SECTION 11 61 33

RIGGING SYSTEMS AND CONTROLS

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\*\* NOTE TO SPECIFIER \*\* ETC, Inc.; lighting and rigging products.  
This section is based on the products of ETC, Inc., which is located at:3031 Pleasant View Rd., P. O. Box 620979Middleton, WI 53562-0979Tel: 608-831-4116Fax: 608-836-1736Email: [request info (mail@etcconnect.com)](https://arcat.com/rfi?action=email&company=ETC%252C%252BInc.&message=RE%253A%2520Spec%2520Question%2520(11064etc)%253A%2520&coid=43555&spec=11064etc&rep=&fax=608-836-1736)  
Web: <https://www.etcconnect.com>   
 [ [Click Here](https://arcat.com/company/etc-inc-43555) ] for additional information.

1. GENERAL
   1. SECTION INCLUDES

\*\* NOTE TO SPECIFIER \*\* Delete items below not required for project.

* + 1. Rigging compact self-climbing hoists. (FlyPipe) (FlyPipe Studio)
    2. Rigging package hoists. (Prodigy P1) (Prodigy P1 EXO) (Prodigy P2 - 650)
    3. Rigging low profile package hoists. (Prodigy P-75) (Prodigy P75-SC) (Vortek NXT)
    4. Rigging cable management. (Prodigy Cable Management) (Helix) (Pantograph) (Cable Cradle) (House Light Trough)
    5. Rigging controls. (QuickTouch) (QuickTouch+) (QuickTouch Preset) (Foundation)
  1. SCOPE OF WORK
     1. One company is to be responsible for all aspects of stage rigging equipment installation. Work in this Section: Includes furnishing labor, materials, tools, transportation services, supervision, etc., to complete installation of stage rigging equipment and other items as described in these specifications, as illustrated on accompanying drawings; or as directed by the Owner's Representative.
  2. RELATED SECTIONS
     1. Related Documents: Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification sections, apply to work of this section.

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

* + 1. 13809 - Instrumentation and Control for Electrical Systems.
    2. 16145 - Lighting Control Devices.
    3. 16575 - Theatrical Lighting Controls.
    4. 16500 - Lighting.
    5. 16555 - Theatrical Lighting.
  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 National Standards Institute (ANSI):
       1. ANSI/PLASA E1.6-1.
    2. Canadian Standards Association (CSA):
       1. CSA C22.2 - General requirements - Canadian Electrical Code, Part II, Includes Update No. 1.
    3. Intertek's Electrical Testing Labs (ETL).
    4. Federal Communications Commission (FCC).
    5. Restriction of Hazardous Substances Directive (RoHS):
       1. RoHS 2011/65/EU - Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment Directive
    6. Underwriters Laboratories (UL or Ulus):
       1. UL 61010 - Safety Requirements for Electrical Equipment.
    7. Underwriters Laboratories Canada (cUL).
  1. SUBMITTALS
     1. Submit under provisions of Section 01 30 00 - Administrative Requirements.
     2. Product Data:
        1. Manufacturer's data sheets on each product to be used.
        2. Preparation instructions and recommendations.
        3. Storage and handling requirements and recommendations.
        4. Typical installation methods.
        5. Shop Drawings: Submit within 45 days after award of Contract.
        6. Shop Drawing Information: Submit completed package at one time. Partial submittal will be rejected.
        7. Drawings: Complete details, dimensions, product types, equipment locations, clearances, guides, cables, sets, Contractor fabricated equipment, and other details required to describe the Work.
        8. Scale; Equipment Layouts: 1/4 inch to 1 ft (6 to 305 mm).
        9. Scale; Equipment Details, Mounting, and Other Details: 1/2 inch to 1 ft (12 to 305 mm).
        10. Each Sheet to have Designated Space for the Following: Approval stamp, Project name, Supplier's name, address, telephone number, and email, and Date submitted.
        11. Variations from Construction Documents and Specifications: Indicate by arrow and boxed caption.
        12. Approval of Submitted Equipment: Obtained prior to equipment purchase or fabrication.
        13. Rejected Shop Drawings: Correct and resubmit in manner specified.
        14. Submit the following items for Architect's approval, prior to fabrication:
            1. Stage plan view.
            2. Stage side section view.
            3. Gridiron Layout: Stage equipment.
            4. Electrical Riser Diagrams: Necessary power and control wiring for rigging equipment and systems.
            5. Plan and Elevation Views: Power, motor and control hardware locations and layout.
            6. Custom Panels: Dimensions for panel layouts, finishes and materials.
            7. Details of installation and erection, including adjoining conditions and necessary clearances.
            8. Variations from Construction Documents and Specifications: Indicate by arrow and boxed caption.
     3. Discrepancies: If there are discrepancies in the specifications, the Contractor must ask the Architect for clarification. If no clarification is requested, the Architect's judgment will rule.
     4. Record Drawings and Data: Within 30 days of final test and installation completion, submit the following to the Architect.
        1. Three complete sets of "as built and approved" drawings showing systems and elements as installed, including field modifications and adjustments.
        2. Three sets of maintenance data including a list indicating replacement parts lists for all items of equipment, wiring diagrams, control diagrams, any and all keys for cabinets, racks, key operated switches etc. and complete operation manuals.
        3. Three Certificates of Guarantee.
  2. QUALITY ASSURANCE
     1. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with a minimum five years documented experience.
     2. Installer Qualifications: Company specializing in performing Work of this section with minimum two years documented experience with projects of similar scope and complexity.
     3. Source Limitations: Provide each type of product from a single manufacturing source to ensure uniformity.
  3. 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.
  4. DELIVERY, STORAGE, AND HANDLING
     1. Store and handle in strict compliance with manufacturer's written instructions and recommendations.
     2. Protect from damage due to weather, excessive temperature, and construction operations.
  5. 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.
  6. WARRANTY
     1. Manufacturer's standard limited warranty unless indicated otherwise.
     2. Installer: Guarantees the work result this specification defines, including materials and workmanship for three years from date of full acceptance of work in accordance with the following conditions.
        1. Warranty must be in effect on materials and equipment for three years from date of system commissioning under following conditions.
           1. Maintaining warranty requires annual inspection of system by a factory trained and certified contractor.
           2. The three year warranty is contingent upon annual inspection at end of the first and second years of service. The end user is responsible for making arrangements for each inspection with the contractor identified on the Motor Controller or a factory certified inspector/installer.
           3. If annual inspection is not performed at the end of the first or second year of service, the warranty becomes void at the end of that service year
           4. Warranty Inspection Reports Must be sent to factory by the inspecting contractor within 10 days of completing inspection.
        2. Nothing in this guarantee shall cause repair or replacement by Contractor where negligence, neglect or improper operation by Owner has caused failure of any equipment installed as defined by this specification.
  7. SYSTEM INTEGRATOR
     1. System Integrator: Contractor may utilize to coordinate and assist the installation of motorized rigging equipment as specified. This may include but not be limited to all motorized rigging and miscellaneous equipment.
        1. The following companies have prior approval as System Integrator:

\*\* NOTE TO SPECIFIER \*\* Add in pre-approved contractors.

* + - * 1. System Integrator Company: \_\_\_\_\_\_\_\_.
        2. System Integrator Company: \_\_\_\_\_\_\_\_.
      1. To be Considered a System Integrator:
         1. Contractor requesting approval must submit to Architect ten days prior to bid opening date, a letter expressing intent to bid.
         2. Letter: Include list of five projects of similar size37 and scope completed by within the last five years.
         3. Inspection of completed installation may be requested by Architect or Engineer's Representative prior to consideration of bid request.
         4. Must be in business under the same name for five years preceding bid date, doing work similar to type specified.
         5. ETCP Certification in Theatre Rigging: Required by lead installer or project manager of System Integrator. Verification of certification must be provided.
         6. Decision of Architect or Engineer as to capability of Bidder to successfully complete and maintain system based on this pre-qualification will be final.
      2. Pre-Bid Request Letter: Must state that major equipment items must be bid and supplied as specified or contain details of substitute equipment for review by Architect or Engineer's Representative. Substitute equipment items to include: Specifications, parts numbers, and details of interconnection to proposed system. Decision of Architect or Engineer as to substitute equipment acceptability will be final.
      3. System Integrator: Employ fully trained stage riggers and mechanics, for stage equipment erection. Stage riggers to be completely familiar with equipment being installed. Job Superintendent: To be ETCP certified in theatre rigging. Furnish copy of certification to General Contractor prior to installation.

1. PRODUCTS
   1. MANUFACTURERS
      1. Acceptable Manufacturer: ETC, Inc., which is located at:3031 Pleasant View Rd., P. O. Box 620979Middleton, WI 53562-0979Tel: 608-831-4116Fax: 608-836-1736Email: [request info (mail@etcconnect.com)](https://arcat.com/rfi?action=email&company=ETC%252C%252BInc.&message=RE%253A%2520Spec%2520Question%2520(11064etc)%253A%2520&coid=43555&spec=11064etc&rep=&fax=608-836-1736);Web: <https://www.etcconnect.com>

\*\* NOTE TO SPECIFIER \*\* Delete one of the following two 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.

\*\* NOTE TO SPECIFIER \*\* Delete article if not required or delete basis of design option not required.

* 1. RIGGING COMPACT SELF-CLIMBING HOISTS
     1. General:
        1. Purpose-built for overhead lifting of theatre lights, equipment, curtains, and scenic elements, whether used on stages, in auditoriums or places of public assembly where people move beneath suspended or moving loads. Incorporate mechanical, electrical and safety features inherent to this equipment.
        2. Equipment Items: New and conform to applicable provisions of Underwriters' Laboratories (UL 1340), American National Standards Institute (ANSI E1.6-1:2018, and C63.4:2014), and the National Fire Protection Association (NFPA 70).
        3. Provided wire rope shall be galvanized.
        4. Materials to be new, unused and of latest design. No refurbished materials allowed.
        5. Anodization as Required per this Specification: Manufacturer's standard finish and color except as noted.
     2. Performance and Design Requirements:
        1. Minimum Design Factor: 10 for equipment and hardware specified.
        2. The following factors must be used:
           1. Cables and Fittings: 10:1 Design Factor.
           2. Cable Bending Ratio: 25 times diameter.
           3. Maximum fleet angle: 0 degrees.
     3. Basis of Design: Prodigy FlyPipe as manufactured by ETC.
        1. Hoists: Self-climbing. Supported Travel: 50 ft (15.24 m). Hoists not self-climbing are not acceptable.
        2. Standards Compliance: UL Listed and tested as a complete system made up of UL listed components.
        3. Dual 1/8 inch (3 mm) Wire Rope Lift Line Sets: Design factor of 10:1. Ultimate Combined Strength: 4,200 lbs (1905 kg).
        4. Support a 500 lbs (227 kg) live load suspended from hoist as follows:
           1. FlyPipe Drive Section (HxWxL): 26.25 x 14 x 132.5 inches (668 x 356 x 3365 mm). Weight: 140 lbs (63 kg).
           2. FlyPipe End Section (HxWxL): 12 x 5.5 x 85.5 inches (305 x 140 x 2172 mm). Weight: 40 lbs (18 kg).

\*\* NOTE TO SPECIFIER \*\* FlyPipe span sections are optional Delete if not required.

* + - * 1. FlyPipe Span Section (HxWxL): 12 x 5.5 x 120 inches (305 x 140 x 3048 mm). Weight: 60 lbs (27 kg).
      1. Aluminum Strut-Compatible Channel: Integrated into bottom of FlyPipe sections. Channel supports point loads up to 250 lbs (113 kg).
         1. Hoists not supporting direct connections of stage equipment or lighting fixtures are not acceptable.
      2. Major Components:
         1. Motor section.
         2. Span sections; if required.
         3. End section.
         4. Lift Lines: A set of TwinLines (dual 1/8 inch (3 mm) GAC lift lines) per section.
         5. Clamps: One TwinLine Clamp per TwinLine set.
         6. Pipe batten; if required.
      3. Powerhead Enclosure: Fully enclosed, powder coated sheet metal preventing contact with moving and electrical parts. Protects against dirt, dust, and debris.
         1. Powerhead Components: Gear motor, motor brake, limit switches, control electronics, emergency contactor, position sensor slack line detector, and information storage
         2. Local User Interface:

Hoist up/down control.

Limit switch override buttons; tool accessible.

Address switches.

Status LEDs.

* + - 1. Gearmotor and Motor Brake: An integral unit from a single manufacturer.
         1. Operating Voltage: 208 or 480 Volt 60 Hz 3 Phase.
         2. Motor Brake: Capable of holding 125 percent of motor full load torque.

Spring Actuated: To apply and hold braking force.

Magnetically released and held open upon actuation.

* + - 1. Limit Switch: Mounted in drive section for hard "normal" and "ultimate" end of travel limits.
         1. Hard End of Travel Limits: Set and adjusted at time of installation. Installation: Aided by indicator light on Powerhead enclosure panel. Any system where limit is set only by audible or tactile means is not acceptable.
      2. Position Sensor System: Built into drive section. An encoder sensor providing accurate position information for each batten at power-up of system, and continually throughout normal operation. Hoisting systems requiring re-homing are not acceptable.
      3. Slack Line Detector: Built into Powerhead enclosure. When a slack line condition in excess of 24 inches develops in a lift line, the detector removes power from the hoist. Hoist is allowed to move in the upward direction to allow removal of the slack line fault cause.
      4. Information Storage: Within Powerhead.
         1. Record of severe fault conditions with date and time stamp.
         2. Record of E-stops, overloads, moves and power cycles.
         3. Record of travel distance since installation and inspection.
      5. Over Speed Load Arrest Brake: When an over speed mechanism detects a runaway condition, it trigger a load arresting device to stop the load.
         1. Brake noise shall not be audible at any time in operational cycle of hoist.
         2. Normal hoist operation must not be limited by load brake heat or noise.
      6. Wire Rope Cable Drum: Each drive, span, and end section contains one drum.
         1. Each Drum: Accommodate two, 1/8 inch (3 mm) diameter 7x19 galvanized aircraft utility wire rope lift lines up to 50 ft (15.24 m) long in a compact manner on cable drum.
         2. Drum Design: Prevent wire rope pairs from tangling or crossing over.
      7. Hoist Power and Control Cables: Each drive section requires a power cord and Cat 5e or better connection between receptacles mounted in hoist and hoist power and communication distribution (PCD) equipment by ETC.
         1. PCD Equipment: Must have barrier between high and low voltage components.
         2. Strain relief at drive section must be provided.

\*\* NOTE TO SPECIFIER \*\* Breaker is optional. Delete if not required.

* + - * 1. Breaker: 20 amp 3-phase located in the PCD.

\*\* NOTE TO SPECIFIER \*\* Pipe battens are optional. Delete if not required. Cannot be used with House Light Trough Systems.

* + - 1. Pipe Battens: Outside Diameter: 1.9 inch (48 mm). Construction: 0.150 inch (4 mm) extruded aluminum with 0.150 inch (4 mm) vertical web available for use with hoist.
         1. Extruded with a witness line to indicate web position.
         2. Support Distributed Load: 150 lbs (68 kg) over a 10 ft (3048 mm) span.
         3. Support a Point Load: 65 lbs (29 kg) over a 10 ft (30348 mm) span.
         4. Weight: 1.5 lbs per ft (2.23 kg per m) or less.
         5. Designed to a 10:1 safety factor.
         6. Finish: Black hard coat anodization.
      2. Power and Data Distribution: Hoist and hoist cable management system allows attachment of dedicated circuit and data distribution equipment, UL listed for this application. All cables to be UL Listed.
      3. Helix Cable Management for Hoist Power and Control: Supplied motor power and control wiring is fed to motor control enclosure by multi-conductor SO cable and Cat 5e or better cable. Each cable to be held in place at enclosure by a dedicated strain relief assembly.

\*\* NOTE TO SPECIFIER \*\* Helix cable management for Electrics is optional. Delete if not required.

* + - 1. Cable Management System for Electrics: Helix. See "Cable Management" article in this specification.
    1. Basis of Design: Prodigy FlyPipe Studio as manufactured by ETC.
       1. Hoists: Self-climbing. Supported Travel: 23 ft (7 m). Hoists not self-climbing are not acceptable.
       2. Standards Compliance: UL Listed and tested as a complete system made up of UL listed components.
       3. Dual 1/8 inch Wire Rope Lift Line Sets: Design factor of 10:1. Ultimate Combined Strength: 4,200 lbs.
          1. FlyPipe Studio (HxWxL): 26.25 x 14 x 132.5 inches (667 x 356 x 3365 mm). Weight: 140 lbs (64 kg).

Supported Load: 300 lbs (136 kg).

* + - * 1. Major Components:

Motor control housing.

Aluminum extrusion.

Lift Lines: Two sets of TwinLines (dual 1/8 inch (3 mm) GAC lift lines) spaced 70 inches (1778 mm) apart.

Two TwinLine Clamps.

* + - * 1. Motor Control Housing: Fully enclosed, powder coated sheet metal preventing contact with moving and electrical parts. Protects against dirt, dust, and debris
        2. Motor Control Components: Limit switches, remote operating electronics, slack line detector, position sensor.
        3. Built-in slack line sensor.
        4. Emergency contactor built into hoist.
        5. Aluminum Extrusion: Includes the drum assembly and wire rope.
      1. Aluminum Strut-Compatible Channel: Integrated into bottom of FlyPipe sections. Channel supports point loads up to 250 lbs (113 kg).
         1. Available Functions: Operating switches, address setting knobs, limit switch override buttons, power indicators, status, and communication. Functions to be clearly labeled.
         2. Gearmotor and Motor Brake: An integral unit from a single manufacturer.
         3. Operating Voltage: 208 or 480 Volt 60 Hz 3 Phase.
         4. Motor Brake: Capable of holding 125 percent of motor full load torque.

Spring Actuated: To apply and hold braking force.

Magnetically released and held open upon actuation.

* + - 1. Over Speed Load Arrest Brake: When and over speed mechanism detects a runaway condition, it trigger a load arresting device to stop the load.
         1. Brake noise shall not be audible at any time in operational cycle of hoist.
         2. Normal hoist operation must not be limited by load brake heat or noise.
      2. Wire Rope Cable Drum: Each drive, span, and end section contains one drum.
         1. Each Drum: Accommodate two, 1/8 inch (3 mm) diameter 7x19 galvanized aircraft utility wire rope lift lines up to 23 ft (7 m) long in a compact manner on cable drum.
         2. Drum Design: Prevent wire rope pairs from tangling or crossing over.
      3. Limit Switch: Mounted in drive section for hard "normal" and "ultimate" end of travel limits.
         1. Hard End of Travel Limits: Set and adjusted at time of installation. Installation: Aided by indicator light on Powerhead enclosure panel. Any system where limit is set only by audible or tactile means is not acceptable.
      4. Position Sensor System: Built into motor control housing. An encoder sensor providing accurate position information for each batten at power-up of system, and continually throughout normal operation. Hoisting systems requiring re-homing are not acceptable.
      5. Slack Line Detector: Built into drive section. When a slack line condition in excess of 24 inches develops in a lift line, the detector removes power from the hoist. Hoist is allowed to move in the upward direction to allow removal of the slack line fault cause.
      6. Local User Interface: Located on Drive Section.
         1. Hoist up/down control.
         2. Limit switch override buttons; tool accessible.
         3. Address switches.
         4. Status LEDs.
      7. Information Storage: Within motor control housing.
         1. Record of severe fault conditions with date and time stamp.
         2. Record of E-stops, overloads, moves and power cycles.
         3. Record of travel distance since installation and inspection.
      8. Hoist Power and Control Cables: Each motor control housing requires a power cord and Cat 5e or better connection between receptacles mounted in hoist and hoist power and communication distribution (PCD) equipment by ETC.
         1. PCD Equipment: Must have barrier between high and low voltage components.
         2. Strain relief at motor control housing must be provided.

\*\* NOTE TO SPECIFIER \*\* Breaker is optional. Delete if not required.

* + - * 1. Breaker: 20 amp 3-phase located in the PCD.

\*\* NOTE TO SPECIFIER \*\* Pipe battens are optional. Delete if not required. Cannot be used with House Light Trough Systems.

* + - 1. Pipe Battens: Outside Diameter: 1.9 inch (48 mm) diameter. Construction: 0.15 inch (3.8 mm) extruded aluminum with 0.15 inch (3.8 mm) vertical web available for use with hoist.
         1. Extruded with a witness line to indicate web position.
         2. Support Distributed Load: 150 lbs (68 kg) over a 10 ft (3048 mm) span.
         3. Support a Point Load: 65 lbs (29 kg) over a 10 ft (3048 mm) span.
         4. Weight: 1.5 lbs per ft (2.2 kg per m) or less.
         5. Designed to a 10:1 safety factor.
         6. Finish: Black hard coat anodization.
      2. Power and Control Distribution: Hoist and hoist cable management system allows attachment of dedicated circuit and data distribution equipment, UL listed for this application.
      3. Helix Cable Management for Hoist Power and Control: Supplied motor power and control wiring is fed to motor control enclosure by multi-conductor SO cable and Cat 5e or better cable. Each cable to be held in place at enclosure by a dedicated strain relief assembly.

\*\* NOTE TO SPECIFIER \*\* Helix cable management for Electrics is optional. Delete if not required.

* + - 1. Cable Management System for Electrics: Helix. See "Cable Management" article in this specification.

\*\* NOTE TO SPECIFIER \*\* Delete article if not required or delete basis of design options not required.

* 1. RIGGING PACKAGE HOIST
     1. General:
        1. Purpose-built for overhead lifting of theatre lights, equipment, curtains, and scenic elements, whether used on stages, in auditoriums or places of public assembly where people move beneath suspended or moving loads. Incorporate mechanical, electrical and safety features inherent to this equipment.
        2. Standards Compliance: UL Listed and tested as a complete system made up of UL listed components.
        3. Equipment Items: New and conform to applicable provisions of Underwriters' Laboratories (UL), American Standards Association (ASA), American National Standards Institute (ANSI), National Fire Protection Association (NFPA) Life Safety Code 01, National Electric Code (NEC) and PLASA.
        4. Pre-Shipment Testing. Test hoists under full rated load through its full travel with its lift lines terminated to hoist before hoist is shipped. Only hoists passing pre-shipment testing are to be shipped.
        5. Testing Includes:
           1. Hoist operation.
           2. Hoist and motor speed.
           3. Lift line terminations under load.
           4. Braking and stopping under load.
           5. Load cell functions.
           6. Slack line detection.
           7. Position sensing.
           8. Hoist noise.
        6. Testing Results: To be available at Manufacturer's facility for one year after testing.
           1. Installing Contractor: Furnish test results to Architect or Owner representative prior to system commissioning.
        7. Painting: Manufacturer's standard finish and color except as noted.
        8. Pipe Battens: From 1.5 inch (38 mm) Schedule 40 pipe.
        9. Turnbuckles and Cable Clips: Drop forged.
        10. Hardware Finish:
            1. Fasteners, chains, and Miscellaneous Hardware: Cadmium or zinc plated.
            2. Turnbuckles, Clips, Tracks, Chains, and incidental items: Plated or painted.
        11. Wire Rope: Galvanized.
        12. Materials: New, unused and of latest design. No refurbished materials allowed.
        13. Safety Factors:
            1. Cables and Fittings: 10 times design factor.
            2. Cable Bending Ratio: 26 times diameter.
            3. Fleet Angle: 2 degrees maximum.
            4. Steel: 1/5 of yield.
            5. Bearings: 2 times required load at full for 2000 hours.
     2. Basis of Design: Prodigy P1 as manufactured by ETC.
        1. Minimum Safety Factor: 10:1 for equipment and hardware unless specified otherwise.
        2. Standards Compliance: UL Listed and tested as a complete system made up of UL listed components.
        3. Hoists:
           1. Wire Rope Lift Lines: Design factor of 10:1. Ultimate strength: 4200 lbs. (1905 kg).
           2. Load Path Components Between Building Structure and Batten: Must exceed breaking strength of wire rope.
           3. Motor Brake: Rated at 125 percent of motor torque.
           4. Capable of Supporting the Following Loads:

\*\* NOTE TO SPECIFIER \*\* Delete hoist types and models not required.

General Purpose Hoists:

V1000S 0 to 180 fpm (0 to 0.914 m per s): Capacity: 1000 lbs (453 kg) in standard configuration. Powerhead (HxWxL): 16 x 16 x 55.25 inch (406 x 406 x 1403 mm). Weight: 495 lbs (225 kg).

P800G 30 fpm (0.15 m per s): Capacity: 900 lbs (408 kg) in standard configuration. Powerhead (HxWxL): 16 x 16 x 47.5 inch (406 x 406 x 1206 mm), Weight: 395 lbs (179 kg).

P1300G 30 fpm (0.15 m per s): Capacity: 1400 lbs (635 kg) in standard configuration. Powerhead (HxWxL): 16 x 16 x 47.5 inch (406 x 406 x 1206 mm), Weight: 395 lbs (179 kg).

P1900G 30 fpm (0.15 m per s): Capacity: 2000 lbs (907 kg) in standard configuration. Powerhead (HxWxL): 16 x 18 x 53.5 inches (406 x 157 x 1359 mm). Weight: 580 lbs (263 kg).

Stage Electric Hoists:

\*\* NOTE TO SPECIFIER \*\* Selection on one of the "E Series" load configurations below requires the use of the "Prodigy Cable Management System. See the "Cable Management" article in this specification.

P650E 30 fpm (0.15 m per s): Capacity: 650 lbs (294.8 kg) in standard configuration. Powerhead (HxWxL): 16 x 16 x 47.5 inch (406 x 406 x 1206 mm), Weight: 395 lbs (179 kg).

P1000E 30 fpm (0.15 m per s): Capacity: 1000 lbs (454 kg) in standard configuration. Powerhead (HxWxL): 16 x 16 x 47.5 inch (406 x 406 x 1206 mm), Weight: 395 lbs (179 kg).

P1500E 30 fpm (0.15 m per s): Capacity: 1500 lbs (680 kg) in standard configuration. Powerhead (HxWxL): 16 x 18 x 53.5 inch (406 x 157 x 1359 mm). Weight: 580 lbs (263 kg).

\*\* NOTE TO SPECIFIER \*\* Pipe Battens are to be included if House Light Trough is not selected. Delete options not required.

* + - * 1. General Purpose Hoists: Major components.

Powerhead.

Compression tube with beam clamps, loft blocks, lift line and lift line terminations, Right Angle Cable Adjuster (RACA).

Pipe batten.

* + - * 1. Stage Electric Hoists: Major components.

Powerhead.

Compression Tube with beam clamps, cable management system, loft blocks, lift line and lift line terminations Right Angle Cable Adjuster (RACA).

Cable management system.

Pipe batten and power and control distribution strip.

* + - * 1. Features:

Compression Tube: Prevents hoist system lateral forces from transferring to building. Hoisting systems imposing lateral loads on buildings are not acceptable.

Built-in load cell.

Built-in slack line sensor.

Emergency contactor built into the hoist.

Absolute position encoders.

* + - 1. Powerhead Components: Housing, gear motor, motor brake, load brake, limit switches, control electronics, load cell, slack line detector, absolute position encoders, cable drum assembly, and wire rope, and information storage.
         1. Housing: Fully enclosed, powder coated sheet metal preventing contact with moving and electrical parts. Protects against dirt, dust, and debris.
         2. Functions Available from Powerhead: Power and operating switches, address setting knobs, limit switch setting knobs, limit switch override button, indicators for power, status, and communication.

Each function to be clearly labeled.

* + - 1. Gear Motor and Motor Brake: An integral unit from a single manufacturer.
         1. Operating Voltage Fixed Speed: 208 V or 480 V, 60 Hz, 3 phase current.
         2. Operating Voltage Variable Speed: 480 V, 60 Hz, 3 phase current.
         3. Motor Brake: Capable of holding 125 percent of motor full load torque.

Spring Actuated: To apply and hold braking force.

Magnetically released and held open upon actuation.

\*\* NOTE TO SPECIFIER \*\* The following paragraph is optional. Delete if not required.

* + - 1. Soft Start and Stop: Hoists to support a motor drive for soft start and stop operation of fixed-speed models.
         1. Starting Speed: 4 fpm (0.02 m per sec). Accelerating to hoist speed at a rate of 9 ft per sec2 (2.74 m per sec2).
         2. Alternate Drive: Must maintain the hoist braking distance during normal operation and when emergency stop is triggered.

Configured such that hoist will not move in event of an electrical fault in the variable frequency drive (VFD) or the variable speed drive (VSD)

* + - 1. Load Brake:
         1. Fixed Speed Hoists Rotary Disk Load Brakes:

Brings moving load to complete stop. Holds load in position in event of mechanical failure of motor, motor brake or gearbox.

Load Brake Noise: Minimally audible at any time in operational cycle.

Normal Hoist Operation: Not limited by heat or noise from load brake.

Brake is electrically released when load is moving in up direction.

Brake is always engaged when load has stopped moving up or down.

* + - * 1. Variable Speed Hoists Rotary Disk Load Brakes:

Must open upon activation of hoist movement and close after load has come to a stop and hold load in position.

Load Brake Noise: Minimally audible at any time in operational cycle.

Normal Hoist Operation: Not limited by heat or noise from load brake.

Brake is electrically released when load is moving up or down.

Load brake must be engaged when load has stopped moving either up or down.

* + - 1. Limit Switch Assembly: Mounted in Powerhead for hard "normal" and "ultimate" end of travel limits.
         1. Hard End of Travel Limits: Set and adjusted at installation. Installation is aided by indicator light visible on Powerhead. Any system where limit is set by audible or tactile means is not acceptable.
      2. Local User Interface to Powerhead Control Panel: At rear of hoist.
         1. Hoist Up and Down control.
         2. Limit switch override buttons; tool accessible.
         3. Address switches.
         4. Status LEDs.
      3. Load Sensor and Load Profiling: Load Sensor: Built into Powerhead to create a profile of actual load on hoist as it travels through its normal cycle.
         1. Profile may be changed by "re-training" profiling system whenever suspended load is changed on batten by activating a key-switch operated training cycle on the motor controller. The load sensor continuously monitors load when load sensing is turned on.
      4. Slack Line Detector: Built into Powerhead. When a slack line condition above 15 inches develops in a lift line, the detector will remove power from hoist. Batten will be allowed to move in upward direction to allow removal of slack line fault cause.
      5. Position Sensor System: Built into Powerhead. Two absolute sensor types provide accurate position information for each batten at system power-up. Systems requiring re-homing are not acceptable. Incremental encoders are not acceptable for position readout purposes.
      6. Cable Drum, Wire Rope: Accommodate wrapping in a compact manner, eight 3/16 inch (5 mm) diameter 7x19 galvanized aircraft utility wire rope lift lines up to 50 ft (15.24 m) long. Manage wire ropes with wire rope keeper integral to Powerhead.
         1. Design: Prevent each wire rope from tangling or crossing over itself.
      7. Information Storage within Powerhead: Records the following events.
         1. Severe fault conditions with date and time stamp.
         2. E-stops, overloads, moves and power cycles.
         3. Travel distance and peak loads since installation and/or inspection.
      8. Compression Tube and Beam Clamps:
         1. Compression Tube: Extruded aluminum channel, engineered in conjunction with beam clamps to neutralize rigging-generated lateral forces on buildings.

Support the system loft blocks.

Sections joined in a continuous assembly by a pair of dedicated splicing plates at each tube joint.

Installed with dedicated beam clamps that allow tube to snap into place and fractionally move horizontally under load.

* + - * 1. Beam Clamps: Capable of attaching to horizontal beams, joists, truss flanges or flat steel plates. Thickness: 1/4 to 1 inch (6 to 25 mm). Width: 4 to 14 inches (102 to 356 mm).

Place a maximum 14 ft (4.27 m) apart. Accommodate 1/2 inch (13 mm) vertical misalignment.

P650E, P800G, P1000E and P1300G Powerheads: Mount on 1/4 x 4 inch (6 x 102 mm) or larger steel if deemed sufficient by a structural engineer.

P1500E, P1900G and V1000S Powerheads: Mount on 3/8 x 6 inch (10 x 152 mm) wide or larger steel if deemed sufficient by a structural engineer.

Support structures must be deemed sufficient by a structural engineer to support any forces imposed by the hoisting systems.

* + - 1. Loft Blocks: Assemblies of steel side plates, a wire rope idler, sheave, bearings, shaft locked against rotation and support hardware.
         1. Loft blocks are inserted into the slot on the bottom of compression tube positioned no closer than 48 inches (1219 mm) from each other, unless muled.
         2. Loft Block Sheaves: 5 inch (127 mm) diameter. Contain a pair of press fit sealed ball bearings and are concentric about the hub and evenly balanced for rotation.

Lift Lines: Travel in groove sized for 3/16 inch (5 mm) diameter wire rope per latest edition of Wire Rope Users' Manual, published by the Wire Rope Technical Board.

* + - * 1. Idler: on top of loft block to guide and support lift lines as they pass the block.
        2. Hoisting systems requiring loft blocks be mounted directly to facility structure are not acceptable.
      1. Lift Line Terminations:
         1. In Powerhead: With copper oval compression sleeves. Installed and crimped at factory.
         2. At Load Hanger: With low profile Right Angle Cable Adjusters (RACA), thimbles, and copper oval compression sleeves. RACA and cable terminations at batten are installed at time of hoist installation.
         3. Batten Trim: Adjustable under load up to 6 inches (152 mm) with the RACA.
         4. Systems utilizing turnbuckles or chain, or that cannot be adjusted under load, to trim batten are not acceptable.

\*\* NOTE TO SPECIFIER \*\* Delete cable management systems not required.

* + - 1. Cable Management System for Electrics: Prodigy Cable Management. See "Cable Management" article in this specification.
      2. Cable Management System for Electrics: Helix. See "Cable Management" article in this specification.
      3. Cable Management System for Electrics: Pantograph. See "Cable Management" article in this specification.
      4. Cable Management System for Electrics: Cable Cradle. See "Cable Management" article in this specification.
      5. House Light Trough System for Electrics. See "Cable Management" article in this specification.

\*\* NOTE TO SPECIFIER \*\* Pipe battens are always to be included if House Light Trough System is not required. Delete if not required.

* + - 1. Pipe Batten: 1.5 inch (38 mm) schedule 40 grade A, seamless pipe fabricated in largest possible lengths without splices.
         1. Batten Splices: DOM tube: 0.120 x 1-9/16 inch (3 x 40 mm) diameter, 18 inches (457 mm) long. Insert 9 inches (229 mm) of tube into each half of the splice.

Securing Splice Tube:

\*\* NOTE TO SPECIFIER \*\* Delete securing option not required.

Held in place by a pair of 3/8 x 2-1/2 inch (10 x 64 mm), grade 5 hex bolts on each side of joint. Bolts pass through pipe, perpendicular to each other, spaced 3 and 6 inches (76 and 152 mm) from joint.

Plug Welds: Two 1/2 inch plug welds, perpendicular to each other, spaced 3 and 6 inches (76 and 152 mm) from joint.

* + - * 1. Safety-Yellow Batten Cap: On each end of each pipe batten.
        2. Manufacturer to provide self-adhesive labels for each batten on which the rated batten load will be written by the installer.
      1. Power and Control Distribution (PCD): Hoists receive power and control via a pair of 8 ft long cables extending from Powerhead to source outlets.
         1. Receptacles: Installed in sheet metal junction box or trough with outlets. Outlets: Located no more than 6 ft (1.8 m) away from rear face of hoists.
         2. Powerheads include power cord hardwired to hoist with a grounded twist-lock connector at the PCD end and removable control cable with circular 9 pin connector at each end. Breaker: Appropriately rated 3 phase included in the PCD. Wiring and Connectors: Barriered between high and low voltage.
         3. Power/Distribution Channel: UL Listed for application.
    1. Basis of Design: Prodigy P1-EXO as manufactured by ETC.
       1. Minimum Safety Factor: 8:1 for equipment and hardware unless specified otherwise.
       2. Standards Compliance: UL Listed and tested as a complete system made up of UL listed components.
       3. Hoists:
          1. Wire Rope Lift Lines: Design factor of 10:1. Ultimate strength: 4200 lbs. (1905 kg).
          2. Load Path Components Between Building Structure and Batten: Must exceed breaking strength of wire rope.
          3. Motor Brake: Rated at 125 percent of motor torque.
          4. Capable of supporting a live load suspended from the batten as follows:

\*\* NOTE TO SPECIFIER \*\* Delete EXO hoist options not required. Choosing the EXO-1200VS requires no cable management options are to be specified.

EXO 1200VS Variable Speed 0 to 180 fpm (0 to 0.914 m per s): Capacity: 1200 lbs (544 kg) in standard configuration. Powerhead (HxWxL): 19.5 x 16 x 56-1/2 inches (495 x 406 x 1435 mm). Weight: 538 lbs.

EXO P900G 30 fpm (0.15 m per s): Capacity: 900 lbs (408 kg) in standard configuration. Powerhead (HxWxL): 18 x 16 x 48.50 inch (457 x 406 x 1232 mm). Weight: 448 lbs (538 kg).

EXO P1400G 30 fpm (0.15 m per s): Capacity: 1400 lbs (635 kg) in standard configuration. Powerhead (HxWxL): 18 x 16 x 48.50 inch (457 x 406 x 1232 mm). Weight: 448 lbs (538 kg).

EXO P2000G 30 fpm (0.15 m per s): Capacity: 2000 lbs (907 kg) in standard configuration. Powerhead (HxWxL): 20.75 x 18 x 48.5 inches (527 x 457 x 1232 mm). Weight: 657 lbs (298 kg).

\*\* NOTE TO SPECIFIER \*\* Pipe Battens are to be included if House Light Trough is not selected. Delete options not required.

* + - * 1. Hoists: Major components.

Powerhead with Remote Enclosure.

Head block.

Loft blocks.

Lift lines.

Pipe batten.

* + - * 1. Powerhead Components: Gear motor, motor brake, load brake, limit switches, remote operating electronics, load cell, slack line detector, absolute position sensors, cable drum assembly, and wire rope, and information storage.

Housing: Fully enclosed, powder coated sheet metal preventing contact with moving and electrical parts. Protects against dirt, dust, and debris.

Remote Enclosure: Fully enclosed, powder coated sheet metal preventing contact with electrical parts. Protects against dirt, dust, and debris.

Functions Available from Powerhead: Power and operating switches, address setting knobs, limit switch override button, indicators for power, status, and communication.

Each function to be clearly labeled.

* + - * 1. Exo-Skeleton Frame: Surrounds hoist allowing multiple mounting options; including upright, under hung and vertical.
      1. Gear Motor and Motor Brake: An integral unit from a single manufacturer.
         1. Operating Voltage Fixed Speed: 208 V or 480 V, 60 Hz, 3 phase current.
         2. Operating Voltage Variable Speed: 480 V, 60 Hz, 3 phase current.
         3. Motor Brake: Capable of holding 125 percent of motor full load torque.

Spring Actuated: To apply and hold braking force.

Magnetically released and held open upon actuation.

\*\* NOTE TO SPECIFIER \*\* The following paragraph is optional. Delete if not required.

* + - 1. Soft Start and Stop: Hoists to support a motor drive for soft start and stop operation of fixed-speed models.
         1. Starting Speed: 4 fpm (0.02 m per sec). Accelerating to hoist speed at a rate of 9 ft per sec2 (2.74 m per sec2).
         2. Alternate Drive: Must maintain the hoist braking distance during normal operation and when emergency stop is triggered.

Configured such that hoist will not move in event of an electrical fault in the variable frequency drive (VFD) or the variable speed drive (VSD)

* + - 1. Load Brake:
         1. Fixed Speed Hoists Rotary Disk Load Brakes:

Brings moving load to complete stop. Holds load in position in event of mechanical failure of motor, motor brake or gearbox.

Load Brake Noise: Minimally audible at any time in operational cycle.

Normal Hoist Operation: Not limited by heat or noise from load brake.

Brake is mechanically released when load is moving in up direction.

Brake is closed when hoist has stopped.

Brake is always engaged when load has stopped moving up or down.

Brake partially disengages when lowering load allowing controlled descent of batten.

Brake remains closed in absence of rotational torque on gearbox.

* + - * 1. Variable Speed Hoists Rotary Disk Load Brakes:

Must open upon activation of hoist movement and close after load has come to a stop and hold load in position.

Load Brake Noise: Minimally audible at any time in operational cycle.

Normal Hoist Operation: Not limited by heat or noise from load brake.

Brake is mechanically released when load is moving up or down.

* + - 1. Limit Switch Assembly: Mounted in Powerhead for hard "normal" and "ultimate" end of travel limits.
         1. Hard End of Travel Limits: Set and adjusted at installation. Installation is aided by indicator light visible a Drive Section enclosure panel. Any system where limit is set by audible or tactile means is not acceptable.
      2. Local User Interface to Remote Enclosure Interface to Powerhead: Located next to Powerhead.
         1. Hoist Up and Down control.
         2. Limit switch override buttons; tool accessible.
         3. Address switches.
         4. Status LEDs.
      3. Load Sensor and Load Profiling: Load Sensor: Built into Powerhead to create a profile of actual load on hoist as it travels through its normal cycle.
         1. Profile may be changed by "re-training" profiling system whenever suspended load is changed on batten by activating a key-switch operated training cycle on the motor controller. The load sensor continuously monitors load when load sensing is turned on.
      4. Slack Line Detector: Built into Powerhead. When a slack line condition above 15 inches (381 mm) develops in a lift line, the detector will remove power from hoist. Batten will be allowed to move in upward direction to allow removal of slack line fault cause.
      5. Position Sensor System: Built into Powerhead. Two absolute sensor types provide accurate position information for each batten at system power-up. Systems requiring re-homing are not acceptable. Incremental encoders are not acceptable for position readout purposes.
      6. Cable Drum, Wire Rope: Accommodate wrapping in a compact manner, eight 3/16 inch (5 mm) diameter 7x19 galvanized aircraft utility wire rope lift lines up to 50 ft (15.24 m) long. Manage wire ropes with wire rope keeper integral to Powerhead.
         1. Design: Prevent each wire rope from tangling or crossing over itself.
      7. Information Storage in Remote Enclosure Next to Powerhead: Records the following events.
         1. Severe fault conditions with date and time stamp.
         2. E-stops, overloads, moves and power cycles.
         3. Travel distance and peak loads since installation and/or inspection.

\*\* NOTE TO SPECIFIER \*\* Delete cable management system options not required.

* + - 1. Cable Management System for Electrics: Helix. See "Cable Management" article in this specification.
      2. Cable Management System for Electrics: Pantograph. See "Cable Management" article in this specification.
      3. Cable Management System for Electrics: Cable Cradle. See "Cable Management" article in this specification.
      4. House Light Trough System for Electrics: See "Cable Management" article in this specification.

\*\* NOTE TO SPECIFIER \*\* Pipe battens are always to be included if House Light Trough System is not required. Delete if not required.

* + - 1. Pipe Batten: 1.5 inch (38 mm) schedule 40 grade A, seamless pipe fabricated in largest possible lengths without splices.
         1. Batten Splices: DOM tube: 0.120 x 1-9/16 inch (3 x 40 mm) diameter, 18 inches long. Insert 9 inches of tube into each half of the splice.

Securing Splice Tube:

\*\* NOTE TO SPECIFIER \*\* Delete securing option not required.

Held in place by a pair of 3/8 x 2-1/2 inch (10 x 64 mm), grade 5 hex bolts on each side of joint. Bolts pass through pipe, perpendicular to each other, spaced 3 and 6 inches (76 and 152 mm) from joint.

Plug Welds: Two 1/2 inch plug welds, perpendicular to each other, spaced 3 and 6 inches (76 and 152 mm) from joint.

* + - * 1. Safety-Yellow Batten Cap: On each end of each pipe batten.
        2. Manufacturer to provide self-adhesive labels for each batten on which the rated batten load will be written by the installer.
      1. Power and Control Distribution (PCD): Hoists receive power and control via a pair of 8 ft long cables extending from Powerhead to source outlets.
         1. Receptacles: Installed in sheet metal junction box or trough with outlets. Outlets: Located no more than 6 ft away from rear face of hoists.
         2. Powerheads include power cord hardwired to hoist with a grounded twist-lock connector at the PCD end and removable control cable with circular 9 pin connector at each end. Breaker: Appropriately rated 3 phase included in the PCD. Wiring and Connectors: Barriered between high and low voltage.
         3. Power/Distribution Channel: UL Listed for application.
    1. Basis of Design: Prodigy P2 - 650LB as manufactured by ETC.
       1. Hoists:
          1. Wire Rope Lift Lines: Design factor of 10:1. Ultimate strength: 4200 lbs (1905 kg).
          2. Load Path Components Between Building Structure and Batten: Must exceed breaking strength of wire rope.
          3. Motor Brake: Rated at 125 percent of motor torque.
          4. Capable of Supporting the Following Loads:

P2-650LB 25 fpm (0.127 m per s): Capacity: 650 lbs (295 kg) in standard configuration. Powerhead (HxWxL): 16 x 13-1/2 x 45-1/2 inch (406 x 343 x 1156 mm).

Weight without Compression Tube: 300 lbs (136 kg).

Weight with Compression Tube: 350 lbs (159 kg).

\*\* NOTE TO SPECIFIER \*\* Delete hoist type not required.

* + - * 1. Hoist Type: General Purpose Without Compression Tube: Powerhead, Head block (if used), Loft blocks, Lift lines, Right Angle Cable Adjuster (RACA), and pipe batten.
        2. Hoist Type: General Purpose With Compression Tube:

Powerhead, compression tube with beam clamps, loft blocks, lift line and lift line terminations, Right Angle Cable Adjuster (RACA), and pipe batten.

\*\* NOTE TO SPECIFIER \*\* The option below is required for use with the �Prodigy Cable Management System.� See the �Cable Management� article in this specification.

* + - * 1. Hoist Type: Stage Electric with Compression Tube:

Components: Powerhead, Compression Tube with beam clamps, cable management system, loft blocks, lift line and lift line terminations, Right Angle Cable Adjuster (RACA), pipe batten, and power and control distribution strip.

\*\* NOTE TO SPECIFIER \*\* P2-650LB hoists without compression tube to be used for stage electrics support Helix, Pantograph, or cable cradle cable management systems only.

* + - * 1. Hoist Type: Stage Electric without Compression Tube.
        2. Hoist Features:

Powerhead Drive System Containing the Following Components: Gear motor, motor brake, secondary load arrest device, limit switches, operating electronics, load cell, slack line detector, incremental position sensors, cable drum assembly, and wire rope.

\*\* NOTE TO SPECIFIER \*\* Delete if compression tube is not required.

Compression Tube: Prevents hoist system lateral forces from transferring to building.

Built-in load cell.

Built-in slack line sensor.

Emergency contactor built into hoist.

* + - * 1. Standards Compliance: UL Listed and tested as a complete system. Hoist to be manufactured from UL Listed components.
      1. Powerhead Housing: Fully enclosed preventing contact with moving and electrical parts. Protects against dirt, dust, and debris.

\*\* NOTE TO SPECIFIER \*\* Delete the following paragraph if specifying compression tubes.

* + - * 1. Exo-Skeleton Frame Surrounding Hoist: Provides multiple mounting options; such as upright, underhung, and vertical.
        2. Functions Available from Powerhead: Power and operating switches, address setting knobs, limit switch adjustment mechanism, limit switch override button, indicators for power, status, and communication.

Each function to be clearly labeled.

* + - 1. Gear Motor and Motor Brake: An integral unit from a single manufacturer.

\*\* NOTE TO SPECIFIER \*\* Delete operating voltage options not required.

* + - * 1. Operating Voltage: 208 Volt 60 Hz, 3 phase.
        2. Operating Voltage: 480 Volt 60 Hz, 3 phase.
        3. Motor Brake: Integral to gear motor and capable of holding 125 percent of motor's lifting capacity.

Spring actuated to apply and hold braking force.

Magnetically released and held open upon actuation.

* + - 1. Secondary Load Arrest Device: A redundant load arrest device utilizing a dynamically self-locking gearbox in addition to primary electro-mechanical motor brake.
         1. Dynamically Self-Locking Gearbox: Brings moving load to complete stop and holds load in position in event of mechanical motor or motor brake failure.
         2. Load Arrest Device Noise: Minimally audible any time in operational cycle.
         3. Hoist Operation: Not limited by heat or noise from secondary load arrest device.
      2. Wire Rope Drum: Capable of wrapping eight 3/16 inch (4.8 mm) diameter 7x19 galvanized aircraft utility wire rope lift lines for up to 50 ft (15.24 m) travel in a compact manner. Managed by a wire rope cable keeper integral to Powerhead. Drum design prevents wire rope from tangling or crossing over itself.
      3. Limit Switch Assembly: Mounted within Powerhead, for hard "normal" and "ultimate" end of travel limits. Hard End of Travel Limits: Set and adjusted at installation, aided by indicator lights visible on Powerhead cover.
      4. Load Sensor and Load Profiling: Load sensor is built into Powerhead to profile actual load on hoist as it travels through normal cycles. Profiling system may be changed by "re-training" when suspended load is changed on the batten by activating a key-switch operated record cycle or using the appropriate password-protected account type on the motor controller. When Load Profiling is turned on the load sensor continuously monitors the load, whether hoist is in a dynamic or static state.
      5. Position Sensing System: Built into Powerhead. Consists of an incremental encoder providing accurate position information for each batten at system power-up. Systems require re-homing are not acceptable.
      6. Slack Line Detector: Built into Powerhead. Detector removes power from motor and engages motor brakes. When a slack line condition above 15 inches (380 mm) in a lift line occurs. Batten may move in upward direction only to allow removal of slack line condition cause.
         1. Notification of Fault State: Indicated on hoist via diagnostic indicators, and in plain language at hoist controller.
         2. Once cause of slack line condition is removed, normal operation is automatically restored without additional action by operator.
      7. User Interface to Powerhead Control Panel: At rear of hoist.
         1. Service Hoist Up and Down Control with local E-Stop.
         2. Metal cover to inhibit use during normal remote operation.
         3. Limit Switch override buttons; tool accessible.
         4. Address switches.
         5. Status LED's.
      8. Information Storage within Powerhead: Records the following information into non-volatile memory, available for analysis via log files.
         1. Severe fault conditions with date and time stamp.
         2. E-stops, overloads, moves and power cycles.
         3. Cumulative travel distance, hours of operation and peak loads since installation/last inspection.
         4. Record of last known position.

\*\* NOTE TO SPECIFIER \*\* Delete paragraph if compression tubes are not required. Compression tubes are mandatory if specifying the "Prodigy cable Management System."

* + - 1. Compression Tubes and Beam Clamps:
         1. Compression Tube: Extruded aluminum channel; in conjunction with beam clamps, neutralize rigging-generated lateral forces on building.

Supports system's loft blocks.

Tube Section Joints: Joined into continuous assembly by pairs of dedicated splicing plates.

Installed by means of dedicated beam clamps that allow tube to snap into place and fractionally move horizontally under load.

* + - * 1. Beam Clamps: Attach to horizontal beams, joists, truss flanges or flat steel plates measuring from 1/4 to 1 inch (5 to 25 mm) thick and from 4 to 14 inches (100 to 360 mm) wide placed no more than 14 ft (4.3 m) apart.

Accommodates 1/2 inch (13 mm) vertical misalignment.

* + - * 1. Powerheads may be mounted on 1/4 inch (5 mm) thick x 4inch (100 mm) wide or larger steel structures if deemed sufficient by a structural engineer.

Support structures must be deemed sufficient by a structural engineer to support any forces imposed by the Stage Machinery systems.

\*\* NOTE TO SPECIFIER \*\* Delete paragraph if compression tubes are not required.

* + - 1. Loft Blocks: Assemblies of steel side plates, a wire rope idler, sheave, bearings, shaft locked against rotation and support hardware.
         1. Loft blocks to be inserted into slot on bottom of Compression Tube and positioned no closer than 4 ft (1220 mm) from each other, unless muled.
         2. Loft Block Sheaves: 5 inches (127 mm) diameter with a pair of press fit sealed ball bearings. Concentric about hub and balanced.
         3. Lift lines travel sheave grooves sized for 3/16 inch (4.8 mm) diameter wire rope per latest edition of Wire Rope Users' Manual as published by the Wire Rope Technical Board.
         4. Idler: Incorporated in top assembly of drop pulley to guide and support lift lines.
      2. Lift Line Terminations: In Powerhead via a standard copper/aluminum oval compression sleeve factory installed and crimped.
         1. Terminated at load hanger with a low-profile Right Angle Cable Adjuster (RACA), thimble and copper/aluminum oval compression sleeve at time of hoist installation.
         2. Batten Trim: Adjustable up to 6 inches (152 mm) via the RACA.

\*\* NOTE TO SPECIFIER \*\* Delete cable management options not required. If specifying Prodigy Cable Management then compression tubs must be specified as well earlier in this article.

* + - 1. Cable Management for Hoist Electrics: Prodigy Cable Management. See "Cable Management" article in this specification.
      2. Cable Management System for Electrics: Helix. See "Cable Management" article in this specification.
      3. Cable Management System for Electrics: Pantograph. See "Cable Management" article in this specification.
      4. Cable Management System for Electrics: Cable Cradle. See "Cable Management" article in this specification.
      5. House Light Trough System for Electrics: See "Cable Management" article in this specification.
      6. Quantity of Systems Specified: \_\_\_\_\_\_\_\_.

\*\* NOTE TO SPECIFIER \*\* Pipe battens are always to be included if House Light Trough System is not required. Delete if not required. Delete if not required.

* + - 1. Pipe Batten: 1.5 inch (38 mm) schedule 40 grade A, seamless pipe fabricated in largest possible lengths without splices.
         1. Batten Splices: DOM Tube: 0.120 x 1-9/16 inch (3 x 40 mm) diameter, 18 inches long. Insert 9 inches of tube into each half of the splice.

Securing Splice Tube:

\*\* NOTE TO SPECIFIER \*\* Delete securing option not required.

Held in place by a pair of 3/8 x 2-1/2 inch (10 x 64 mm), grade 5 hex bolts on each side of joint. Bolts pass through pipe, perpendicular to each other, spaced 3 and 6 inches (76 and 152 mm) from joint.

Plug Welds: Two 1/2 inch plug welds, perpendicular to each other, spaced 3 and 6 inches (76 and 152 mm) from joint.

* + - * 1. Safety-Yellow Batten Cap: On each end of each pipe batten.
        2. Manufacturer to provide self-adhesive labels for each batten on which the rated batten load will be written by the installer.
      1. Power and Control Distribution (PCD): Hoists receive power and control via a pair of 8 ft long cables extending from Powerhead to source outlets.
         1. Receptacles: Installed in sheet metal junction box or trough with outlets. Outlets: Located no more than 6 ft away from rear face of hoists.
         2. Powerheads include power cord hardwired to hoist with a grounded twist-lock connector at the PCD end and removable control cable with circular 9 pin connector at each end. Breaker: Appropriately rated 3 phase included in the PCD. Wiring and Connectors: Barriered between high and low voltage.
         3. Power/Distribution Channel: UL Listed for application.

\*\* NOTE TO SPECIFIER \*\* Delete article if not required or delete basis of design options not required.

* 1. RIGGING LOW PROFILE PACKAGE HOISTS
     1. General:
        1. Purpose-built for overhead lifting of theatre lights, equipment, curtains, and scenic elements, on stage, in auditoriums or places of public assembly where people move beneath the suspended or moving load.
        2. System incorporates mechanical, electrical and safety features that are inherent to this equipment.

\*\* NOTE TO SPECIFIER \*\* Delete the following paragraphs below if specifying the Prodigy Vortek NXT Hoists.

* + - 1. Each hoist to be tested under full rated load throughout its full travel distance with its lift lines terminated to hoist before hoist is shipped from Manufacturer.
      2. Testing Includes:
         1. Hoist operation.
         2. Hoist/motor speed.
         3. Lift line terminations under load.
         4. Braking and stopping under load.
         5. Load cell functions.
         6. Slack line detection.
         7. Position sensing.
         8. Hoist noise.
      3. Hoists successfully passing pre-shipment testing are sent to job sites:
         1. Test result records are available for review for one year after testing.
      4. Paint: Manufacturer's standard finish and color except as noted.
      5. Equipment Items: New and conform to applicable provisions of Underwriters' Laboratories (UL), American Standards Association (ASA), American National Standards Institute (ANSI), National Fire Protection Association (NFPA) Life Safety Code 01, National Electric Code (NEC) and PLASA.
         1. Materials Used: New, unused and of latest design.
         2. Turnbuckles and Cable Clips: Drop forged.
         3. Turnbuckles and Clips, Tracks, Chains, and incidental hardware items: Plated or painted.
         4. Wire Rope: Galvanized.
         5. Fasteners, Chain, Miscellaneous Hardware: Cadmium or zinc plated.

\*\* NOTE TO SPECIFIER \*\* Delete paragraph below if specifying the Prodigy Vortek NXT Hoists

* + 1. Performance and Design Requirements:
       1. Minimum Safety Factor: 8 for equipment and hardware specified.
          1. Cables and Fittings: 10:1 Design factor.
          2. Cable Bending Ratio: 26 times diameter.
          3. Maximum fleet angle: 2 degrees.
          4. Steel: 1/5 of Yield strength.
          5. Bearings: Two times required load at full for 2000 hours.
    2. Basis of Design: Prodigy P75 as manufactured by ETC.
       1. Standards Compliance: UL Listed and tested as a complete system made up of UL listed components.
       2. Hoists:
          1. Hoist Type: General Purpose Without Compression Tube.
          2. Hoist Type: General Purpose With Compression Tube.
          3. Hoist Type: Stage Electric With Compression Tube.
          4. Hoist Type: Stage Electric Without Compression Tube.
          5. Wire Rope Lift Lines: Design factor of 10:1. Ultimate strength: 7000 lbs (3175 kg).
          6. Load Path Components Between Building Structure and Batten: Must exceed breaking strength of wire rope.
          7. Motor Brake: Rated at 125 percent of motor torque.

\*\* NOTE TO SPECIFIER \*\* Pipe Battens are to be included if House Light Trough is not selected. Delete options not required.

* + - * 1. Hoist Major Components: Powerhead, Head block, Loft blocks, Lift lines, and Pipe batten.
        2. Hoists support live loads suspended from batten as follows:

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

P75-V1200S, Variable Speed 0-180 fpm: Capacity: 1200 lbs in standard configuration. Powerhead (HxWxL): 23-1/8 x 11-7/8 x 100 inch (587 x 302 x 2540 mm). Weight: 700 lbs (318 kg).

P75-2000G, Fixed Speed 20 fpm: Capacity: 2000 lbs in standard configuration. Powerhead (HxWxL): 23-1/8 x 11-7/8 x 100 inch (587 x 302 x 2540 mm). Weight: 700 lbs (318 kg).

P75-2000GS, Fixed Speed 20 fpm with soft start/stop: Capacity: 2000 lbs in standard configuration. Powerhead (HxWxL): 23-1/8 x 11-7/8 x 100 inch (587 x 302 x 2540 mm). Weight: 700 lbs (318 kg).

P-75-3300GS, Fixed Speed 15 fpm with soft start/stop: Capacity: 3300 lbs in standard configuration. Powerhead (HxWxL): 23-1/8 x 11-7/8 x 100 inch (587 x 302 x 2540 mm). Weight: 700 lbs (318 kg).

* + - * 1. Powerhead Components: Housing, gear motor, motor brake, load brake, limit switches, remote operating electronics, load sensor, slack line detector, absolute position sensors, cable drum assembly, and wire rope.

Built-in load cell.

Built-in slack line sensor.

Emergency contactor built into hoist.

Powerhead Housing: Fully enclosed, powder coated sheet metal preventing contact with moving and electrical parts. Protects against dirt, dust, and debris.

Functions Available from Powerhead: Power and operating switches, address setting knobs, limit switch override button, indicators for power, status, and communication.

Each function to be clearly labeled.

* + - * 1. Exo-Skeleton Frame: Surrounds hoist allowing multiple mounting options; including upright, under hung and vertical.
      1. Gear Motor and Motor Brake: An integral unit from a single manufacturer.
         1. Operating Voltage Fixed Speed: 208 V or 480 V, 60 Hz, 3 phase current.
         2. Operating Voltage Variable Speed: 480 V, 60 Hz, 3 phase current.
         3. Motor Brake: Capable of holding 125 percent of motor full load torque.

Spring Actuated: To apply and hold braking force.

Magnetically released and held open upon actuation.

\*\* NOTE TO SPECIFIER \*\* The following paragraph is optional. Delete if not required.

* + - 1. Soft Start and Stop: Hoists to support a motor drive for soft start and stop operation of fixed-speed models.
         1. Starting Speed: 4 fpm (0.02 m per sec). Accelerating to hoist speed at a rate of 9 ft per s2 (2.74 m per sec2).
         2. Alternate Drive: Must maintain the hoist braking distance during normal operation and when emergency stop is triggered.

Configured such that hoist will not move in event of an electrical fault in the variable frequency drive (VFD) or the variable speed drive (VSD).

* + - 1. Load Brake:
         1. Fixed Speed Hoists Rotary Disk Load Brakes:

Brings moving load to complete stop. Holds load in position in event of mechanical failure of motor, motor brake or gearbox.

Load Brake Noise: Minimally audible at any time in operational cycle.

Normal Hoist Operation: Not limited by heat or noise from load brake.

Brake is mechanically released when load is moving in up direction.

Brake is closed when hoist has stopped.

Brake is always engaged when load has stopped moving up or down.

Brake partially disengages when lowering load allowing controlled descent of batten.

Brake remains closed in absence of rotational torque on gearbox.

* + - * 1. Variable Speed Hoists Rotary Disk Load Brakes:

Must open upon activation of hoist movement and close after load has come to a stop and hold load in position.

Load Brake Noise: Minimally audible at any time in operational cycle.

Normal Hoist Operation: Not limited by heat or noise from load brake.

Brake is mechanically released when load is moving up or down.

* + - 1. Limit Switch Assembly: Mounted within Powerhead, for hard "normal" and "ultimate" end of travel limits. Hard End of Travel Limits: Set and adjusted at installation, aided by indicator lights visible on Powerhead cover.
      2. Local User Interface to Within Powerhead: Located next to Powerhead.
         1. Hoist Up and Down control.
         2. Limit switch override buttons; tool accessible.
         3. Address switches.
         4. Status LEDs.
      3. Load Sensor and Load Profiling: Load sensor is built into Powerhead to profile actual load on hoist as it travels through normal cycles. Profiling system may be changed by "re-training" when suspended load is changed on the batten by activating a key-switch operated training cycle on the motor controller. When Load Profiling is turned on the load sensor continuously monitors the load.
      4. Slack Line Detector: Built into Powerhead. Detector removes power from motor and engages motor brakes. When a slack line condition above 15 inches (380 mm) in a lift line occurs. Batten may move in upward direction only to allow removal of slack line condition cause.
      5. Position Sensing System: Built into Powerhead. Consists of an incremental encoder providing accurate position information for each batten at system power-up. Systems require re-homing are not acceptable.
      6. Cable Drum, Wire Rope: Capable of wrapping eight 1/4 inch (5 mm) diameter 7x19 galvanized aircraft utility wire rope lift lines for up to 75 ft (22.86 m) travel in a compact manner. Managed by a wire rope cable keeper integral to Powerhead. Drum design prevents wire rope from tangling or crossing over itself.
      7. Information Storage Within Powerhead: Records the following events.
         1. Severe fault conditions with date and time stamp.
         2. E-stops, overloads, moves and power cycles.
         3. Travel distance and peak loads since installation and/or inspection.

\*\* NOTE TO SPECIFIER \*\* Delete cable management systems not required.

* + - 1. Cable Management for Hoist Electric Distribution: Prodigy Cable Management. See "Cable Management" article in this specification.
      2. Cable Management System for Electrics: Helix. See "Cable Management" article in this specification.
      3. Cable Management System for Electrics: Pantograph. See "Cable Management" article in this specification.
      4. Cable Management System for Electrics: Cable Cradle. See "Cable Management" article in this specification.
      5. House Light Trough System for Electrics: See "Cable Management" article in this specification.

\*\* NOTE TO SPECIFIER \*\* Pipe battens are always to be included if House Light Trough System is not required. Delete if not required.

* + - 1. Pipe Batten: 1.5 inch (38 mm) schedule 40 grade A, seamless pipe fabricated in largest possible lengths without splices.
         1. Batten Splices: DOM tube: 0.120 x 1-9/16 inch (3 x 40 mm) diameter, 18 inches long. Insert 9 inches of tube into each half of the splice.

Securing Splice Tube:

\*\* NOTE TO SPECIFIER \*\* Delete securing option not required.

Held in place by a pair of 3/8 x 2-1/2 inch (10 x 64 mm), grade 5 hex bolts on each side of joint. Bolts pass through pipe, perpendicular to each other, spaced 3 and 6 inches (76 and 152 mm) from joint.

Plug Welds: Two 1/2 inch plug welds, perpendicular to each other, spaced 3 and 6 inches (76 and 152 mm) from joint.

* + - 1. Power and Control Distribution (PCD): Hoists receive power and control via a pair of 8 ft long cables extending from Powerhead to source outlets.
         1. Receptacles: Installed in sheet metal junction box or trough with outlets. Outlets: Located no more than 6 ft away from rear face of hoists.
         2. Powerheads include power cord hardwired to hoist with a grounded twist-lock connector at the PCD end and removable control cable with circular 9 pin connector at each end. Breaker: Appropriately rated 3 phase included in the PCD. Wiring and Connectors: Barriered between high and low voltage.
         3. Power/Distribution Channel: UL Listed for application.
    1. Basis of Design: Prodigy P75-SC Self Climbing Hoists as manufactured by ETC.
       1. Standards Compliance: UL Listed and tested as a complete system made up of UL listed components.
       2. Hoists:
          1. Wire Rope Lift Lines: Design factor of 10:1. Ultimate strength: 7000 lbs (3175 kg).
          2. Load Path Components Between Building Structure and Batten: Must exceed breaking strength of wire rope.
          3. Motor Brake: Rated at 125 percent of motor torque.
          4. General Purpose Hoist Major Components: Powerhead, Head block, Loft blocks, and Lift lines.
          5. Hoists support live loads suspended from truss as follows.

General purpose P-75 SC 15 fpm with soft start/stop: Capacity: 3300 lbs (1497 kg) in standard configuration. Powerhead (HxWxL): 30 x 20.5 x 125.5 inch (762 x 521 x 3188 mm). Weight: 1105 lbs (501 kg).

* + - * 1. Powerhead: Designed for direct attachment to standard 20.5 x 20.5 inch (521 x 521 mm) spigot box truss attachable to either end of powerhead structure.

Powerhead Components: Gear motor, motor brake, load brake, limit switches, remote operating electronics, load sensor, slack line detector, absolute position sensors, cable drum assembly, and wire rope, and information storage.

Built-in load cell.

Built-in slack line sensor.

Emergency contactor built into hoist.

Functions Available from Powerhead: Power and operating switches, address setting knobs, limit switch override button, indicators for power, status, and communication.

Each function to be clearly labeled.

Fully contained within aluminum spigot box truss structure compatible with TomCat medium duty 20.5 x 20.5 inch (521 x 521 mm) spigot box truss.

* + - 1. Gear Motor and Motor Brake: An integral unit from a single manufacturer.
         1. Operating Voltage Fixed Speed: 208 V or 480 V, 60 Hz, 3 phase current.
         2. Operating Voltage Variable Speed: 480 V, 60 Hz, 3 phase current.
         3. Motor Brake: Capable of holding 125 percent of motor full load torque.

Spring Actuated: To apply and hold braking force.

Magnetically released and held open upon actuation.

* + - 1. Load Brake: Fixed speed hoists rotary disk load brakes.
         1. Brings moving load to complete stop. Holds load in position in event of mechanical failure of motor, motor brake or gearbox.
         2. Load Brake Noise: Minimally audible at any time in operational cycle.
         3. Normal Hoist Operation: Not limited by heat or noise from load brake.
         4. Mechanically released when load is moving in up direction.
         5. Closed when hoist has stopped.
         6. Always engaged when load has stopped moving up or down.
         7. Partially disengages when lowering load allowing controlled descent of batten.
         8. Remains closed in absence of rotational torque on gearbox.
      2. Limit Switch Assembly: Mounted within Powerhead, for hard "normal" and "ultimate" end of travel limits. Hard End of Travel Limits: Set and adjusted at installation, aided by indicator lights visible on Powerhead cover.
      3. User interface remote enclosure located next to the Powerhead:
         1. Hoist Up/Down Control.
         2. Limit Switch override buttons; tool accessible.
         3. Address switches.
         4. Status LEDs.
      4. Load Sensor and Load Profiling: Load sensor is built into Powerhead to profile actual load on hoist as it travels through normal cycles. Profiling system may be changed by "re-training" when suspended load is changed on the batten by activating a key-switch operated training cycle on the motor controller. When Load Profiling is turned on the load sensor continuously monitors the load.
      5. Slack Line Detector: Built into Powerhead. Detector removes power from motor and engages motor brakes. When a slack line condition above 15 inches (380 mm) in a lift line occurs. Batten may move in upward direction only to allow removal of slack line condition cause.
      6. Position Sensing System: Built into Powerhead. Consists of an incremental encoder providing accurate position information for each batten at system power-up. Systems require re-homing are not acceptable.
      7. Cable Drum, Wire Rope: Capable of wrapping eight 1/4 inch (6 mm) diameter 7x19 galvanized aircraft utility wire rope lift lines for up to 75 ft (22.86 m) travel in a compact manner. Managed by a wire rope cable keeper integral to Powerhead. Drum design prevents wire rope from tangling or crossing over itself.
      8. Information Storage Within Powerhead: Records the following events.
         1. Severe fault conditions with date and time stamp.
         2. E-stops, overloads, moves and power cycles.
         3. Travel distance and peak loads since installation and inspection.

\*\* NOTE TO SPECIFIER \*\* Delete cable management system option not required.

* + - 1. Cable Management System for Hoist Power and Control: Helix. See "Cable Management" article in this specification.
      2. Cable Management System for Hoist Power and Control: Pantograph.

\*\* NOTE TO SPECIFIER \*\* Cable management for Electrics is optional. Delete if not required.

* + - 1. Cable Management Systems for Electrics: Helix. See "Cable Management" article in this specification.
      2. Cable Management Systems for Electrics: Pantograph. See "Cable Management" article in this specification.
    1. Basis of Design: Prodigy Vortek NXT Hoists as manufactured by ETC.
       1. Paint: Manufacturer's standard finish and color except as noted.
       2. All hoist components to be treated or designed to avoid oxidation. Untreated or bare steel surfaces is not acceptable.
       3. Equipment Items: New, of latest design, and conform to applicable provisions of Underwriters' Laboratories (UL), American Standards Association (ASA).
          1. Materials Used: New and unused.
          2. Turnbuckles and Cable Clips: Drop forged.
          3. Turnbuckles and Clips, Tracks, Chains, and incidental hardware items: Plated or painted.
          4. Wire Rope: Galvanized.
          5. Fasteners, Chain, Miscellaneous Hardware: Cadmium or zinc plated.
       4. Performance and Design Requirements:
          1. Minimum Safety Factor: 8 for equipment and hardware specified.

Cables and Fittings, Dead Hung: 8:1 Safety factor.

Cables and Fittings, Motorized: 10:1 Safety factor.

Cable Bending Ratio: 30 times diameter.

Maximum fleet angle: 1-1/2 degrees.

Steel: 1/5 of Yield strength.

Bearings: Two times required load at full for 2000 hours.

* + - 1. Hoisting Equipment: Attaches horizontally or vertically to structural steel provided by others.
         1. Hoists support live loads suspended from batten as follows:

\*\* NOTE TO SPECIFIER \*\* Delete model options not required. Only Fixed Speed selections can be selected with Cable Management options.

VF-14140, Variable Speed 0-140 fpm: Capacity: 1400 lbs in standard configuration. Powerhead (HxWxL): 30-1/4 x 9-1/16 x 153 inch (768 x 230 x 3886 mm). Weight: 725 lbs (330 kg).

VF-12180, Variable Speed 0-180 fpm: Capacity: 1200 lbs in standard configuration. Powerhead (HxWxL): 30-1/4 x 9-1/16 x 153 inch (768 x 230 x 3886 mm). Weight: 715 lbs (325 kg).

VF-0820, Fixed Speed 20 fpm: Capacity: 800 lbs in standard configuration. Powerhead (HxWxL): 30-1/4 x 9-1/16 x 153 inch (768 x 230 x 3886 mm). Weight: 625 lbs (285 kg).

VF-2020, Fixed Speed 20 fpm: Capacity: 2000 lbs in standard configuration. Powerhead (HxWxL): 30-1/4 x 9-1/16 x 153 inch (768 x 230 x 3886 mm). Weight: 625 lbs (285 kg).

VF-1740, Fixed Speed 40 fpm: Capacity: 1700 lbs in standard configuration. Powerhead (HxWxL): 30-1/4 x 9-1/16 x 153 inch (768 x 230 x 3886 mm). Weight: 650 lbs (295 kg).

* + - * 1. Integral Brake Motor: IEC standard totally enclosed fan cooled (TEFC) NEMA MGI rated for inverter duty.
        2. Primary brake rated at 150 percent of motor torque.
        3. Gearbox: Meeting AGMA standards with service factor of 1.0.
        4. Hoist Control Enclosure: One AC flux vector motor drive and necessary control components to meet specification without secondary motor rooms.
      1. Dual, Independent Braking Systems: On every hoist module.
      2. Electro-Mechanical Secondary Holding Brake: Rated at 125 percent of torque imposed on drum shaft at full load, which operates in tandem with primary motor brake. Located on drive side of wire rope drum provided it is directly coupled to drum shaft.
         1. Wire Rope Drum to holding brake ratio shall be 1:1.
         2. Braking: Occurs instantaneously in event of motor brake failure, drive system failure, system fault, or power failure.

Imposes no impact to load or structure which hoisting system is attached.

* + - 1. User configurable load sensing limits to detect changes in weight; overload or underload, above or below the realized live load.
      2. Power, Control and Network Connections: Safety latching or twist-locking connectors.
         1. Connectors and Plugs: Male type, factory installed, and tested.
      3. Input Voltage for Hoists: 480 VAC, 60 Hz, 3 Phase, unless otherwise specified.
         1. Dielectric Voltage Withstand Test in Accordance with UL-1340 Standards.

Hoists must pass ensuring there is no excessive current leakage to ground anywhere in electrical system.

* + - 1. Limit Switch Protection: Controller interprets and responds to limit switch feedback ensuring immediate response and respecting software limits as programmed.
         1. Three levels of protection in Up and Down Directions: "Ultimate" and "Normal" hard struck limits, and "Factory" programmed software limits.

Upper "Ultimate" and "Normal" Limits: Easily field adjusted. Must maintain their position relative to one another during adjustment to ensure factory set relationship is not jeopardized.

Down "Ultimate" and "Normal" Limits: Easily field adjusted. Must maintain their position relative to one another during adjustment to ensure factory set relationship is not jeopardized.

Maximum travel between activation of "Normal" and "Ultimate" limit in either direction is not to exceed 6 inches (152 mm).

\*\* NOTE TO SPECIFIER \*\* Rotary style limit switches cannot achieve the precision or repeatability required due to dwell inherent to their design.

Rotary style limit switches are not acceptable.

* + - 1. Wire Rope Drum: Single, helically grooved hard coat anodized aluminum, or steel, that envelopes a least 33 percent of wire rope diameter.
      2. Shafting: A.I.S.I. No. 1045.
      3. Beam Clamps: Appropriately sized for ease of installation.
      4. Wire Rope Lift Cables: 3/16 inch (5 mm) diameter, 7x19 construction, galvanized aircraft cable (GAC).
         1. Breaking Strength: 4200 lbs (1905 kg).
         2. Wire Rope Rigging: Installed to prevent abrasion of wire rope against any part of building construction or other equipment.
         3. Cable Fittings and Sheave Diameters: Conform to wire rope manufacturer's recommendations as to size, number, and method of installation.

Cable Clips: Not allowed.

Cable Terminations: Formed using load-rated copper swaged fittings.

Swaged Fittings: Installed per manufacturer's instructions using appropriate tools and checked with manufacturer's certified "Go-No Go" gauge. Eyes to only be formed over galvanized wire rope thimbles of correct size.

* + - 1. Lift Line Terminations:
         1. At Drum: With two copper, compression, end stop sleeves installed at factory.
         2. At Load Hanger : With low profile Right Angle Cable Adjuster (RACA), thimble, and copper oval compression sleeve. RACA and cable terminations to be installed at time of hoist installation.
         3. Batten Trim: Adjusted up to 6 inches (152 mm) at RACA.

\*\* NOTE TO SPECIFIER \*\* Delete cable management options not required.

* + - 1. Cable Management System for Electrics: Helix. See "Cable Management" article in this specification.
      2. Cable Management System for Electrics: Pantograph. See "Cable Management" article in this specification.
      3. Cable Management System for Electrics: Cable Cradle. See "Cable Management" article in this specification.
      4. House Light Trough System for Electrics: See "Cable Management" article in this specification.

\*\* NOTE TO SPECIFIER \*\* Pipe battens are always to be included if House Light Trough System is not required. Delete if not required.

* + - 1. Pipe Batten: 1.5 inch (38 mm) schedule 40 grade A, seamless pipe fabricated in largest possible lengths without splices.
         1. Batten Splices: DOM tube: 0.120 x 1-9/16 inch (3 x 40 mm) diameter, 18 inches long. Insert 9 inches of tube into each half of the splice.

Securing Splice Tube:

\*\* NOTE TO SPECIFIER \*\* Delete securing option not required.

Held in place by a pair of 3/8 x 2-1/2 inch (10 x 64 mm), grade 5 hex bolts on each side of joint. Bolts pass through pipe, perpendicular to each other, spaced 3 and 6 inches (76 and 152 mm) from joint.

Plug Welds: Two 1/2 inch plug welds, perpendicular to each other, spaced 3 and 6 inches (76 and 152 mm) from joint.

* + - * 1. A safety-yellow batten cap to be installed at each end of each pipe batten.
        2. Manufacturer to provide self-adhesive labels for each batten on which the rated batten load will be written by the installer.
      1. Power and Control Distribution: Hoists receive power and control via a pair of 8 ft (2.438 m) long jumper cables extending from powerhead to source outlets.
         1. Receptacles: Installed in sheet metal junction box located less than 8 ft (2.438 m) away from hoist powerhead and includes a power and control outlet.

Inclusion of a 20 Amp 3 phase breaker in the distribution box is optional.

* + - * 1. Wiring and Connectors: Barriered between high and low voltage.
        2. Power and Distribution Channel: UL listed for this application.

\*\* NOTE TO SPECIFIER \*\* Delete article if not required or delete cable management paragraph options not required.

* 1. CABLE MANAGEMENT
     1. Cable Management System for Electrics: Prodigy Cable Management.
        1. Load Circuits and Control Wiring: Fed to distribution trough; a built-in cable management system allowing flat feeder cable to fold and store along top of connector strip.
        2. At High Trim: Entire system stores in 48 inches (1.219 m) of vertical space from bottom of the mounting steel to the horizontal centerline of batten.
        3. Integral to hoist system.
        4. UL Listed; system and components. Meet appropriate National Electrical Codes (NEC).
        5. Flat Cable: Meet physical and thermal requirements of UL for 20 A loads. Four flat cables may be fed from each end of distribution system providing power for 24 circuits from each end of system A maximum of 48 total circuits.
           1. One ground wire, one data cable, individually insulated hot and neutral conductor for each of six. 120 V 20 A circuits.
           2. Passes through a strain relief before entering termination box at designated end of raceway. Within raceway, wiring is attached at the factory to a terminal block.
        6. Connector Strip: Built to length specified with outlets or pigtails located as specified or as shown on Drawings.
           1. Outlets or Plugs: 15 amp grounded pin connectors, 15 amp twist lock connectors, or 15 amps Edison plugs.
           2. Distro Trough: May contain connectors for Ethernet and/or DMX connections.
        7. Hoisting systems utilizing cable management systems from third-party vendors are to be fully integrated into hoisting system without additional structural changes or changes to rigging controller.
     2. Cable Management System for Electrics: Helix.
        1. Load Circuits and Data Wiring: Fed to power distribution equipment by UL listed helix cable management system.
        2. Helix allows feeder cable and data wiring to stack and store without imposing a direct physical load on connector strip.
        3. A series of steel ribs connected to each other with nylon straps allowing entire distance of travel required by batten; up to 75 ft (22.86 m).
           1. Nylon Straps: Attach directly to building structure.
           2. At bottom, helix attaches to a steel plate in a manner imposing no additional physical load on power distribution equipment.
        4. Helix must support two pairs of cables.
           1. One hoist power and data pair. Factory-installed connectors at each end.
           2. One distribution power and data pair which are unterminated.

Distribution Power Cable: Support three or six 20 A circuits. Circuits may be 120 V, 208 V, or a combination of the two.

Data Distribution Cable: Single Cat 5e. Transmit DMX or Ethernet.

* + - * 1. Hoist and Distribution Power Cables: Multi-conductor SO cables.
        2. SO and Data Cables: Secured with a dedicated strain relief assembly.
        3. Support each pair on opposite ends of each steel rib, managing cables within required NEC bending radii.
        4. Ribs: Stack and separate as batten is lowered or raised and do not impede movement of line set.
        5. Cables must never heat in excess of rated temperature maximum of cable when all circuits are loaded at maximum electrical capacity.
        6. Circuit and Data Terminations between Helix and Distribution Equipment: Performed in the field.
    1. Cable Management System for Electrics: Pantograph.
       1. Load Circuits and Data Wiring: Fed to distribution trough by one or more UL Listed Pantograph cable management systems. Interfaces with traditional stage distribution raceways. Allows cable trays, feeder cable and data wiring to fold and store along top of connector strip without imposing a direct physical load on connector strip.
       2. Series of Ventilated Steel Trays: 18 ga. Hinged to each other allowing entire distance of travel required by batten; up to 75 ft (22.86 m).
          1. Hinges and Hinge Attachment Points: Stiffened to prevent pantograph distortion.
          2. Trays connect to moving trolley at compression tube allowing relief as system moves slightly from side to side during ascent/descent of batten. At bottom, pantograph is attached to a hinge point above the house light or distribution trough in a manner imposing no additional physical load on those assemblies.
          3. Hinge open and closed as batten is lowered and raised and does not impede movement of line set.
          4. Must not bow, warp, sag, or twist whether or not under load of flat cable.
          5. Flat cable in trays exit pantograph and enter a termination box on distro strip where electrical connections are made.
       3. Flat Cable: UL Listed.
          1. Cable in Pantograph Tray: Never to heat above rated maximum temperature when circuits in tray are loaded at maximum electrical capacity.
       4. Pantograph to support a double-high and double wide stack of flat cable and allow flat cable to bend at each joint within required NEC bending radii.
       5. Capable of powering sixteen 20 amp circuits plus ground and data via each pantograph.
       6. Interface with circuit distribution trough with standard mechanical and electrical hardware purpose-built for this assembly.
       7. Circuit and Data Terminations: Between pantograph and distribution strip, to be performed by Manufacturer. Field terminations at distribution trough is not acceptable.
       8. Hoisting systems utilizing cable management systems from third-party vendors to be fully integrated into hoisting system without additional custom hardware, changes to pantograph or changes to rigging controller.
    2. Cable Management System for Electrics: Cable Cradle.
       1. Load Circuits and Data Wiring: Fed to standard stage distribution trough by multi-conductor SO cable supported by cable cradles suspended from one of the Prodigy hoist lift lines. SO Cable: Held in place at distro with a dedicated strain relief assembly.
       2. Single or multiple multi-conductor SO cables and multiple cable cradles can be suspended from a single lift line so long as Working Load Limit (WLL) of lift line is not exceeded.
    3. House Light Trough System: To be used without pipe battens.
       1. House Light Trough: Formed 18 ga steel. Powder coated. Reinforced with 12 ga. formed steel at utilized fixture attachment points. Encloses internal wiring to which fixture wiring is terminated within the trough.
       2. May incorporate internal barrier for emergency circuit wiring in same trough.
       3. Circuit Wiring: Supplied to trough with ETC Pantograph cable management system.
       4. Cable Management: Utilize ETC Pantograph. Up to eight line-voltage circuits, or combination of line-voltage and up to two emergency circuits.
          1. Raceway Knockouts: Located 6 inches (152 mm) on-center. Permit installation of houselights with canopy or stem mounts attaching directly to raceway.
          2. Up to 50 lbs (23 kg) may be suspended between raceway supports.
       5. Pantograph cable management and house light trough is UL Listed for use with flat cable circuit distribution and fixture mounting as described above.

\*\* NOTE TO SPECIFIER \*\* Delete article if not required or delete basis of design options not required.

* 1. CONTROLS
     1. Basis of Design: QuickTouch Preset rigging motor control system as manufactured by ETC, Inc.
        1. General: For controller.
           1. Purpose-built to manage and operate motors designed for overhead lifting.
           2. UL Listed and fabricated from UL Listed components.
           3. Incorporate mechanical, electrical and safety features inherent to equipment.
           4. Controller supports 12 motors. Control of up to 96 motors is possible with use of MCX Nodes.
           5. One connection for motor communication. 24 motors per connection.
           6. Control System: Surface, panel, or rack mounted primary controller and up to three external E-stop stations.

Employ controller, a power and control distribution infrastructure, and motors. Separate drive cabinets or motor-starters is not acceptable.

* + - * 1. Emergency Stop and Hold-To-Run (Dead-man) Signals: Between control station and motor starters or drives in motors. Hard wired 24 Volt signals.

Physical, Industrial Pushbuttons: A "Dead-Man" Signal Operation: Required, so operator must be at console and pressing a button to initiate and continue motion.

Software and bus signal transmission is not acceptable.

For safety, movement initiated from touch screen is not permitted.

Allowing motors to run without operator at console is not permitted.

* + - * 1. No permanently moving components such as hard drives or fans.
        2. Maintenance free and quiet during operation.
      1. Mechanical:
         1. Enclosure: Formed steel and machined aluminum; Finish: black, scratch-resistant, powder-coat paint.

\*\* NOTE TO SPECIFIER \*\* Choose mounting options. Delete any not required.

Flush wall mount bracket.

Surface wall mount bracket.

Rack mount bracket.

Locking cover.

Locking cover with E-stop cutout.

* + - * 1. Face Panel: Printed labeling identifying button functions.

Identifies system as a controller for stage rigging.

* + - 1. Electrical: No discrete wiring connections. Terminate wiring into wall mounted bracket. Power Requirements: 24 VDC.
      2. Functional:
         1. User Interface: One illuminated and dimmable "GO" button.
         2. Emergency Stop (E-Stop): Hardwired NFPA-79 compliant mushroom head button with illuminated ring surrounding button.

Ring will blink in case of E-stop condition, illumination level is adjustable

Software or serial bus E-Stop systems are not acceptable.

Controller to support up to three remote E-stop stations.

* + - * 1. LCD Screen: 7 inch (178 mm) industrial grade multitouch LCD display communicates system information in symbols, colors, and readable text.

Control system employs an ambient light sensor and proximity sensor for automatic wakeup of display.

Intensities of indicator lights and LCD intensity are dimmable and automatically adjust based on ambient light conditions.

* + - * 1. User Access Levels: Six access levels with differentiated functionality. Controllers without password-protected user access levels are not acceptable.
        2. Fault Conditions: Reported in readable text. A pattern of illuminated or blinking lights is not acceptable.
        3. Manual Operation: Directly move selected motors.
        4. Preset Operation: Store up to 999 presets with numbers ranging from 1 to 999.

\*\* NOTE TO SPECIFIER \*\* Pendants are optional. Delete one or both if not required.

* + - * 1. Fixed Speed Remote Control Pendant: 50 ft (15.24 m) long attached cable and plug.
        2. Remote Enable Pendant: 50 ft (15.24 m) long attached cable and plug.

\*\* NOTE TO SPECIFIER \*\* Secondary QuickTouch Preset controller is optional. Delete options not required.

* + - * 1. Secondary QuickTouch Preset Controller:

Controllers share configuration and settings.

Configuration or setting changes and hoist status and telemetry are to be available on both controllers simultaneously.

Only one controller to control hoist movement at any time.

* + - 1. System Diagnostics and Monitoring:
         1. Automatic Self-Tests.
         2. System Inspection Reminder.
         3. Faults and Failures.
         4. System and Individual Motor History.
      2. Configuration Software: Allow easy and simple configuration of system by factory trained and authorized installers.
      3. Inspection: On-Board software allows easy and quick annual inspection of control system functions by a factory trained and authorized inspector.
    1. Basis of Design: QuickTouch Preset Handheld rigging motor control system as manufactured by ETC, Inc.
       1. General: For controller.
          1. Purpose-built to manage and operate motors designed for overhead lifting.
          2. UL Listed and fabricated from UL Listed components.
          3. Incorporate mechanical, electrical and safety features inherent to equipment.
          4. Controller supports 24 motors. Control of 96 motors is possible with use of MCX Nodes.
          5. One connection for motor communication. 24 motors per connection.
          6. Control System: A handheld controller, 50 ft (15.24 m) umbilical cable, surface panel, or rack mounted plug-in station. Up to three optional external E-stop stations.

Supports a single plug-in station when used as a standalone controller.

Supports up to three plug-in stations when used as a client for a QuickTouch Preset controller or Foundation control console.

* + - * 1. Emergency Stop and Hold-To-Run (Dead-man) Signals: Between control station and motor starters or drives in motors. Hard wired 24 Volt signals.

Physical, Industrial Heavy-Duty Pushbuttons: A "Dead-Man" Signal Operation: Required, so operator must be at console and pressing a button to initiate and continue motion.

Software and bus signal transmission is not acceptable.

For safety, movement initiated from touch screen is not permitted.

Allowing motors to run without operator at controller is not permitted.

* + - * 1. No permanently moving components such as hard drives or fans.
        2. Maintenance free and quiet during operation.
      1. Mechanical:
         1. Remote Control Unit: Ergonomically designed. Hold with either hand and operate with the other.

Length Including Grip: 13 inches (330 mm).

Width: 7.85 inches (125 mm).

Weight: 9.9 lbs (5 kg).

Support two 1/4-20 D-rings, not included, for attaching a strap, not included.

\*\* NOTE TO SPECIFIER \*\* Optional. Delete if not required.

Wall mounted storage bracket.

* + - * 1. Plug-In Station: 30 VDC power and hoist communication data to handheld controller. Run in and terminate all wires on terminals within the plug-in station.

Controller Power: Support 100 to 240 VAC, 50 to 60Hz circuit, 2A max.

Electrical Connections: Made via touch safe connectors.

Support termination of a single hoist communication run, and single safety communication run to external e-stop stations.

Directly terminated building wires to controller is not acceptable.

* + - * 1. Face Panel: Printed labeling identifying function of buttons on control station.

Identify system as a controller for stage rigging.

* + - 1. Electrical: No discrete wiring connections. Terminate wiring into plug-in station.
         1. Controller to run on 30 VDC power.
      2. Functional:
         1. User Interface: Include hold-to-run dead man, operable one-handed. Multi-touch LCD screen.
         2. Emergency Stop (E-Stop): Hardwired NFPA-79 compliant mushroom head button with illuminated ring surrounding button.

Ring will blink in case of E-stop condition, illumination level is adjustable.

Software or serial bus E-Stop systems are not acceptable.

Controller to support up to three remote E-stop stations.

* + - * 1. LCD Screen: 7 inch (178 mm) industrial grade multitouch LCD display communicates system information in symbols, colors, and readable text.

Control system employs an ambient light sensor and proximity sensor for automatic wakeup of display.

Intensities of indicator lights and LCD intensity are dimmable and automatically adjust based on ambient light conditions.

* + - * 1. User Access Levels: Six access levels with differentiated functionality. Controllers without password-protected user access levels are not acceptable.
        2. Fault Conditions: Reported in readable text. A pattern of illuminated or blinking lights is not acceptable.
        3. Manual Operation: Directly move selected motors.
        4. Preset Operation: Store up to 999 presets with numbers ranging from 1 to 999.
      1. System Diagnostics and Monitoring:
         1. Automatic Self-Tests.
         2. System Inspection Reminder.
         3. Faults and Failures.
         4. System and Individual Motor History.
      2. Configuration Software: Allow easy and simple configuration of system by factory trained and authorized installers.
      3. Inspection: On-Board software allows easy and quick annual inspection of control system functions by a factory trained and authorized inspector.
    1. Basis of Design: QuickTouch rigging motor control system as manufactured by ETC, Inc.
       1. General: For controller.
          1. Purpose-built to manage and operate motors designed for overhead lifting.
          2. UL Listed and fabricated from UL Listed components.
          3. Incorporate mechanical, electrical and safety features inherent to equipment.
          4. QuickTouch Control System: Surface, flush, or rack mounted primary control panel and up to three remote E-stop stations.
          5. Controller Features:

LCD display for feedback and operating information.

Key operated power switch.

Key operated motor load profile training and enable switch.

Latching motor selection buttons with backlit naming tabs.

Backlit hold-to-operate, Dead-man, up and down buttons.

Dedicated E-stop button.

Connection port for wired remote.

\*\* NOTE TO SPECIFIER \*\* Delete door option not required.

Door with Lock: Surface mounted.

Door with Lock: Flush mounted.

\*\* NOTE TO SPECIFIER \*\* Rack mount kit is optional. Delete if not required.

Rack mount kit.

* + - * 1. Control System: QuickTouch controller, power and control distribution, and motors. Separate drive cabinets or motor-starters is not acceptable.
      1. Enclosure: Back box and face panel. 16 ga powder coated sheet steel formed to provide support for installation and components installed within housing.
         1. QuickTouch Face Panel: Steel panel with labels identifying function of buttons on control station.

Identify system as controller for stage rigging.

Color: Shades of grey. Ring surrounding E-stop button to be safety yellow, and backlit.

* + - * 1. Steel panel to which switches are mounted to be removable via screws in surface located underneath the face panel film.
      1. LCD Screen: Communicates information in readable text. Backlit with configurable intensity level.
      2. Motor Selection / Operation Buttons: Backlit when motor is selected.
      3. Key Switches:
         1. Power Switch: Controls power to control system. Key must be in lock and key turned to "ON"to operate motoring system.
         2. Load Profiling Switch:

Key must be in lock and turned to "ON" for load profiling to function.

* + - 1. Emergency Stop (E-Stop): Hardwired NFPA-79 compliant mushroom head button with illuminated ring surrounding button.
         1. Ring will blink in case of E-stop condition, illumination level is adjustable.
         2. Software or serial bus E-Stop systems are not acceptable.
         3. Controller to support up to three remote E-stop stations.
      2. System Diagnostics and Monitoring:
         1. Automatic Self-Tests.
         2. System Inspection Reminder.
         3. Faults and Failures.
         4. System and Individual Motor History.

\*\* NOTE TO SPECIFIER \*\* Pendant is optional. Delete if not required.

* + - 1. Fixed Speed Remote Control Pendant: 50 ft (15.24 m) long attached cable and plug.
      2. System Commissioning: Capable of commissioning basic system functionality without a laptop computer or additional software.
    1. Basis of Design: QuickTouch+ rigging motor control system as manufactured by ETC, Inc.
       1. General: For controller.
          1. Purpose-built to manage and operate motors designed for overhead lifting.
          2. UL Listed and fabricated from UL Listed components.
          3. Incorporate mechanical, electrical and safety features inherent to equipment.
          4. QuickTouch+ Control System: Surface, flush, or rack mounted primary control panel and up to three remote E-stop stations.
          5. Controller Features:

LCD display for feedback and operating information.

Key operated power switch.

Key operated motor load profile training and enable switch.

Latching motor selection buttons with backlit naming tabs.

Backlit hold-to-operate, dead-man, up and down buttons.

Recessed speed adjustment slide-pot.

Rotary data entry encoder.

Dedicated E-stop button.

Connection port for wired remote.

\*\* NOTE TO SPECIFIER \*\* Delete door option not required.

Door with Lock: Surface mounted.

Door with Lock: Flush mounted.

\*\* NOTE TO SPECIFIER \*\* Rack mount kit is optional. Delete if not required.

Rack mount kit.

* + - * 1. Control System: QuickTouch+ controller, power and control distribution, and motors. Separate drive cabinets or motor-starters is not acceptable.
      1. Enclosure: Back box and face panel. 16 ga powder coated sheet steel formed to provide support for installation and components installed within housing.
         1. QuickTouch+ Face Panel: Steel panel with labels identifying function of buttons on control station.

Identify system as QuickTouch+ controller for stage rigging.

Color: Shades of grey. Ring surrounding E-stop button to be safety yellow, and Backlit.

* + - * 1. Steel panel to which switches are mounted to be removable via screws in surface located underneath the face panel film.
      1. LCD Screen: Communicates information in readable text. Backlit with configurable intensity level.
      2. Motor Selection / Operation Buttons: Backlit when motor is selected.
      3. Key Switches:
         1. Power Switch: Controls power to control system. Key must be in lock and key turned to "ON" to operate motoring system.
         2. Load Profiling Switch:

Key must be in lock and turned to "ON" for load profiling to function.

* + - 1. Emergency Stop (E-Stop): Hardwired NFPA-79 compliant mushroom head button with illuminated ring surrounding button.
         1. Ring will blink in case of E-stop condition, illumination level is adjustable
         2. Software or serial bus E-Stop systems are not acceptable.
         3. Controller to support up to three remote E-stop stations.
      2. System Diagnostics and Monitoring:
         1. Automatic Self-Tests.
         2. System Inspection Reminder.
         3. Faults and Failures.
         4. System and Individual Motor History.

\*\* NOTE TO SPECIFIER \*\* Pendant is optional. Delete if not required.

* + - 1. Fixed Speed Remote Control Pendant: 50 ft (15.24 m) long attached cable and plug.
      2. Trim Positions: Store or delete up to five trim positions per motor.
      3. Speed Control: Motor controller to provide a recessed speed adjustment slider.
      4. System Commissioning: Capable of commissioning basic system functionality without a laptop computer or additional software.
    1. Basis of Design: Foundation rigging motor control system as manufactured by ETC, Inc.
       1. General: For control system.
          1. Entire motor system to be operated by a Foundation rigging control system.
          2. Purpose-built to manage and operate motors designed for overhead lifting.
          3. Incorporate mechanical, electrical and safety features inherent to equipment.
          4. Capable to control up to 48 motors.
          5. Two motor communication connections, supplying 24 motors per connection.
          6. A surface or panel mounted primary controller and up to six external E-stop stations.
          7. UL Listed and fabricated from UL Listed components.
          8. Emergency Stop and Hold-To-Run Dead-man signals between control station and motor starters or drives in the motors to be hard wired 24 Volt signals.

Use physical, industrial heavy duty pushbuttons to create a "dead-man" signal. "Dead-man" requires operator to be at the console and pressing a button to initiate and continue motion.

Software and bus communications to transmit signals is not acceptable.

* + - * 1. Control System: Foundation controller, power and control distribution infrastructure, and motors. Separate drive cabinets or motor-starters are not acceptable.

\*\* NOTE TO SPECIFIER \*\* Select Foundation HD or Foundation Desk enclosure. Delete option not required.

* + - 1. Enclosure: Foundation HD wall-mount rigging control console.
         1. Side Panels of Control System: Machined out of solid Aluminum. Thickness: 0.25 inches (6 mm) minimum.
         2. Wall Mount Bracket and Face Panel: 16 ga powder coated sheet steel formed to provide installation support.

Wall Mount Bracket: Mountable independent of control station. Run in and terminate all wires on connectors just with the installed wall bracket.

\*\* NOTE TO SPECIFIER \*\* Lockable cover is optional. Delete if not required.

* + - * 1. Lockable cover.
      1. Enclosure: Foundation Desk rigging control console.
         1. Side Panels of Control System: Machined out of solid Aluminum. Thickness: 0.25 inches (6 mm) minimum.
         2. Dust cover included.
         3. Plug-In Station: 30 VDC power and hoist communication data to Foundation Desk. Run in and terminate all wires on terminals within the plug-in station.

\*\* NOTE TO SPECIFIER \*\* Choose desired umbilical plug-in cable length. Delete option not required.

* + - * 1. 50 foot power and data umbilical cable.
        2. 6 foot power and data umbilical cable.

\*\* NOTE TO SPECIFIER \*\* Rolling cart is optional. Delete if not required.

* + - * 1. Rolling cart.
      1. Electrical:
         1. Controller Power: Support 100 to 240 VAC, 50 to 60Hz circuit, 20A max.
         2. Electrical Connections: Made via touch safe connectors.
      2. Face Panel: Printed labeling identifying button functions. Identifies system as a controller for stage rigging.
      3. Display: High resolution, full color, multitouch LCD. Articulates in Foundation Desk
      4. Buttons and Joystick:
         1. Power Button: One, with a power indication LED.
         2. USB Port: One, readily accessible for connection of a memory stick for use with file transfer, inspection reports, log files, and software updates.
         3. "GO" Buttons: Two, illuminated and dimmable.
         4. Proportional Joystick:

Incorporate one dead man button.

Incorporate two illuminated and dimmable RGB LEDs that indicate direction, function, and status of Joystick.

* + - 1. Emergency Stop (E-Stop): Hardwired NFPA-79 compliant mushroom head button with illuminated ring surrounding button.
         1. Ring will blink in case of E-stop condition, illumination level is adjustable.
         2. Software or serial bus E-Stop systems are not acceptable.
         3. Controller to support up to six remote E-stop stations.
         4. LCD Screen: 18 inch (450 mm) industrial grade multitouch LCD display communicates system information in symbols, colors, and readable text.

Control system employs an ambient light sensor and proximity sensor for automatic wakeup of display.

Intensities of indicator lights and LCD intensity are dimmable and automatically adjust based on ambient light conditions.

* + - * 1. User Access Levels: Six access levels with differentiated functionality. Controllers without password-protected user access levels are not acceptable.
      1. User Access Levels: Six access levels with differentiated functionality. Controllers without password-protected user access levels are not acceptable.
      2. Manual Operation: Directly move selected motors
      3. Preset Operation: Store up to 999 presets with numbers ranging from 1 to 999.
      4. Cue Stack Operation: User capabilities.
         1. Store cues with numbers ranging from 1.00 to 999.99.
      5. Locked Group Operation: Supports the control of multiple hoists connected to a single load. All hoists assigned to a Locked Group will:
         1. Be selected for manual movement whenever any single hoist in the group is selected.
         2. Move in the same direction, up or down.
         3. Respond to a fault, such as an overload or slack line condition, in any of the hoists assigned to the group.
         4. Stop movement if programmed position deltas fall outside of user-defined parameters.
      6. File Operation: Store and read show-files on internal hard-drive and USB thumb drive.
      7. Help System: Provide online help system embedded in console.

\*\* NOTE TO SPECIFIER \*\* Pendant remotes are optional. Delete if not required.

* + - 1. Fixed Speed Remote Control Pendant: With a 30 ft (9.144 m) long attached cable and plug.
      2. Remote Enable Pendant: With a 30 ft (9.144 m) long attached cable and plug.

\*\* NOTE TO SPECIFIER \*\* Foundation Handheld remote is optional. Delete if not required.

* + - 1. Foundation Handheld Remote 2: With a 50 ft (15.24 m) long attached cable and plug.
         1. Connect to control system via a connector on a plug-in station.
         2. Ergonomically designed to hold in either hand and operate with the other.

Length including Grip: 13 inches (330 mm). Width: 7.85 inches (199 mm).

Weight: Not to exceed 10 lbs (5 kg).

Support two 1/4-20 D-rings for attaching an optional strap. D-rings and strap not included.

\*\* NOTE TO SPECIFIER \*\* Storage bracket is optional. Delete if not required.

Wall mounted storage bracket.

* + - * 1. Screen: Full color 7 inch (178 mm) touch screen. Resolution: 640x480 pixels.
        2. Power: Unit will be supplied with 30 VDC.
        3. E-Stop Button: provided on front of unit.

Proportional Joystick: Manually move motors and proportionally control motor movement speed during target moves or cues.

* + - * 1. User Functions:

Manually move one or multiple motors up and down with joystick.

Recall presets and move associated motors to preset stores positions.

Recall cues from cue stack and start these cues.

* + - * 1. Hard-wired dead man trigger.
        2. Plug-In Station: 30 VDC power and hoist communication data to handheld controller. Run in and terminate all wires on terminals within the plug-in station.

Controller Power: Support 100 to 240 VAC, 50 to 60Hz circuit, 2A max.

Electrical Connections: Made via touch safe connectors.

Support termination of a single hoist communication run, and single safety communication run to external e-stop stations.

Directly terminated building wires to controller is not acceptable.

\*\* NOTE TO SPECIFIER \*\* Foundation Remote Station is optional. Delete if not required.

* + - 1. Foundation Remote Station.
         1. Connect to control system via two Category 5e or better wires.
         2. Enclosure: Formed steel and machined aluminum; Finish: black, scratch-resistant, powder-coat paint.

\*\* NOTE TO SPECIFIER \*\* Choose mounting options. Delete any not required.

Flush wall mount bracket.

Surface wall mount bracket.

Rack mount bracket.

Locking cover.

Locking cover with E-stop cutout.

* + - * 1. Screen: Full color 7 inch (178 mm) touch screen. Resolution: 640x480 pixels.
        2. Power: Unit will be supplied with 30 VDC.
        3. E-Stop Button: provided on front of unit.
        4. User Functions:

Manually move one or multiple motors up and down with joystick.

Recall presets and move associated motors to preset stores positions.

Recall cues from cue stack and start these cues.

* + - * 1. Hard-wired dead man button.
      1. System Diagnostics and Monitoring:
         1. Automatic Self-Tests.
         2. System Inspection Reminder.
         3. Faults and Failures.
         4. System and Individual Motor History.
      2. Inspection: On-Board software allows easy and quick annual inspection of control system functions by a factory trained and authorized inspector.

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.
      3. Defective or Non-Approved Materials During Construction and Warranty Period: Defective equipment or material not meeting specifications, or not approved in writing by Architect will, be replaced with specified equipment or material at no additional cost to Owner.
   2. PREPARATION
      1. Permits: Obtain permits necessary for execution of work pertaining to installation and conform in all trades with all applicable local codes and national codes. Obtain permits necessary for operation of any equipment by the Owner.
      2. Clean surfaces thoroughly prior to installation.
      3. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
   3. INSTALLATION
      1. Install in accordance with manufacturer's instructions, approved submittals, and in proper relationship with adjacent construction.
         1. Discrepancies: Equipment to be sized to fit properly. Contractor is responsible for exact measurements.
   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.
       1. Instruction of Owner's Personnel: Installer or their representative, fully knowledgeable and qualified in systems operation.
          1. Provide four hours of instruction to Owner-designated personnel on use and operation of System. Designated instruction times to be arranged through the Architect.
  1. CLEANING AND PROTECTION
     1. Clean products in accordance with the manufacturers recommendations:
     2. Touch-up, repair or replace damaged products before Substantial Completion.
     3. Clean Up: It is the responsibility of the Installer to remove debris from building or site caused by hoist installation to a common trash point or receptacle on the job site, as determined by the General Contractor.

END OF SECTION