the extra stock in quantities determined by owner. The price for the extra stock shall be as indicated in the Unit Price Schedule in Exhibit A of the Purchase Agreement. Owner acknowledges that in order to place the order for extra stock at these prices, that the order must be finalized prior to the final production release for this project.

Fixture Type	Extra Stock Fixture Quantity	Extra Stock Ballast/Transformer Quantity
F-1	TBD	ZERO
F-2	TBD	TBD
F2A	TBD	TBD
F2C	TBD	TBD
F-3	TBD	TBD
F-4	TBD	TBD
F-5	TBD	TBD
F-6	TBD	TBD
F-7	TBD	TBD
F-8	TBD	TBD
F-9	TBD	TBD
F10	TBD	TBD
F-10A	TBD	TBD
F-11	TBD	TBD
F-12	TBD	TBD
F12A	TBD	TBD
F-13	TBD	TBD
F-14	TBD	TBD
F-15	TBD	TBD
F-16	TBD	TBD

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### PART 2 - PRODUCTS

#### 2.01 MANUFACTURERS

- A. All lighting fixtures and ballasts shall be manufactured by the companies shown within these Specifications.

#### 2.02 MATERIALS

- A. Manufacturer shall comply with requirements of referenced standards.
- B. The location, number, size and type of all lighting fixtures, accessories and ballasts to be supplied shall be as shown on the Contract Documents.

#### 2.03 FIXTURE FABRICATION, GENERAL

- A. Lighting Fixtures: Provide lighting fixtures completely factory assembled, wired and equipped with necessary sockets, ballasts, wiring, shielding, reflectors, channels, lenses, brackets, fasteners and other parts necessary to complete the fixture installation. Lighting fixtures shall be furnished with lamps, which comply with the requirements of this Section, and as shown on the Contract Drawings. All fluorescent and high intensity discharge lighting fixtures supplied shall come with factory installed ballasts, which comply with the requirements of this Section, and as specified on the Contract Drawings.
- B. Sheet Metal Work: Sheet metal work shall be free from tool marks and dents, and shall have accurate angles bent as sharp as is compatible with the gauge and material of the required metal. All intersections and joints shall be formed true, of adequate strength and structural rigidity to prevent any distortion after assembly. Return or clean edges free of all burrs or sharp spots.
- C. Castings: Provide cast or extruded metal fixtures parts, of ample weight and thickness, that are close grained, smoothly finished and buffed, rigid and free from imperfections, sand pits, blemishes, scales, rust or discolorations. Provide for tolerance of shrinkage of the metal castings so as to allow the finished castings to accurately fit in their designated locations.
- D. Hinged door closure frames shall operate smoothly without binding. Fabricate frames to allow lamp installation and/or removal without the use of tools. Hinge mechanism shall be designed to preclude accidental falling of hinged door closure frames during relamping operations and while secured in the operating position.
- E. Weld exposed metal at joints, fill with compatible weld material, grind smooth and make free from light leaks. Construct fixtures with the minimum number of joints. Fabricate unexposed joints utilizing welding, brazing, screwing or bolting. Soldered joints are unacceptable. Do not utilize self-tapping methods or rivets for fastening parts which require removal to gain access to electrical components requiring service or replacement or for fastening any electrical components or their supports. Gasket incandescent fixtures with overlapping trim. Weld ballast support studs, socket saddle studs and reflector support studs to fixture body. Ventilate ballast compartments and firmly secure ballasts to conducting metal surface.
- F. Light leaks between ceiling trims of recessed lighting equipment and the ceilings will not be allowed. If fixtures are used in partially transparent ceilings, light leaks above the ceiling line will not be allowed. Interior light reflecting surfaces shall have reflectance of not less than 85% for white surfaces, 83% for specular surfaces and 75% for specular diffusing surfaces.
- G. Provide yokes, brackets and supplementary supporting members needed to mount lighting fixtures to black iron in the ceiling. The installation contractor is responsible for furnish and install of the black iron.
- H. All fixtures and ballasts must operate within the temperature limits of their design and as specified by Underwriters' Laboratories, Inc. in the applications and mounting conditions specified herein.

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### 2.04 FIXTURE FABRICATION, SPECIFIC ITEMS

- A. Enclosures: Fabricate fixture enclosures with minimum 20 gauge (ga.) thick cold rolled sheet steel. Lighting fixtures shall be of rigid construction and built in accordance with NEMA WD6. Enclosures may be constructed of other metals, provided they are equivalent in mechanical strength and acceptable for the purpose. Fabricate lighting fixtures with vitreous porcelain enamel finish from minimum 20 ga. enameling steel.
- B. Housings: Fabricate housings so that all electrical components are easily accessible and replaceable without removing fixtures from their mountings, or altering adjacent construction. Provide fixtures using bottom relamping unless otherwise noted. Ferrous components shall be protected from corrosion by plating or finished with white baked enamel unless another color is shown on the Contract Drawings. All paint shall be spray-applied and baked at 350° F, for at least 20 minutes. Interior surfaces of all fluorescent fixtures shall be white enamel of minimum 87% reflectance. Ballast compartment shall be so designed that ballast temperature shall not exceed the UL limit of 105°C at 40°C ambient temperature.
- C. Mounting Frames and Rings: If required for installation in specified ceiling system, provide each recessed and semi-recessed fixture with a mounting frame or ring compatible with the ceiling system in which they are to be installed. Frames and rings shall be one piece or constructed with electrically-welded butt joints, and of sufficient size and strength to sustain the weight of the fixture. Ceiling opening frames shall either be manufactured of non-ferrous metal or be suitably rust-proofed after fabrication. Exposed parts of the lighting fixture housing shall be free from spinning lines, ripples, or other visible marks and manufacturer's stickers.
- D. Fasteners and Hardware: For steel and aluminum fixtures, all screws, bolts, nuts and other fastening and latching hardware shall be cadmium or equivalent plated. For stainless steel fixtures, all hardware shall be stainless steel. For bronze fixtures, all hardware shall be stainless steel or bronze. Where exposed in the finish work, fasteners shall be of color and finish, matching base metal and finish.
- E. Lamp Sockets: Provide lamp sockets in lighting fixtures suitable for the specified lamps and set so that lamps are positioned in optically correct relation to all lighting fixture components. If adjustable socket positions are provided, preset socket in factory for lamp specified. If different socket positions are specified for same fixture, preset sockets for each type, and mark cartons accordingly.
- F. Adjustable Angle Fixtures: Provide each lighting fixture which has a beam angle adjustment with a reliable angle locking device. Fixture relamping shall not disturb preset focus.
- G. Spread Lens Fixtures: Each light fixture which has a spread lens shall contain lens orientation locking devices to insure that lens orientation is not disturbed during future lamp replacement or cleaning.

### 2.05 FIXTURE FINISHES

- A. General: As shown for the respective units and matching the Architect's samples. Remove scratches, abrasions, dents, die markings and other defects prior to finishing operations. Perform this work in addition to finish treatment specified. Unless otherwise noted, colors and finishes shall be as selected by the Architect and Lighting Consultant.
- B. Shop Finishes
  - 1. Ferrous Metals: Except for stainless steel, give ferrous metal surfaces a five stage phosphate treatment or other acceptable base bonding treatment before final painting and after fabrication.
  - 2. Anodized Aluminum Surfaces: Finish interior aluminum trims with an anodized coating of not less than 7 mg. per sq. in. of a color and surface finish as selected by the Architect and Lighting Consultant. Finish exterior aluminum and aluminum trims with an anodized coating of not less than 35 mg. per sq. in. of a color and surface finish as selected by the Architect and Lighting Consultant.

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3. Porcelain Enamel Surfaces: Apply porcelain finishes smoothly. Finish shall be not less than 7.5 mm thick of non-yellowing, white, vitreous porcelain enamel with a reflectance of not less than 85% except as noted otherwise.
  4. Unpainted non-reflecting surfaces shall receive a mechanically applied satin finish and shall be coated with a baked-on clear lacquer to preserve the surface. Where aluminum surfaces are treated with an anodic process, the clear lacquer coating may be omitted.
- C. Field Painting
1. Painted Surfaces: Synthetic enamel, with acrylic, alkyd, epoxy, polyester or polyurethane base, light stabilized, baked-on at 350 deg. F. minimum, catalytically or photochemically polymerized after application.
  2. White Finishes: Minimum of 85% reflectance.

### 2.06 FLUORESCENT LIGHTING FIXTURES

- A. General Construction and Materials: Conform to UL 1570 except for damp and wet locations conform to UL 57. Housing end plates, socket bridges, reflectors, wiring channels and ballast covers shall be die formed of not less than 20 ga. cold-rolled steel unless otherwise specified.
- B. Lamp holders shall be heavy white thermoset urea plastic with definite locking feature and silver-plated contacts for proper lamp operation and life. Sockets with open circuit voltage over 300 volts shall be safety type and designed to open supply circuit on lamp removal.
- C. Construct fixtures so that ballast may be serviced or replaced without removal of fixture housing.
- D. Construct fixtures with a continuous raceway to facilitate wiring from one fixture to the next.
- E. Fixtures shall be 100% factory tested with ballasts installed prior to delivery to the construction site located at 620 8<sup>th</sup> Avenue, New York, NY. Testing protocol shall be submitted with bid proposal and shall include photometric performance.

### 2.07 FLUORESCENT BALLASTS (Non-Dimming)

- A. General: Use two-lamp or single-lamp ballasts in each fluorescent fixture as scheduled or shown. Fluorescent lighting fixture ballasts (except single reactor type) shall be equipped with an internal, automatic resetting thermal protector adjacent to the coils, and on-time non-resetting thermal device to protect the capacitor. Provide identical ballasts within each fixture type. Ballasts within the same lighting fixture shall be from the same manufacturer.
- B. Ballasts shall be designed, manufactured and tested in accordance with the applicable provisions of NEC and ANSI C82.1 "Ballasts for Fluorescent Lamps". Certified ballasts shall be CBM and ETL certified and UL Labeled as class "P".
- C. Ballasts shall be high power factor, high efficiency, low loss type, similar to Universal SLH or General Electric Maxi-Miser I and compatible with specified lamp.
- D. Provide ballasts with the manufacturer's lowest sound rating (least noisy) available for the lamps specified, and clearly indicate the sound rating on the ballast. Ballasts found by the Architect to be unduly noisy shall be removed and replaced without additional charge prior to Final Acceptance by the Owner.
- E. Relative light output (percentage of light emitted with reference tube and ballast) shall be not less than 95%.
- F. Operating Environment: Ballasts shall be designed and constructed to maintain a case temperature not greater than 90 deg. C. when operated at an ambient room temperature of 50 deg. C. as tested in accordance with UL and CBM standards.
- G. Electrical Characteristics: Ballasts shall be designed for single frequency operation 60 Hz. nominal, and shall operate at the nominal voltages indicated on label, 120 volts and/or 277 volts as required. Provide ballasts suitable for the electrical characteristics of the supply circuits to which they are to be connected, and which are suitable for operating the lamps specified.

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- H. Secure ballasts firmly in lighting fixtures to prevent vibrations.
- I. Electronic Fluorescent Ballasts: All electronic ballasts for interior use shall be controlled by the digital lighting control system. They shall have a Ballast Efficiency Factor (BEF) of not less than 1.14 for F28 2-lamp ballasts at 277 volts. Total Harmonic Distortion (TAD) shall not exceed 20% of fundamental 60 Hz for all ballasts. Current crest shall not exceed 1.7 for F28 lamp ballasts. Provide electronic ballasts equivalent to Advance Transformer "IC", Magnatek Triad "Ballastar Electronic", or Motorola "M-RN-T8-1LL" unless otherwise specified.
- J. Fluorescent lamp ballasts shall comply with ANSI C 82.1 and shall be Class 'A' sound rated Class 'P' listed by ETL and UL.
- K. Fluorescent lamp ballasts shall be certified for the application minimum starting temperature.
- L. Unless otherwise shown on the Contract Drawings, fluorescent lamp ballasts for indoor applications shall be high-frequency, electronic type, suitable for operation in rapid start circuitry and comply with the following requirements:
  - M. Minimum Power Factor: 0.98
  - N. Total Harmonic Distortion: less than 20%
  - O. Lamp Crest Factor: less than 1.7
  - P. Lamp Current Frequency: greater than 20 kHz
  - Q. In-rush current: less than 20x normal current
- R. Fluorescent lamp ballasts shall be wired and grounded in accordance with NFPA 70 and the manufacturer's instructions.

### 2.08 FLUORESCENT ELECTRONIC DALI DIMMING BALLASTS

- A. DALI ballasts shall utilize standard open communication protocol.
- B. Each ballasts shall operate a two lamp, 14W, T5 fixture.
- C. Each ballast shall have its own individual address.
- D. Ballasts shall be individually configured. Parameters required to be configured within the ballast are:
  - 1. Programmable minimum and maximum dimming levels
  - 2. Ballast status – on, off, failed
  - 3. Lamp status – on, off, failed
  - 4. Programmable fade time from 5 seconds to 30 minutes
  - 5. Programmable fade rate
  - 6. Programmable 64 addresses, 16 groups and 16 scenes
- E. Two way communication is required between the ballast and the control panel.
  - 1. Light fixture status (on/off)
  - 2. Total ballast output
  - 3. Lamp condition (failure status) – a failure of a single lamp within the two lamp fixture shall provide a general lamp failure signal for that fixture
  - 4. Ballast condition (failure status)
- F. Dimming range shall be 10% to 100%. The lowest level of output shall be 10%, then the next level is off.
- G. Ballast shall operate at 20 kHz or above. Ballasts shall be inaudible with no apparent humming or buzzing at any point in the dimming range.
- H. Ballast shall operate in ambient temperature up to 105 degrees Fahrenheit.
- I. Ballast shall tolerate voltage variation of plus or minus 10% from nominal voltage.
- J. Ballast shall include in rush current limiting circuitry and end-of-lamp life protection
- K. Ballast shall operate at 60 Hz plus or minus 5%.
- L. Ballasts shall have: a power factor greater than 0.98.
- M. Ballasts shall capable of striking lamps at any light level without first flashing to full light.
- N. Ballasts shall be free of Polychlorinated Biphenyls (PCB's)
- O. Ballast shall operate without flicker throughout entire dimming range.
- P. Input current total harmonic distortion shall not exceed 10% at full output.
- Q. Ballast shall have lamp crest factor less than 1.6 per ANSI C82.11-1993.

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- R. Ballast warranty shall be for 5 years against defects in workmanship, including replacement (material and labor at prevailing NYC union rates) for 5 years from date of Final Acceptance.
- S. Two-lamp ballasts shall track evenly, with no perceptible difference in light levels for the same type lamps.
- T. Ballast controls shall be polarity free.
- U. The EEPROM or flash card in each ballast shall be able to recover from loss of power. Lifetime of each EEPROM or flash card shall be equal to the lifetime of the ballast. Program must only allow one address at any given time. The program shall provide lamp status, ballast status, lamp output and failure modes with address.
- V. Energy usage at 10% output level shall not exceed 30% of power consumed at 100%.
- W. All ballasts shall be 100% factory tested. Testing protocol shall be submitted with bid proposal and shall include reliability, longevity, performance and DALI address stability.

### 2.09 INCANDESCENT LIGHTING FIXTURES

- A. Incandescent lighting fixtures shall be listed and labeled by Underwriters' Laboratories, Inc. or other testing agency acceptable to local code authorities, as required for installation in rated construction, non-rated construction, damp or wet locations.
- B. Aluminum reflectors shall be Alzak (finish as selected) or as authorized, and not less than 0.057 in. thick unless otherwise specified.
- C. Lamp holders shall be UL listed, and heavy duty type constructed of high grade porcelain. Provide medium base sockets for lamps up to and including 250 watts and mogul based sockets from 300 watts up to 1500 watts (rated for 1500 watts, 600 volt service) unless specified otherwise.
- D. Tungsten Halogen: Incandescent lighting fixtures utilizing tungsten halogen sources shall be designed and constructed so that lamp seal temperatures do not exceed 350 deg. C. at an ambient temperature of 25 deg. C. when tested in accordance with UL Standard No. 57 and shall maintain an operating bulb wall temperature of approximately 600 deg. C. and not less than 250 deg. C.
- E. Lead wires for fixtures utilizing tungsten halogen sources shall be rated for not less than 200 deg. C. operation, unless temperature warrants rating of 250 deg. C.
- F. Temperature on reflectors shall not exceed 205 deg. C. at any point.
- G. Junction Boxes: All fixtures supplied for recessing in suspended ceilings shall be supplied with pre-wired junction boxes.
- H. All fixtures shall be controlled by incandescent dimming modules in the digital lighting control system.

### 2.10 LAMP HOLDERS

- A. Incandescent: Porcelain body; Nickel-plated brass screw-shell, pre-lubricated with silicone compound.
- B. Fluorescent: White urea plastic body; Silver-plated phosphor bronze contacts.

### 2.11 LAMPS

- A. Lamps shall comply with the requirements of the Energy Policy Act of 1992 or its latest edition.
- B. Lamps shall be manufactured by General Electric, Philips or Osram Sylvania unless otherwise specified. All lamps of a given type shall be supplied by the same manufacturer.
- C. If a specific manufacturer is noted in the lighting fixture schedule in Part 4 of this section 16510 of these Specifications, then only that manufacturer shall be acceptable.
- D. Provide lamps for all lighting fixtures.
- E. Incandescent and tungsten halogen lamps shall not be operated, other than for initial testing, prior to final inspection.
- F. Fluorescent lamps shall be 3500 degree Kelvin and CRI of no less than 85 unless otherwise specified on the drawings.

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### 2.13 REFLECTORS

- A. Aluminum reflectors shall be finished specular, semi-specular or diffuse as required and shall meet or exceed Alzak specifications. Minimum requirements of reflector finishes for interior and exterior service shall be as follows:

Description of Service	Min. Weight of Coating Mg. Per Sq. In.	Min. Reflectance Specular %	Min. Reflectance Diffuse %
Normal interior commercial service.	5.0	83	75
General interior industrial and exterior work reflector protected by glass covering.	7.5	82	73

### 2.14 LENSES

- A. Plastic for lenses and diffusers shall be formed of colorless 100% virgin acrylic as manufactured by Rohm & Haas, DuPont or approved equal. The quality of the raw material must exceed IES, SPI and NEMA Specifications by at least 100% which, as a minimum standard, shall not exceed a yellowness factor of 3 after 2,000 hrs. of exposure in the Fade Meter or as tested by an independent test laboratory. Acrylic plastic lenses and diffusers shall be properly cast, molded or extruded as specified, and shall remain free of dimensional instability, discoloration, brittleness, or loss of light transmittance for a minimum of 15 years.
- B. Glass used for lenses, refractors and diffusers in incandescent lighting fixtures shall be tempered for high impact and heat resistance; the glass shall be crystal clear in quality with a transmittance of not less than 88%. For fixtures directly exposed to the elements and aimed above the horizontal with a radiant energy of 4.16 watts per sq. in., or greater, use Vycor glass.
- C. Where optical lenses are used, they shall be free from spherical and chromatic aberrations and other imperfections which may hinder the functional performance of the lenses.
- D. Mechanical: All lenses, louvers or other light diffusing elements shall be removable, but positively held so that hinging or other normal motion will not cause them to drop out.

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**PART 3 – Intentionally blank**

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### PART 4 - LIGHTING FIXTURE SCHEDULE (INTERIOR)

#### General Notes:

1. Architect to verify all finishes.
2. Engineer to verify all voltages.
3. Architect to verify all mounting details. Electrical Contractor to coordinate.
4. Refer to both lighting fixture schedule and lighting fixture cuts sheets for complete information. Should there be any conflicting information; notify Lighting Designer immediately for clarification.
5. Lighting Fixture Supplier to provide all manufacturer fixture cuts of specified and proposed alternates to Lighting Designer for review and approval.

- F-1 Description: Recessed fluorescent downlight with two 14W T5 (2'-0"L) fluorescent lamps with steel housing nominally 6"W x 6" D x 5'L, matte white enamel finish removable metal reflector, integral electronic dimming ballast. Extruded acrylic diffuser nominally 6" wide 2'-0" long to be lightly frosted. Louver assembly nominally 3/8" deep x 1/2" on center vertical metal fins (matte white finish) mechanically mounted to the extruded acrylic diffuser. Fixture to have 6" square removable center plate for mounting photo sensors, occupancy sensors, sprinkler heads and sound masking speakers. Fixture to have two 4 sq-in (total of 8 sq-in) return air diffuser slots as part of the fixture end cover plates. Fixture to have 5/8" wide extruded aluminum overlap trim at each long (5'-0") section to support 2'-3" wide x 5'-0" long acoustic ceiling tile.
- Manufacturers: Zumtobel Staff Lighting  
Mark Lighting  
Linear Lighting
- Remarks: Provide all mounting accessories as required for complete installation except black iron.  
Direct source luminance shall not exceed 2000 cd/m2 when viewed at 55 degrees.  
Extruded acrylic diffuser shall not exceed a yellowness factor of 3 after 2,000 hrs. of exposure.  
Fixture shall have (min) 4" diameter access hole continuous wire-way(s) as required at the top of the housing.  
Lighting Fixture Supplier shall coordinate fixture's overlap trim with ceiling and tile system. The scope has been defined for a 1-1/2" (1.5") T ceiling grid system in accordance with Type F1 sketches attached to this specification. The working assumption is that the F1 fixture with some modifications to its design may be installed in a custom 5/8" ceiling grid system. The ceiling grid system will be finalized after the lighting fixtures bid period.
- Location: Open plan areas, enclosed offices, conference rooms, aisles, corridors and other spaces as defined in the Contract Documents.
- Supply: 277 Volts  
Lamp: (2) F14T5/835
- F-2 Description: Recessed 50W MR16 down light with 1" regressed white cone and white overlap flange, matte lens, steel housing nominal 12 1/2" L x 10 1/2" W x 4 1/4" deep, with 3 3/8" -ceiling cutout and 2" aperture. Integral magnetic transformer.

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- Manufacturers: USA Illumination, 325NC-9349white-9143matte-10white-magnetic transformer  
RSA Lighting
- Remarks: Trim finish to be verified. Lighting Fixture Supplier shall verify fixture mounting detail with ceiling system and coordinate with architect. Provide all mounting accessories as required for complete installation.
- Location: Cafeteria seating area perimeter zone, elevator lobbies, cafeteria mezzanine, conference center corridors.
- Supply: 277 Volts  
Lamp: (1) Q50MR16/C/WFL55 (GE)
- F-2A Description: Similar to F-2, with fixed frost tempered diffuser under the narrow flood MR lamp.
- Manufacturers: USA Illumination, Mod-325NC-9349white-9143matte-10white-magnetic transformer
- Remarks: Fixture to be suitable for food servery area. Trim finish to be verified. Lighting Fixture Supplier shall verify fixture mounting detail with ceiling system and coordinate with architect. Provide all mounting accessories as required for complete installation. Fixture to be dimmed.
- Location: Cafeteria and kitchen windows perimeter zones.  
Supply: 277 Volts  
Lamp: (1) Q50MR16/C/CG25 (GE)
- F-2C Description: Recessed 50W MR16 fixed lens wall washer with black vert groove baffle, black overlap flange, matte lens, steel housing nominal 12 1/2"L x 10 1/2"W x 4 1/4" deep, with 3 3/8" ceiling cutout and 2" diameter aperture. Integral magnetic transformer shall be supplied.
- Manufacturers: USA Illumination, 325NC-7998black-9143matte-21-magnetic transformer  
RSA Lighting
- Remarks: Trim finish to be verified. Lighting Fixture Supplier shall verify fixture mounting detail with ceiling system and coordinate with architect. Provide all mounting accessories as required for complete installation.
- Location: Cafeteria Wood-panel walls – cafeteria and conference center elevator lobbies, cafeteria mezzanine.
- Supply: 277 Volts  
Lamp: (1) Q50MR16/C/WFL55 (GE)
- F-3 Description: Recessed fixture with one 28W T5 fluorescent lamp in the center and two 50W MR16 lamps at each end. Baked white enamel finish, with frosted clear acrylic lens 40° shielding angle, matte white enamel reflector, integral electronic fluorescent ballast and electronic low voltage step-down transformer in the metal housing (nominal 60"L x 5 5/8"W x 6" deep.) Fixture to have extruded aluminum 1 1/4" deep white finish regressed trim. MR 16 lamp to sit on 1" deep regressed metal trim with 6" x 6" square plate.
- Manufacturers: Mark Lighting, B13197Mod-19-1T\*ACR-2MR16-60-S/W/ceiling  
Zumtobel,  
Linear Lighting

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- Remarks: All finishes to be verified. Electrical contractor to verify fixture mounting and aluminum trim detail with ceiling system. Provide all mounting accessories as required for complete installation.
- Location: Corridor, elevator lobby
- Supply: 277 Volts
- Lamp: (1) F28T5/835  
(2) Q50MR16/C/WFL55 (General Electric)
- F-4 Description: Wall-mounted flood light, copper alloy cast aluminum body. Fixture head size: 4"W x 2"D x 7"high with 18"long bracket. One 18W 4P compact fluorescent lamp, with clear prismatic tempered glass lens, integral electronic ballast shall be supplied.
- Manufacturers: Design Plan, NIGHTLINE A, NA2-8-58-1-TBD-0-TBV-T-0
- Remarks: Finish to be determined by architect. Center of the ballast/mounting box to be installed 6" below the ceiling line (refer to architectural elevations for fixture mounting locations). Architect to verify finish. Lighting Fixture Supplier shall verify fixture mounting detail and provide all mounting accessories as required for complete wall mounting installation.
- Location: Pantry/copy room
- Supply: 277 Volts
- Lamp: (1) PL-C 18W/835/4P/ALTO
- F-5 Description: Cove mounted fluorescent (mini-staggered) channel with one 4' 28W T5 fluorescent lamps. Steel housing, nominally 4"W x 2 5/8"H. Integral electronic ballast shall be supplied.
- Manufacturers: Legion Lighting, 1520-232-4 EBO  
Mark Lighting  
Zumtobel,  
Linear Lighting
- Remarks: Provide all mounting accessories as required for complete cove installation. See lighting sketches for the cove size and lamp position. Continuous staggered mounting on 3'-9" center, use different length of lamp at the end to make maximum 6" end of the cove.
- Location: Pantry (wall washer) coves, copy rooms.
- Supply: 277 Volts
- Lamp: (1) F28T5/835 @ 3'-9" O.C
- F-6 Description: Under-cabinet fixture, with one 28W T5 fluorescent lamp, steel housing nominal 5"W x 2"H x 4' long. Ribbed translucent white acrylic wrap around plastic diffuser, integral electronic ballast.
- Manufacturers: Legion Lighting  
Belfer Lighting
- Remarks: Architect to verify finish. Lighting Fixture Supplier shall verify fixture mounting detail with cabinet system and coordinate with architect's details. Provide all mounting accessories as required for complete installation.
- Location: Pantry, copy rooms.
- Supply: 120 Volts
- Lamp: (1) F28T5/835 @ 4'-0" O.C.  
(1) F21T5/835 @ 3'-0" O.C.
- F-7 Description: Wall-mounted asymmetric fluorescent uplight with one 54W T5HO lamp and integral ET5HO ballast. Extruded smooth surface aluminum housing, nominal 4'L x 8"D x 4-3/8" H. Semi-

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- gloss white finish, with end plates and cutoff visor, and decorative mounting bracket and wall plate.
- Manufacturers: Elliptipar: F106-T155-S-02-TBV-V0-0  
Winona Lighting
- Remarks: Architect to verify finish. Lighting Fixture Supplier shall verify fixture mounting detail with wall mounting system and coordinate with architect's wall detail. Fixture shall be mounted at least one (1) foot below ceiling. Provide all mounting accessories as required for complete installation.
- Location: Service Elevator Lobby
- Supply: 277 Volts
- Lamp: (1) F54 T5/835/HO
- F-8 Description: Customized linear channel with two 4'-0"L 28W T5 fluorescent lamp, nominally 4"W x 1 1/4"H x 48"L. die-formed aluminum channel body with white powder coated enamel finish, specular anodized aluminum reflector, integral electronic ballast, mounted in architectural upright cove.
- Manufacturers: Electrix: EX-31-S-2-UE-46-I  
Linear Lighting  
Mark Lighting,  
Zumtobel,
- Remarks: Fixture to be centered within curtain wall module, typically a five (5) feet wide module. Provide all mounting accessories as required for complete installation.
- Location: Ceiling perimeter cove
- Supply: 277 Volts
- Lamp: (1) F28T5/835
- F-9 Description: Stem-mounted industrial down light, with two 4'-0" long 28W T5 fluorescent exposed lamp. Steel reflector of powdered coated white finish, nominally 4 1/8"W x 2 1/2"H x 46"L, with integral electronic ballast shall be supplied.
- Manufacturers: Lightolier: SV5R-1-W-4-S-SLD-Stem mounted (T5 lamp)  
Legion Lighting
- Remarks: Architect to verify finish. Lighting Fixture Supplier shall verify fixture stem mounting detail (with ceiling system), stem mounting length and coordinate with architectural details. Provide all mounting accessories as required for complete installation.
- Location: Technology Room (TR)
- Supply: 277 Volts
- Lamp: (2) F28T5/835
- F-10 Description: Recessed fluorescent trouffer, die-formed steel housing nominally 5" deep x 12"W x 4'-0" L. Steel reflector, flat white acrylic lens, integral electronic ballast. Flange type to be determined by ceiling type. The lamps are UV emission blocked.
- Manufacturers: Legion Lighting: 71-332-EBO-FA
- Remarks: Architect to verify finish. Lighting Fixture Supplier shall verify fixture's mounting detail with ceiling system and coordinate with architect's detail. Provide all mounting accessories as required for complete installation.
- Location: Kitchen Support Room
- Supply: 277 Volts
- Lamp: Special UV-Blocked lamps: (3) F32T8/GO (General Electric)

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- F-10A Description: Recessed fluorescent fixture, with two 5' 35W T5 lamp in metal housing (nominal 60"L x 5 5/8"W x 6" deep). Fixture to have extruded baked white enamel finish regressed trim, with frosted clear acrylic lens of 40° shielding angle, matte white enamel reflector, integral electronic fluorescent ballast
- Manufacturers: Mark Lighting, Slot Series, SL / Grid type TBV / 65 / 60 / EB / volt TBV / FA / Ind  
Zumtobel,  
Linear Lighting
- Remarks: Fixture to be mounted at custom architectural (5'x5') ceiling. Lighting Fixture Supplier shall coordinate fixture trim and ceiling system detail. Provide all mounting accessories as required for complete installation. All finishes to be verified by architect. Lighting Fixture Supplier shall verify fixture mounting detail with ceiling system requirements and coordinate with architect.
- Location: Cafeteria Kitchen  
Supply: 277 Volts  
Lamp: (2) F35T5/835 @5'-0" O.C.
- F-11 Description: Pendant mounted low voltage flood up light, with one 45 degree wide beam 100W 12V T4 halogen lamp, with cast aluminum housing nominal 6 1/8" dia x 12" H, with integral electronic step-down transformer, adjustable steel suspension cables (length to be determined in the field). Fixture' metal spun cone reflector to accommodate clear frost lens and 1" tall symmetrical glare hood (cut-off shield). Fixture to have modified adjustable and lockable yoke assembly with 5" diameter canopy cover plate. Finish of the fixture housing shall be determined by architect.
- Manufacturers: Sistemalux, Le Perroquet Pendant, Medium Large, MOD-3144-TBV-clear frost lens, modified yoke for up light configuration. Address is: 1310 Blue Oaks Blvd, Roseville, CA, 95678 Tel. (916) 772-7800.
- Remarks: All finishes to be verified by architect. Architect to verify fixture mounting height and detail with cable size/length and coordinate with electrical contractor. Provide all mounting accessories as required for complete installation.
- Location: Cafeteria dining area  
Supply: 120 Volts  
Lamp: (1) 100W/12V/Capsule (PHILIPS)
- F-12 Description: Surface mounted downlight with halogen PAR 30 lamp. Metal housing (nominal 33.4cm L x 14cm "W x 18cm high), with adjustable frost glass lens diffuser assembly mounted to the cafeteria ceiling with 5" diameter decorative cover plate. Color to be determined by architect.
- Manufacturers: Deltalight,  
Lighting Services Inc.
- Remarks: All finishes to be verified by architect. Lighting Fixture Supplier shall verify fixture mounting detail and coordinate with architect. Provide all mounting accessories and frosted tempered clear glass lens as required for complete installation.
- Location: Cafeteria Ceiling  
Supply: 120 Volts  
Lamp: (1) 75PAR30/H/FL35 (General Electric)
- F12A Description: Similar to F12, except using 45W lamp.

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- Manufacturers: Deltalight,  
Lighting Services Inc.
- Remarks: All finishes to be verified by architect. Lighting Fixture Supplier shall verify fixture mounting detail and coordinate with architect. Provide all mounting accessories and frosted tempered clear glass lens as required for complete installation.
- Location: Cafeteria Ceiling  
Supply: 120 Volts  
Lamp: (1) 75PAR30/H/FL35 (General Electric)
- F-13 Description: Recessed fluorescent downlight, with one horizontal 32W triple tube compact fluorescent lamp and integral prism lens. Steel housing (nominal 19"L x 13-1/2"W x 6" deep) with 5 7/8" dia aperture. Clear Alzak cone, Integral electronic fluorescent ballast.
- Manufacturers: Kurt Versen, P921-32W-LP prism lens / trim finish.  
Zumtobel Staff Lighting,  
Edison Price Lighting
- Remarks: Fixture to be suitable for food preparation areas. All finishes to be verified by architect. Lighting Fixture Supplier shall verify fixture mounting detail and coordinate with architect. Provide all mounting accessories as required for complete installation.
- Location: Cafeteria kitchen corridors.  
Supply: 277 Volts  
Lamp: (1) PL-T 32W/835/4P/ALTO
- F-14 Description: Recessed compact fluorescent down light, with one 32W Triple tube 4pin compact fluorescent lamp in horizontal position. Steel housing (nominal 19"L x 13- 1/2"W x 6" deep) with 4-1/2"x8-1/2" rectangular aperture and white parabolic splay trim. Specular primary reflector and spread lens, integral electronic fluorescent ballast.
- Manufacturers: Kurt Versen, T4142-32W-FR frosting on lens  
Zumtobel Staff Lighting,  
Lightolier
- Remarks: All finishes to be verified by architect. Lighting Fixture Supplier shall verify fixture mounting detail and coordinate with architect. Provide all mounting accessories as required for complete installation.
- Location: Servery south counters and cafeteria floor vending machine wall  
Supply: 277 Volts  
Lamp: (1) PL-T32/835/4P/ALTO
- F-15 Description: Wall-mounted decorative T5 fluorescent fixture with one 3'-0" long 21W T5 lamp and integral electronic ballast. Painted aluminum housing and end plates, nominal 34"L x 2" projecting x 4-3/8" H mounted horizontally.
- Manufacturers: Troy, Frame 1, (with out cable, swing arm opening direction and color to be determined by architect)
- Remarks: Architect to verify finish and coordinate fixture mounting location with telephone wall elevation. Lighting Fixture Supplier shall verify fixture mounting detail and coordinate with architect. Provide all mounting accessories as required for complete installation.
- Location: Phone Rooms  
Supply: 120 Volts

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	Lamp:	(1) F21 T5/835
F16	Description:	Wall bracket mounted up light, with one 150W T3 halogen lamp. Metal housing, head nominal 14"L x 13"W x 4" H, with modified back spill cutoff shield
	Manufacturers:	Erco, MOD-33274.023-wall mounting plate-modified back spill cutoff shield.
	Remarks:	Rambusch Lighting Fixtures up-light reflector assembly to be modified to minimize the back spill and controlled up-light components. See marked up photometric curve for the modification. Architect to verify finish and coordinate fixture' mounting location. Lighting Fixture Supplier shall verify fixture mounting detail and coordinate with architect. Provide all mounting accessories as required for complete installation.
	Location:	14 <sup>th</sup> floor underneath mezzanine.
	Supply:	120 Volts
	Lamp:	(1) BC150T3Q/CL/TP

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### **PART 5 - ALTERNATES**

1. Provide commissioning alternate to use radio frequency ID tags for ballast addresses.

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### **PART 6 – DRAWINGS INCLUDED IN THE SPECIFICATION**

1. Lighting Fixture TYPE F1 sheets 1-5
2. Milestone Schedule 17 sheets 1-2

End of Section 16510