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APPLICATION		REVISION HISTORY					
NEXT ASSY	USED ON	PART NO.	ZONE	REV	DESCRIPTION	DATE	APPROVAL

DOCUMENT INFORMATION: (TITLE, NUMBER, REV, DATE)  
 Install Elevator, VAB Tower F  
 PCN 99000.8  
 December 17, 2012

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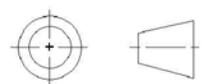
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 TOLERANCES PER ASME Y14.5M-1994.  
 TOLERANCES ON:  
 FRACTIONS    DECIMALS    ANGLES

THIRD ANGLE PROJECTION



TECHNICAL SPECIFICATIONS



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 Florida Engineering Number: 000002

CAD MAINTAINED. CHANGES SHALL BE INCORPORATED ONLY BY THE DESIGN ACTIVITY.	ORIGINAL DATE OF DRAWING (YY/MM/DD)	<b>JOHN F. KENNEDY SPACE CENTER, NASA KENNEDY SPACE CENTER, FLORIDA</b>			
	DRAFTSMAN B. Cochran	CHECKER S. Nute	Install Elevator, VAB Tower F PCN 99000.8 January 11, 2013		
ARCHITECT S. Nute	CHECKER D. Morelli				
ENGINEER	STRESS				
SOFTWARE	ENGINEER	SIZE	CAGE CODE	DWG NO	REV
FILENAME	SUBMITTED	<b>A</b>		79K39279	
MATERIAL	APPROVED	SCALE	UNIT WEIGHT	SHEET	1 OF 348

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**Technical Specifications  
Install Elevator, VAB Tower F  
PCN 99000.8**

**Technical Specifications**

Project Title:	Install Elevator, VAB Tower F
Project Control Number:	99000.8
Project Drawing Number:	79K39278
Project Specification Number:	79K39279
Project Calculations/Data Manual Number:	KSC-TA-12264

Discipline	Name	ST	License No.	Signature
Architectural	Susan Nute	FL	0011916	<i>Susan Nute</i> 1/11/13
Electrical	Carlos Turcios	FL	64578	<i>Carlos Turcios</i> 1/11/13



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## SECTION 01 11 00

## SUMMARY OF WORK

08/11

## PART 1 GENERAL

## 1.1 PROJECT HISTORY

The combined existing Elevator 15/16 shaft is approximately 46 years old and was constructed with one working elevator designated as Elevator 15. The adjacent shaft for Elevator 16 is unused but was constructed to accommodate the installation of a future elevator as indicated on Record Drawings attached hereto. The hoistway doors for Elevator 16 were installed at the time of original construction and subsequently bolted shut. The existing shaft is open to adjacent spaces. It is separated from pedestrian walking areas by wire mesh partitions.

The new Elevator 16 installation is being performed in support of a project NASA currently has underway to construct new platforms in Tower F related to the construction of new vehicles.

## 1.2 OPERATION OF NEW ELEVATOR 16

The new Elevator 16 shall travel 34 levels to Elevation 419'-9" as shown on Drawings and shall be programmed to stop at all existing front landings.

The elevator platform shall be capable of moving vertically. For accessing the new work platforms to the rear of the elevator, Elevator 16 shall be capable of stopping and opening at any level required to coincide with the new work platforms.

Current rear landings of the Elevator 15/16 group are also capable of being relocated vertically. The rear door of Elevator 16 opens toward the vehicle assembly area, and the shaft at the rear of the elevator car is open. The ability to re-program the levels where the rear elevator door will open shall be handled by the elevator control software program.

The stops for the front doors for Elevator 16 are already in place and are at the same existing floor levels as are the stops for Elevator 15.

The new elevator hoist motors shall be located in the elevator machinery room at the Level 449'-7" (the level above the 36th floor). It is recognized that Elevator 16 will be redundant to existing Elevator 15, which will provide flexibility for future elevator maintenance.

Existing Elevator 15 is available to transport equipment from the ground level to the last stop (34th Floor). Coordinate existing dimensions and load limit of Elevator 15 regarding sizes and weights of equipment to be provided with Contracting Officer prior to utilization. Transporting equipment disassembled and in parts is required due to front/rear entrance dimensions and load limit including additional transport requirement to the equipment room from top landing (34th Floor).

## 1.3 SUMMARY

This specification is intended to be a Design-Build performance specification. The successful Contractor shall provide all design and

engineering analysis for the implementation of this project.

The work to be performed under this project includes design and installation of one electric gearless traction elevator in existing empty hoistway #16 in Tower F in the Vehicle Assembly Building (VAB), Kennedy Space Center, Florida.

This includes, but is not limited to, the following as specified herein: the design and replacement of existing control system of existing adjacent Elevator 15 and supply and installation of a new control system to serve both elevators.

Record drawings have been provided (see paragraph 1.3 of this section). These drawings are thought to be reasonably representative of actual conditions. The Contractor shall be required to verify dimensions and actual field conditions and to include this information in his proposal.

Sequence of work shall minimize downtime and shall be as follows:

- a. Complete submittal process necessary to obtain "Notice to Proceed" (pre-construction submittals), and technical submittals associated with the detailed fabrication and installation design.
- b. Complete the detailed fabrication and installation design process including design reviews at KSC. The Government shall also make up to three site inspections at the Contractor's facility during the fabrication process. Up to four Government employees will be present during the site inspections for a visit duration of four days.
- c. Once the detailed design process is complete and approved, order materials and complete the factory fabrication process. Perform VAB site modifications necessary to keep Elevator 15 operational while installing Elevator 16.
- d. Once the factory fabrication process is complete, perform initial factory testing to ensure systems function as designed. The entire test procedure shall be stepped-through, with necessary corrections made, prior to Government witness.
- e. Perform final factory testing in the presence of Government witness and receive Government approval to ship material at KSC.
- f. Once factory testing is complete and approved; ship materials to the KSC field installation site and perform the field installation. Elevator 15 is to remain operational during the installation of Elevator 16.
- g. Once the Elevator 16 field installation is complete, perform field testing to allow operation of Elevator 16 while Elevator 15 is being modified.
- h. Modify Elevator 15 and integrate operations with Elevator 16.
- i. Once field testing is complete and approved, submit all as-built documentation and contract close-out submittals.

#### 1.4 DESCRIPTION

The Contractor shall provide the design and engineering analysis as well as

demolition (as required), installation and testing of the modifications identified herein for Elevator 16. The work includes but is not limited to the following:

Design, construction, installation, and testing of one new 8,000 pound passenger elevator, Elevator 16, complete.

Design, installation, and testing of a new control system for Elevators 15 and 16 that connects to the KCCS monitoring center.

Removal of existing hoistway doors and operators serving the empty shaft for Elevator 16, and replacement with new doors and operators.

Construction of shaft wall type closures at hoistway openings, for Elevators 15 and 16, that are not scheduled for use with code compliant materials and methods.

Design, installation, and testing of the power supply systems for Elevators 15 and 16.

Design, installation, and testing of the fire alarm systems and associated elevator control for Elevators 15 and 16. The existing Simplex 4100 fire alarm control panel and system is to be utilized.

The new power and control systems and the lifting motors and sheaves are located in the existing elevator machine room which is accessed from the 36th floor, Level 445'-1".

Perform validation and testing of the completed system. This includes shop testing of the completed controls and final acceptance testing of the controls after installation.

Provide and install all elevator ancillary control devices; such as lighting, wiring and conduit for a complete, functioning system.

Provide operation and maintenance and control systems training for maintenance personnel.

Provide Operation and Maintenance Manuals for the new equipment, spare parts lists, as built drawings and design data manuals.

The Contractor shall provide all design investigations, studies, calculations, shop drawings, specifications, and back-up data required to perform the work under this contract.

#### 1.5 CONTRACT DRAWINGS / PUBLICATIONS

The following drawings accompany this specification and are a part thereof.

Drawing No. 79K39278          Install Elevator VAB Tower F  
Sheets 1 - 11

The following drawings are included with this specification as reference material.

LAUNCH COMPLEX 39 VOLUME 13 - HIGH BAY - ARCHITECTURAL PLANS - TOWERS  
D, E & F (October 1963)

Sheets 13-01, 13-02, and 13-43 through 13-55

LAUNCH COMPLEX 39 VOLUME 14 - HIGH BAY - ARCHITECTURAL ELEVATIONS,  
SECTIONS & DETAILS, BRIDGES - PLANS, ELEVATIONS, SECTIONS & DETAILS  
(October 1963)

Sheets 14-01 through 14-03 and 14-77 through 14-81

Refurbish VAB Highbays 1 & 3 Elevator Controls on Elevators 9 through  
15 (February/1996)

Sheets 1 through 13 of 13

## 1.6 SUBMITTALS

### 1.6.1 Construction Notice to Proceed

Design documents, and technical submittals for individual project systems/components for all specification sections must be approved by the COTR before procurement and construction on those systems/components may begin.

Government approval is required for submittals with a "G" designation:

Design Engineer Qualifications; G

Elevator Specialist Qualifications; G

Design Review Products; G

Elevator Test Plan; G

## 1.7 QUALITY ASSURANCE AND ENGINEERING SERVICES

### 1.7.1 Engineering Services

Provide the design services of state-licensed Architects and Engineer(s) meeting the requirements of the Qualifications paragraph below. The design services shall include the preparation of the construction documents that, once approved by the Government, shall govern the construction of, and be the controlling documents for the project described in this contract. The Engineer(s) shall supervise, be responsible for, and sign and seal all required construction documents prepared in accordance with the rules and regulations of the licensing State.

Qualifications: In addition to being a Registered Professional Engineer, the Engineer or Architect of Record for design of this project shall have a minimum of five (5) years demonstrated experience designing similar elevator structural/electrical installation(s). The Structural and Electrical design shall also be by Registered Professional Engineers, and the Engineers of Record for design of this project shall have a minimum of five (5) years demonstrated experience designing similar elevator installation.

Submittal of Record Approval: Submit resume of proposed Architects and Engineers of Record to the Contracting Officer for approval prior to beginning design services.

Design drawing submittals for construction shall be signed and sealed by the Registered Architects or Professional Engineers in responsible

charge of their respective disciplines.

### 1.7.2 Design Safety

Design to mitigate or design out hazards. Design for personnel safety and security. Provide Fall Protection for O&M activities.

Site Specific Safety Plan and Job Hazard Analysis are required to address both the design and construction phases of this project. Do not commence work involving hazards until all the safety and JHA submittals have been approved.

### 1.7.3 Design Review Products

#### 1.7.3.1 Data Requirements

During the design phase, submit catalog data, technical data sheets, operations manuals, maintenance manuals, parts lists, and all other technical data as indicated in the detailed specification sections to fully detail all components to be provided by the Contractor. All such components shall be approved prior to the Contractor developing shop drawings. Installation of all components approved shall be as detailed on shop drawings.

#### 1.7.3.2 Calculations

During the design phase, submit engineering calculations associated with the design and detailed specification sections including structural loads, motor power ratings, motor torque ratings, drive calculations, weight and speed ratings, wire size calculations, etc.

#### 1.7.3.3 Construction Shop Drawings (Deliverable)

Provide detailed design and fabrication shop drawings which shall be approved by the Government prior to fabrication of the elevator. Include all shop drawings as indicated in the detailed specification sections. Final submittal for all drawings shall be as-built configuration after installation, and shall include digital media containing all drawing and software source files. Drawing content shall include, but not be limited to, the following:

Cover and index sheet.

Legend sheet including equipment ratings.

Hazardous material sampling, removal, and disposal.

Demolition of all required structure, electrical, and control systems including panels, piping, raceways, and wiring. Show existing condition and demolition details on separate sheets. Show all existing equipment, wiring, and devices to be removed and retained. Upon completion of adequate field investigations, show existing conditions through digitized photographs and details on CAD drawings.

Interface drawings showing all elevator-to-facility interfaces.

Indicate paint removal and re-painting requirements.

Indicate all structural and electrical modifications required.

Indicate miscellaneous mechanical, electrical, and structural modifications required.

Space allocation drawings showing areas available for new equipment installation (e.g. controls, motors, equipment enclosures).

Submit detail drawings, including dimensioned layouts in plan and elevation showing the arrangement of equipment, accessories, supporting systems, anchorage of equipment, clearances for maintenance and operation; and details on hoistway, controllers, motors, guide rails and brackets, limit switches, and points of interface with electrical power, elevator controls, lighting and HVAC systems.

Detailed plan view drawings of all equipment and component locations including control and instrumentation field devices. Provide elevation and detail view of drawings of major equipment, motor installation/mounting/alignment details, component installation, and any other modifications. Scale of plan views shall be 1/8 inch or greater. Scale of elevation and detail views shall be 1/4 inch or greater.

Complete elevator diagrams, schematics, and connection diagrams showing all equipment, instrument and component locations and their interconnection.

Complete power three line diagrams, control logic diagrams, control schematics, and wiring interconnection diagrams of systems showing all equipment, instrument and component locations and their interconnection. Prepare drawings with complete wiring diagrams showing electrical connections and other details required to demonstrate sequence of operations and functions of system devices. Include the appropriate sizing of electrical protective devices on the drawings.

Provide a Sequence of Operations (SOO) on control diagrams describing the operation of the process with alarms and set points and ranges, where necessary.

Complete and fully annotated software logic submittals.

Provide drawings in AutoCAD™ or MicroStation™ (.DXF or .DWG) format. Format on KSC "F" size sheets using black ink on paper media or vellum. Drawings shall be fully readable when reduced to B-size (11-inches by 17-inches). Drawing .pdf files shall be provided on compact disc for design review submittals. Drawing source files and .pdf files shall be provided on compact disc for construction and as-built submittals. Adhere to the following requirements:

Double dimensioning shall be avoided. All sheets shall include a graphic scale for each scale used on that sheet.

Take positive measures to insure that all disciplines of the design are coordinated so that no conflicts will result. Drawings in the various disciplines shall be drawn to the same scale with the same match line and located in the same position, where practical.

Drawings shall show the type of fabrication and installation details required.

Work point locations shall be vertically and horizontally tied to basic points of reference for proper installation.

#### 1.7.4 Test Plan

Elevator test plans in accordance with Section 14 21 00.00 20 ELECTRIC TRACTION. Elevator shall be submitted and reviewed in a meeting at KSC. Include all associated system testing including fire alarm, electrical power source testing, remote monitoring, and communications.

#### 1.7.5 Design Reviews and Meetings

Design Review Participation: Participate in design reviews at KSC. Deliver all design review packages to the COTR for distribution. The COTR will schedule the review meeting(s) within 21-days of receiving the submittal(s).

Four design reviews, held at KSC, will be required prior to equipment procurement and modification to the control system and hoistway doors.

1. The first design review will be a kickoff meeting at KSC and will include a walk down of the elevator.
2. The second review will be a 30% review. At a minimum all product data and manufacturer's instruction shall be submitted for approval. This review shall include the KCCS monitoring system integration kick-off meeting.
3. The third design review will be a 75 percent review and will include a table top review of the revised building system drawings, shop drawings, calculations, and product data. The Contractor shall include with the submittal a checklist of all requirements validating they have been included in the design. This review shall include the second KCCS monitoring system integration review meeting.
4. The fourth design review will be a 100 percent review and will include a table top review of the shop drawings, calculations, product data and a construction implementation plan. This review shall include the third KCCS monitoring system integration review meeting.

Prior to elevator testing an additional KSC review shall be held to review the elevator test plan. Elevator testing shall not commence until the elevator test plan is approved by the Government.

Submit twelve (12) complete hard-copy sets of all design products for each review meeting (project) to the COTR. Review meeting drawings shall be half-size. Also provide .pdf format files on a compact disc for all drawings and data to be reviewed.

Design Review Format: The Contractor shall chair the design review (table-top review). Review all review comments and disposition as "Accepted," all comments that the Contractor determines as within scope and that requires no further discussion. Present for discussion all comments, "Accepted" and otherwise, during these open reviews. Record the dispositions and follow up by incorporating the agreed disposition actions into the design drawings and specifications.

Present and make clear to review participants, all issues that affect design and that have interdisciplinary effects (e.g. layout of mechanical elements may affect structural or architectural features). Clearly resolve such issues with the COTR. The following disposition codes shall be recorded on each review comment:

"ACCEPTED" - the comment is within scope and will be incorporated as stated.

"REJECTED" - the comment will not be incorporated.

WITHDRAWN" - the comment is withdrawn by the originator or the originator's representative.

Provide dispositions of Review Comments on Engineering Review Comment (ERC) Form and minutes of design review meeting to the COTR. Capture in minutes all actions that may be required to bring the design to its next level. Identify the responsible parties for the action(s) and note any agreed dates for return responses. Provide a copy of the Attendees List for record.

Final submittal shall be a complete design ready for construction and shall be signed and sealed by the Registered Architects and Engineers in responsible charge of their preparation.

Construction Notice to Proceed: Design documents and construction schedules for individual project systems/components must be approved by the COTR before procurement and construction on those systems/components may begin.

#### 1.7.6 Design Reviews and Meetings

##### SD-07 Certificates

Submit qualifications, licensing credentials, and resume of design professional(s) performing the design work on this project.

MANUFACTURER'S LETTERHEAD AND SIGNED BY RESPONSIBLE OFFICIALS OF MANUFACTURER

#### 1.8 ELECTRONIC MAIL (E-MAIL) ADDRESS

The Contractor shall establish and maintain electronic (e-mail) capability along with the capability to open various electronic attachments in Microsoft, Adobe Acrobat, and other similar formats. Within 10 days after contract award, the Contractor shall provide the Contracting Officer a single (only one) e-mail address for electronic communications from the Contracting Officer related to this contract including, but not limited to contract documents, invoice information, request for proposals, and other correspondence. The Contracting Officer may also use e-mail to notify the Contractor of Base access conditions when emergency conditions warrant, such as hurricanes, terrorist threats, etc. Multiple e-mail addresses will not be allowed.

It is the Contractor's responsibility to make timely distribution of all Contracting Officer initiated e-mail with its own organization including field office(s). The Contractor shall promptly notify the Contracting Officer, in writing, of any changes to this e-mail address.

1.9 OCCUPANCY OF PREMISES

Building(s) will be occupied during performance of work under this Contract.

PART 2 PRODUCTS

Not used.

PART 3 EXECUTION

Not used.

-- End of Section --

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## SECTION 01 33 00

## SUBMITTAL PROCEDURES

05/11

## PART 1 GENERAL

## 1.1 SUMMARY

The Contracting Officer may request submittals in addition to those specified when deemed necessary to adequately describe the work covered in the respective sections.

Units of weights and measures used on all submittals are to be the same as those used in the contract drawings.

Each submittal is to be complete and in sufficient detail to allow ready determination of compliance with contract requirements.

Contractor's Quality Control (CQC) System Manager and the Designer of Record, if applicable, to check and approve all items prior to submittal and stamp, sign, and date indicating action taken. Proposed deviations from the contract requirements are to be clearly identified. Include within submittals items such as: Contractor's, manufacturer's, or fabricator's drawings; descriptive literature including (but not limited to) catalog cuts, diagrams, operating charts or curves; test reports; test cylinders; samples; O&M manuals (including parts list); certifications; warranties; and other such required submittals.

Submittals requiring Government approval are to be scheduled and made prior to the acquisition of the material or equipment covered thereby. Pick up and dispose of samples not incorporated into the work in accordance with manufacturer's Material Safety Data Sheets (MSDS) and in compliance with existing laws and regulations.

## 1.2 DEFINITIONS

## 1.2.1 Submittal Descriptions (SD)

Submittals requirements are specified in the technical sections. Submittals are identified by Submittal Description (SD) numbers and titles as follows:

## SD-01 Preconstruction Submittals

Submittals which are required prior to issuance of contract notice to proceed.

## SD-02 Shop Drawings

Drawings, diagrams and schedules specifically prepared to illustrate some portion of the work.

Diagrams and instructions from a manufacturer or fabricator for use in producing the product and as aids to the Contractor for integrating the product or system into the project.

Drawings prepared by or for the Contractor to show how multiple systems

and interdisciplinary work will be coordinated.

All shop drawings shall be produced using Bentley Microstation or AutoCad (.DXF or .DWG format). Final record shop drawing submittals shall include both digital media source files and .pdf files for all shop drawings.

#### SD-03 Product Data

Catalog cuts, illustrations, schedules, diagrams, performance charts, instructions and brochures illustrating size, physical appearance and other characteristics of materials, systems or equipment for some portion of the work.

Samples of warranty language when the contract requires extended product warranties.

#### SD-05 Design Data

Design calculations, mix designs, analyses or other data pertaining to a part of work.

Design submittals, design substantiation submittals and extensions of design submittals.

#### SD-06 Test Reports

Report signed by authorized official of testing laboratory that a material, product or system identical to the material, product or system to be provided has been tested in accord with specified requirements. (Testing must have been within three years of date of contract award for the project.)

Report which includes findings of a test required to be performed by the Contractor on an actual portion of the work or prototype prepared for the project before shipment to job site.

Report which includes finding of a test made at the job site or on sample taken from the job site, on portion of work during or after installation.

Investigation reports.

Daily logs and checklists.

Final acceptance test and operational test procedure.

#### SD-07 Certificates

Statements printed on the manufacturer's letterhead and signed by responsible officials of manufacturer of product, system or material attesting that product, system or material meets specification requirements. Must be dated after award of project contract and clearly name the project.

Document required of Contractor, or of a manufacturer, supplier, installer or Subcontractor through Contractor, the purpose of which is to further quality of orderly progression of a portion of the work by documenting procedures, acceptability of methods or personnel

qualifications.

Confined space entry permits.

Text of posted operating instructions.

#### SD-08 Manufacturer's Instructions

Preprinted material describing installation of a product, system or material, including special notices and (MSDS) concerning impedances, hazards and safety precautions.

#### SD-10 Operation and Maintenance Data

Data that is furnished by the manufacturer, or the system provider, to the equipment operating and maintenance personnel, including manufacturer's help and product line documentation necessary to maintain and install equipment. This data is needed by operating and maintenance personnel for the safe and efficient operation, maintenance and repair of the item.

This data is intended to be incorporated in an operations and maintenance manual or control system.

#### SD-11 Closeout Submittals

Documentation to record compliance with technical or administrative requirements or to establish an administrative mechanism.

Special requirements necessary to properly close out a construction contract. For example, Record Drawings and as-built drawings.

### 1.2.2 Approving Authority

Office or designated person authorized to approve submittal; Contracting Officer (CO) or when designated the Contracting Officer's Technical Representative (COTR).

Design documents, and construction schedules for individual project systems/components must be approved by the COTR before procurement and construction on those systems/components may begin.

### 1.2.3 Work

As used in this section, on- and off-site construction required by contract documents, including labor necessary to produce submittals, except those SD-01 Pre-Construction Submittals noted above, construction, materials, products, equipment, and systems incorporated or to be incorporated in such construction.

## 1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for Contractor QC approval. Submit the following in accordance with this section.

#### SD-01 Preconstruction Submittals

Certificates of Insurance; G

Surety Bonds; G  
List of Proposed Subcontractors; G  
Construction Progress Schedule; G  
Schedule of Prices (Values); G  
Health and Safety Plan; G  
Work and Demolition Plans; G  
Quality Control (QC) Plan; G  
Environmental Protection Plan; G  
Waste Management Plan; G

#### 1.4 SUBMITTAL CLASSIFICATION

Submittals are classified as follows:

##### 1.4.1 Designer of Record Approved (DA)

Designer of Record (DOR) approval is required for extensions of design, critical materials, any deviations from the solicitation, the accepted proposal, or the completed design, equipment whose compatibility with the entire system must be checked, and other items as designated by the Contracting Officer. Within the terms of the Contract Clause entitled, "Specifications and Drawings for Construction," they are considered to be "shop drawings." Contractor to provide the Government with the number of copies designated hereinafter of all DOR approved submittals. The Government may review any or all Designer of Record approved submittals for conformance to the Solicitation, Accepted Proposal and the completed design. The Government will review all submittals designated as deviating from the Solicitation or Accepted Proposal, as described below.

##### 1.4.2 Government Approved G

Government approval is required for extensions of design, critical materials, deviations, equipment whose compatibility with the entire system must be checked, and other items as designated by the Contracting Officer. Government approval is required for any deviations from the Solicitation or Accepted Proposal and other items as designated by the Contracting Officer. Within the terms of the Contract Clause entitled, "Specifications and Drawings for Construction," they are considered to be "shop drawings."

##### 1.4.3 Government Conformance Review of Design (CR)

The Government will review all intermediate and final design submittals for conformance with the technical requirements of the solicitation.

#### 1.5 PREPARATION

##### 1.5.1 Transmittal Form

Transmit submittals with transmittal form prescribed by Contracting Officer and standard for project. On the transmittal form identify Contractor,

indicate date of submittal, and include information prescribed by transmittal form and required in paragraph entitled, "Identifying Submittals," of this section.

#### 1.5.2 Identifying Submittals

When submittals are provided by a Subcontractor, the Prime Contractor is to prepare, review and stamp with Contractor's approval all specified submittals prior to submitting for Government approval.

Identify submittals, except sample installations and sample panels, with the following information permanently adhered to or noted on each separate component of each submittal and noted on transmittal form. Mark each copy of each submittal identically, with the following:

- a. Project title and location.
- b. Construction contract number.
- c. Date of the drawings and revisions.
- d. Name, address, and telephone number of subcontractor, supplier, manufacturer and any other subcontractor associated with the submittal.
- e. Section number of the specification section by which submittal is required.
- f. Submittal description (SD) number of each component of submittal.
- g. When a resubmission, add alphabetic suffix on submittal description, for example, submittal 18 would become 18A, to indicate resubmission.
- h. Product identification and location in project.

#### 1.5.3 Format for SD-02 Shop Drawings

Shop drawings are not to be less than 8 1/2 by 11 inches nor more than 30 by 42 inches, except for full size patterns or templates. Prepare drawings to accurate size, with scale indicated, unless other form is required. Drawings are to be suitable for reproduction and be of a quality to produce clear, distinct lines and letters with dark lines on a white background.

Present 8 1/2 by 11 inches sized shop drawings as part of the bound volume for submittals required by section. Present larger drawings in sets.

Include on each drawing the drawing title, number, date, and revision numbers and dates, in addition to information required in paragraph entitled, "Identifying Submittals," of this section.

Number drawings in a logical sequence. -Contractors may use their own number system.- Each drawing is to bear the number of the submittal in a uniform location adjacent to the title block. Place the Government contract number in the margin, immediately below the title block, for each drawing.

Reserve a blank space, no smaller than 3 inches on the right hand side of each sheet for the Government disposition stamp.

Dimension drawings, except diagrams and schematic drawings; prepare

drawings demonstrating interface with other trades to scale. Use the same unit of measure for shop drawings as indicated on the contract drawings. Identify materials and products for work shown.

Include the nameplate data, size and capacity on drawings. Also include applicable federal, military, industry and technical society publication references.

#### 1.5.4 Format of SD-03 Product Data and SD-08 Manufacturer's Instructions

Present product data submittals for each section as a complete, bound volume. Include table of contents, listing page and catalog item numbers for product data.

Include the manufacturer's name, trade name, place of manufacture, and catalog model or number on product data. Also include applicable federal, military, industry and technical society publication references.

Where equipment or materials are specified to conform to industry and technical society reference standards of the organizations such as American National Standards Institute (ANSI), ASTM International (ASTM), National Electrical Manufacturer's Association (NEMA), Underwriters Laboratories (UL), and Association of Edison Illuminating Companies (AEIC), submit proof of such compliance. The label or listing by the specified organization will be acceptable evidence of compliance.

Collect required data submittals for each specific material, product, unit of work, or system into a single submittal and marked for choices, options, and portions applicable to the submittal. Mark each copy of the product data identically. Partial submittals will not be accepted for expedition of construction effort unless pre-approved by the Government.

Submit manufacturer's instructions prior to installation.

#### 1.5.5 Format of SD-05 Design Data and SD-07 Certificates

Provide design data and certificates on 8 1/2 by 11 inches paper. Provide a bound volume for submittals containing numerous pages.

#### 1.5.6 Format of SD-06 Test Reports and SD-09 Manufacturer's Field Reports

Provide reports on 8 1/2 by 11 inches paper in a complete bound volume.

Indicate by prominent notation, each report in the submittal. Indicate specification number and paragraph number to which it pertains.

#### 1.5.7 Format of SD-10 Operation and Maintenance Data (O&M)

Comply with the requirements specified in Section 01 78 23 OPERATION AND MAINTENANCE DATA for O&M Data format.

#### 1.5.8 Format of SD-01 Preconstruction Submittals and SD-11 Closeout Submittals

When submittal includes a document which is to be used in project or become part of project record, other than as a submittal, do not apply Contractor's approval stamp to document, but to a separate sheet accompanying document.

## 1.6 QUANTITY OF SUBMITTALS

### 1.6.1 Number of Copies of SD-02 Shop Drawings

Submit twelve (12) copies of shop drawings requiring review and approval by Contracting Officer. Four (4) sets marked with review notations will be returned to the Contractor.

### 1.6.2 Number of Copies of SD-03 Product Data and SD-08 Manufacturer's Instructions

Submit in compliance with quantity requirements specified for shop drawings.

### 1.6.3 Number of Copies SD-05 Design Data and SD-07 Certificates

Submit in compliance with quantity requirements specified for shop drawings.

### 1.6.4 Number of Copies SD-06 Test Reports and SD-09 Manufacturer's Field Reports

Submit in compliance with quantity and quality requirements specified for shop drawings other than field test results that will be submitted with QC reports.

### 1.6.5 Number of Copies of SD-10 Operation and Maintenance Data

Submit five copies of O&M Data to the Contracting Officer for review and approval.

### 1.6.6 Number of Copies of SD-01 Preconstruction Submittals and SD-11 Closeout Submittals

Unless otherwise specified, submit two sets of administrative submittals.

## 1.7 SCHEDULING

### 1.7.1 Government Reviewed Design

All design technical submittals shall be provided prior to the scheduled KSC design review meetings. Submittals shall be reviewed and dispositions provided during the design review process. Pre-construction submittals required for notice to proceed may be submitted at any time.

The Government will review design submittals for conformance with the technical requirements of the solicitation. Sections 01 11 00 SUMMARY OF WORK and Section 14 21 00.00 20 ELECTRIC TRACTION ELEVATORS covers the design submittal and review process in detail. Government review is required for deviation from the completed design. Review will be only for conformance with the contract requirements. Included are only those construction submittals for which the Designer of Record design documents do not include enough detail to ascertain contract compliance. The Government may, but is not required, to review extensions of design such as structural steel or reinforcement shop drawings.

## 1.8 GOVERNMENT REVIEW

### 1.8.1 Review Notations

Submittals will be returned to the Contractor with the following notations:

- a. Submittals marked "approved" or "accepted" authorize the Contractor to proceed with the work covered.
- b. Submittals marked "approved as noted" "or approved except as noted, resubmittal not required," authorize the Contractor to proceed with the work covered provided he takes no exception to the corrections.
- c. Submittals marked "not approved" or "disapproved," or "revise and resubmit," indicate noncompliance with the contract requirements or design concept, or that submittal is incomplete. Resubmit with appropriate changes. No work shall proceed for this item until resubmittal is approved.

#### 1.9 DISAPPROVED SUBMITTALS

Contractor shall make corrections required by the Contracting Officer. If the Contractor considers any correction or notation on the returned submittals to constitute a change to the contract drawings or specifications; notice as required under the clause entitled, "Changes," is to be given to the Contracting Officer. Contractor is responsible for the dimensions and design of connection details and construction of work. Failure to point out deviations may result in the Government requiring rejection and removal of such work at the Contractor's expense.

If changes are necessary to submittals, the Contractor shall make such revisions and submission of the submittals in accordance with the procedures above. No item of work requiring a submittal change is to be accomplished until the changed submittals are approved.

#### 1.10 APPROVED SUBMITTALS

The Contracting Officer's approval or acceptance of submittals is not to be construed as a complete check, and indicates only that the general method of construction, materials, detailing and other information are satisfactory. design, general method of construction, materials, detailing and other information appear to meet the Solicitation and Accepted Proposal.

Approval or acceptance will not relieve the Contractor of the responsibility for any error which may exist, as the Contractor under the Contractor Quality Control (CQC) requirements of this contract is responsible for dimensions, the design of adequate connections and details, and the satisfactory construction of all work design, dimensions, all design extensions, such as the design of adequate connections and details, etc., and the satisfactory construction of all work.

After submittals have been approved or accepted by the Contracting Officer, no resubmittal for the purpose of substituting materials or equipment will be considered unless accompanied by an explanation of why a substitution is necessary.

#### PART 2 PRODUCTS

Not used.

#### PART 3 EXECUTION

Not used.

-- End of Section --

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## SECTION 01 42 00

## SOURCES FOR REFERENCE PUBLICATIONS

08/10

## PART 1 GENERAL

## 1.1 REFERENCES

Various publications are referenced in other sections of the specifications to establish requirements for the work. These references are identified in each section by document number, date and title. The document number used in the citation is the number assigned by the standards producing organization, (e.g. ASTM B564 Nickel Alloy Forgings). However, when the standards producing organization has not assigned a number to a document, an identifying number has been assigned for reference purposes.

## 1.2 ORDERING INFORMATION

The addresses of the standards publishing organizations whose documents are referenced in other sections of these specifications are listed below, and if the source of the publications is different from the address of the sponsoring organization, that information is also provided. Documents listed in the specifications with numbers which were not assigned by the standards producing organization should be ordered from the source by title rather than by number.

AMERICAN INDUSTRIAL HYGIENE ASSOCIATION (AIHA)  
2700 Prosperity Ave., Suite 250  
Fairfax, VA 22031  
Tel: 703-849-8888  
Fax: 703-207-3561  
E-mail: [infonet@aiha.org](mailto:infonet@aiha.org)  
Internet <http://www.aiha.org>

AMERICAN SOCIETY OF SAFETY ENGINEERS (ASSE/SAFE)  
1800 East Oakton Street  
Des Plaines, IL 60018-2187  
Ph: 847-699-2929  
Fax: 847-768-3434  
E-mail: [customerservice@asse.org](mailto:customerservice@asse.org)  
Internet: <http://www.asse.org>

AMERICAN WELDING SOCIETY (AWS)  
550 N.W. LeJeune Road  
Miami, FL 33126  
Ph: 800-443-9353 - 305-443-9353  
Fax: 305-443-7559  
E-mail: [info@aws.org](mailto:info@aws.org) or [customerservice@awspubs.com](mailto:customerservice@awspubs.com)  
Internet: <http://www.aws.org>

ASME INTERNATIONAL (ASME)  
Three Park Avenue, M/S 10E  
New York, NY 10016-5990  
Ph: 800-854-7179 or 800-843-2763  
Fax: 212-591-7674  
E-mail: [infocentral@asme.org](mailto:infocentral@asme.org)

Internet: <http://www.asme.org>

ASTM INTERNATIONAL (ASTM)  
100 Barr Harbor Drive, P.O. Box C700  
West Conshohocken, PA 19428-2959  
Ph: 610-832-9585  
Fax: 610-832-9555  
E-mail: [service@astm.org](mailto:service@astm.org)  
Internet: <http://www.astm.org>

COMPRESSED GAS ASSOCIATION (CGA)  
4221 Walney Road, 5th Floor  
Chantilly, VA 20151  
Ph: 703-788-2700  
Fax: 703-961-1831  
E-mail: [cga@cganet.com](mailto:cga@cganet.com)  
Internet: <http://www.cganet.com>

FLORIDA ADMINISTRATIVE CODE (FAC)  
Florida Department of State  
R.A. Gray Building  
Mail Station 22  
Tallahassee, FL 32399-0250  
Ph: 850-245-6270  
Fax: 850-245-6282  
E-mail: [administrativecode@dos.state.fl.us](mailto:administrativecode@dos.state.fl.us)

FM GLOBAL (FM)  
270 Central Avenue  
P.O. Box 7500  
Johnston, RI 02919  
Ph: 401-275-3000 ext. 1945  
Fax: 401-275-3029  
E-mail: [servicedesk.myrisk@fmglobal.com](mailto:servicedesk.myrisk@fmglobal.com)  
Internet: <http://www.fmglobal.com>

GREEN SEAL (GS)  
1001 Connecticut Avenue, NW  
Suite 827  
Washington, DC 20036-5525  
Ph: 202-872-6400  
Fax: 202-872-4324  
E-mail: [greenseal@greenseal.org](mailto:green seal@greenseal.org)  
Internet: <http://www.greenseal.org>

INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)  
445 Hoes Lane or 2001 L Street, NW, Suite 700  
Piscataway, NJ 08855-1331 or Washington, DC 20036-4910 USA  
Ph: 732-981-0060 or 800-701-4333  
Fax: 732-562-6380  
E-mail: [onlinesupport@ieee.org](mailto:onlinesupport@ieee.org) or [ieeeusa@ieee.org](mailto:ieeeusa@ieee.org)  
Internet: <http://www.ieee.org>

INTERNATIONAL ELECTRICAL TESTING ASSOCIATION (NETA)

3050 Centre Ave. Suite 102  
Portage, MI 49024  
Ph: 269-488-6382  
Fax: 269-488-6383

E-mail: [neta@netaworld.org](mailto:neta@netaworld.org)  
Internet: <http://www.netaworld.org>

IPC - ASSOCIATION CONNECTING ELECTRONICS INDUSTRIES (IPC)  
3000 Lakeside Drive, 309S  
Bannockburn, IL 60015  
Ph: 847-615-7100  
Fax: 847-615-7105  
E-mail: [webmaster@ipc.org](mailto:webmaster@ipc.org)  
Internet: <http://www.ipc.org>

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION (NASA)

Superintendent of Documents at  
U.S. Government Printing Office  
732 North Capitol Street, NW  
Washington, DC 20401-0001  
Ph: 202-783-3238  
Fax: 202-512-1800  
E-mail: [ContactCenter@gpo.gov](mailto:ContactCenter@gpo.gov)  
Internet: <http://www.nasa.gov> or <http://www.gpoaccess.gov/help>

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)  
1300 North 17th Street, Suite 1752  
Rosslyn, VA 22209  
Ph: 703-841-3200  
Fax: 703-841-5900  
Internet: <http://www.nema.org/>

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)  
1 Batterymarch Park  
Quincy, MA 02169-7471  
Ph: 617-770-3000 or 800-344-3555  
Fax: 617-770-0700  
E-mail: [webmaster@nfpa.org](mailto:webmaster@nfpa.org)  
Internet: <http://www.nfpa.org>

NATIONAL INSTITUTE FOR CERTIFICATION IN ENGINEERING TECHNOLOGIES  
(NICET)  
1420 King Street  
Alexandria, VA 22314-2794  
Ph: 888-476-4238 (1-888 IS-NICET)  
E-mail: [tech@nicet.org](mailto:tech@nicet.org)  
Internet: <http://www.nicet.org>

NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND HEALTH (NIOSH)  
Mail Stop C-34  
4676 Columbia Parkway  
Cincinnati, OH 45226  
Ph: 513-533-8611  
Fax: 513-533-8285  
E-mail: [nioshdocket@cdc.gov](mailto:nioshdocket@cdc.gov)  
Internet: <http://www.cdc.gov/nchs/products.htm>

UNDERWRITERS LABORATORIES (UL)  
2600 N.W. Lake Road  
Camas, WA 98607-8542  
Ph: 877-854-3577  
Fax: 360-817-6278

E-mail: [CEC.us@us.ul.com](mailto:CEC.us@us.ul.com)  
Internet: <http://www.ul.com/>  
UL Directories available through IHS at <http://www.ihs.com>

U.S. ARMY CORPS OF ENGINEERS (USACE)  
Order CRD-C DOCUMENTS from:  
Headquarters Points of contact  
441 G Street NW  
Washington, DC 20314-1000  
Ph: 202-761-0011  
E-mail: [hq-publicaffairs@usace.army.mil](mailto:hq-publicaffairs@usace.army.mil)  
Internet: <http://www.wes.army.mil/SL/MTC/handbook.htm>  
Order Other Documents from:  
USACE Publications Depot  
Attn: CEHEC-IM-PD  
2803 52nd Avenue  
Hyattsville, MD 20781-1102  
Ph: 301-394-0081  
Fax: 301-394-0084  
E-mail: [pubs-army@usace.army.mil](mailto:pubs-army@usace.army.mil)  
Internet: <http://www.usace.army.mil/publications>  
or <http://www.hnd.usace.army.mil/techinfo/engpubs.htm>

U.S. DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT (HUD)  
Order from:  
HUD User  
P.O. Box 23268  
Washington, DC 20026-3268  
Ph: 800-245-2691 or 202-708-9981  
Fax: 202-708-9981  
E-mail: [helpdesk@Huduser.org](mailto:helpdesk@Huduser.org)  
Internet: <http://www.huduser.org>

U.S. GENERAL SERVICES ADMINISTRATION (GSA)  
General Services Administration  
1800 F Street, NW  
Washington, DC 20405  
Ph: 202-501-0800  
Internet: [www.GSA.gov](http://www.GSA.gov)  
Obtain documents from:  
Acquisition Streamlining and Standardization Information System  
(ASSIST)  
Department of Defense Single Stock Point (DODSSP)  
Document Automation and Production Service (DAPS)  
Building 4/D  
700 Robbins Avenue  
Philadelphia, PA 19111-5094  
Ph: 215-697-6396 - for account/password issues  
Internet: <http://assist.daps.dla.mil/online/start/>; account  
registration required

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)  
8601 Adelphi Road  
College Park, MD 20740-6001  
Ph: 866-272-6272  
Fax: 301-837-0483  
E-mail: [contactcenter@gpo.gov](mailto:contactcenter@gpo.gov)  
Internet: <http://www.archives.gov>  
Order documents from:

Superintendent of Documents  
U.S. Government Printing Office (GPO)  
732 North Capitol Street, NW  
Washington, DC 20401  
Ph: 202-512-1800  
Fax: 202-512-2104  
E-mail: [contactcenter@gpo.gov](mailto:contactcenter@gpo.gov)  
Internet: <http://www.gpoaccess.gov>

PART 2 PRODUCTS

Not used.

PART 3 EXECUTION

Not used.

-- End of Section --

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## SECTION 01 57 20.00 10

ENVIRONMENTAL PROTECTION  
04/06

## PART 1 GENERAL

## 1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

## FLORIDA ADMINISTRATIVE CODE (FAC)

Rule 62-701.200(14)	Definitions - Class III Waste
Chapter 62-710	Used Oil Management
Chapter 62-730	Hazardous Waste
Chapter 62-737	Management of Spent Mercury-Containing Lamps and Devices Destined for Recycling

## JOHN F. KENNEDY SPACE CENTER (KSC)

KNPR 8500.1	KSC Environmental Requirements
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## U.S. ARMY CORPS OF ENGINEERS (USACE)

EM 385-1-1	(2008; Errata 1-2010; Changes 1-3 2010; Changes 4-6 2011) Safety and Health Requirements Manual
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## U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

40 CFR 260	Hazardous Waste Management System: General
40 CFR 261	Identification and Listing of Hazardous Waste
40 CFR 262	Standards Applicable to Generators of Hazardous Waste
40 CFR 263	Standards Applicable to Transporters of Hazardous Waste
40 CFR 264	Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities
40 CFR 265	Interim Status Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities
40 CFR 266	Standards for the Management of Specific Hazardous Wastes and Specific Types of

## Hazardous Waste Management Facilities

40 CFR 268	Land Disposal Restrictions
40 CFR 273	Standards For Universal Waste Management
40 CFR 279	Standards for the Management of Used Oil
40 CFR 761	Polychlorinated Biphenyls (PCBs) Manufacturing, Processing, Distribution in Commerce, and Use Prohibitions

## 1.2 DEFINITIONS

## 1.2.1 Environmental Pollution and Damage

Environmental pollution and damage is the presence of chemical, physical, or biological elements or agents which adversely affect human health or welfare; unfavorably alter ecological balances of importance to human life; affect other species of importance to humankind; or degrade the environment aesthetically, culturally and/or historically.

## 1.2.2 Environmental Protection

Environmental protection is the prevention/control of pollution and habitat disruption that may occur to the environment during construction. The control of environmental pollution and damage requires consideration of land, water, and air; biological and cultural resources; and includes management of visual aesthetics; noise; solid, chemical, gaseous, and liquid waste; radiant energy and radioactive material as well as other pollutants.

## 1.2.3 Contractor Generated Hazardous Waste

Contractor generated hazardous waste means materials that, if abandoned or disposed of, may meet the definition of a hazardous waste. These waste streams would typically consist of material brought on site by the Contractor to execute work, but are not fully consumed during the course of construction. Examples include, but are not limited to, excess paint thinners (i.e. methyl ethyl ketone, toluene etc.), waste thinners, excess paints, excess solvents, waste solvents, and excess pesticides, and contaminated pesticide equipment rinse water.

## 1.2.4 Process Waste Questionnaire (PWQ)

KSC Form 26-551 used to perform hazardous waste determination as required by 40 CFR 262.11.

## 1.2.5 Technical Response Package (TRP)

Documentation given by the IHA Waste Management Office in response to the PWQ that includes a hazard determination and direction on proper handling, storage, and disposal of the waste stream.

## 1.3 GENERAL REQUIREMENTS

Minimize environmental pollution and damage that may occur as the result of construction operations. The environmental resources within the project boundaries and those affected outside the limits of permanent work must be

protected during the entire duration of this contract. The Contractor shall comply with all applicable environmental Federal, State, and local laws and regulations. The Contractor shall be responsible for any delays resulting from failure to comply with environmental laws and regulations.

The Contractor shall use the Pollution Prevention hierarchy to manage all potential wastes generated by demolition and construction:

1. Prevent, Reduce
2. Salvage, Reuse
3. Recycle
4. Treat, Dispose

#### 1.4 SUBCONTRACTORS

Ensure compliance with this section by subcontractors.

#### 1.5 PAYMENT

No separate payment will be made for work covered under this section. Payment of fees associated with environmental permits, application, and/or notices obtained by the Contractor, and payment of all fines/fees for violation or non-compliance with Federal, State, Regional and local laws and regulations are the Contractor's responsibility. All costs associated with this section must be included in the contract price.

#### 1.6 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for Contractor Quality Control approval. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

##### SD-01 Preconstruction Submittals

Environmental Protection Plan

Material Safety Data Sheets (MSDS)

##### SD-03 Product Data

KSC Form 28-809 Waste Support Request

KSC Form 26-551 Process Waste Questionnaire (PWQ)

#### 1.7 ENVIRONMENTAL PROTECTION PLAN

Prior to commencing construction activities or delivery of materials to the site, submit an Environmental Protection Plan for review and approval by the Contracting Officer. The purpose of the Environmental Protection Plan is to present a comprehensive overview of known or potential environmental issues which the Contractor must address during construction. Issues of concern must be defined within the Environmental Protection Plan as outlined in this section. Address each topic at a level of detail commensurate with the environmental issue and required construction task(s). Topics or issues which are not identified in this section, but are considered necessary, must be identified and discussed after those items formally identified in this section. Prior to submittal of the Environmental Protection Plan, meet with the Contracting Officer for the

purpose of discussing the implementation of the initial Environmental Protection Plan; possible subsequent additions and revisions to the plan including any reporting requirements; and methods for administration of the Contractor's Environmental Plans. The Environmental Protection Plan must be current and maintained onsite by the Contractor.

#### 1.7.1 Compliance

No requirement in this Section will relieve the Contractor of any applicable Federal, State, and local environmental protection laws and regulations. During Construction, the Contractor will be responsible for identifying, implementing, and submitting for approval any additional requirements to be included in the Environmental Protection Plan.

#### 1.7.2 Contents

Include in the environmental protection plan, but not limit it to, the following:

- a. Name(s) of person(s) within the Contractor's organization who is(are) responsible for ensuring adherence to the Environmental Protection Plan.
- b. Work area plan showing the proposed activity in each portion of the area and identifying the areas of limited use or nonuse. Plan should include measures for marking the limits of use areas including methods for protection of features to be preserved within authorized work areas.
- c. An air pollution control plan detailing provisions to assure that dust, debris, materials, trash, etc., do not become air borne and travel off the project site.
- d. A contaminant prevention plan that: identifies potentially hazardous substances to be used on the job site; identifies the intended actions to prevent introduction of such materials into the air, water, or ground; and details provisions for compliance with Federal, State, and local laws and regulations for storage and handling of these materials. In accordance with EM 385-1-1, a copy of the Material Safety Data Sheets (MSDS) and the maximum quantity of each hazardous material to be onsite at any given time must be included in the contaminant prevention plan. Update the plan as new hazardous materials are brought onsite or removed from the site.

#### 1.8 PROTECTION FEATURES

This paragraph supplements the Contract Clause PROTECTION OF EXISTING VEGETATION, STRUCTURES, EQUIPMENT, UTILITIES, AND IMPROVEMENTS. Prior to start of any onsite construction activities, the Contractor and the Contracting Officer will make a joint condition survey. Immediately following the survey, the Contractor will prepare a brief report including a plan describing the features requiring protection under the provisions of the Contract Clauses, which are not specifically identified on the drawings as environmental features requiring protection along with the condition of trees, shrubs and grassed areas immediately adjacent to the site of work and adjacent to the Contractor's assigned storage area and access route(s), as applicable. This survey report will be signed by both the Contractor and the Contracting Officer upon mutual agreement as to its accuracy and completeness. The Contractor must protect those environmental features included in the survey report and any indicated on the drawings, regardless of interference which their preservation may cause to the work

under the contract.

#### 1.9 ENVIRONMENTAL ASSESSMENT OF CONTRACT DEVIATIONS

Any deviations from the drawings, plans and specifications, requested by the Contractor and which may have an environmental impact, will be subject to approval by the Contracting Officer and may require an extended review, processing, and approval time. The Contracting Officer reserves the right to disapprove alternate methods, even if they are more cost effective, if the Contracting Officer determines that the proposed alternate method will have an adverse environmental impact.

#### 1.10 NOTIFICATION

The Contracting Officer will notify the Contractor in writing of any observed noncompliance with Federal, State or local environmental laws or regulations, permits, and other elements of the Contractor's Environmental Protection plan. After receipt of such notice, the Contractor will inform the Contracting Officer of the proposed corrective action and take such action when approved by the Contracting Officer. The Contracting Officer may issue an order stopping all or part of the work until satisfactory corrective action has been taken. No time extensions will be granted or equitable adjustments allowed for any such suspensions. This is in addition to any other actions the Contracting Officer may take under the contract, or in accordance with the Federal Acquisition Regulation or Federal Law.

#### PART 2 PRODUCTS

Not used.

#### PART 3 EXECUTION

##### 3.1 LAND RESOURCES

The Contractor shall confine all activities to areas defined by the drawings and specifications. The Contractor's field offices, staging areas, stockpile storage, and temporary buildings shall be placed in areas designated as directed by the Contracting Officer.

##### 3.2 WATER RESOURCES

The Contractor shall monitor all water areas affected by construction activities to prevent pollution of surface and ground waters. Toxic or hazardous chemicals shall not be applied to soil or vegetation. All water areas affected by construction activities shall be monitored by the Contractor.

##### 3.3 AIR RESOURCES

Equipment operation, activities, or processes will be in accordance with all Federal and State air emission and performance laws and standards.

###### 3.3.1 Particulates

Dust particles; aerosols and gaseous by-products from construction activities; and processing and preparation of materials, shall be controlled at all times, including weekends, holidays and hours when work is not in progress. The Contractor shall comply with all State and local

visibility regulations.

### 3.3.2 Odors

Odors from construction activities must be controlled at all times. The odors shall be in compliance with State regulations and/or local ordinances and shall not cause a health hazard.

### 3.3.3 Sound Intrusions

The Contractor shall keep construction activities under surveillance and control to minimize environment damage by noise. Comply with the provisions of the State of Florida rules.

### 3.3.4 Burning

Burning is prohibited on the Government premises.

## 3.4 MATERIALS MANAGEMENT AND WASTE DISPOSAL

All hazardous and non-hazardous wastes generated on KSC shall be managed, controlled and disposed of per the KSC Waste Management requirements outlined in KNPR 8500.1. All paint sludge, chips, rust, debris, blast media, etc. generated during preparation of surfaces and/or deconstruction will be contained and disposed of according to waste management guidelines and all contract clauses.

## 3.5 CHEMICAL MATERIALS MANAGEMENT AND WASTE DISPOSAL

Disposal of wastes will be as directed below, unless otherwise specified in other sections and/or shown on the drawings.

### 3.5.1 Solid Wastes

Solid wastes (excluding clearing debris) shall be placed in containers which are emptied on a regular schedule. Handling, storage, and disposal must be conducted to prevent contamination. Segregation measures shall be employed so that no hazardous or toxic waste will become co-mingled with solid waste. Trash items not requiring special handling, or which cannot be resold or recycled, shall be disposed of in receptacles slated for disposal in either the KSC landfill or the Brevard County landfill. The physical dimensions of the waste shall be within the handling capabilities of the landfill disposal equipment. The physical dimensions for the landfill handling capabilities are 8 feet in length x 8 feet in width. The KSC landfill is an unlined Class III landfill with permit restrictions and limited capacity. Only the following items listed with be accepted at the landfill:

(1) Asphalt: Asphalt removed from parking lots, driveways, and roadways.

(2) Blast Media: The blast media must be as free from debris as possible and determined non-hazardous for acceptance into the KSC landfill. The Spent Sandblast Media Disposal Form must accompany the blast media to the landfill and will be reviewed by the landfill operator. Blasting media determined to be hazardous waste must be managed as hazardous waste.

(3) Carpeting: Carpet may be disposed of in the KSC landfill.

(4) Construction and Demolition Debris: Materials considered not water soluble and non-hazardous in nature, including but not limited to steel, brick, glass, concrete, asphalt, pipe, gypsum wallboard and lumber. This includes rocks, soils, tree remains and other vegetative matter, which normally result from land clearing or development. Scrap metal from demolition projects should be managed according to guidance provided in this section for recyclable material.

(5) Fiberglass: Fiberglass is accepted.

(6) Glass (except for Light Bulbs or Lamps): Glass is accepted.

(7) Non-Friable Asbestos: Also referred to as Non-Regulated Asbestos Containing Materials (NRACM) are handled on a case-by-case basis. KSC policy allows for the disposal of NRACM only. In order to dispose of non-friable asbestos, the Contractor shall complete and submit the KSC/Schwartz Road landfill non-friable asbestos Form 28-1024, which can be obtained from the Contracting Officer or the Contracting Officer's designee. The form shall be sent to NASA EMB, TA-B1B through the Contracting Officer. The following scheduling procedures shall be followed before NRACM wastes are accepted at the landfill:

a. The waste generator/hauler shall make arrangements with the landfill operator a minimum of 24 hours before disposal of NRACM waste and shall inform the operator of the quantity of the waste and the scheduled date the shipment will arrive at the landfill.

b. NRACM will be accepted at the landfill with prior arrangement with the scale house attendant (minimum of 24 hours notification) Monday through Friday during regular landfill hours, but will not be accepted later than 1400 hours.

(8) Pallets (Unserviceable Wood and Plastics): Pallets that are not reusable or recyclable are accepted.

(9) PCB Bulk Product Waste: Refer to Section 02 84 33 REMOVAL AND DISPOSAL OF POLYCHLORINATED BIPHENYLS (PCBs).

(10) Wood: Miscellaneous non-pressure treated wood items are accepted.

(11) Yard Waste (Vegetation): Vegetation from maintenance activities is accepted.

The following wastes are not authorized for disposal at the KSC landfill:

(1) Any waste not permitted by DEP regulations to be disposed of in a Class III landfill as defined in Rule 62-701.200(14).

(2) Putrescible (brown bag) office waste.

(3) Chromated Copper Arsenate (CCA) treated wood.

(4) Liquid or non-liquid polychlorinated biphenyls (PCBs) (with the exception of PCB Bulk Product Waste).

(5) Friable Asbestos.

(6) Hazardous wastes as specified by the U.S. Environmental Protection Agency (EPA); EPA defines hazardous waste as those wastes that exhibit

flammability, corrosivity, reactivity, and/or toxicity characteristics; (Per EPA's list of hazardous wastes, 40 CFR 261, Subpart D, and most recent revision thereof).

- (7) Biomedical waste.
- (8) Liquid wastes, including oil (containerized or non-containerized).
- (9) Lead-acid batteries.
- (10) Tires, other than "shredded waste tires."
- (11) White goods (i.e. appliances).
- (12) Unpainted Concrete: Unpainted concrete shall be stockpiled at the Diverted Aggregate Recycling and Collection Yard (DARCY located at the KSC landfill).

### 3.5.2 Chemicals and Chemical Wastes

Chemicals shall be dispensed ensuring no spillage to the ground or water. Periodic inspections of dispensing areas to identify leakage and initiate corrective action shall be performed and documented. This documentation will be periodically reviewed by the Government. Collect chemical waste in corrosion resistant, compatible containers. Collection drums must be monitored and removed to a staging or storage area when contents are 70 percent full. Wastes shall be classified, managed, stored, and disposed of in accordance with Federal, State, and local laws and regulations.

### 3.5.3 Hazardous Wastes/Excess Hazardous Materials

No substances shall be delivered to KSC without the appropriate Material Safety Data Sheets (MSDS).

Hazardous and controlled waste shall be managed in accordance with all applicable statutes, rules, orders, and regulations which may include but are not limited to 40 CFR 260, 40 CFR 261, 40 CFR 262, 40 CFR 263, 40 CFR 264, 40 CFR 265, 40 CFR 266, 40 CFR 268, 40 CFR 273, 40 CFR 279, 40 CFR 761, and KNPR 8500.1 KSC Environmental Requirements. The Contractor shall be responsible for identifying processes and operations and the location and nature of all potentially hazardous and controlled waste including any chemicals, paints, solvents, aerosol cans, petroleum, oil and lubricant (POL) products, lamps, mercury switches, etc., and their containers, as defined in 40 CFR 261, 40 CFR 273, 40 CFR 279, or 40 CFR 761.

The Contractor shall follow the PWQ/TRP process. The Government will provide DOT-compliant storage containers and labels. The CO will arrange for the containers to be available at the Base Support Contractor Supply Building, M6-744, at the request of the Contractor. The Contractor shall request storage containers in writing from the CO a minimum of three (3) days before the required need date. The Contractor shall be responsible for transporting the containers from Building M6-744 to the project site.

The Contractor shall establish an on-site satellite waste accumulation area within 50 feet (ft) of and within sight of any point where hazardous or controlled wastes may be generated. If a satellite accumulation area must be more than 50 ft from the point of generation, or out of sight of the generator, the Contractor shall provide a written request to the CO thirty (30) days before the start of the waste generating process. The CO will

send a notification to the NASA Environmental Management Branch (EMB), TA-B1B, for their review and concurrence. The Contractor shall not place the satellite site in service before receiving written approval of the variance. The Contractor shall store potential or identified hazardous and/or controlled wastes in the appropriate properly labeled containers inside the accumulation area in accordance with KNPR 8500.1 (as revised). The Environmental Protection Agency (EPA) has set the following standards for wastes collected at satellite accumulation areas:

- a. Hazardous wastes at satellite accumulation areas must be collected in approved containers.
- b. No more than 55 gallons per waste stream of hazardous waste or 1 quart per stream of acutely hazardous wastes may be accumulated.
- c. Containers must be labeled with the words "Hazardous Waste" and with other words which identify the contents of the drum.
- d. The waste being placed in the container must be compatible with the container.
- e. A container holding hazardous waste must always be kept closed during accumulation except when adding or removing waste.
- f. The site must be equipped with emergency equipment per 40 CFR 265.32.
- g. A written contingency plan must be maintained for the site.
- h. Personnel generating and managing the waste must have hazardous waste training per 40 CFR 265.16.

The Contracting Officer may at any time during the course of the contract performance period require the Contractor to provide individual training records for any employee involved in the performance of this contract, and the contents of the course or courses completed to satisfy the training requirements. Attendance at KSC Training Course QG-211 "Hazardous Waste Management" will satisfy the above training requirements. If more than 55 gallons per waste stream of hazardous waste are generated at a satellite accumulation site, documentation, including the waste type, quantity, locations, and organization responsible for the waste shall be provided on KSC Form 28-809 "Waste Support Request", to the Medical and Environmental Support Contractor (MESC) Waste Management. The Contractor shall fax the waste support request to the Contracting Officer and MESC Waste Management at fax 867-9466. If a hazardous/non-hazardous waste determination cannot be made by process knowledge and no MSDS is available for the waste stream, the container of waste shall be marked with a Hazardous Waste Determination In Progress (HWDIP) label until chemical analysis is completed. At the request of the Contractor, the CO will provide any analytical support required by the TRP. The CO will arrange for all sampling and testing of potentially hazardous or controlled waste.

Universal Waste (UW) - The EPA established Universal Waste regulations to ease the requirements for managing hazardous wastes that can be recycled. Items which meet the definition of UW can be collected and managed under requirements found in 40 CFR 273 and Chapter 62-730 and Chapter 62-737, FAC. Waste streams currently adopted by the State for management as UW are batteries, mercury-containing lamps and devices, and certain pesticides. UW generators are called handlers and must comply with the following requirements:

- a. Handlers shall manage UW using the PWQ/TRP.
- b. Handlers shall manage UW in a way that prevents releases to the environment. Non-leaking containers in good condition shall be used if the UW is damaged or leaking.
- c. Handlers shall use the KSC Universal Waste Label and shall not accumulate universal wastes for more than six months.
- d. Handlers shall clearly show the length of time that the wastes have been accumulated by marking or labeling the container with the earliest date that the waste was generated or received.
- e. Handlers shall be familiar with proper waste handling and emergency response procedures. Attendance at the KSC training course QG-299 "Universal Waste Rule" will satisfy the above.

Used Oil - Any lubricant that has been refined from crude oil (or synthetic oil) that has been "used," and as a result of such use is contaminated by physical or chemical impurities shall be considered Used Oil. Used oil is managed according to regulations established in 40 CFR 279 and Chapter 62-710 FAC. The following waste generator standards shall apply to the management of used oil:

- a. Used oil containers, tanks, and associated piping must be marked "Used Oil."
- b. Used oil containers, tanks, and associated piping must be in good condition with no severe rusting, structural defects, deterioration, or leaks.
- c. Used oil containers must be kept in secondary containment.
- d. Containers storing used oil must be sealed or otherwise protected from the weather and stored on an oil-impermeable surface such as polyethylene sheeting, rigid plastic secondary containment, or epoxy-coated concrete. Within 48 hours of having waste ready for disposal, the Contractor shall contact the CO to have MESC Waste Management pick-up and remove hazardous waste. Documentation including the waste type, quantity, locations, and organization responsible for the waste will be provided on KSC Form 28-809 "Waste Support Request" to MESC Waste Management when requesting waste disposal. The Contractor shall fax the waste support request to the Contracting Officer and to MESC Waste Management at fax 867-9466.

#### 3.5.4 Fuel and Lubricants

Storage, fueling and lubrication of equipment and motor vehicles must be conducted in a manner that affords the maximum protection against spill and evaporation. Manage and store fuel, lubricants and oil in accordance with all Federal, State, Regional, and local laws and regulations.

#### 3.6 RECYCLING AND WASTE MINIMIZATION

Every attempt should be made to minimize wastes generated during both demolition and construction. Demolition shall be limited to the contract Scope of Work and changes approved by the CO. Demolished materials or

equipment shall be reused, salvaged or recycled per this specification to the greatest extent possible.

### 3.6.1 Sustainable Acquisition

Federal agencies and their Contractors are required to purchase products made from recycled or recovered materials and other environmentally preferable products whenever possible. The EPA Environmentally Preferable Purchasing (EPP) website at <http://www.epa.gov/epp/> provides information and useful links and tools for finding and evaluating green products. Detailed information on EPA approved products is available at <http://www.epa.gov/cpg/products>. A Request for Waiver Form (KSC 28-825 NS) must be submitted for the purchase of items that are on the Comprehensive Procurement Guidelines (CPG) list but were replaced with non AP approved items. Also, a list of bio-based preferred products is available at <http://www.biopreferred.gov/DesignationItemList.aspx>. Contact Alice Smith (867-8454) with any questions on this requirement.

### 3.6.2 Reuse

First consideration shall be given to salvage for reuse since little or no re-processing is necessary for this method, and less pollution is created when items are reused in their original form. Sale or donation of waste suitable for reuse shall be considered. Salvaged materials, other than those specified in other sections to be salvaged and reinstalled, shall not be used in this project.

### 3.6.3 Recycle

The Contractor must make every practical effort to reclaim and segregate materials that have the ability to be recycled. All reclaimed scrap metal, not being recycled by Contractor outside of KSC, must be transported to the Reutilization, Recycling and Marketing Facility (RRMF) with a KSC Form 7-49. Turn these items and the KSC Form 7-49 into RRMF personnel to ensure the proper disposition of the materials prior to leaving the recycling area. For any other information regarding what materials can be recycled or other general information regarding recycling policies at KSC, please contact the Environmental Management Branch (Alice Smith, 867-8454).

### 3.7 PREVIOUSLY USED EQUIPMENT

The Contractor shall clean all previously used construction equipment prior to bringing it onto the project site. The Contractor shall ensure that the equipment is free from soil residuals, egg deposits from plant pests, noxious weeds, and plant seeds. The Contractor shall consult with the USDA jurisdictional office for additional cleaning requirements.

### 3.8 MAINTENANCE OF POLLUTION FACILITIES

The Contractor shall maintain permanent and temporary pollution control facilities and devices for the duration of the contract or for that length of time construction activities create the particular pollutant.

### 3.9 TRAINING OF CONTRACTOR PERSONNEL

The Contractor's personnel must be trained in all phases of environmental protection and pollution control. Conduct environmental protection/pollution control meetings for all personnel prior to commencing construction activities. Additional meetings must be conducted for new

personnel and when site conditions change. Include in the training and meeting agenda: methods of detecting and avoiding pollution; familiarization with statutory and contractual pollution standards; installation and care of devices, vegetative covers, and instruments required for monitoring purposes to ensure adequate and continuous environmental protection/pollution control; anticipated hazardous or toxic chemicals or wastes, and other regulated contaminants; recognition and protection of archaeological sites, artifacts, wetlands, and endangered species and their habitat that are known to be in the area.

### 3.10 POST CONSTRUCTION CLEANUP

The Contractor will clean up all areas used for construction in accordance with Section 01 78 00, Item 1.8. Unless otherwise instructed in writing by the Contracting Officer, obliterate all signs of temporary construction facilities such as haul roads, work area, structures, foundations of temporary structures, stockpiles of excess or waste materials, and other vestiges of construction prior to final acceptance of the work. The disturbed area must be graded, filled and the entire area seeded unless otherwise indicated.

-- End of Section --

## SECTION 01 74 19

CONSTRUCTION AND DEMOLITION WASTE MANAGEMENT  
01/07

## PART 1 GENERAL

## 1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

## JOHN F. KENNEDY SPACE CENTER (KSC)

FAR Clause KSC 52.223-97 Hazardous Wastes

KNPR 8500.1 KSC Environmental Requirements

## U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

40 CFR 302 Designation, Reportable Quantities, and Notification

40 CFR 355 Emergency Planning and Notification

40 CFR 68 Chemical Accident Prevention Provisions

## 1.2 GOVERNMENT POLICY

Government policy is to apply sound environmental principles in the design, construction and use of facilities. As part of the implementation of that policy the Contractor shall: (1) practice efficient waste management when sizing, cutting, and installing products and materials and (2) use all reasonable means to divert construction and demolition waste from landfills and incinerators and to facilitate their recycling or reuse.

## 1.3 MANAGEMENT

The Contractor shall take a pro-active, responsible role in the management of construction and demolition waste and require all subcontractors, vendors, and suppliers to participate in the effort. Construction and demolition waste includes products of demolition or removal, excess or unusable construction materials, packaging materials for construction products, and other materials generated during the construction process but not incorporated into the work. In the management of waste consideration shall be given to the availability of viable markets, the condition of the material, the ability to provide the material in suitable condition and in a quantity acceptable to available markets, and time constraints imposed by internal project completion mandates. The Contractor shall be responsible for implementation of any special programs involving rebates or similar incentives related to recycling of waste. Revenues or other savings obtained for salvage, or recycling accrue to the Contractor. Firms and facilities used for recycling, reuse, and disposal for the intended use to the extent required by federal, state, and local regulations shall be appropriately permitted.

#### 1.4 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for Contractor Quality Control approval. The following shall be submitted in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

##### SD-01 Preconstruction Submittals

Waste Management Plan; G

##### SD-11 Closeout Submittals

Records; G

#### 1.5 MEETINGS

Conduct Construction Waste Management meetings. After award of the Contract and prior to commencement of work, schedule and conduct a meeting with the Contracting Officer to discuss the proposed Waste Management Plan and to develop a mutual understanding relative to the details of waste management. At a minimum, environmental and waste management goals and issues shall be discussed at the following additional meetings:

- a. Pre-bid meeting.
- b. Preconstruction meeting.
- c. Regular QC meetings.
- d. Work safety meetings.

#### 1.6 WASTE MANAGEMENT PLAN

A waste management plan shall be submitted within 15 days after notice to proceed and prior to initiating any site preparation work the plan shall include the following:

- a. Name of individuals on the Contractor's staff responsible for waste prevention and management.
- b. Name(s) and qualification(s) of person(s) responsible for manifesting hazardous waste to be removed from the site, if applicable.
- c. Description of the specific approaches to be used in recycling/reuse of the various materials generated, including the areas on site and equipment to be used for processing, sorting, and temporary storage of wastes.
- d. Characterization, including estimated types and quantities, of the waste to be generated.
- e. Name of landfill and/or incinerator to be used.
- f. Identification of local and regional reuse programs, including non-profit organizations such as schools, local housing agencies, and organizations that accept used materials such as materials exchange networks and Habitat for Humanity.

- g. List of specific waste materials that will be salvaged for resale, salvaged and reused or recycled. Recycling facilities that will be used shall be identified.
- h. Identification of materials that cannot be recycled/reused with an explanation or justification.
- i. Description of the means by which any waste materials identified in item (h) above will be protected from contamination.
- j. Description of the means of transportation of the recyclable materials (whether materials will be site-separated and self-hauled to designated centers, or whether mixed materials will be collected by a waste hauler and removed from the site).
- k. Anticipated net cost savings determined by subtracting Contractor program management costs and the cost of disposal from the revenue generated by sale of the materials and the incineration and/or landfill cost avoidance.
- l. Locations of proposed material storage areas, structures, sanitary facilities, and stockpiles of excess or spoil materials including methods to control runoff and to contain materials on the site.
- m. The Spill Control plan shall include the procedures, instructions, and reports to be used in the event of an unforeseen spill of a substance regulated by KNPR 8500.1, 40 CFR 68, 40 CFR 302, 40 CFR 355, and/or regulated under State or Local laws and regulations. The Spill Control Plan supplements the requirements of FAR Clause KSC 52.223-97. This plan shall include:

The name of the individual who will report any spills or hazardous substance releases and who will follow up with complete documentation. The Contractor shall make all reasonable and safe efforts to contain and control any spills or releases that may occur. The Contractor shall immediately report (by phone) any occurrence of a pollution incident or spill, first to the Emergency 911 (321-867-7911 from a non 867/861 exchange), then to the Contracting Officer (CO). The Contractor shall document the incident or spill on KSC Form 21-555, "Pollution Incident Report," and submit it to the CO and NASA Environmental Management Branch, TA-B1B, within 24 hours of the incident. The Contractor shall provide spill response materials to contain and control spills including, but not limited to, containers, absorbent material, shovels, and personal protective equipment. Spill response materials shall be available at all times in which materials/wastes are being handled or transported. Spill response materials shall be compatible with the type of material being handled. The KSC Spill Cleanup Team will be responsible for the final cleanup and validation of a spill or release contaminant cleanup.

- n. A non-hazardous solid waste disposal plan identifying methods and locations for solid waste disposal. The plan shall include schedules for disposal. The Contractor shall identify any subcontractors responsible for the transportation and disposal of solid waste. Licenses or permits shall be submitted for solid waste disposal sites that are not a commercial operating facility. Evidence of the disposal facility's acceptance of the solid waste shall be attached to this plan during the construction. The Contractor shall attach a copy of each of the Non-hazardous Solid Waste Diversion Reports to the disposal plan.

The report shall be submitted on the first working day after the first quarter that non-hazardous solid waste has been disposed and/or diverted and shall be for the previous quarter (e.g. the first working day of January, April, July, and October). The report shall indicate the total amount of waste generated and total amount of waste diverted in cubic yards or tons along with the percent that was diverted.

- o. A recycling and solid waste minimization plan. The plan shall detail the Contractor's actions to comply with and to participate in Federal, State, Regional, and local government sponsored recycling programs to reduce the volume of solid waste at the source.

Revise and resubmit Plan as required by the Contracting Officer. Approval of Contractor's Plan will not relieve the Contractor of responsibility for compliance with applicable environmental regulations or meeting project cumulative waste diversion requirement. Distribute copies of the Waste Management Plan to each subcontractor, the Quality Control Manager, and the Contracting Officer.

The Waste Management Plan shall describe all methods used to manage both demolition debris and materials and construction wastes. Waste Management methods shall use the Pollution Prevention hierarchy:

- a. Prevent, Reduce
- b. Salvage, Reuse
- c. Recycle
- d. Treat, Dispose

#### 1.7 RECORDS

Records shall be maintained to document the quantity of waste generated; the quantity of waste diverted through sale, reuse, or recycling; and the quantity of waste disposed by landfill or incineration. The records shall be made available to the Contracting Officer during construction, and a copy of the records shall be delivered to the Contracting Officer upon completion of the construction.

#### 1.8 COLLECTION

The necessary containers, bins and storage areas to facilitate effective waste management shall be provided and shall be clearly and appropriately identified. Recyclable materials shall be handled to prevent contamination of materials from incompatible products and materials, and separated by one of the following methods:

##### 1.8.1 Source Separated Method

Waste products and materials that are recyclable shall be separated from trash and sorted into appropriately marked separate containers and then transported to the respective recycling facility for further processing.

##### 1.8.2 Co-Mingled Method

Waste products and recyclable materials shall be placed into a single container and then transported to a recycling facility where the recyclable materials are sorted and processed.

1.8.3 Other Methods

Other methods proposed by the Contractor may be used when approved by the Contracting Officer.

1.9 DISPOSAL

Control accumulation of waste materials and trash. Recycle or dispose of collected materials off-site at intervals approved by the Contracting Officer and in compliance with waste management procedures. Disposal shall be in accordance with the contract and applicable sections and the following specifications:

Section 01 57 20.00 10 ENVIRONMENTAL PROTECTION

Section 02 41 00 DEMOLITION

Section 02 82 13.00 98 ASBESTOS ABATEMENT

Section 02 82 33.13 20 REMOVAL/CONTROL AND DISPOSAL OF PAINT WITH LEAD

PART 2 PRODUCTS

Not used.

PART 3 EXECUTION

Not used.

-- End of Section --

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SECTION 01 78 00

CLOSEOUT SUBMITTALS  
08/11

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM INTERNATIONAL (ASTM)

ASTM E1971 (2005; R 2011) Stewardship for the Cleaning of Commercial and Institutional Buildings

GREEN SEAL (GS)

GS-37 (2000; R 2009) Industrial and Institutional Cleaners

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION (NASA)

NASA GP-435 (Revision B, Change 1; January 17, 1995) Engineering Drawing Practices, Volume II of II, Facilities

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for Contractor Quality Control approval. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-03 Product Data

- Equipment-In-Place List
- Warranty Management Plan
- Warranty Tags
- Final Cleaning
- Spare Parts Data

SD-08 Manufacturer's Instructions

- Preventative Maintenance
- Condition Monitoring (Predictive Testing)
- Inspection
- Posted Instructions

SD-10 Operation and Maintenance Data

- Operation and Maintenance Manuals

SD-11 Closeout Submittals

## Record Drawings

## 1.3 PROJECT RECORD DOCUMENTS

## 1.3.1 Record Drawings

Drawings showing final as-built conditions of the project. This paragraph covers record drawings complete, as a requirement of the contract. The terms "drawings," "contract drawings," "drawing files," "working record drawings" and "final record drawings" refer to contract drawings which are revised to be used for final record drawings showing as-built conditions. The final CAD record drawings must consist of one set of electronic CAD drawing files in the specified format, 2 sets of prints, and one set of the approved working Record drawings.

## 1.3.1.1 Government Furnished Materials

One set of electronic CADD files in the specified software and format revised to reflect all bid amendments will be provided by the Government at the preconstruction conference for projects requiring CADD file record drawings.

## 1.3.1.2 Working Record and Final Record Drawings

Revise 2 sets of paper drawings by red-line process to show the as-built conditions during the prosecution of the project. Keep these working as-built marked drawings current on a weekly basis and at least one set available on the jobsite at all times. Changes from the contract plans which are made in the work or additional information which might be uncovered in the course of construction must be accurately and neatly recorded as they occur by means of details and notes. Prepare final record (as-built) drawings after the completion of each definable feature of work as listed in the Contractor Quality Control Plan (Foundations, Utilities, Structural Steel, etc., as appropriate for the project). The working as-built marked prints and final record (as-built) drawings will be jointly reviewed for accuracy and completeness by the Contracting Officer and the Contractor prior to submission of each monthly pay estimate. If the Contractor fails to maintain the working and final record drawings as specified herein, the Contracting Officer will deduct from the monthly progress payment an amount representing the estimated cost of maintaining the record drawings. This monthly deduction will continue until an agreement can be reached between the Contracting Officer and the Contractor regarding the accuracy and completeness of updated drawings. Show on the working and final record drawings, but not limited to, the following information:

- a. The location and dimensions of any changes within the building structure.
- b. Correct grade, elevations, cross section, or alignment of roads, earthwork, structures or utilities if any changes were made from contract plans.
- c. Changes in details of design or additional information obtained from working drawings specified to be prepared and/or furnished by the Contractor; including but not limited to fabrication, erection, installation plans and placing details, pipe sizes, insulation material, dimensions of equipment foundations, etc.

- d. Changes or modifications which result from the final inspection.
- e. Where contract drawings or specifications present options, show only the option selected for construction on the final as-built prints.
- f. Systems designed or enhanced by the Contractor, such as fire alarm and electrical power systems.
- g. Modifications (include within change order price the cost to change working and final record drawings to reflect modifications) and compliance with the following procedures: NASA GP-435.

#### 1.3.1.3 Drawing Preparation

Modify the record drawings as may be necessary to correctly show the features of the project as it has been constructed by bringing the contract set into agreement with approved working as-built prints, and adding such additional drawings as may be necessary. These working as-built marked prints must be neat, legible and accurate. These drawings are part of the permanent records of this project and must be returned to the Contracting Officer after approval by the Government. Any drawings damaged or lost by the Contractor must be satisfactorily replaced by the Contractor at no expense to the Government.

#### 1.3.1.4 Computer Aided Design and Drafting (CADD) Drawings

Only employ personnel proficient in the preparation of CADD drawings to modify the contract drawings or prepare additional new drawings. Additions and corrections to the contract drawings must be equal in quality and detail to that of the originals. Line colors, line weights, lettering, layering conventions, and symbols must be the same as the original line colors, line weights, lettering, layering conventions, and symbols. If additional drawings are required, prepare them using the specified electronic file format applying the same graphic standards specified for original drawings. The title block and drawing border to be used for any new final record drawings must be identical to that used on the contract drawings. Accomplish additions and corrections to the contract drawings using CADD files. The Contractor will be furnished "as-designed" drawings in AutoCad or Microstation format compatible with a Windows operating system. The electronic files will be supplied on compact disc, read-only memory (CD-ROM). Provide all program files and hardware necessary to prepare final record drawings. The Contracting Officer will review final record drawings for accuracy and return them to the Contractor for required corrections, changes, additions, and deletions.

- a. Provide CADD "base" colors of red, green, and blue. Color code for changes as follows:
  - 1. Deletions (Red) - Over-strike deleted graphic items (lines), lettering in notes and leaders.
  - 2. Additions (Green) - Added items, lettering in notes and leaders.
  - 3. Special (Blue) - Items requiring special information, coordination, or special detailing or detailing notes.
- b. Rename the Contract Drawing files in a manner related to the contract number (i.e., 98-C-10.DGN) as instructed in the Pre-Construction

conference. Use only those renamed files for the Marked-up changes. All changes shall be made on the layer/level as the original item.

- c. When final revisions have been completed, show the wording "RECORD DRAWINGS / AS-BUILT CONDITIONS" followed by the name of the Contractor in letters at least 3/16 inch high on the cover sheet drawing. Mark all other contract drawings either "Record" drawing denoting no revisions on the sheet or "Revised Record" denoting one or more revisions. Date original contract drawings in the revision block.
- d. Within 21 days after Government approval of all of the working record drawings for a phase of work, prepare the final CADD record drawings for that phase of work and submit two sets of blue-lined prints of these drawings for Government review and approval. The Government will promptly return one set of prints annotated with any necessary corrections. Within 14 days revise the CADD files accordingly at no additional cost and submit one set of final prints for the completed phase of work to the Government. Within 21 days of substantial completion of all phases of work, submit the final record drawing package for the entire project. Submit one set of electronic files on compact disc, read-only memory (CD-ROM), two sets of blue-line prints and one set of the approved working record drawings. They must be complete in all details and identical in form and function to the contract drawing files supplied by the Government. Any transactions or adjustments necessary to accomplish this is the responsibility of the Contractor. The Government reserves the right to reject any drawing files it deems incompatible with the customer's CADD system. Paper prints, drawing files and storage media submitted will become the property of the Government upon final approval. Failure to submit final record drawing files and marked prints as specified will be cause for withholding any payment due the Contractor under this contract. Approval and acceptance of final record drawings must be accomplished before final payment is made to the Contractor.

#### 1.3.2 Final Approved Shop Drawings

Furnish final approved project shop drawings 30 days after transfer of the completed work. Provide drawings in AutoCAD<sup>TM</sup>, MicroStation<sup>TM</sup>, or DXF format. Drawing source files and .pdf files shall be provided on compact disc.

#### 1.3.3 Construction Contract Specifications

Furnish final record (as-built) construction contract specifications, including modifications thereto, 30 days after completion of the elevator modifications.

#### 1.3.4 Real Property Equipment

Furnish a list of installed equipment furnished under this contract. Include all information usually listed on manufacturer's name plate. In the "EQUIPMENT-IN-PLACE LIST" include, as applicable, the following for each piece of equipment installed: description of item, location (by room number), model number, serial number, capacity, name and address of manufacturer, name and address of equipment supplier, condition, spare parts list, manufacturer's catalog, and warranty. Furnish a draft list at time of transfer. Furnish the final list 30 days after transfer of the completed facility.

### 1.3.5 System Software

Furnish final record (as-built) electronic copies of programming code, configuration settings for all hardware furnished, and software packages necessary to modify the software provided on (2) compact disk sets.

### 1.4 SPARE PARTS DATA

Submit two copies of the Spare Parts Data list.

- a. Indicate manufacturer's name, part number, nomenclature, and stock level required for maintenance and repair. List those items that may be standard to the normal maintenance of the system.

### 1.5 PREVENTATIVE MAINTENANCE

Submit Preventative Maintenance, Condition Monitoring (Predictive Testing) and Inspection schedules with instructions that state when systems should be retested.

- a. Define the anticipated length of each test, test apparatus, number of personnel identified by responsibility, and a testing validation procedure permitting the record operation capability requirements within the schedule. Provide a signoff blank for the Contractor and Contracting Officer for each test feature; e.g., gpm, rpm, psi. Include a remarks column for the testing validation procedure referencing operating limits of time, pressure, temperature, volume, voltage, current, acceleration, velocity, alignment, calibration, adjustments, cleaning, or special system notes. Delineate procedures for preventative maintenance, inspection, adjustment, lubrication and cleaning necessary to minimize corrective maintenance and repair.
- b. Repair requirements must inform operators how to check out, troubleshoot, repair, and replace components of the system. Include electrical and mechanical schematics and diagrams and diagnostic techniques necessary to enable operation and troubleshooting of the system after acceptance.

### 1.6 WARRANTY MANAGEMENT

#### 1.6.1 Warranty Management Plan

Develop a warranty management plan which contains information relevant to the clause Warranty of Construction in Section 14 21 00.00 20 ELECTRIC TRACTION ELEVATORS. At least 30 days before the planned pre-warranty conference, submit one set of the warranty management plan. Include within the warranty management plan all required actions and documents to assure that the Government receives all warranties to which it is entitled. The plan must be in narrative form and contain sufficient detail to render it suitable for use by future maintenance and repair personnel, whether tradesmen, or of engineering background, not necessarily familiar with this contract. The term "status" as indicated below must include due date and whether item has been submitted or was accomplished. Warranty information made available during the construction phase must be submitted to the Contracting Officer for approval prior to each monthly pay estimate. Assemble approved information in a binder and turn over to the Government upon acceptance of the work. The construction warranty period will begin on the date of project acceptance and continue for the full product warranty period. A joint 4 month and 9 month warranty inspection will be

conducted, measured from time of acceptance, by the Contractor, Contracting Officer and the Customer Representative. Include within the warranty management plan , but not limited to, the following:

- a. Roles and responsibilities of all personnel associated with the warranty process, including points of contact and telephone numbers within the organizations of the Contractors, subcontractors, manufacturers or suppliers involved.
- b. Furnish with each warranty the name, address, and telephone number of each of the guarantor's representatives nearest to the project location.
- c. Listing and status of delivery of all Certificates of Warranty for extended warranty items, to include roofs, HVAC balancing, pumps, motors, transformers, and for all commissioned systems such as fire protection and alarm systems, sprinkler systems, lightning protection systems, etc.
- d. A list for each warranted equipment, item, feature of construction or system indicating:
  1. Name of item.
  2. Model and serial numbers.
  3. Location where installed.
  4. Name and phone numbers of manufacturers or suppliers.
  5. Names, addresses and telephone numbers of sources of spare parts.
  6. Warranties and terms of warranty. Include one-year overall warranty of construction, including the starting date of warranty of construction. Items which have extended warranties must be indicated with separate warranty expiration dates.
  7. Cross-reference to warranty certificates as applicable.
  8. Starting point and duration of warranty period.
  9. Summary of maintenance procedures required to continue the warranty in force.
  10. Cross-reference to specific pertinent Operation and Maintenance manuals.
  11. Organization, names and phone numbers of persons to call for warranty service.
  12. Typical response time and repair time expected for various warranted equipment.
- e. The Contractor's plans for attendance at the 4 and 9 month post-construction warranty inspections conducted by the Government.
- f. Procedure and status of tagging of all equipment covered by extended warranties.
- g. Copies of instructions to be posted near selected pieces of equipment where operation is critical for warranty and/or safety reasons.

#### 1.6.2 Pre-Warranty Conference

Prior to contract completion, and at a time designated by the Contracting Officer, meet with the Contracting Officer to develop a mutual understanding with respect to the requirements of this section. Communication procedures for Contractor notification of construction warranty defects, priorities with respect to the type of defect, reasonable time required for Contractor response, and other details deemed necessary by the Contracting Officer for the execution of the construction warranty

will be established/reviewed at this meeting. In connection with these requirements and at the time of the Contractor's quality control completion inspection, furnish the name, telephone number and address of a licensed and bonded company which is authorized to initiate and pursue construction warranty work action on behalf of the Contractor. This point of contact will be located within the local service area of the warranted construction, be continuously available, and be responsive to Government inquiry on warranty work action and status. This requirement does not relieve the Contractor of any of its responsibilities in connection with other portions of this provision.

1.6.3 Warranty Tags

At the time of installation, tag each warranted item with a durable, oil and water resistant tag approved by the Contracting Officer. Attach each tag with a copper wire and spray with a silicone waterproof coating. Also, submit two record copies of the warranty tags showing the layout and design. The date of acceptance and the QC signature must remain blank until the project is accepted for beneficial occupancy. Show the following information on the tag.

Type of product/material	
Model number	
Serial number	
Contract number	
Warranty period from/to	
Inspector's signature	
Construction Contractor	
Address	
Telephone number	
Warranty contact	
Address	
Telephone number	
Warranty response time priority code	
WARNING - PROJECT PERSONNEL TO PERFORM ONLY OPERATIONAL MAINTENANCE DURING THE WARRANTY PERIOD.	

1.7 OPERATION AND MAINTENANCE MANUALS

Submit 6 copies of the project operation and maintenance manuals 30 calendar days prior to testing the system involved. Update and resubmit data for final approval no later than 30 calendar days prior to contract

completion.

#### 1.7.1 Configuration

Operation and Maintenance Manuals must be consistent with the manufacturer's standard brochures, schematics, printed instructions, general operating procedures, and safety precautions. Bind information in manual format and grouped by technical sections. Test data must be legible and of good quality. Light-sensitive reproduction techniques are acceptable provided finished pages are clear, legible, and not subject to fading. Pages for vendor data and manuals must have 0.3937-inch holes and be bound in 3-ring, loose-leaf binders. Organize data by separate index and tabbed sheets, in a loose-leaf binder. Binder must lie flat with printed sheets that are easy to read. Caution and warning indications must be clearly labeled.

#### 1.7.2 Training and Instruction

Submit classroom and field instructions in the operation and maintenance of systems equipment where required by the technical provisions. These services must be directed by the Contractor, using the manufacturer's factory-trained personnel or qualified representatives. Contracting Officer will be given 7 calendar days written notice of scheduled instructional services. Instructional materials belonging to the manufacturer or vendor, such as lists, static exhibits, and visual aids, must be made available to the Contracting Officer.

#### 1.8 CLEANUP

Provide final cleaning in accordance with ASTM E1971 and submit two copies of the listing of completed final clean-up items. Leave premises "broom clean." Comply with GS-37 for general purpose cleaning and bathroom cleaning. Use only nonhazardous cleaning materials, including natural cleaning materials, in the final cleanup. Remove temporary labels, stains and foreign substances; polish transparent and glossy surfaces. Clean equipment and fixtures to a sanitary condition. Replace filters of operating equipment and comply with the Indoor Air Quality (IAQ) Management Plan. Remove waste and surplus materials, rubbish and construction facilities from the site. Recycle, salvage, and return construction and demolition waste from project in accordance with the Waste Management Plan. Promptly and legally transport and dispose of any trash. Do not burn, bury, or otherwise dispose of trash on the project site.

#### PART 2 PRODUCTS

Not used.

#### PART 3 EXECUTION

Not used.

-- End of Section --

## SECTION 01 78 23

## OPERATION AND MAINTENANCE DATA

07/06

## PART 1 GENERAL

## 1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

## ASTM INTERNATIONAL (ASTM)

ASTM E1971 (2005; R 2011) Stewardship for the Cleaning of Commercial and Institutional Buildings

## 1.2 SUBMISSION OF OPERATION AND MAINTENANCE DATA

Submit Operation and Maintenance (O&M) Data specifically applicable to this contract and a complete and concise depiction of the provided equipment, product, or system, stressing and enhancing the importance of system interactions, troubleshooting, and long-term preventative maintenance and operation. The subcontractors must compile and prepare data and deliver to the Contractor prior to the training of Government personnel. The Contractor must compile and prepare aggregate O&M data including clarifying and updating the original sequences of operation to as-built conditions. Organize and present information in sufficient detail to clearly explain O&M requirements at the system, equipment, component, and subassembly level. Include an index preceding each submittal. Submit in accordance with this section and Section 01 33 00 SUBMITTAL PROCEDURES.

## 1.2.1 Package Quality

Documents must be fully legible. Poor quality copies and material with hole punches obliterating the text or drawings will not be accepted.

## 1.2.2 Package Content

Data package content shall be as shown in the paragraph titled "Schedule of Operation and Maintenance Data Packages." Comply with the data package requirements specified in the individual technical sections, including the content of the packages and addressing each product, component, and system designated for data package submission, except as follows. Commissioned items without a specified data package requirement in the individual technical sections must use Data Package 4. Commissioned items with a Data Package 1 or 2 requirement must use instead Data Package 4.

## 1.2.3 Changes to Submittals

Manufacturer-originated changes or revisions to submitted data must be furnished by the Contractor if a component of an item is so affected subsequent to acceptance of the O&M Data. Submit changes, additions, or revisions required by the Contracting Officer for final acceptance of submitted data within 30 calendar days of the notification of this change requirement.

#### 1.2.4 Review and Approval

The Government's Commissioning Authority (CA) must review the commissioned systems and equipment submittals for completeness and applicability. The Government shall verify that the systems and equipment provided meet the requirements of the Contract documents and design intent, particularly as they relate to functionality, energy performance, water performance, maintainability, sustainability, system cost, indoor environmental quality, and local environmental impacts. The CA shall communicate deficiencies to the Contracting Officer. Upon a successful review of the corrections, the CA must recommend approval and acceptance of these O&M manuals to the Contracting Officer. This work is in addition to the normal review procedures for O&M data.

#### 1.2.5 O&M Database

Develop a database from the O&M manuals that contains the information required to start a preventative maintenance program.

### 1.3 TYPES OF INFORMATION REQUIRED IN O&M DATA PACKAGES

#### 1.3.1 Operating Instructions

Include specific instructions, procedures, and illustrations for the following phases of operation for the installed model and features of each system:

##### 1.3.1.1 Safety Precautions

List personnel hazards and equipment or product safety precautions for all operating conditions.

##### 1.3.1.2 Operator Prestart

Include procedures required to install, set up, and prepare each system for use.

##### 1.3.1.3 Startup, Shutdown, and Post-Shutdown Procedures

Provide narrative description for Startup, Shutdown and Post-shutdown operating procedures including the control sequence for each procedure.

##### 1.3.1.4 Normal Operations

Provide narrative description of Normal Operating Procedures. Include Control Diagrams with data to explain operation and control of systems and specific equipment.

##### 1.3.1.5 Emergency Operations

Include Emergency Procedures for equipment malfunctions to permit a short period of continued operation or to shut down the equipment to prevent further damage to systems and equipment. Include Emergency Shutdown Instructions for fire, explosion, spills, or other foreseeable contingencies. Provide guidance and procedures for emergency operation of all utility systems including required valve positions, valve locations and zones or portions of systems controlled.

#### 1.3.1.6 Operator Service Requirements

Include instructions for services to be performed by the operator such as lubrication, adjustment, inspection, and recording gage readings.

#### 1.3.1.7 Environmental Conditions

Include a list of Environmental Conditions (temperature, humidity, and other relevant data) that are best suited for the operation of each product, component or system. Describe conditions under which the item equipment should not be allowed to run.

#### 1.3.2 Preventive Maintenance

Include the following information for preventive and scheduled maintenance to minimize corrective maintenance and repair for the installed model and features of each system. Include potential environmental and indoor air quality impacts of recommended maintenance procedures and materials.

##### 1.3.2.1 Lubrication Data

Include preventative maintenance lubrication data, in addition to instructions for lubrication provided under paragraph titled "Operator Service Requirements":

- a. A table showing recommended lubricants for specific temperature ranges and applications.
- b. Charts with a schematic diagram of the equipment showing lubrication points, recommended types and grades of lubricants, and capacities.
- c. A Lubrication Schedule showing service interval frequency.

##### 1.3.2.2 Preventive Maintenance Plan and Schedule

Include manufacturer's schedule for routine preventive maintenance, inspections, tests and adjustments required to ensure proper and economical operation and to minimize corrective maintenance. Provide manufacturer's projection of preventive maintenance work-hours on a daily, weekly, monthly, and annual basis including craft requirements by type of craft. For periodic calibrations, provide manufacturer's specified frequency and procedures for each separate operation.

##### 1.3.2.3 Cleaning Recommendations

Provide environmentally preferable cleaning recommendations in accordance with ASTM E1971.

#### 1.3.3 Corrective Maintenance (Repair)

Include manufacturer's recommended procedures and instructions for correcting problems and making repairs for the installed model and features of each system. Include potential environmental and indoor air quality impacts of recommended maintenance procedures and materials.

##### 1.3.3.1 Troubleshooting Guides and Diagnostic Techniques

Include step-by-step procedures to promptly isolate the cause of typical malfunctions. Describe clearly why the checkout is performed and what

conditions are to be sought. Identify tests or inspections and test equipment required to determine whether parts and equipment may be reused or require replacement.

#### 1.3.3.2 Wiring Diagrams and Control Diagrams

Wiring diagrams and control diagrams shall be point-to-point drawings of wiring and control circuits including factory-field interfaces. Provide a complete and accurate depiction of the actual job specific wiring and control work. On diagrams, number electrical and electronic wiring and pneumatic control tubing and the terminals for each type, identically to actual installation configuration and numbering.

#### 1.3.3.3 Maintenance and Repair Procedures

Include instructions and a list of tools required to repair or restore the product or equipment to proper condition or operating standards.

#### 1.3.3.4 Removal and Replacement Instructions

Include step-by-step procedures and a list required tools and supplies for removal, replacement, disassembly, and assembly of components, assemblies, subassemblies, accessories, and attachments. Provide tolerances, dimensions, settings and adjustments required. Instructions shall include a combination of text and illustrations.

#### 1.3.3.5 Spare Parts and Supply Lists

Include lists of spare parts and supplies required for maintenance and repair to ensure continued service or operation without unreasonable delays. Special consideration is required for facilities at remote locations. List spare parts and supplies that have a long lead-time to obtain.

#### 1.3.4 Corrective Maintenance Work-Hours

Include manufacturer's projection of corrective maintenance work-hours including requirements by type of craft. Corrective maintenance that requires completion or participation of the equipment manufacturer shall be identified and tabulated separately.

#### 1.3.5 Appendices

Provide information required below and information not specified in the preceding paragraphs but pertinent to the maintenance or operation of the product or equipment. Include the following:

##### 1.3.5.1 Product Submittal Data

Provide a copy of all SD-03 Product Data submittals required in the applicable technical sections.

##### 1.3.5.2 Manufacturer's Instructions

Provide a copy of all SD-08 Manufacturer's Instructions submittals required in the applicable technical sections.

#### 1.3.5.3 O&M Submittal Data

Provide a copy of all SD-10 Operation and Maintenance Data submittals required in the applicable technical sections.

#### 1.3.5.4 Parts Identification

Provide identification and coverage for all parts of each component, assembly, subassembly, and accessory of the end items subject to replacement. Include special hardware requirements, such as requirement to use high-strength bolts and nuts. Identify parts by make, model, serial number, and source of supply to allow reordering without further identification. Provide clear and legible illustrations, drawings, and exploded views to enable easy identification of the items. When illustrations omit the part numbers and description, both the illustrations and separate listing shall show the index, reference, or key number that will cross-reference the illustrated part to the listed part. Parts shown in the listings shall be grouped by components, assemblies, and subassemblies in accordance with the manufacturer's standard practice. Parts data may cover more than one model or series of equipment, components, assemblies, subassemblies, attachments, or accessories, such as typically shown in a master parts catalog

#### 1.3.5.5 Warranty Information

List and explain the various warranties and clearly identify the servicing and technical precautions prescribed by the manufacturers or contract documents in order to keep warranties in force. Include warranty information for primary components such as the compressor of air conditioning system.

#### 1.3.5.6 Personnel Training Requirements

Provide information available from the manufacturers that is needed for use in training designated personnel to properly operate and maintain the equipment and systems.

#### 1.3.5.7 Testing Equipment and Special Tool Information

Include information on test equipment required to perform specified tests and on special tools needed for the operation, maintenance, and repair of components.

#### 1.3.5.8 Testing and Performance Data

Include completed prefunctional checklists, functional performance test forms, and monitoring reports. Include recommended schedule for retesting and blank test forms.

#### 1.3.5.9 Contractor Information

Provide a list that includes the name, address, and telephone number of the General Contractor and each Subcontractor who installed the product or equipment, or system. For each item, also provide the name address and telephone number of the manufacturer's representative and service organization that can provide replacements most convenient to the project site. Provide the name, address, and telephone number of the product, equipment, and system manufacturers.

## 1.4 TYPES OF INFORMATION REQUIRED IN CONTROLS O&amp;M DATA PACKAGES

Include Data Package 5 and the following for control systems:

- a. Narrative description on how to perform and apply all functions, features, modes, and other operations, including unoccupied operation, seasonal changeover, manual operation, and alarms. Include detailed technical manual for programming and customizing control loops and algorithms.
- b. Full as-built sequence of operations.
- c. Copies of all checkout tests and calibrations performed by the Contractor (not Cx tests).
- d. Full points list. All control points.
- e. Full print out of all schedules and set points after testing and acceptance of the system.
- f. Full as-built print out of software program.
- g. Electronic File: Copy on disk or CD of the entire program for Elevators 15 and 16.
- h. Marking of all system sensors and thermostats on the as-built floor plan and mechanical drawings with their control system designations.

## 1.5 SCHEDULE OF OPERATION AND MAINTENANCE DATA PACKAGES

Furnish the O&M data packages specified in individual technical sections. The required information for each O&M data package is as follows:

## 1.5.1 Data Package 1

- a. Safety precautions
- b. Cleaning recommendations
- c. Maintenance and repair procedures
- d. Warranty information
- e. Contractor information
- f. Spare parts and supply list

## 1.5.2 Data Package 2

- a. Safety precautions
- b. Normal operations
- c. Environmental conditions
- d. Lubrication data
- e. Preventive maintenance plan and schedule

- f. Cleaning recommendations
- g. Maintenance and repair procedures
- h. Removal and replacement instructions
- i. Spare parts and supply list
- j. Parts identification
- k. Warranty information
- l. Contractor information

1.5.3 Data Package 3

- a. Safety precautions
- b. Operator prestart
- c. Startup, shutdown, and post-shutdown procedures
- d. Normal operations
- e. Emergency operations
- f. Environmental conditions
- g. Lubrication data
- h. Preventive maintenance plan and schedule
- i. Cleaning recommendations
- j. Troubleshooting guides and diagnostic techniques
- k. Wiring diagrams and control diagrams
- l. Maintenance and repair procedures
- m. Removal and replacement instructions
- n. Spare parts and supply list
- o. Product submittal data
- p. O&M submittal data
- q. Parts identification
- r. Warranty information
- s. Testing equipment and special tool information
- t. Testing and performance data
- u. Contractor information

1.5.4 Data Package 4

- a. Safety precautions
- b. Operator prestart
- c. Startup, shutdown, and post-shutdown procedures
- d. Normal operations
- e. Emergency operations
- f. Operator service requirements
- g. Environmental conditions
- h. Lubrication data
- i. Preventive maintenance plan and schedule
- j. Cleaning recommendations
- k. Troubleshooting guides and diagnostic techniques
- l. Wiring diagrams and control diagrams
- m. Maintenance and repair procedures
- n. Removal and replacement instructions
- o. Spare parts and supply list
- p. Corrective maintenance man-hours
- q. Product submittal data
- r. O&M submittal data
- s. Parts identification
- t. Warranty information
- u. Personnel training requirements
- v. Testing equipment and special tool information
- w. Testing and performance data
- x. Contractor information

1.5.5 Data Package 5

- a. Safety precautions
- b. Operator prestart
- c. Start-up, shutdown, and post-shutdown procedures
- d. Normal operations

- e. Environmental conditions
- f. Preventive maintenance plan and schedule
- g. Troubleshooting guides and diagnostic techniques
- h. Wiring and control diagrams
- i. Maintenance and repair procedures
- j. Removal and replacement instructions
- k. Spare parts and supply list
- l. Product submittal data
- m. Manufacturer's instructions
- n. O&M submittal data
- o. Parts identification
- p. Testing equipment and special tool information
- q. Warranty information
- r. Testing and performance data
- s. Contractor information

PART 2 PRODUCTS

Not used.

PART 3 EXECUTION

Not used.

-- End of Section --

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## SECTION 02 41 00

DEMOLITION  
05/10

## PART 1 GENERAL

## 1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

## AMERICAN SOCIETY OF SAFETY ENGINEERS (ASSE/SAFE)

ASSE/SAFE A10.6 (2006) Safety Requirements for Demolition Operations

## 1.2 PROJECT DESCRIPTION

## 1.2.1 Demolition Plan

Prepare a Demolition Plan and submit proposed demolition and removal procedures for approval before work is started. Include in the plan procedures for careful removal and disposition of materials specified to be salvaged, coordination with other work in progress, a disconnection schedule of utility services, a detailed description of methods and equipment to be used for each operation and of the sequence of operations. Identify components and materials to be salvaged for recycling with reference to paragraph Existing Facilities to be removed. Append tracking forms for all removed materials indicating type, quantities, condition, destination, and end use. Coordinate with Waste Management Plan. Provide procedures for safe conduct of the work in accordance with ASSE/SAFE A10.6. Plan shall be approved by Contracting Officer prior to work beginning.

## 1.2.2 General Requirements

Do not begin demolition until authorization is received from the Contracting Officer. The work of this section is to be performed in a manner that maximizes salvage and recycling of materials. Remove rubbish and debris from the project site; do not allow accumulations inside or outside the building. The work includes demolition, salvage of identified items and materials, and removal of resulting rubbish and debris. Remove rubbish and debris from Government property daily, unless otherwise directed. Store materials that cannot be removed daily in areas specified by the Contracting Officer. In the interest of occupational safety and health, perform the work in accordance with ASSE/SAFE A10.6.

## 1.3 ITEMS TO REMAIN IN PLACE

Take necessary precautions to avoid damage to existing items to remain in place, to be reused, or to remain the property of the Government. Repair or replace damaged items as approved by the Contracting Officer. Coordinate the work of this section with all other work indicated. Construct and maintain shoring, bracing, and supports as required. Ensure that structural elements are not overloaded. Increase structural supports or add new supports as may be required as a result of any cutting, removal,

deconstruction, or demolition work performed under this contract. Do not overload structural elements. Provide new supports and reinforcement for existing construction weakened by demolition, deconstruction, or removal work. Repairs, reinforcement, or structural replacement require approval by the Contracting Officer prior to performing such work.

#### 1.3.1 Existing Construction Limits and Protection

Do not disturb existing construction beyond the extent indicated or necessary for installation of new construction. Provide temporary shoring and bracing for support of building components to prevent settlement or other movement. Provide protective measures to control accumulation and migration of dust and dirt in all work areas. Remove dust, dirt, and debris from work areas daily.

#### 1.4 SUBMITTALS

Government approval is required for all submittals. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

##### SD-01 Preconstruction Submittals

Demolition Plan; G

The Contractor shall prepare and submit a detailed Demolition Plan of the work procedures and safety precautions to be used at the beginning of work.

#### PART 2 PRODUCTS

Not used.

#### PART 3 EXECUTION

##### 3.1 GENERAL

Demolition shall not begin until all major components for installation have been assembled, have passed shop testing, shipped and has arrived at KSC.

##### 3.2 DISCONNECTING EXISTING UTILITIES

Prior to the start of work, utilities serving each area of alteration or removal will be shut off by the Government.

##### 3.3 TEMPORARY UTILITY SERVICES

Install temporary utility services before disconnecting existing utilities. Maintain the temporary services during the period of construction and remove only after permanent services have been installed and tested and are in operation.

##### 3.4 DEMOLITION AND REMOVAL WORK

###### 3.4.1 Protective Measurers

Protective measurers shall be provided to prevent parts, tools and debris from falling from the work area.

3.4.2 Removed Material and Equipment

The contract drawings shows existing control enclosures, equipment and fixtures to be removed. This includes items that will be designated for turnover to the Government. Items that are not designated for turnover to the Government shall be removed and handled such that they are not damaged, they shall be secured on a pallet, labeled and tagged for turnover. Items that are not scheduled for turnover to the Government shall be disposed by the Contractor.

Hazardous waste shall be disposed of in accordance with requirements of the applicable Specification Section.

All openings resulting from items removed shall have a permanent type protective cover installed to prevent contamination. Conduit not to be reutilized shall be remain in place and pull a string and cap installed.

A complete list of all items removed with part number and manufacturer shall be submitted as an appendix to the demolition plan.

-- End of Section --

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## SECTION 02 82 13.00 98

## ASBESTOS ABATEMENT

02/12

## PART 1 GENERAL

## 1.1 SUMMARY

Asbestos could be encountered during the prosecution of this contract, but the Contractor shall avoid and address existing asbestos-containing materials in the work area as indicated in Section 1.2 of this specification section.

This section specifies the asbestos abatement requirements and the Contractor's applicable asbestos procedures, which include:

- a. Demolition or salvage of structures where asbestos is present
- b. Removal or encapsulation of materials containing asbestos
- c. Construction, alteration, repair, maintenance, or renovation of structures, substrates, or portions thereof, that contain asbestos
- d. Installation of products containing asbestos
- e. Asbestos spill/emergency cleanup
- f. Transportation
- g. Disposal
- h. Storage
- i. Containment of and housekeeping activities involving asbestos or products containing asbestos, on the site or location at which construction activities are performed

Under OSHA, Asbestos Abatement work is categorized into four classes:

Class I Work: Activities involving the removal of Thermal System Insulation (TSI) and surfacing Asbestos Containing Materials (ACM) and Presumed Asbestos Containing Material (PACM).

Class II Work: Activities involving the removal of ACM is not TSI or surfacing material. This includes wallboard, floor tile and sheeting, roofing, siding, shingles, and construction mastics.

Class III Work: Repair and Maintenance operations, where ACM, including TSI and surfacing ACM and PCM, is likely to be disturbed.

Class IV Work: Maintenance and custodial activities during which employees contact but do not disturb ACM or PACM and activities to clean up dust, waste, and debris from Class I, II, and III activities.

Conduct abatement work in accordance with the Class I, II, III, or IV Methods of Compliance as required by 29 CFR 1910, 29 CFR 1926, 40 CFR 61-SUBPART M, 49 CFR 171, 49 CFR 172, FAC CHAPTER 62-257, and

FL-STAT 469. Submit all required training certifications prior to commencement of work, and experience of Contractor's "Competent Person," Supervisor, and workers.

## 1.2 ASBESTOS AVOIDANCE

Environmental testing has been performed and indicates the presence of ACM. The environmental findings for ACM are provided in Appendix A of these specifications.

Asbestos could be encountered during the prosecution of this contract, but the Contractor shall avoid and address existing asbestos-containing materials in the work area as follows:

This project addresses areas associated with the installation of a new elevator and includes removal and replacement of existing elevator doors which are purported to contain asbestos. In addition, asbestos-containing cement board may be present in adjacent areas of the hoistway and it may be disturbed during the performance of this work. The Contractor shall plan and execute work to avoid all known or suspected asbestos-containing materials. Where avoidance is not possible and abatement is not indicated on the drawings, the Contractor shall immediately notify the Contracting Officer.

The Contractor shall be responsible for confirming the presence of ACM at the time actual work is performed in each location.

Protocol Elements for Work Conducted in the Vicinity of Asbestos-Containing Materials includes the following:

- a. The Contractor shall have a designated Competent Person as defined by OSHA 29 CFR 1926.1101 for Class IV work on the job site at all times unless otherwise authorized by the Contracting Officer.
- b. For Class IV work, the Competent Person shall have received documented training that is equivalent in curriculum and training method to the 16-hour Operations and Maintenance course developed by the EPA. Such course shall include "hands-on" training in the use of respiratory protection and work practices.
- c. All employees involved in conducting work in the vicinity of asbestos-containing materials shall have received documented training equivalent in curriculum and training method to the Awareness training course developed by the EPA for maintenance workers who work in buildings containing asbestos. Such a course shall take at least 2 hours.
- d. Prior to conducting any work in the area, the Contractor shall have developed and implemented an Emergency Response Plan (ERP) that addresses the accidental disturbance of asbestos-containing materials. The ERP can be included in the Contractor's Contingency Plan (Section 1.5). The ERP shall present emergency response procedures for the workers and require that as a minimum the following equipment is in the work area at all times that work is being conducted where asbestos-containing materials could be accidentally disturbed or damaged in any way:

1. Penetrating encapsulant

2. Polyethylene sheeting
  3. Duct tape
  4. HEPA equipped vacuum cleaner
  5. Barricade tape
  6. Respiratory protection for the Competent Person
  7. Asbestos waste disposal bag
- e. Prior to conducting work in the area, the Competent Person shall review and be familiar with the requirements of the ERP and the Contingency Plan.
  - f. Prior to conducting work in the area, the Competent Person shall assure that the workers are familiar with the requirements and procedures of the ERP and the Contingency Plan.
  - g. Prior to conducting work in the area, the Competent Person shall review the drawings and specifications to determine what, if any, asbestos-containing materials will be encountered in the work area.
  - h. Upon developing the desired route for all conduits, the Competent Person shall visually identify the location of all asbestos-containing materials defined in the drawings and specifications.
  - i. The Competent Person shall be fully responsible for ensuring that all workers know the exact location of all asbestos-containing materials in the work area and avoid the direct contact or disturbance of same as all the work of the project is conducted.
  - j. As long as all of the protocol elements for work to be conducted in the vicinity of asbestos-containing materials described above are rigorously followed, and no asbestos-containing materials are directly contacted or disturbed, there will be no respiratory protection requirements for workers involved with these tasks.

Where work on the project requires abatement of or direct contact with asbestos-containing materials, the Contractor shall stop work and immediately notify the Contracting Officer. When an asbestos abatement contact change is approved, The Contractor shall comply with all of the following requirements of asbestos abatement indicated in this specification section.

### 1.3 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

#### COMPRESSED GAS ASSOCIATION (CGA)

CGA G-7.1

(2011) Commodity Specification for Air;  
5th Edition

## FLORIDA ADMINISTRATIVE CODE (FAC)

FAC CHAPTER 62-257 (2008) Florida Administrative Code,  
Asbestos Program

## FLORIDA STATUTES (FL-STAT)

FL-STAT 469 (2010) Asbestos Abatement

## JOHN F. KENNEDY SPACE CENTER (KSC)

KNPR 8500.1 KSC Environmental Requirements

KNPR 1840.19 KSC Industrial Hygiene Programs

KNPR 8715.3 KSC Safety Practices Procedural  
Requirements

## NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND HEALTH (NIOSH)

NIOSH 7400 (1994) Standard Test Method for Asbestos  
and Other Fibers by PCM

NIOSH 2003-154 (2003; 4th Ed; Supple 3) NIOSH Manual of  
Analytical Methods

## U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

29 CFR 1910 Occupational Safety and Health Standards

29 CFR 1926 Safety and Health Regulations for  
Construction

29 CFR 1926.1101 Asbestos

40 CFR 61-SUBPART M National Emission Standard for Asbestos

40 CFR 763 Asbestos

49 CFR 171 General Information, Regulations, and  
Definitions

49 CFR 172 Hazardous Materials Table, Special  
Provisions, Hazardous Materials  
Communications, Emergency Response  
Information, and Training Requirements

## 1.4 DEFINITIONS

FLAC - Florida Licensed Asbestos Consultant as defined within the  
FL-STAT 469 ASBESTOS ABATEMENT.

IH - Contractor's independent Industrial Hygienist. This person is  
responsible for the oversight, approval of the abatement procedures and the  
health, safety, and welfare of those who it effects.

## 1.5 ADMINISTRATIVE REQUIREMENTS

### 1.5.1 Licenses And Permits

Submit a copy of asbestos consultant's license to the Contracts Administrator. Ensure that the FLAC possesses a current license and complies with all Federal, State and Local Regulations. Only those consultants who are certified and licensed by DBPR are permitted to perform Asbestos Surveys or abatement specifications and plans as per Florida Statute 469.

Also submit a copy of Asbestos Contractor's License. Possession of a current asbestos contractor's license is mandatory, as well as securing all necessary licenses and permits associated with asbestos removal, transportation, and disposal as may be required by Federal, State, and local regulations. Only those Contractors who are certified and licensed by the State of Florida DBPR will be permitted to perform asbestos abatement activities at Kennedy Space Center.

Obtain and submit a copy of waste disposal permit and all disposal shipping manifests and tickets as they are obtained.

### 1.5.2 Certificates

Submit the following certificates:

- a. Certification of participation (documentation showing current and 2 previous consecutive PAT test round results) in a proficiency analytical test (PAT) program such as or equivalent to the American Industrial Hygiene Association PAT or Asbestos Analytical Registry (AAR) accreditation certificate and Interlab QA/QC Program participation for the independent air monitoring agency selected by the Contractor before starting work.
- b. Training Certifications and accreditation certificates for the independent air monitoring agency's on-site personnel and a copy of independent air monitoring agency's Quality Control Program.
- c. Certification documents by the Contractor verifying that employees have been provided current respirator fit test, training, and medical examinations in compliance with 29 CFR 1926.

### 1.5.3 Material Safety Data Sheets (MSDS)

Submit Material Safety Data Sheets (MSDS) as required for materials to be used on the specified project.

### 1.5.4 Notification

When applicable, submit Florida Department of Environmental Protection (DEP) "Notice of Demolition or Asbestos Renovation" (DEP Form 62-257.900(1)) to DEP District Office. A copy of the notification is to be provided to the Government as part of the Implementation Plan.

## 1.6 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for Contractor Quality Control approval. Submit the following in accordance with Section 01 33 00

SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Asbestos Consultant's License; G  
Asbestos Contractor's License; G  
Training Certifications; G  
Implementation Plan; G  
Air Monitoring Plan; G  
Contingency Plan for Emergencies; G  
Written (OSHA Compliant) Respiratory Protection Plan; G  
Work Schedule; G  
Notification of Demolition/Renovation; G

SD-02 Shop Drawings

Coordination Drawings; G  
Detailed Drawings; G

SD-06 Test Reports

Initial Exposure Assessments; G  
Notification of Demolition/Renovation; G  
Air Monitoring Reports; G  
Work Site Entry Logs; G  
Daily Site Inspection Logs; G  
Waste Inventory; G  
Waste Shipment Record (WSR); G

SD-07 Certificates

Training Certifications; G  
Proficiency Analytical Test; G

SD-08 Manufacturer's Instructions

Material Safety Data Sheets; G  
Implementation Plan; G

SD-11 Closeout Submittals

Notification of Demolition/Renovation; G

Waste Disposal Permit; G

Disposal Shipping Manifests and Tickets; G

Daily Site Inspection Logs; G

Negative Pressure Logs; G

OSHA Compliance Inspection Records; G

Air Monitoring Reports; G

Independent Monitoring Data; G

Calibration Records; G

Waste Stream Inventory; G

#### 1.7 IMPLEMENTATION PLAN

Prepare and submit a detailed, written Implementation Plan created, signed and sealed by a FLAC to the Government for approval, prior to the start of work, that includes the following:

- a. Coordination drawings, in .DWG or .DGN electronic format, including site specific drawings of proposed work areas, clean room/change areas, mini-enclosures, shower, equipment room, waste loading/staging areas, locations of High Efficiency Particulate Air (HEPA) filtered negative pressure devices and exhaust points, work areas, emergency egress, and areas to be modified.
- b. Detailed drawings for asbestos abatement systems consisting of fabrication and assembly drawings for all parts of the work in sufficient detail to enable the Government to check conformity with the requirements of the contract documents.
- c. A copy of the applicable DEP Notification of Demolition/Renovation (DEP Form 62-257.900(1)).
- d. Plan of action, including proposed procedures to be used in complying with the requirements of this specification, 29 CFR 1926, and other applicable regulatory requirements, sequence of asbestos abatement work, the interfaces of trades involved in the performance of work, posting of licenses, permits, etc., methods to be used to assure the safety of building occupants and visitors to the site, disposal plan including location of approved disposal site, a detailed description of the methods employed to control pollution, and a detailed work schedule. Expand upon the method for removal of ACM, the use of portable HEPA ventilation systems, closing out of the buildings HVAC system, method of removal to prohibit visible emissions in the work area, and packaging of removed debris.
- e. Details of the decontamination areas and procedures, locations of staging areas, posting of warning signs, and details of negative air system to be used in the work area.
- f. Sketch(s) or drawing(s) of complete contract area(s) showing the shower room, clean room, drum staging area, decontamination and containment

areas, the negative air system, and exits. Indicate designation of the "Competent Person" (CP), and Site Supervisor.

#### 1.7.1 Air Monitoring Plan

Provide a written Air Monitoring Plan to be prepared under the direction of and signed/stamped by a Certified Industrial Hygienist (C.I.H.) or FLAC specifying the air monitoring criteria and an action plan for implementation by the Competent Person. Identify in the plan the Competent Person to be on site at all times (unless otherwise authorized by the Contracts Administrator) during asbestos abatement operations. The FLAC or his/her representative/competent person is responsible for ensuring applicable regulatory compliance during all phases of the asbestos abatement activities. The competent person has the authority to stop work for unsafe conditions and for not adhering to applicable regulations. Provide a qualified back-up person in the event that the Competent Person is absent from job site.

Provide certification that the Contractor, his staff, and abatement workers (including Supervisors) have attended and successfully completed (an) asbestos abatement course(s) including refresher courses as set forth in FL-STAT 469 and in accordance with 29 CFR 1926 and 40 CFR 763.

Provide a written (OSHA compliant) Respiratory Protection Plan in accordance with 29 CFR 1910 including training in the care, use, and maintenance of respirators and fit test certification.

Provide a written description of respiratory equipment (name, type, model number) and protective clothing provided to the abatement workers.

#### 1.7.2 Personnel Examination

Provide documentation that all personnel assigned to the abatement project have been examined annually by a physician. Submit the physician's written opinion containing the results of the employee's medical examination in compliance with 29 CFR 1926. Establish, maintain, and make readily available for review all work site entry logs of all personnel entering and leaving the regulated work area by the on-site competent person indicating the date and time of entry and egress.

#### 1.7.3 Procedures for enforcement of Personal Hygiene Practices

Prepare and submit a contingency plan for emergencies including fire, accident, power failure, heating or cooling, negative air system failure, respirator supplied air system failure, or any other event that may require modification of the work area isolation procedures. Include in the plan specific procedures for decontamination or work area isolation, safe exiting, and the need for medical attention in the event of an emergency.

#### 1.7.4 Additional Procedures

Submit any additional procedures (fall protection, confined space, etc.) and policies that are in effect to ensure worker safety and environmental, KNPR 8500.1, and KNPR 8715.3, requirements are met.

#### 1.8 AIR MONITORING REPORTS

Obtain the services of an independent Air Monitoring Agency accredited by the American Industrial Hygiene Association (AIHA), for analysis of

airborne asbestos concentration levels, and submittal of Independent Monitoring Data taken during the abatement. Provide a copy of the monitoring agency's Quality Control Program to Contracts Administrator prior to commencement of the abatement activities. Ensure the individual performing the on-site air monitoring meets the requirements as set forth in FL-STAT 469 and 40 CFR 763, and performs sample collections in accordance with the approved Air Monitoring Plan.

Perform all Air Monitoring under the direction of the FLAC using an independent Air Monitoring Contractor, in compliance with Florida Statute 469 requirements.

Calibrate pumps before and after each air sample and submit calibration records to the Government.

Submit daily Air Monitoring Reports. Include in the Air Monitoring Report the following information for each sample:

- a. Sample identification, Sample location
- b. Employee Name, Social Security Number
- c. Description of task being monitored
- d. Exposure level results in (f/cc)
- e. Monitoring instrument identification number
- f. Pre-calibration, post calibration, and average flow rate of each sample
- g. Sample date, start and stop times
- h. Type of protective devices worn (if any)
- i. Project identification number, Facility number and name
- j. Sampling and Analytical Methods used
- k. Contact name and company, and name of individual performing the sampling

1.8.1 Air Sample Analytical Method

Airborne fiber sampling and analytical procedures are to be analyzed by Phase Contrast Microscopy (PCM) in accordance with 29 CFR 1926 and NIOSH 2003-154 7400 method.

1.8.2 Air Sampling Rate, Volumes and Frequency

Conduct daily monitoring utilizing sample rates, volumes and frequency in accordance with 29 CFR 1926 and retain for final submittal at closeout. The minimum number of samples or sample volumes may not be less than those specified below:

<u>Type of Sample</u>	<u>Volume</u>	<u>Minimum No. Samples</u>	<u>Location</u>
Prior to set-up (within 24 hrs)	1200L	2	Regulated Area
Personal, During work	400L	2	Personal B.Z.

<u>Type of Sample</u>	<u>Volume</u>	<u>Minimum No. Samples</u>	<u>Location</u>
Area samples, Adjacent to work area	1200L	2	Regulated Area
Area samples at Negative Air Unit Exhaust	1200L	1	In area of outlets

NOTE: The KSC IH will perform air sampling outside the regulated work area.

#### 1.9 WORKER PROTECTION

Perform Initial Exposure Assessments and Employee Exposure Monitoring in accordance with 29 CFR 1926, part 1926.1101, with input and approval of the FLAC.

Select and provide respiratory protection to employees and ensure they are utilized in accordance with 29 CFR 1926.

Submit the Work schedule indicating the work days, hours, and the number of workers per shift. Include a bar chart to identify the individual milestones through to the completion of the project (i.e., number of days to complete work site preparation, number of days to complete ACM removal, number of days to complete final cleaning and lockdown, etc.).

Submit the OSHA compliance inspection records as part of the closeout documents.

#### PART 2 PRODUCTS

Not used.

#### PART 3 EXECUTION

##### 3.1 TEMPORARY UTILITIES AND SERVICES

The Government will make available at the work site, water at hose bibs and 120 Volt AC at receptacles for the Contractor's use. Provide water proof safety lighting where necessary for safe, adequate illumination.

Ensure all electrical equipment to be used inside the work areas is powered from an Underwriters Laboratory (UL) approved Ground Fault Circuit Interrupter (GFCI). Do not exceed the manufacturers limits per GFCI. Make all necessary connections and restore the site connections to their original condition or better, prior to project completion.

Ensure all energized or pressurized systems inside the work area have been locked out, tagged out or otherwise rendered safe.

Provide temporary water from the existing building water source to control the generation of airborne dust, to allow for area, personnel, and equipment decontamination, and to supply decontamination unit needs. Also provide a backflow preventer at the source.

Provide temporary sanitary drainage piping to the decontamination unit sump and to the shower unit at a minimum slope of 2.0 percent, and temporary drainage piping to waste water pump and existing drain in accordance with local standards and as approved by the Contracts Administrator.

### 3.2 WORK AREA PREPARATION

The Government will re-arrange equipment and storage areas to the extent of providing a direct and unobstructed path to the work area(s). During ACM removal, confine equipment and employees to the designated work area(s).

Unless otherwise directed by the Contracts Administrator, the Contractor is to establish and maintain a 25-foot access control barrier zone(s) around the designated work area(s). Interference with the functional operation of the building occupants outside these areas is not permitted.

Ensure all building supply and return air ducts from the mechanical system are isolated to eliminate air flow into or out of containment area(s).

#### 3.2.1 Pre-Cleaning

Shut down HVAC systems and seal all critical barriers prior to initiating pre-cleaning actions. Seal, with 6 mil minimum thickness plastic sheeting, all openings, including but not limited to, windows, corridors, doorways, elevator openings, skylights, ducts, grilles, diffusers, and any other penetrations between the contaminated work areas and uncontaminated areas.

Pre-clean all movable objects identified as contaminated by the Contracts Administrator or his/her representative within the work area using a HEPA filtered vacuum and wet cleaning methods as appropriate. Remove these objects after cleaning and store in a protected area.

Pre-clean all surfaces in the work area using HEPA filtered vacuums and/or wet cleaning methods as appropriate. Methods that would raise dust, such as dry sweeping or vacuuming with equipment not equipped with HEPA filters, are PROHIBITED. Pay detailed attention to machinery or areas behind grilles and gratings.

Do not remove or otherwise disturb asbestos containing building materials during the pre-cleaning phase.

#### 3.2.2 Work Area(s) Notification

Inform all other Contractors and personnel on the site of the abatement work of the nature of the Contractor's work with ACM and/or PACM, of the existence of and requirements pertaining to regulated areas, and the measures taken to ensure that employees of such other Contractor employers are not exposed to asbestos in accordance with 29 CFR 1926.

Use industry controls and work practice methods in accordance with 29 CFR 1926. Ensure daily site inspection logs are posted at the jobsite by the on-site competent person.

Use flame resistant, 6 mil polyethylene sheeting when constructing Negative Pressure Enclosures (NPE) or decontamination areas.

### 3.3 WASTE LOAD-OUT UNIT

Establish a waste load-out unit to provide for interim secure storage. Include an equipment room for storage of asbestos-contaminated items (drums, tools, equipment). Decontaminate all equipment and waste containers prior to being taken out of the work area(s).

All asbestos-containing waste material is to be sealed in leak-tight

disposal containers. Thoroughly wet all waste within the disposal containers. Maintain proper labeling protocols for all running and final inventory of filled disposable containers.

### 3.4 SIGNS AND MARKINGS

Post signs prior to commencing asbestos work as required in 29 CFR 1926. Post signs at the perimeter of the asbestos work areas, along the route of the temporary waste material holding (Drum Staging) area, and at all entrances to asbestos work areas. Ensure signs are conspicuous and legible.

Post telephone numbers and locations of emergency services including, but not limited to, fire, ambulance, doctor, and hospital, at the regulated area.

Post one copy of all permits at the work site perimeter in a accessible location outside the regulated area.

Post one copy of the Abatement Contractors current license at the work site perimeter in a accessible location outside the regulated area.

Post hazard communication notification signs in accordance with KNPR 1840.19 requirements.

### 3.5 NEGATIVE AIR SYSTEM

Construct Negative Pressure Enclosures (NPE's) as required by 29 CFR 1926.

Duct each of the negative air units through the containment barrier walls to the outside of the work area(s). When the building is occupied, ensure that the ducts exhaust into the outside air; otherwise, they may exhaust into an area of the building beyond the critical barriers. Never exhaust the units into the work area(s).

Provide each unit with temporary back-up electrical power (120 Volt AC) in the event of power failures or outages.

#### 3.5.1 Testing

Design the negative air system to provide a minimum of four (4) air changes per hour and test before any work is begun. After the work area has been prepared, the decontamination unit set up, and the negative air units(s) installed, test the system. Prior to beginning abatement activities, an Asbestos Abatement Pre-Work Inspection checklist (KSC Form 28-1230NS) will be completed by the KSC IH to verify the adequacy of the containment system and work area. Once activated, ensure the negative air exhaust unit(s) remain in operation until final clearance air monitoring has been performed and the KSC IH has approved their shutdown/removal. Maintain daily negative pressure logs for review by the FLAC and submit as part of the closeout documents.

Install a differential pressure meter or manometer to continuously measure pressure differential between inside and outside the work area for all Class I activities which utilize a NPE. Maintain a minimum pressure differential of 0.02 inch of water column.

### 3.6 RESPIRATORY PROTECTION

Instruct and train each worker involved in asbestos abatement in proper

respirator use and care. Fit all respirators by approved qualitative or quantitative test. Use respiratory protection appropriate for the fiber level encountered in the Work Area and as specified herein, or as required for other situations encountered.

### 3.6.1 Air Quality for Supplied Air Respiratory Systems

The Contractor is to provide air used for breathing in Type "C" supplied air respiratory systems that meets or exceeds CGA G-7.1, standards for Grade D air.

### 3.7 REMOVAL OF ASBESTOS

Use industry controls and work practices for all operations in accordance with 29 CFR 1926 Methods of Compliance for Class I, II, III, or IV asbestos work. The FLAC or his/her representative are responsible for these practices.

Ensure all Class I, II, III and IV work is supervised by an on site Competent Person at all times that work is in progress.

Following removal of contaminated items and asbestos material, seal the edges of adjacent surfaces, which were exposed when asbestos was removed, with an asbestos bridging sealant/encapsulant.

### 3.8 DAILY HOUSEKEEPING

Maintain a clean work area in accordance with 29 CFR 1926. Perform the following housekeeping functions at the end of each shift or prior to leaving the work site unattended:

- a. Prepare contaminated waste for disposal by packaging the waste and removing it from the work area.
- b. HEPA vacuum the work area.
- c. Visually inspect polyethylene in the work area and other high traffic areas.

### 3.9 CLEANING PROCEDURES

Clean the work area at the end of each day's abatement activities. Designate a separate, secured area within the work area for storage of debris until it can be properly disposed. Secure the work area after termination of the work day to prevent entry. Regularly dispose and replace disposable supplies, such as mop heads, sponges, and rags. Clean all equipment by HEPA vacuuming and wet wiping.

Clean all work areas in which abatement operations have been completed, starting at the ceiling and working down to the floors, by HEPA vacuuming and wet wiping. Prior to removal of worksite access controls and re-occupancy inspection by the Government, and upon satisfactory final clearance air sampling, and removal of polyethylene sheeting, perform a final cleaning (wet wipe) of all surfaces within the work area.

### 3.10 INSPECTION

Do not commence removal of asbestos materials prior to satisfactory KSC IH, concurrence to proceed on the Asbestos Abatement Pre-Work Inspection

(checklist KSC Form 28-1230NS).

### 3.10.1 Initial Inspection

The Contractor and the independent IH will conduct a walk-through of the work area prior to beginning the abatement work to review existing conditions and ensure safe and practical conditions for the work to be implemented. Any damage to structures, surfaces, and equipment, which could be misconstrued as damage resulting from work, is to be documented by the Contractor and immediately submitted to the Contracts Administrator.

Perform background sampling for work areas in accordance with 29 CFR 1926 prior to beginning the abatement work.

### 3.10.2 Daily Inspection

Maintain a work site entry log of all personnel who enter the regulated work area. Through continuous surveillance and inspections of the worksite, ensure the integrity of containment, proper function of the negative pressure system, and posting of signs and labels. Also ensure, through frequent inspections during each work shift, that negative pressure is maintained, appropriate work practices are followed, appropriate protective clothing and equipment are used, and worker decontamination procedures are being followed.

Ensure that critical barriers and negative pressure enclosures remain effectively sealed and taped. Take immediate action to remedy defects immediately upon discovery. Details of the inspections are to be included in the Contractor's daily inspection log and posted in an accessible location outside the regulated area.

Provide updated copies of the Air Monitoring Reports, daily site inspection logs and waste stream inventory to the Contracts Administrator at the end of each week of the abatement work.

NASA/Kennedy Space Center reserves the right to conduct periodic inspections and air monitoring in the work area(s). If the work area is unsafe as determined by the Contracts Administrator for KSC IH, the Contracts Administrator, will require the Contractor to stop work until the unsafe conditions are corrected.

### 3.10.3 Final Inspection

The thoroughness of asbestos removal is to be evaluated by visually inspecting the affected surfaces for residual asbestos material and accumulated dust followed by air sampling. Evidence of residual asbestos or asbestos debris on any adjacent surfaces upon completion of the work is not acceptable.

Upon completion of the work, conduct a thorough visual inspection of the work area by the Abatement Contractor and by the KSC IH to ensure no residual asbestos material, dust or debris remains. Document final inspections on the Asbestos Abatement Clearance Inspection Checklist (KSC Form 28-1231NS), which will be completed by KSC IH.

If applicable, final aggressive air sampling is to be performed by the KSC IH for each NPE work area after completion of a satisfactory visual inspection. The clearance criteria is 0.01 fibers per cubic centimeter (f/cc) of air as determined by PCM. Satisfactory fiber counts from all

final samples are to be less than 0.01 f/cc. If any of the final air samples contain greater than 0.01 f/cc, repeat the final cleaning operation and re-test the area until satisfactory clearance levels are obtained.

Collect five (5) PCM final air samples for the first 5,000 square feet of containment plus one (1) additional PCM final air sample for each additional 5,000 square feet or one (1) air sample per room, whichever is greater. The number of final air samples may be reduced for small enclosures of less than approximately 2500 square feet. In no case may fewer than two (2) final samples be collected for any enclosure.

Ensure clearance air sample volumes meet the minimum volumes as indicated for analysis by NIOSH 7400 method.

### 3.11 ASBESTOS WASTE AND CONTAMINATED MATERIALS

#### 3.11.1 Removal of Asbestos Waste Materials

For purposes of this paragraph, asbestos waste materials are defined as those materials which contain or have been contaminated by asbestos and are not planned to be encapsulated and remain at the job site. They are primarily removed asbestos, disposable clothing and safety equipment, polyethylene sheeting, contaminated amended water, vacuum cleaner contents, and filtration media.

Contain all asbestos waste material in two (2) 6 mil polyethylene disposal bags, or two (2) 6 mil disposal bags and a sealed leak-tight container such as, but not limited to, a steel or fiberboard drum. Pack the asbestos waste material while still wet. Clean the external surface of the waste containers by HEPA vacuuming and wet wiping before moving from the work area. Protect the interior of truck or dumpster with two layers of polyethylene sheeting.

##### 3.11.1.1 Waste Inventory

Maintain Waste Inventory records of all generated waste drums or containers indicating the location and approximate quantity of material in each container. Clearly label and mark all disposal containers, dumpsters, and trucks, in accordance with 40 CFR 61-SUBPART M, 29 CFR 1910 of OSHA's Hazard Communications Standard, and 49 CFR 171 and 49 CFR 172, Hazardous Substances.

Provide conspicuous, legible labels, affixed to plastic bags and drums indicating the name of the waste generator and the location (facility name and number) where the waste was generated.

For non-friable asbestos that will be disposed at the KSC/Schwartz Road Landfill, provide a completed landfill disposal verification form (KSC Form 28-1064NS) send to Contracts Administration. NOTE: Regulated ACM is not permitted for disposal at KSC/Schwartz Road Landfill.

Provide a Waste Shipment Record (WSR) to the waste site owner in accordance with the instructions in 40 CFR 61-SUBPART M.

#### 3.11.2 Work Area Disposal

After final inspection has been completed and the work area is released for occupancy, shut off and remove the Negative Air System units. Unseal all entrances and exits. Dispose of all plastic sheeting, tape, and any other

trash and debris, except for critical barriers, in sealable plastic bags, or in drums and moved to the staging area. After final wet wipe of the work area and satisfactory clearance air sampling, dismantle critical barriers and the decontamination unit.

### 3.11.3 Decontamination Area And Support Area Disposal

Dismantle the decontamination area after the work area is released by the KSC IH for re-occupancy. Vacuum all surfaces of the decontamination unit before it is disassembled.

### 3.12 WASTE TRANSPORTATION AND DISPOSAL

Transport and dispose of asbestos waste in full compliance with 40 CFR 61-SUBPART M, SUBPART A, 49 CFR 171 and 49 CFR 172.

### 3.13 ASBESTOS ABATEMENT NOTICE AND CHECKLIST

An Asbestos Abatement Pre-Work Inspection form (KSC Form 28-1230NS) and an Asbestos Abatement Clearance Checklist (KSC Form 28-1231NS) will be provided by the KSC IH. Send copies to the Contracts Administrator upon satisfactory completion of the work. Notify KSC IH and the Contracts Administrator at least three days prior to the planned commencement of work. Coordinate and schedule all Pre-Work and Clearance Site inspections with KSC IH. The completed forms are to be used to establish approval of the containment, work practices and final acceptance/re-occupancy of the work area(s).

### 3.14 FINAL ACCEPTANCE

#### 3.14.1 Closeout Submittals

Within 10 days after the completion of work, submit to the Contracts Administrator a written summary and copies of the following items:

- a. Notification of Demolition/Renovation
- b. Waste Disposal Permit
- c. Disposal Shipping Manifests and Tickets
- d. Daily Site Inspection Logs
- e. Negative Pressure Logs
- f. OSHA Compliance Inspection Records
- g. Air Monitoring Reports
- h. Independent Monitoring Data
- i. Calibration Records
- j. Waste Stream Inventory

The work will not be considered complete until the asbestos materials identified herein have been abated, the areas cleaned, satisfactory

clearance air monitoring completed, all asbestos contaminated waste has been properly disposed of, and all project close out documents have been received and approved by the Contracts Administrator.

-- End of Section --

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## SECTION 02 82 33.13 20

## REMOVAL/CONTROL AND DISPOSAL OF PAINT WITH LEAD

08/11

## PART 1 GENERAL

## 1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

## AMERICAN INDUSTRIAL HYGIENE ASSOCIATION (AIHA)

AIHA Z88.6 (2006) Respiratory Protection - Respirator Use-Physical Qualifications for Personnel

## U.S. DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT (HUD)

HUD 6780 (1995; Errata Aug 1996; Rev Ch. 7 - 1997) Guidelines for the Evaluation and Control of Lead-Based Paint Hazards in Housing

## U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

29 CFR 1926.103 Respiratory Protection  
29 CFR 1926.21 Safety Training and Education  
29 CFR 1926.33 Access to Employee Exposure and Medical Records  
29 CFR 1926.55 Gases, Vapors, Fumes, Dusts, and Mists  
29 CFR 1926.59 Hazard Communication  
29 CFR 1926.62 Lead  
40 CFR 261 Identification and Listing of Hazardous Waste  
40 CFR 262 Standards Applicable to Generators of Hazardous Waste  
40 CFR 745 Lead-Based Paint Poisoning Prevention in Certain Residential Structures

## UNDERWRITERS LABORATORIES (UL)

UL 586 (2009) Standard for High-Efficiency Particulate, Air Filter Units

## 1.2 DEFINITIONS

## 1.2.1 Abatement

As applied to target housing and child occupied facilities, "abatement"

means any set of measures designed to permanently eliminate lead-based paint hazards in accordance with standards established by appropriate Federal agencies. Such term includes:

- a. The removal of lead-based paint and lead-contaminated dust, the permanent containment or encapsulation of lead-based paint, the replacement of lead-painted surfaces or fixtures, and the removal or covering of lead contaminated soil; and
- b. All preparation, cleanup, disposal, and post-abatement clearance testing activities associated with such measures.

#### 1.2.2 Action Level

Employee exposure, without regard to use of respirators, to an airborne concentration of lead of 30 micrograms per cubic meter of air averaged over an 8 hour period in a work environment.

#### 1.2.3 Area Sampling

Sampling of lead concentrations within the lead control area and inside the physical boundaries, which is representative of the airborne lead concentrations but is not collected in the breathing zone of personnel.

#### 1.2.4 Competent Person (CP)

As used in this section, refers to a person employed by the Contractor who is trained in the recognition and control of lead hazards in accordance with current Federal, State, and local regulations. A Certified Industrial Hygienist (CIH) certified for comprehensive practice by the American Board of Industrial Hygiene or a Certified Safety Professional (CSP) certified by the Board of Certified Safety Professionals is the best choice.

#### 1.2.5 Contaminated Room

Refers to a room for removal of contaminated personal protective equipment (PPE).

#### 1.2.6 Decontamination Shower Facility

That facility that encompasses a clean clothing storage room, and a contaminated clothing storage and disposal rooms, with a shower facility in between.

#### 1.2.7 Deleading

Activities conducted by a person who offers to eliminate lead-based paint or lead-based paint hazards or to plan such activities in commercial buildings, bridges or other structures.

#### 1.2.8 Eight-Hour Time Weighted Average (TWA)

Airborne concentration of lead to which an employee is exposed, averaged over an 8 hour workday as indicated in 29 CFR 1926.62.

#### 1.2.9 High Efficiency Particulate Air (HEPA) Filter Equipment

HEPA filtered vacuuming equipment with a UL 586 filter system capable of collecting and retaining lead-contaminated paint dust. A high efficiency

particulate filter means 99.97 percent efficient against 0.3 micron or larger size particles.

#### 1.2.10 Lead

Metallic lead, inorganic lead compounds, and organic lead soaps.

#### 1.2.11 Lead-Based Paint (LBP)

Paint or other surface coating that contains lead in excess of 1.0 milligrams per centimeter squared or 0.5 percent by weight.

#### 1.2.12 Lead-Based Paint Activities

In the case of target housing or child occupied facilities, lead-based paint activities include; a lead-based paint inspection, a risk assessment, or abatement of lead-based paint hazards.

#### 1.2.13 Lead-Based Paint Hazard (LBP Hazard)

Any condition that causes exposure to lead from lead-contaminated dust, lead-contaminated soil, lead-based paint that is deteriorated or present in accessible surfaces, friction surfaces, or impact surfaces that would result in adverse human health effects.

#### 1.2.14 Paint with Lead (PWL)

Any paint that contains lead as determined by the testing laboratory using a valid test method. The requirements of this section does not apply if no detectable levels of lead are found using a quantitative method for analyzing paint using laboratory instruments with specified limits of detection (usually 0.01 percent). An X-Ray Fluorescence (XRF) instrument is not considered a valid test method.

#### 1.2.15 Lead Control Area

A system of control methods to prevent the spread of lead dust, paint chips or debris to adjacent areas that may include temporary containment, floor or ground cover protection, physical boundaries, and warning signs to prevent unauthorized entry of personnel. HEPA filtered local exhaust equipment may be used as engineering controls to further reduce personnel exposures or building/outdoor environmental contamination.

#### 1.2.16 Lead Permissible Exposure Limit (PEL)

Fifty micrograms per cubic meter of air as an 8 hour time weighted average as determined by 29 CFR 1926.62. If an employee is exposed for more than eight hours in a workday, the PEL shall be determined by the following formula:

PEL (micrograms/cubic meter of air) = 400/No. hrs worked per day

#### 1.2.17 Personal Sampling

Sampling of airborne lead concentrations within the breathing zone of an employee to determine the 8 hour time weighted average concentration in accordance with 29 CFR 1926.62. Samples shall be representative of the employees' work tasks. Breathing zone shall be considered an area within a hemisphere, forward of the shoulders, with a radius of 6 to 9 inches and

centered at the nose or mouth of an employee.

#### 1.2.18 Physical Boundary

Area physically roped or partitioned off around an enclosed lead control area to limit unauthorized entry of personnel. As used in this section, "inside boundary" shall mean the same as "outside lead control area but inside the physical boundary."

### 1.3 DESCRIPTION

#### 1.3.1 Description of Work

Lead could be encountered during the prosecution of this work. Environmental testing has been performed and indicates the presence of lead. The environmental findings for lead-based paint and the RCRA 8 metals are provided in Appendix B of these Specifications. Environmental testing also indicates the presence of polychlorinated biphenyls (PCB) in the paint of the elevator doors. The findings for PCB are provided in Appendix C of these specifications.

Remove/control lead-based / paint with lead as identified in the Lead-based Paint Investigation Report. Remove paint in accordance with this Section and recycle, handle, and/or dispose of materials with lead paint in accordance with Federal and State regulations, this Section, and NASA/KSC Special Condition contract clauses. If a painted surface has not been tested for lead paint assume lead is present to determine Personnel Protective Equipment (PPE).

#### 1.3.2 Coordination with Other Work

The contractor shall coordinate with work being performed in adjacent areas. Coordination procedures shall be explained in the Removal/Control Plan and shall describe how the Contractor will prevent lead exposure to other Contractors and/or Government personnel performing work unrelated to lead activities.

### 1.4 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for Contractor Quality Control approval. The following shall be submitted in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

#### SD-03 Product Data

Vacuum Filters; G

Respirators; G

#### SD-06 Test Reports

Sampling results

Occupational and Environmental Assessment Data Report

#### SD-07 Certificates

Qualifications of CP; G

Testing Laboratory qualifications; G

Occupant Notification; G

Training Certification of workers and supervisors; G

Notification of the Commencement of LBP Hazard Abatement; G

Third Party Consultant Qualifications; G

Lead-based paint/paint with lead removal/control plan including CP approval (signature, date, and certification number)-; G-

Rental equipment notification

Respiratory Protection Program; G

Hazard Communication Program; G

EPA or State approved hazardous waste treatment, storage, or disposal facility for lead disposal; G

Lead Waste Management Plan; G

Vacuum filters; G

Clearance Certification; G

#### SD-11 Closeout Submittals

Completed and signed hazardous waste manifest from treatment or disposal facility; G

Certification of Medical Examinations; G

Employee Training Certification; G

Waste turn-in documents or weight tickets for non-hazardous wastes that are disposed of at sanitary or construction and demolition landfills; G

### 1.5 QUALITY ASSURANCE

#### 1.5.1 Qualifications

##### 1.5.1.1 Qualifications of CP

Submit name, address, and telephone number of the CP selected to perform responsibilities specified in paragraph entitled "Competent Person (CP) Responsibilities." Provide previous experience of the CP. Submit proper documentation that the CP is trained and licensed and certified in accordance with Federal, State, and local laws.

##### 1.5.1.2 Training Certification

Submit a certificate for each employee and supervisor, signed and dated by the training provider meeting 40 CFR 745 (Subpart L) requirements, stating that the employee or supervisor has received the required lead training and

is certified to perform or supervise deleading or lead removal. Submit proof the work will be performed by a certified firm.

#### 1.5.1.3 Testing Laboratory

Submit the name, address, and telephone number of the testing laboratory selected to perform the air and wipe sampling, testing, and reporting of airborne concentrations of lead. Use a laboratory accredited under the EPA National Lead Laboratory Accreditation Program (NLLAP) by either the American Association for Laboratory Accreditation (A2LA) or the American Industrial Hygiene Association (AIHA) and that is successfully participating in the Environmental Lead Proficiency Analytical Testing (ELPAT) program to perform sample analysis. Laboratories selected to perform blood lead analysis shall be OSHA approved.

#### 1.5.1.4 Third Party Consultant Qualifications

Submit the name, address, and telephone number of the third party consultant selected to perform the wipe sampling for determining concentrations of lead in dust or soil sampling. Submit proper documentation that the consultant is trained and certified as an inspector technician or inspector/risk assessor by the USEPA authorized State (or local) certification and accreditation program.

#### 1.5.2 Requirements

##### 1.5.2.1 Competent Person (CP) Responsibilities

- a. Verify training meets all federal, State, and local requirements.
- b. Review and approve lead-based paint/paint with lead removal/control plan for conformance to the applicable standards. Ensure work is performed in strict accordance with specifications at all times.
- c. Continuously inspect lead-based paint removal/control work for conformance with the approved plan.
- d. Perform air and wipe sampling.
- e. Control work to prevent hazardous exposure to human beings and to the environment at all times.
- f. Certify the conditions of the work as called for elsewhere in this specification.

##### 1.5.2.2 Lead-Based Paint/Paint with Lead Removal/Control Plan (LBP/PWL R/CP)

Submit a detailed job-specific plan of the work procedures to be used in the removal/control of LBP/PWL. The plan shall include a sketch showing the location, size, and details of lead control areas, location and details of decontamination facilities, viewing ports, and mechanical ventilation system. Include a description of equipment and materials, controls and job responsibilities for each activity from which lead is emitted. Include in the plan, eating, drinking, smoking and sanitary procedures, interface of trades, sequencing of lead related work, collected waste water and paint debris disposal plan, air sampling plan, respirators, personal protective equipment, and a detailed description of the method of containment of the operation to ensure that lead is not released outside the lead control area. Include site preparation, cleanup and clearance procedures. Include

occupational and environmental sampling, training, sampling methodology, frequency, duration of sampling, and qualifications of sampling personnel in the air sampling portion of the plan. Include a description of arrangements made among contractors on multi-contractor worksites to inform affected employees and to clarify responsibilities to control exposures.

The Removal/Control Plan shall be developed by a certified planner/project designer.

In occupied buildings, the Removal/Control Plan shall also include an occupant protection program that describes the measures that will be taken during the work to protect the building occupants.

#### 1.5.2.3 Occupational and Environmental Assessment Data Report

If initial monitoring is necessary, submit occupational and environmental sampling results to the Contracting Officer within three working days of collection, signed by the testing laboratory employee performing the analysis, the employee that performed the sampling, and the CP.

In order to reduce the full implementation of 29 CFR 1926.62, the Contractor shall provide documentation. Submit a report that supports the determination to reduce full implementation of the requirements of 29 CFR 1926.62 and supporting the Lead Removal/Control Plan.

- a. The initial monitoring shall represent each job classification, or if working conditions are similar to previous jobs by the same employer, provide previously collected exposure data that can be used to estimate worker exposures per 29 CFR 1926.62. The data shall represent the worker's regular daily exposure to lead for stated work.
- b. Submit worker exposure data gathered during the task based trigger operations of 29 CFR 1926.62 with a complete process description. This includes manual demolition, manual scraping, manual sanding, heat gun, power tool cleaning, rivet busting, cleanup of dry expendable abrasives, abrasive blast enclosure removal, abrasive blasting, welding, cutting and torch burning where lead containing coatings are present.
- c. The initial assessment shall determine the requirement for further monitoring and the need to fully implement the control and protective requirements including the lead compliance plan per 29 CFR 1926.62.

#### 1.5.2.4 Medical Examinations

Initial medical surveillance as required by 29 CFR 1926.62 shall be made available to all employees exposed to lead at any time (1 day) above the action level. Full medical surveillance shall be made available to all employees on an annual basis who are or may be exposed to lead in excess of the action level for more than 30 days a year or as required by 29 CFR 1926.62. Adequate records shall show that employees meet the medical surveillance requirements of 29 CFR 1926.33, 29 CFR 1926.62, and 29 CFR 1926.103. Maintain complete and accurate medical records of employees for a period of at least 30 years or for the duration of employment plus 30 years, whichever is longer.

#### 1.5.2.5 Training

Train each employee performing paint removal, disposal, and air sampling

operations prior to the time of initial job assignment and annually thereafter, in accordance with 29 CFR 1926.21, 29 CFR 1926.62, and State and local regulations where appropriate.

#### 1.5.2.6 Respiratory Protection Program

- a. Provide each employee required to wear a respirator a respirator fit test at the time of initial fitting and at least annually thereafter as required by 29 CFR 1926.62.
- b. Establish and implement a respiratory protection program as required by AIHA Z88.6, 29 CFR 1926.103, 29 CFR 1926.62, and 29 CFR 1926.55.

#### 1.5.2.7 Hazard Communication Program

Establish and implement a Hazard Communication Program as required by 29 CFR 1926.59.

#### 1.5.2.8 Lead Waste Management

The Lead Waste Management Plan shall be in accordance with Section 01 57 20.00 10 ENVIRONMENTAL PROTECTION and NASA/KSC Special Condition contract clauses.

#### 1.5.2.9 Environmental, Safety and Health Compliance

In addition to the detailed requirements of this specification, comply with laws, ordinances, rules, and regulations of Federal, State, and local authorities regarding removing, handling, storing, transporting, and disposing of lead waste materials. Comply with the applicable requirements of the current issue of 29 CFR 1926.62. Submit matters regarding interpretation of standards to the Contracting Officer for resolution before starting work. Where specification requirements and the referenced documents vary, the most stringent requirement shall apply. The following Federal and State laws, ordinances, criteria, rules and regulations regarding removing, handling, storing, transporting, and disposing of lead-contaminated materials apply:

- a. 40 CFR 745 (Subpart L)
- b. 29 CFR 1926.62

Licensing and certification in the State of Florida is required.

#### 1.5.3 Pre-Construction Conference

Along with the CP, meet with the Contracting Officer to discuss in detail the lead waste management plan and the lead-based paint/paint with lead removal/control plan, including work procedures and precautions for the removal plan.

### 1.6 EQUIPMENT

#### 1.6.1 Respirators

Furnish appropriate respirators approved by the National Institute for Occupational Safety and Health (NIOSH), Department of Health and Human Services, for use in atmospheres containing lead dust. Respirators shall comply with the requirements of 29 CFR 1926.62.

### 1.6.2 Special Protective Clothing

Furnish personnel who will be exposed to lead-contaminated dust with proper disposable protective whole body clothing, head covering, gloves, and foot coverings as required by 29 CFR 1926.62. Furnish proper disposable plastic or rubber gloves to protect hands. Reduce the level of protection only after obtaining approval from the CP.

### 1.6.3 Rental Equipment Notification

If rental equipment is to be used during lead-based paint handling and disposal, notify the rental agency in writing concerning the intended use of the equipment. Furnish a copy of the written notification to the Contracting Officer.

### 1.6.4 Vacuum Filters

UL 586 labeled HEPA filters.

### 1.6.5 Equipment for Government Personnel

Furnish the Contracting Officer with two complete sets of personal protective equipment (PPE) daily, as required herein, for entry into and inspection of the paint removal work within the lead controlled area. Personal protective equipment shall include disposable whole body covering, including appropriate foot, head, and hand protection. PPE shall remain the property of the Contractor. The Government will provide respiratory protection for the Contracting Officer.

## 1.7 PROJECT/SITE CONDITIONS

### 1.7.1 Protection of Existing Work to Remain

Perform paint removal work without damage or contamination of adjacent areas. Where existing work is damaged or contaminated, restore work to its original condition or better.

## PART 2 PRODUCTS

Not used.

## PART 3 EXECUTION

### 3.1 PREPARATION

#### 3.1.1 Protection

##### 3.1.1.1 Notification

- a. Notify the Contracting Officer 20 days prior to the start of any paint removal work.
- b. Occupant Notification

Submit occupant written acknowledgment of the delivery of lead hazard information pamphlet (EPA 747-K-99-001 "Protect Your Family From Lead in Your Home") prior to commencing the renovation work for each affected unit per 40 CFR 745 Subpart E.

### 3.1.1.2 Boundary Requirements

- a. Provide physical boundaries around the lead control area by roping off the area designated in the work plan or providing curtains, portable partitions or other enclosures to ensure that lead will not escape outside the lead control area.
- b. Warning Signs - Provide warning signs at approaches to lead control areas. Locate signs at such a distance that personnel may read the sign and take the necessary precautions before entering the area. Signs shall comply with the requirements of 29 CFR 1926.62.

### 3.1.1.3 Heating, Ventilating and Air Conditioning (HVAC) Systems

Shut down, lock out, and isolate HVAC systems that supply, exhaust, or pass through the lead control areas. Seal intake and exhaust vents in the lead control area with 6 mil plastic sheet and tape. Seal seams in HVAC components that pass through the lead control area.

### 3.1.1.4 Decontamination Facility

Provide clean and contaminated change rooms and shower facilities in accordance with this specification and 29 CFR 1926.62.

### 3.1.1.5 Eye Wash Station

Where eyes may be exposed to injurious corrosive materials, suitable facilities for quick drenching or flushing of the eyes shall be provided within the work area.

### 3.1.1.6 Mechanical Ventilation System

- a. Use adequate ventilation to control personnel exposure to lead in accordance with 29 CFR 1926.62.
- b. To the extent feasible, use local exhaust ventilation connected to HEPA filters or other collection systems, approved by the CP. Local exhaust ventilation systems shall be evaluated and maintained in accordance with 29 CFR 1926.62.
- c. Vent local exhaust outside the building only and away from building ventilation intakes.
- d. Use locally exhausted, power actuated, paint removal tools.

### 3.1.1.7 Personnel Protection

Personnel shall wear and use protective clothing and equipment as specified herein. Eating, smoking, or drinking or application of cosmetics is not permitted in the lead control area. No one will be permitted in the lead control area unless they have been appropriately trained and provided with protective equipment.

## 3.2 ERECTION

### 3.2.1 Lead Control Area Requirements

Full containment - Contain removal operations by the use of critical

barriers and HEPA filtered exhaust or a negative pressure enclosure system with decontamination facilities and with HEPA filtered exhaust if required by the CP. For containment areas larger than 1,000 square feet install a minimum of two 18 inch square viewing ports. Locate ports to provide a view of the required work from the exterior of the enclosed contaminated area. Glaze ports with laminated safety glass.

### 3.3 APPLICATION

#### 3.3.1 Work Procedures

Perform removal of lead-based paint in accordance with approved lead-based paint/paint with lead removal/control plan. Use procedures and equipment required to limit occupational and environmental exposure to lead when lead-based paint is removed in accordance with 29 CFR 1926.62. Dispose of removed paint chips and associated waste in compliance with Environmental Protection Agency (EPA), State, and local requirements.

#### 3.3.2 Lead-Based Paint Removal/Control/Deleading

Manual or power sanding of interior and exterior surfaces is not permitted unless tools are equipped with HEPA attachments or wet methods. The dry sanding or grinding of surfaces that contain lead is prohibited. Provide methodology for LBP removal/control in work plan. Remove paint within the areas designated on the drawings in order to completely expose the substrate. Take whatever precautions necessary to minimize damage to the underlying substrate.

Avoid deterioration of the substrate. Provide surface preparations for painting.

Provide methodology for LBP/PWL removal and abatement/control and processes to minimize contamination of work areas outside the control area with lead-contaminated dust or other lead-contaminated debris/waste and to ensure that unprotected personnel are not exposed to hazardous concentrations of lead. Describe this LBP/PWL removal/control process in the LBP/PWL Removal/Control Plan.

##### 3.3.2.1 Indoor Paint Removal

Perform mechanical or chemical paint removal in lead control areas using enclosures, barriers, or containments. Collect residue or debris for disposal in accordance with Federal, State, and local requirements.

#### 3.3.3 Personnel Exiting Procedures

Whenever personnel exit the lead-controlled area, they shall perform the following procedures and shall not leave the work place wearing any clothing or equipment worn during the work day:

- a. Vacuum themselves off.
- b. Remove protective clothing in the contaminated change room, and place them in an approved impermeable disposal bag.
- c. Shower.
- d. Change to clean clothes prior to leaving the physical boundary designated around the lead control area.

### 3.4 FIELD QUALITY CONTROL

#### 3.4.1 Tests

##### 3.4.1.1 Air and Wipe Sampling

Air sample for lead in accordance with 29 CFR 1926.62 and as specified herein. Air and wipe sampling shall be directed or performed by the CP.

- a. The CP shall be on the job site directing the air and non-clearance wipe sampling and inspecting the lead-based paint removal/control work to ensure that the requirements of the contract have been satisfied during the entire lead-based paint removal operation.
- b. Collect personal air samples on employees who are expected to have the greatest risk of exposure as determined by the CP. In addition, collect air samples on at least 25 percent of the work crew or a minimum of two employees, whichever is greater, during each work shift.
- c. Submit results of air samples, within 72 hours after the air samples are taken.
- d. Before any work begins, a third party consultant shall collect and analyze baseline wipe samples in accordance with methods defined in Federal, State, and local standards inside and outside of the physical boundary to assess the degree of dust contamination in the facility prior to lead-based paint removal/control.
- e. Collect surface wipe samples at a location no greater than 10 feet outside the lead control area at a frequency of once per day while lead removal work is conducted. Surface wipe results shall meet criteria in paragraph "Clearance Certification."

##### 3.4.1.2 Air Sampling During Paint Removal Work

Conduct area air sampling daily, on each shift in which lead-based paint removal operations are performed, in areas immediately adjacent to the lead control area. Sufficient area monitoring shall be conducted to ensure unprotected personnel are not exposed at or above 30 micrograms per cubic meter of air. If 30 micrograms per cubic meter of air is reached or exceeded, stop work, correct the conditions(s) causing the increased levels. Notify the Contracting Officer immediately. Determine if condition(s) require any further change in work methods. Removal work shall resume only after the CP and the Contracting Officer give approval. For outdoor operations, at least one sample on each shift shall be taken on the downwind side of the lead control area.

##### 3.4.1.3 Sampling After Paint Removal/Control

After the visual inspection, collect wipe samples according to the HUD protocol contained in HUD 6780 to determine the lead content of settled dust and dirt in micrograms per square meter foot of surface area.

##### 3.4.1.4 Testing of Removed Paint and Used Abrasive

Test removed paint and used abrasive in accordance with 40 CFR 261 for hazardous waste.

### 3.5 CLEANING AND DISPOSAL

#### 3.5.1 Cleanup

Maintain surfaces of the lead control area free of accumulations of paint chips and dust. Restrict the spread of dust and debris; keep waste from being distributed over the work area. Do not dry sweep or use compressed air to clean up the area. At the end of each shift and when the paint removal operation has been completed, clean the area of visible lead paint contamination by vacuuming with a HEPA filtered vacuum cleaner, wet mopping the area and wet wiping the area as indicated by the CP. Reclean areas showing dust or residual paint chips or debris. After visible dust, chips and debris is removed, wet wipe and HEPA vacuum all surfaces in the work area. If adjacent areas become contaminated at any time during the work, clean, visually inspect, and then wipe sample all contaminated areas. The CP shall then certify in writing that the area has been cleaned of lead contamination before restarting work.

##### 3.5.1.1 Clearance Certification

The CP shall certify in writing that air samples collected outside the lead control area during paint removal operations are less than 30 micrograms per cubic meter of air; the respiratory protection used for the employees was adequate; the work procedures were performed in accordance with 29 CFR 1926.62 and 40 CFR 745; and that there were no visible accumulations of material and dust containing lead left in the work site. Do not remove the lead control area or roped off boundary and warning signs prior to the Contracting Officer's acknowledgement of receipt of the CP certification.

For lead-based paint hazard abatement work, surface wipe and soil sampling shall be conducted and clearance determinations made according to the work practice standards presented in 40 CFR 745.227.

#### 3.5.2 Disposal

- a. Collect lead-contaminated waste, scrap, debris, bags, containers, equipment, and lead-contaminated clothing that may produce airborne concentrations of lead particles. Label the containers in accordance with 29 CFR 1926.62 and 40 CFR 262. Dispose of lead-contaminated waste material in accordance with Section 01 57 20.00 10 ENVIRONMENTAL PROTECTION paragraph "Materials Management and Waste Disposal" and NASA/KSC Special Condition Contract clauses.
- b. Transport all waste materials in accordance with Federal and state regulations.

-- End of Section --

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## SECTION 14 21 00.00 20

## ELECTRIC TRACTION ELEVATORS

05/12

## PART 1 GENERAL

## 1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

## AMERICAN WELDING SOCIETY (AWS)

AWS D1.1/D1.1M (2010; Errata 2010) Structural Welding Code - Steel

## ASME INTERNATIONAL (ASME)

ASME A17.1/CSA B44 (2010) Safety Code for Elevators and Escalators

ASME A17.2 (2010) Guide for Inspection of Elevators, Escalators, and Moving Walks Includes Inspection Procedures for Electric Traction and Winding Drum Elevators, Hydraulic Elevators, and Escalators and Moving Walks

ASME A17.5 (2011) Elevator and Escalator Electrical Equipment

ASME A17.6 (2010) Standard for Elevator Suspension, Compensation, and Governor Systems

## NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

NEMA MG 1 (2011) Motors and Generators

## NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70 (2011; Errata 2 2012) National Electrical Code

## U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

36 CFR 1191 Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities

## 1.2 SYSTEM DESCRIPTION

## 1.2.1 General Requirements

The Contractor shall coordinate all requirements with the elevator manufacturer for a complete design, installation, and checkout of specific elevator supplied.

The Contractor shall coordinate additional structural steel support requirements with the elevator manufacturer based on the specific equipment provided.

#### 1.2.2 Design Requirements

Provide passenger elevator, accessory equipment, and installation that meets or exceeds requirements of ASME A17.1/CSA B44.

Manufacturer's Standard Color Charts shall be submitted for elevator systems showing the manufacturer's recommended color and finish selections. Sample alarm covers shall also be submitted for approval.

##### 1.2.2.1 Electrical and Fire Alarm Requirements

Section 26 20 00 entitled INTERIOR DISTRIBUTION SYSTEM applies to work specified in this section.

Section 28 31 00.00 98 entitled FIRE DETECTION AND ALARM applies to work specified in this section.

#### 1.2.3 Performance Requirements

Hoist motor shall provide continuous service of not less than 140 floor stops per hour, and with this service motor windings shall not exceed 50 degrees C ambient temperature rise. Speed regulation, when the car is carrying its rated load, shall not exceed plus or minus 5 percent of the average round trip speed. Acceleration under full load, up and down, shall not exceed 10 percent of Operating Speed.

#### 1.2.4 Operational Requirements

This new Elevator 16, and associated components, shall operate in combination with existing Elevator 15. Replace Elevator 15 control systems with Programmable Automation Controller equipment matching new Elevator 16. Standardize each elevator's operating sequences and software to the greatest extent possible.

##### 1.2.4.1 Hoistway and Car Door

Doors shall operate smoothly in both directions and shall be cushioned to stop at full-open and full-closed positions. Maximum closing speed of the doors shall comply with ASME A17.1/CSA B44 Section 2.13 Power Operation of Hoistway Doors and Car Doors.

Door operations shall be integrated with car-leveling system to prevent elevator movement before doors close.

Doors shall operate in following manner:

- a. Hoistway door closure shall lead to car-door enclosure; car-door opening shall lead to hoistway-door opening.
- b. Hoistway door opening shall not begin until car is stopped.
- c. Upon initial opening, doors remain open for a predetermined interval, adjustable from 0 to 8 seconds.

- d. DOOR OPEN buttons shall open doors unless elevator is in motion. DOOR CLOSE button is supplementary to automatic closure of doors when a call button is pressed.
- e. Pressing DOOR OPEN button shall temporarily open doors unless car is moving. Pressing DOOR CLOSE button shall close doors, subject to door-edge controls specified.
- f. Door closing shall reverse when using DOOR OPEN button or car door infra-red light curtain sensors are interrupted.
- g. Upon initial interruption of photoelectric light curtain, door reclosing time shall become shorter at a predetermined interval, adjustable from 0 to 4 seconds.
- h. Should either light curtain be interrupted while doors are closing, doors shall return to open position, reclosing again after a predetermined interval.
- i. When doors are unable to close within an interval of 0 to 30 seconds, the photoelectric unit shall be made inoperative and a loud buzzer shall be activated while doors close at reduced speed.

#### 1.2.4.2 Operating and Control System

Design system for automatic flush leveling of car at each stop.

Single Car Operation: Operation system shall be "selective collective automatic operation" as defined by ASME A17.1/CSA B44. Car shall return to first-floor landing after calls are satisfied, remaining there with doors closed until a call is registered. Key-activated maintenance switch shall deactivate call buttons and permit car operation by car station buttons. Provide maintenance switch control at Landings.

Multiple Car Operation: Operation system shall be "selective collective automatic operation." Provide these additional features with key-operated selector switch:

- a. When no calls are registered, one car shall be stationed at Landing No. 1 fully lighted with doors open, and the other car shall be located at a designated upper landing with lighting maintained at 25 percent of normal illumination with doors closed. When fully lighted car leaves Landing No. 1, after a set time, illumination of other car shall normalize and car will return to Landing No. 1.
- b. When car is at first floor while another car is answering calls, standing car shall respond to calls for up travel, registered on floors below an active elevator traveling up; car shall respond to calls for down travel registered on floors above an active elevator traveling down.
- c. First car returning to home floor (Landing No. 1) shall remain there. The Landing No. 1 car shall then respond when up calls are registered on floors below an active car traveling up, or down calls from floors above an active car traveling down.
- d. Provide key-activated switches to place any car in single car operation; or to remove any car from service while others remain

in multiple car operation.

#### 1.2.4.3 Remote Monitoring System

The Kennedy Complex Control System (KCCS) is a combination of hardware and software components that are used to monitor and control Power, HVAC, Water and Waste, elevator, and Pneumatic Utilities across the Kennedy Space Center.

The elevator systems shall be provided with remote monitoring of elevator equipment functions with tie-in to the local KCCS System. The elevator control system shall be completely compatible with the CITECT based KCCS system.

CITECT is an Industrial Controls, Supervisor Control and Data Acquisition (SCADA) software application that is used to monitor and control the I/O devices connected to the KCCS network. The CITECT application provides the Human Machine Interface (HMI) to display, trend, alarm and control and/or monitors the I/O points connected to or through the I/O devices. Information is transferred to and from the CITECT server over a dedicated Ethernet controls network using Modbus TCP/IP as the preferred transportation protocol.

### 1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for Contractor Quality Control approval. The following shall be submitted in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

#### SD-02 Shop Drawings

The following shall be submitted for electric passenger elevator systems in accordance with paragraph entitled, "Shop Drawing Requirements," of this section.

Submit Shop Drawings for review and approval prior to equipment manufacturing.

Submit "As-Built" Shop Drawings after installation, inspection and testing is complete which document all field changes made. Provide Digital media compact disc (CD) with all submittals including .DWG or .DXF CAD source files as well as PDF format files for all drawings.

Connection Diagrams; G

Schematics; G

Fabrication Drawings; G

Elevator and accessories; G

Supporting systems; G

Machinery and controls; G

Wiring diagrams; G

Sequence of operations; G

Annotated Software; G

Installation Drawings; G

Submit for electric passenger elevator systems in accordance with the paragraph entitled, "Installation," of this section.

KCCS Monitoring and Control Systems; G

Include hardware, software, and interconnection drawings which include details of the power sources and communications pathways for devices accessed by KCCS.

KCCS Integration Project Data; G

Provide prior to the second and third KCCS integration review meetings. Submit read/write register list that is available through TCP/IP Modbus and/or RS-485 Modbus for remote KCCS monitoring.

#### SD-03 Product Data

Equipment and performance data shall be submitted for the following items consisting of load ratings, design speeds, car and platform dimensions, and opening and closing speeds.

Manufacturer's data shall be submitted for the following items also:

Car Frame and Platform; G

Driving Machine; G

Steel Support Requirements; G

Hoistway and Car Doors; G

Operation and Control Systems; G

Emergency Operation and Signaling; G

Operating Devices; G

Telephone; G

Guide Rails; G

Terminal Stopping Devices; G

Safeties; G

Electrical Protective Devices; G

Electrical Equipment; G

Elevator Pit and Buffers; G

Elevator and accessories; G  
Elevator supporting systems; G  
Data sheets; G  
Maintenance and diagnostic tools; G  
Programmable Automation Controller; G  
Control components and enclosures; G  
Uninterruptible Power Supply (UPS); G  
Software packages; G

Software tools; G

Manufacturer's data shall be submitted for the following items as well:

Paint Materials; G  
Manufacturer's Standard Color Charts; G  
Entrances; G  
Counterweights; G  
Hoisting Ropes; G  
Emergency Exit; G

Detailed weights shall be provided for all equipment, components, materials and products which will be installed in the elevator machine room during construction/fabrication as a permanent part of the facility.

SD-05 Design Data

Reaction loads; G  
Elevator Engineering Calculations; G

SD-06 Test Reports

Test reports on the following tests shall be submitted for elevator systems in accordance with ASME A17.1/CSA B44. Include continuous-operations test, temperature rise test, and acceptance inspections.

Field Test Plan; G  
Submit for approval prior to field testing.

Field Test Results; G  
Submit for record and in the Operations and Maintenance Manual after final field testing is complete.

Elevator KCCS Test; G

Showing elevator monitoring and communication system hardware successfully communicate with existing CITECT Software.

#### SD-07 Certificates

Certificates shall be submitted in accordance with paragraph entitled, "Certifications," of this section.

Welders' qualifications; G

Controls Specialist Qualifications; G  
Submit qualifications of the controls engineer that will perform PAC controls installation, KCCS system integration, and overall system validation.

#### SD-10 Operation and Maintenance Data

Elevator, Data Package 4; G  
Include as-built drawings, as-built annotated software program, sequence of operation, and field test results. Submittal shall include digital files (.pdf format) on compact disc of the entire manual.

Submit in accordance with Section 01 78 23 OPERATION AND MAINTENANCE DATA.

Maintenance and Repair Action Plan; G

Operations and Maintenance Manuals; G

Provide final as-built read/write register list that is available through TCP/IP Modbus and/or RS-485 Modbus for remote KCCS monitoring.

System software; G  
Provide two licensed copies of all software necessary to modify and download the programs to elevator control and monitoring systems.

### 1.4 QUALITY ASSURANCE

#### 1.4.1 Qualification

Provide an engineered elevator system by a manufacturer regularly engaged in the manufacture of elevator systems. The manufacturer shall either install elevator system or shall provide letter of endorsement certifying that the elevator-system installer is acceptable to the manufacturer. An installer is required to be regularly engaged in the installation and maintenance of elevator system.

#### 1.4.2 Shop Drawing Requirements

Provide assembly and arrangement of elevator(s), accessories, and supporting systems. Show location of machinery and controls in machine room. Provide details for materials and equipment, including but not limited to operating and signal fixtures, doors, door and car frames, car enclosure, controllers, motors, guide rails and brackets, layout of hoistway in plan and elevation, and other layout information and clearance dimensions. Submit complete wiring diagrams and sequence of operations,

which show electrical connections and functions of elevator systems, for the machine room, hall and in the hoistway. Include the following:

1. Demolition of all required existing Elevator 15 equipment. Show existing condition and demolition details on separate sheets. Show all existing equipment, wiring, and devices to be removed and retained. Upon completion of adequate field investigations, show existing conditions through digitized photographs or details on CAD drawings.
2. Fabrication Drawings shall be submitted for electric passenger elevator systems consisting of fabrication and assembly details to be performed in the factory.
3. Connection Diagrams shall be submitted for electrical passenger elevator systems indicating the relations and connections of devices and apparatus by showing the general physical layout of all controls, the interconnection of one system (or portion of system) with another, and internal tubing, wiring, and other devices.
4. Installation drawings, including dimensioned layouts in plan and elevation showing the arrangement of elevator equipment, accessories, support systems, anchorage of equipment, and clearances for maintenance and operation. Provide details on hoistway, operation and signal stations, controllers, motors, guide rails and brackets, elevator equipment and points of interface with electrical power, fire alarm, communications, and HVAC or exhaust systems.
5. Elevator Monitoring and Control Systems (KCCS); Hardware, software, read/write register lists, and interconnection drawings which include details of the power sources and communications pathways for devices accessed by KCCS.
6. Complete power three line diagrams, control logic diagrams, communications wiring diagrams, control schematics, and wiring interconnection diagrams of all electrical systems showing all equipment, instrument and component locations and there interconnection. Prepare drawings with complete wiring diagrams showing electrical connections and other details required to demonstrate sequence of operations and functions of system devices. Include the appropriate sizing of electrical protective devices on the drawings, which are frequently different from National Electrical Code standard sizes.
7. Sequence of Operations (S00) on control diagrams describing the operation of the process with alarms and set points and ranges, where necessary. Require systems supervised and controlled by programmable automation controllers (PAC).
8. Complete and fully annotated software logic submittals.

#### 1.4.3 Product Data Requirements

Submit manufacturer's catalog data, technical data sheets, operations manuals, maintenance manuals, parts lists, and all other technical data required to fully detail all components to be provided by the Contractor. All such components shall be approved prior to the Contractor developing

shop drawings. Installation of all components approved shall be detailed on manufacturer's shop drawings.

Include information on motor, hall station, and buffer on elevators and accessories. For elevator supporting systems, include information on car control and emergency power systems, and for data sheets, provide document identification number or bulletin number, published or copyrighted prior to the date of contract bid opening.

#### 1.4.4 Design Data

##### 1.4.4.1 Reaction Load Data Requirements

Provide calculations to the Contracting Officer for reaction loads imposed on building by elevator system. Demonstrate calculations complying with ASME A17.1/CSA B44, Appendix F. Provide calculations certified by a licensed structural engineer registered in any state. Do not fabricate materials nor perform construction until approved by the Contracting Officer.

##### 1.4.4.2 Elevator Engineering Calculations

Submit all engineering calculations associated with the elevator design including motor power ratings, motor torque ratings, weight and speed ratings, wire size calculations, etc.

##### 1.4.5 Certificates: Welders' Requirements

Comply with AWS D1.1/D1.1M, Section 5. Include certified copies of welders' qualifications. List welders' names with corresponding code marks to identify each welder's welding work.

##### 1.4.6 Testing and Independent Testing Laboratory

Contractor shall employ an independent testing laboratory to conduct tests specified.

Furnish the services of a manufacturer's representative and Controls Specialist to perform programming, start-up and testing services for the new and modified elevators.

Provide complete elevator system field installation test plan to be submitted for approval prior to start-up and testing of elevator equipment.

Provide complete field test results of the elevator systems. These tests will be witnessed by the Government and Government approval will be required prior to contract completion. The completed field test results shall be submitted to the Government for record.

##### 1.4.7 Certifications

Certificates shall be submitted certifying that each product used complies with ASME A17.1/CSA B44, Section 8.3, and has been tested to those requirements by an independent testing laboratory within a two year period.

#### 1.5 NEW INSTALLATION SERVICE

Provide routine warranty service in accord with the manufacturer's warranty

requirements, for a period of 12 months after the date of acceptance by Contracting Officer. Include 24-hour emergency service, with 1 hour response time, during this period without additional cost to the Government. Include adjustments, greasing, oiling, and cleaning. Provide routine inspection and tests of elevators in accordance with ASME A17.1/CSA B44 Section 8.11 and ASME A17.2. Provide supplies and parts to keep elevator system in operation. Perform service only by factory trained personnel.

#### 1.5.1 Special Operations

Every six months, test systems for Emergency Power Operation, and Firefighters Service. Schedule to not interfere with building operations. For Firefighters Service, test monthly in accordance with ASME A17.1/CSA B44, Section 8.6.4.19.6. Deliver written results of each test operation to the Contracting Officer.

#### 1.5.2 Maintenance and Diagnostic Tools

Elevator control software shall be non-proprietary. Provide all special tools and software necessary to service and maintain each elevator; deliver at time of final acceptance. Provide two of each tool and software. Provide solid state or microprocessor diagnostic tools unavailable on the open market. Include necessary diagnostic software in cases where the solid state or microprocessor diagnostic tools are available on the open market.

#### 1.5.3 Keys for Elevator Key Switches

Provide a minimum of twelve keys per unique cylinder used on all key switches for a single elevator. If there is more than one elevator, additional keys will not be required unless there are additional unique lock cylinders. Provide keys with brass or fiberglass tags marked "PROPERTY OF THE U.S. GOVERNMENT" on one side with function of key or approved code number on the other side.

### 1.6 FIRE PROTECTION SYSTEM

Additional fire protection requirements are located in; Division 28. Elevator fire alarm interface is as shown on contract drawings. The Contractor is required to program the elevator controls to communicate with the local modular fire control panel.

### 1.7 MAINTENANCE

#### 1.7.1 Maintenance and Repair Action Plan

Provide plan of action by the Elevator Installation Contractor to provide emergency and routine maintenance in accordance with paragraph entitled "New Installation Services". In addition to Data Package SD-10 "Operation and Maintenance Data", provide a list of phone numbers, personnel contacts, and all tools to be provided to the Contracting Officer.

Submit elevator manuals in accordance with Section 01 78 23 OPERATION AND MAINTENANCE DATA.

## PART 2 PRODUCTS

## 2.1 ELEVATOR DESCRIPTION

Provide elevator system that complies with ASME A17.1/CSA B44 in its entirety, ASME A17.2 in its entirety, ASME A17.5 in its entirety, ASME A17.6 in its entirety, and additional requirements specified herein.

## 2.1.1 Passenger Elevator

- a. Type: Gearless
- b. Rated load: 8,000 lb.
- c. Rated Speed: 700 fpm
- d. Travel Length: 419'-9" ft.
- e. Number of Stops: 34 (see f.)
- f. Number of Hoistway Openings: 19 Front; 14 Rear (3 Catwalks and up to 11 platforms) plus the first floor level.
- g. Car Inside Dimensions: 92-3/4 in. wide, 116-1/4 in. deep and 113-5/8 in. high
- h. Platform Size: Overall dimensions of the platform shall be 8' wide, 11' deep, to be verified in the field. The platform shall be constructed of structural steel.
- i. Car Door Opening: 5 ft. 0 in. wide and 8 ft. 0-1/4 in. high
- i. Car Door Types: Two-speed side slide Horizontal sliding.

## 2.1.1.1 Cab Enclosures and Door Finishes

Finish for corrosion-resistant steel shall be ASM 065 42G No. 6.

Provide finishes as listed below:

- a. Floor; Top floor plate shall be 1/4" Type 5052, Temper H32, anti-skid aluminum diamond deck plate with 15 lb. felt isolation between top floor plate and subfloor. The remainder of the floor will be stainless steel (Type 316L).
- b. Walls; prefinished steel. Provide each cab wall with equally spaced and equally sized wall panels. All wall panel fasteners shall be concealed.  
Wall trim; stainless steel.  
Accessories; stainless steel Type 304 or 316 hand rails.
- c. Interior face of door(s); prefinished baked-on enamel steel panels.
- d. Ceilings; prefinished steel panels.  
Ceiling frame; stainless steel.
- e. Hoistway Doors and Frame Finishes

Provide finishes on exterior of hoistway as follows:

1. Frame; stainless steel.
2. Exterior face of door; prefinished baked-on enamel steel panels to match existing.

#### 2.1.1.2 Car Roof Hatch

Car roof hatch shall be approximately 2 inches above the roof level with overlapping inverted ends on the cover to waterproof the opening. The exit hatch shall be as large as practical, not less than 18 inches x 24 inches.

Top exit hatch to open with key from inside of door and open without key from the car top.

#### 2.1.1.3 Ventilating System

Provide a forced air ventilating system incorporating a three-speed squirrel cage blower delivering 100 cfm per person of rated car capacity. Blower shall be sized to deliver the air required at a fan speed of 1600 rpm. Design mounting for low noise and to prevent vibration. Motor shall be UL listed.

### 2.2 SPECIAL OPERATION AND CONTROL

Provide all special operations and control systems in accordance with ASME A17.1/CSA B44. Provide special operation key switches with 7 pin cylinder locks with removable cores. Provide a key control lock for each operation system. This system shall have the ability to grant or block floor access via Best lock core key switch.

#### 2.2.1 Firefighters' Service

ASME A17.1/CSA B44, Section 2.27.3 Provide equipment and signaling devices including provisions on all potential front and rear landings. The designated level for firefighters' key operated switch is the ground floor.

#### 2.2.2 Smoke Detectors

Smoke detectors are specified in Section 28 31 00.00 98 FIRE DETECTION AND ALARM, including conduit and wiring from each detector to elevator machinery space control panel. Provide connections through the fire alarm system to elevator controls which will, when smoke is detected by any smoke detector, actuate Firefighters Service and send each elevator to the correct floor as required by ASME A17.1/CSA B44. Provide smoke detectors located in the elevator machine room. Smoke detector system must comply with ASME A17.1/CSA B44.

#### 2.2.3 Top-of-Car Operating Device

ASME A17.1/CSA B44, Section 3.26.2. Provide elevator with an operating device, mounted on or from the car crosshead, that will permit car operation at a speed not exceeding 150 fpm for purposes of adjustment, maintenance, testing, and repair. Include an integral or remote safety device, "UP" and "DOWN" switches or buttons, an emergency stop switch, and inspection switch.

#### 2.2.4 Hoistway Access Switches

ASME A17.1/CSA B44, Section 5.1.10. Provide key-operated hoistway access switches that permit limited movement of the car at terminal floors for car door opening and car positioning, operative only when the "INSPECTION" switch in car operating panel is in inspection position. Locate switch 6 feet above floor level, with in 12 inches of hoistway entrance frame of an elevator or with the ferrule exposed when located in entrance frame.

#### 2.2.5 Independent Service

Provide exposed key-operated switch in car operating panel to enable independent service and simultaneously disable in-car signals and landing-call responses. Provide indicator lights that automatically illuminate during independent service. If one car is removed from group, provide other car responding to its hall calls.

#### 2.2.6 Elevator Operation

ASME A17.1/CSA B44, Introduction, Section 1.3, Definitions.

##### 2.2.6.1 Duplex Selective Collective Automatic Operations

Provide Duplex Selective Collective Automatic Operation. Provide a single push button for terminal landings and dual push buttons, up and down, at intermediate landings. In each car operating panel, provide push buttons numbered to correspond to each landing. If a car is taken out of service or fails to respond to a landing call within a predetermined adjustable time limit of approximately 40 to 180 seconds, transfer calls to the other car functioning as a single car Selective Collective elevator until the out-of-service car is returned to the system.

#### 2.3 ELEVATOR MACHINE

ASME A17.1/CSA B44, Section 2.24, gearless traction, direct-drive machines. Paint or finish ferrous surfaces with minimum of two (2) coats (1 prime and 1 finish) of rust-inhibiting paint conforming to manufacturer's standard practice.

##### 2.3.1 Direct Current Drive Motor

NEMA MG 1, Part 18, hoisting drive motor with Class F insulation and rated for continuous duty.

#### 2.4 CONTROL EQUIPMENT

##### 2.4.1 Elevator 16 Controller Cabinet

Provide a NEMA 12, 10 gauge steel elevator controller cabinet as shown on contract drawings. Cabinet shall include (2) sections with separate doors and metal barrier; no 480V wiring shall be present within the controller section. The cabinet shall be environmentally controlled and have two steel back plates. Enclosure and back plates shall be of the same manufacturer. Provide an industrial corrosion inhibitor, ground lug, a local 120 VAC service receptacle and two 40-Watt fluorescent light (one for each section) with associated section door activated switch. The Contractor shall provide all electrical components and devices, support hardware, fasteners, interconnecting wiring and/or piping required to make the control panels and/or enclosures complete and operational. The bottom

six inches of all free standing panels shall be free of all devices, including terminal strips. Provide a three-point latch, surge protection for low voltage section, internal FLOR mounted online uninterruptible supply (UPS) sized to maintain power to the internal mounted PAC for a minimum of 15 minutes, and ground studs on body. The UPS shall provide surge protection to the 120V controls. The environmentally controlled enclosure shall be provided with an air cooled panel mounted CFC-free refrigerant air conditioner sized as required to maintain the electronics inside the enclosure at a set temperature of no more than 90 Deg F. and no internal condensation. Provide internal corrosion protection spray as required. Provide a front mounted set of selector switches for elevator maintenance with a plastic protection cover. The selector switches shall match those mounted on Elevator 15 control cabinet. Buttons for up to 15 stops on the reverse side (3 catwalks and up to 11 platforms and the ground floor) are required. Coordinate with the Contracting Officer. Provide a front mounted man machine interface (MMI) that shall allow the operators control of the elevator at the elevator enclosure. The MMI shall be windows based software configurable, with 8 user definable keys for elevator interface, two by twenty LCD characters display, 32k EEPROM memory, 24 VDC, and NEMA-4/IP65 rating. Where applicable, all Control Panel internal and front mounted lights shall be of the Light Emitting Diode (LED) type of color required by local code, industry practice or local AHJ. Elevator 16 controller cabinet shall be as manufactured by Hoffman model SEQUESTR or approved equal.

Control cabinet for Elevator 15 shall be modified to match the control, and human interface functions, as in elevator control cabinet 16.

All wiring to panel connections from field devices and other panels shall be terminated at master numbered terminal strips. Controls shall be completely wired with cable terminals, cable lugs, and terminal blocks. Terminal blocks shall be readily accessible for the external connections.

All control components, including but not limited to fuse blocks, pushbuttons, selector switches, indicating lights and terminal blocks, shall have a unique designation. A label with minimum 1/4-inch high lettering with the device designation shall identify the device. Wiring between sections/cubicles shall be identified in accordance with the approved shop drawing schematic and wiring diagrams.

Terminal blocks shall have engraved plastic terminal strips with screw type terminals having letter designations and numbered terminal points. Terminate all conductors with compression ring terminal lugs. Male/female spade or forked connectors shall not be used. Wire marking shall be at both ends. Wire markers shall be white plastic tubing heat stamped with black block type letters.

An identification plate engraved with circuit and function designations shall identify each elevator assembly.

#### 2.4.1.1 SCR Control

Provide individual isolation transformers and individual choke reactors for each individual hoist motor. Provide filtering to maintain harmonic distortion below IEEE standards as measured at the elevator machine room disconnect.

#### 2.4.2 Programmable Automation Controller (PAC)

Replace the existing GE 90-30 PLC located in the existing Elevator 15 controller cabinet with a new PAC as described below. Appendix D contains existing Elevator 15 control schematics to aid the Contractor to retain the number of IOs associated with the system. New Elevator 16, as a minimum shall match the same number of IOs as those in the existing Elevator 15 rework PAC. With the exception of the IOs associated with existing hall buttons in existing Elevator 15 Tower F, the Contractor shall accommodate the existing I/Os in the new PAC for existing Elevator 15. For the new elevator 16 control cabinet, provide a new PAC as described below. The PAC shall be GE FANUC (used in other VAB elevators) or approved equal designed and constructed for the demanding requirements of real time process management and control on a continuous basis for use in an industrial environment. The logic shall be entered and displayed in ladder diagram and functional block format. The ladder diagram format shall contain a complete cross reference with each coil referred to in logic and identified as normally open or normally closed. Mnemonic information shall be added to each coil and to both real and internal I/O points. Alphanumeric titles and descriptions shall appear on the screen. At each elevator control panel, provide the necessary number of I/O modules, and I/O expansion modules to meet an additional 20% of the total I/O elevator control count, and power supplies, necessary for the complete control and communications of Elevators 15 and 16. Programmable automation controllers shall be GE PAC-Systems RX3i. Provide the necessary communication modules to communicate between each PAC and via Ethernet with NASA Kennedy Complex Control System (KCCS). Each PAC shall be provided with the following features:

- a. Central Processor Unit (CPU) speed: 1 GHz, 64 Mbytes of memory, two serial ports.
- b. Universal backplate, 12 universal Slots, Provide expansion bases as required.
- c. 120/240V. 30-Watt Multipurpose power supply. Provide expansion power supplies as required.
- d. Provide the necessary expansion modules, expansion cables, terminal blocks, Logic Developer Software Program, and additional hardware necessary for a complete functioning system.

The Contractor shall provide labor and materials to load the PAC developers program, programming, configure, develop and place into satisfactory operation the PAC system and the MMI as specified in Section 2.4.1 to control Elevators 15 and 16 functions, and to communicate with existing fire alarm system, and existing Kennedy Complex Control System.

##### 2.4.2.1 Repair Requirements

For the repair and maintenance of the programmable automation controller system, provide maintenance tools (computers, cables, etc.), supporting computer software, and software documentation required for complete maintenance of elevator system including diagnostics and adjustments. Tools may be hand-held or built into control system. Provide tools which do not require recharging to maintain their memory or authorization for use. Do not use software which requires periodic reprogramming, or reauthorization. Programs shall be stored in non-volatile memory.

Elevator control software shall be non-proprietary. For each elevator PAC program, obtain a fully licensed copy of the development and programming code program for the life of the equipment. Contractor shall provide two copies of application software plus the operating licensed codes to NASA for the life of the equipment to include the software for MMIs/User interfaces.

#### 2.4.2.2 Remote Elevator Monitoring and Control

Provide complete elevator monitoring and control systems as described in this section. These systems are defined to include, but are not limited to, a programmable automation controller (PAC) that monitors and controls remote devices, human machine interface (HMI), electrical power monitoring system, device communications interface hardware, intercommunication wiring, software, startup and training services, and ongoing technical support. This system shall comply with the applicable portions of IEEE 802.3. The Manufacturer and Controls Specialist shall demonstrate that the communication systems provided under this project will communicate efficiently with the KCCS CITECT software. Efficiently implies that the data will be transmitted and received such that the response time to the KCCS workstation will be less than 4 seconds.

The following shall be remotely monitored and controlled for each elevator:

1. All hall call stations. The remote operator shall have the ability to activate or lock-out (disable) each hall call station individually.
2. Car call stations, front and rear. The remote operator shall have the ability to activate or lock-out (disable) each car call station individually.
3. Elevator position.
4. Power Status Monitor
5. Safety Status Monitor
6. System Normal Status Monitor
7. Up Status Monitor
8. Down Status Monitor
9. Front Door Open Limit Status Monitor
10. Front Door Close Limit Status Monitor
11. Rear Door Open Limit Status Monitor
12. Rear Door Close Limit Status Monitor
13. Rear Floor Door Lock Indicator
14. Door Gate Lock Status Monitor
15. Front Door Zone Status Monitor
16. Rear Door Zone Status Monitor
17. Run Local Status Monitor
18. Front Electric Eye Status Monitor
19. Rear Electric Eye Status Monitor
20. Security Override Status Monitor
21. In-Service Status Monitor
22. Inspection Status Monitor
23. Auto Mode Status Monitor
24. Independent Service Status Monitor
25. Door Disable Status Monitor
26. Emergency Power Status Monitor
27. Fire Service Phase 1 Status Monitor
28. Fire Service Phase 2 Status Monitor
29. Fire Service Zone 1 Status Monitor
30. Fire Service Zone 2 Status Monitor
31. Fire Service Bypass Status Monitor

32. Fire Service Not Safe To Use Status Monitor
33. OSRV Status Monitor
34. Heartbeat Status Monitor
35. Front Door Latest Time to Open
36. Front Door Latest Dwell Time
37. Front Door Latest Time to Close
38. Front Door Previous Time to Open
39. Front Door Previous Dwell Time
40. Front Door Previous Time to Close
41. Rear Door Latest Time to Open
42. Rear Door Latest Dwell Time
43. Rear Door Latest Time to Close
44. Rear Door Previous Time to Open
45. Rear Door Previous Dwell Time
46. Rear Door Previous Time to Close

A government sample KCC CITECT project for existing Elevator 15 containing a library of CITECT symbols, genies and super genies will be provided to the contractor to use for development of the new read/write registers.

The Government will provide the CITECT operator screens to monitor and control the new data points on any new or modified switchgear that communicates to KCCS. The Government will perform the final integration of the new screens, Genies, and Super Genies into the existing KCCS CITECT file server.

Three KCCS integration design reviews will be scheduled by the Contractor to ensure that all of the parties involved in developing any new CITECT interfaces are properly coordinated. The first meeting will be a kickoff meeting where the government will provide a sample KCCS CITECT project to assist in the development of new interfaces. Provide KCCS Project Integration Data for the second and third review meetings. At the second meeting the contractor will provide a sample of all the new types of CITECT interfaces that are being developed. At the third meeting the contractor will provide a fully working sample of the entire project. The first meeting shall be scheduled within 75 days of the contract award. See Appendix E for KCCS Console Elevator Monitoring Guide.

#### 2.4.3 PAC to RS485 Signal Multiplexer Channel Generator

The PAC to RS485 Multiplexer channel communication module shall be composed of a 3-wire bus with signal, DC power and common ground that shall be installed from the PAC I/O module section, throughout the elevator shaft hoist-way, till reaching the lowest floor level where an elevator call hall button has been installed. Each hall button associated with Tower F, Elevator 15 shall be reworked to include a module to interface with the multiplexer channel generator. The system shall interface each elevator hall call button and lights at each floor including the top floor, intermediate floors and bottom floor with the elevator PAC controller. Provide multiplexer channel generator interface modules for Elevator 16 and rework Elevator 15 to include a new car station module. The PAC to RS485 Signal Multiplexer Channel Generator system shall be as manufactured by Dupline or approved equal.

#### 2.4.4 Elevator Motor Control DC Drive

Provide an AC voltage to DC voltage silicon controlled rectifier (SCR) microprocessor based elevator drive to be installed inside a metallic control enclosure. The drive shall be supplied with the following features:

- a. A LED display unit shall be located on the face of the drive which shall display basic drive conditions and diagnostic information. Local control push buttons shall be located on the face of the drive for full local control of the unit. The drive shall be able to be connected to a three wire ungrounded power system or a four wire grounded or ungrounded power system. Basic drive specifications shall include 10-300 amps at 600V, 3-phase, 60HZ, 150% full load current for one minute and 250% full load current for five seconds, full wave six pulse SCR control, regulation to 0.05% with digital encode speed feedback, current regulated shunt field control, and self-adapting incoming power line. Instantaneous overcurrent protection, phase loss protection, DC bus fuse, field current economizer and loss protection. The elevator drive shall be able to remotely be controlled by a programmable automation controller (PAC) via a serial communication connection. Provide input protection as required by the National Electrical Code 2011 edition.

## 2.5 OPERATING PANELS, SIGNAL FIXTURES, AND COMMUNICATIONS CABINETS

### 2.5.1 Capacity and Data Plates

ASME A17.1/CSA B44, Section 2.16.3. Attach faceplates with spanner security screws. On car panel, provide stainless steel capacity and data plates, with name of elevator manufacturer.

### 2.5.2 Car and Hall Buttons

Provide recessed tamper-proof push buttons of minimum 3/4 inch size satin-finish stainless steel with illuminated jewel center. Match existing push buttons if possible.

### 2.5.3 Passenger Car-Operating Panel

ASME A17.1/CSA B44, Sections 2.27 and 2.26. Provide car with two car operating panel that contain operation controls and communication devices. Provide exposed, flush mounted buttons for the controls that must be passenger accessible. Provide service cabinet or keyed switches for those controls that should not be passenger accessible. Allow maximum 48 inches between car floor and center line of bottom button. Use engraving and backfilling or photo etching for button and switch designators. Do not use attached signs.

#### 2.5.3.1 Passenger Controls

- a. Illuminated operating call buttons identified to correspond to landings served by elevator car. For two openings at a floor, provide two buttons marked "FRONT" and "REAR" above button location.
- b. "DOOR OPEN" and "DOOR CLOSE" buttons.
- c. Keyed "STOP" switch in accordance with ASME A17.1/CSA B44, Section 2.26.2.21.
- d. "ALARM" button in compliance with UFAS, ADA, and ASME A17.1/CSA B44, Section 5.1.21.1. Alarm button shall be red with engraved legend "ALARM." Alarm button shall illuminate when pushed. Locate "ALARM" button at panel bottom.

- e. "FIRE DEPARTMENT" key switch, with "OFF-HOLD-ON" positions, in that order with key to be removable in all positions. Provide fire sign or jewel and audible signal device, in accordance with ASME A17.1/CSA B44, Section 2.27.3.1. Both visual and audible signals are activated when Phase I key switch in hall is activated or when smoke detector activates return of elevator(s) to main fire response floor. Visual and audible signal shall remain activated until car has reached designated or alternate fire response floor. Upon arrival at fire response floor visual signal remains illuminated and audible signal becomes silent.
- f. Emergency two-way communication. Provide momentary pressure, single illuminating pushbutton operated communication device that complies with ASME A17.1/CSA B44, UFAS, and the Americans with Disabilities Act.

#### 2.5.3.2 Service Controls

- a. Inspection switch that transfers car control to top-of-car inspection operating controls and prevents car operation from in-car control panel.
- b. Independent service switch.
- c. Two car light switches, one for light in car and one for lights on top and bottom of car frame.
- d. Fan switch, two-speed.
- e. Infra-red curtain unit cutout switch.
- f. 120-volt ac 60 Hz single-phase duplex electrical outlet of ground-fault-circuit-interrupt (GFCI) design.
- g. Device for communication between car and elevator machine room.

#### 2.5.3.3 Certificate Window

Provide a minimum 9-inch high by 6-inch wide certificate window in car operating panel for Elevator Inspection Certificate Form KSC F3-50 NS.

#### 2.5.4 Semi-Selective Door Operation

For elevator with rear opening at elevations differing from front opening, provide semi-selective door operation so that only car door or gate adjacent to hoistway door opens when car stops.

#### 2.5.5 Full-Selective Door Operation

For elevator with one or more rear openings at same level as front opening, provide full-selective operation with car and door operating buttons clearly marked for front and rear openings, front and rear car button for each such floor, and front and rear "DOOR OPEN" and "DOOR CLOSE" buttons. Only door for which the button was operated opens or closes.

#### 2.5.6 Switches and Devices

Provide elevator manufacturer's standard grade for switches and devices on car operating panel. Legibly and indelibly identify each device and its operating positions. Locate car dispatching buttons in identical positions in car operating panels for corresponding floors.

### 2.5.7 In-Car Position and Direction Indicator and Signal

In-car direction indicator shall be included in the in-car position indicator fixture.

#### 2.5.7.1 In-Car Position Indicator and Signal

Provide horizontal electrical or electronic digital position indicator located minimum of 84 inches above car floor. Arrange indicator to show floor position of car in hoistway and its traveling direction. Indicate position by illumination of numeral or letter corresponding to landing at which car is passing or stopping. Provide audible signal to alert passenger that elevator is passing or stopping at a floor. Provide audible signals exceeding ambient noise level by at least 20 decibels with frequency not higher than 1500 Hz.

#### 2.5.7.2 In-Car Direction Indicator and Signal

Provide visual and audible car direction indicators in car, indicating car traveling direction. For visual directional signal, provide arrow of minimum 2 1/2 inches in size. Use equilateral triangles for arrows, green for upward direction and red for downward direction. Provide audible signal that sounds once for upward direction and twice for downward direction. Match existing indicators if possible.

### 2.5.8 Landing Position and Direction Indicator and Signal

Provide a single fixture containing the landing position and direction indicators.

#### 2.5.8.1 Landing Position Indicator and Signal

Provide an electrical or electronic digital position indicator similar to the car position indicator. Arrange position indicator in wall horizontally above the door frame or vertically at the side of the door frame. Indicators to show floor position of car in hoistway. Indicate position by illumination of numeral or letter corresponding to landing at which car is passing or stopping.

#### 2.5.8.2 Landing Direction Indicator and Signal

Provide landing direction indicator with visual and audible signal devices. Provide single direction indicator at terminal floors; "UP" and "DOWN" direction indicator at intermediate floors. Provide equilateral triangles not less than 2 1/2 inches in size, green for upward direction and red for downward direction. Provide electronic audible device that sounds once for upward direction and twice for downward direction. Provide audible signals exceeding ambient noise level by at least 20 decibels with frequency not higher than 1500 Hz.

## 2.6 HOISTWAY AND CAR EQUIPMENT

ASME A17.1/CSA B44, Sections 2.1 and 2.7.

### 2.6.1 Car and Counterweight Guide Rails and Fastenings

ASME A17.1/CSA B44, Section 2.23. Paint rail shanks with one coat of black enamel. Provide pit channel for anchoring main guide rail brackets and

mounting buffers. Only T-section type guide rail is acceptable.

#### 2.6.2 Car and Counterweight Buffers

ASME A17.1/CSA B44, Section 2.22. Provide data plate on each buffer.

#### 2.6.3 Pit Equipment

ASME A17.1/CSA B44, Section 2.2. Provide pit channel for anchorage of main guide rail brackets and also for anchorage of counterweight guide rail brackets. Each channel shall span distance between guides. In addition, pit channel for main guide rails shall serve as mounting surface for car buffer(s). Pit channel for counterweight guide rails shall serve as mounting surface for counterweight buffer(s). Method of installation of channels, brackets and buffer mounts shall be such that pit waterproofing is not punctured. On completion of guide rail and buffer installation, both pit channels shall be fully grouted.

##### 2.6.3.1 Pit "STOP" Switch

Provide push/pull type pit "STOP" switch for stopping elevator motor, independent of regular operating device. Locate switch on same side of hoistway as ladder.

##### 2.6.3.2 Ladder

Demolish the existing hoistway ladder. Provide OSHA compliant replacement ladder if necessary and/or required by code.

##### 2.6.3.3 Lighting of Pits

Demolish existing lighting and replace with enclosed and gasketed fixtures as necessary to comply with ASME A17.1/CSA B44. The illumination shall be not less than 100 lx (10 fc) at the pit floor and at a pit platform (when provided).

##### 2.6.3.4 Lighting and Environment of Existing Machine Room

Demolish existing lighting and replace with fluorescent fixtures providing not less than 200 lx (19fc) at the floor level, at the standing surface of a working platform, or at the level of the standing surface when the car is in the blocked position.

The new equipment shall be of design to operate within the environment (ventilation) conditions of the existing machine room.

#### 2.6.4 Terminal Stopping Devices

ASME A17.1/CSA B44, Section 2.25.

#### 2.6.5 Wiring and Traveling Cables

NFPA 70, Article 620 and Section 26 20 00 INTERIOR DISTRIBUTION SYSTEM. Suspend traveling cables by means of self-tightening webbed devices.

#### 2.6.6 Emergency Signaling Devices

Provide an audible signaling device, operable from the Car Operating Panel button marked "ALARM". The audible signaling device shall be mounted in

the hoistway and shall conform to the requirements of ASME A17.1/CSA B44, Section 2.27.1.

## 2.7 PASSENGER CAR AND HOISTWAY DOOR ACCESSORIES

ASME A17.1/CSA B44, Sections 2.12, 2.13 and 2.14. Provide infra-red curtain unit. Provide high-speed electric operator, safety interlocks for car and hoistway doors, and electric safety contact to prevent car operation unless doors are closed. Provide electrical circuitry that restores car to service at specified time lapse with time out circuit as option for intensive service elevators. Provide hoistway door unlocking devices (escutcheons) at no more than 6-feet, 11-inches (6'-11") above the floor per ASME A17.2, Section 4.5, 1a.

### 2.7.1 Infra-red Curtain Unit

Provide Infra-red Curtain Unit (ICU) with multiple infra-red beams that protect to the full height of the door opening. Minimum coverage shall extend from 2 inches off the floor to 70 inches above floor level. Door operation must meet the requirements of ASME A17.1/CSA B44, Sections 2.27.3.1.6(e), 2.13.5 and 2.13.6.

## 2.8 PASSENGER ELEVATOR GUIDES, PLATFORM, AND ENCLOSURE

### 2.8.1 Roller Guides

ASME A17.1/CSA B44, Section 2.23. Provide roller guide assemblies in adjustable mountings on each side of car and counterweight frames in accurate alignment at top and bottom of frames.

### 2.8.2 Car Frame and Platform

ASME A17.1/CSA B44, Section 2.15.

### 2.8.3 Car Enclosure, Car Door, and Car Illumination

ASME A17.1/CSA B44, Section 2.14. Provide natural and forced ventilation, emergency exit, and stainless-steel hooks with fire retardant protective pads. Carpeting shall comply with ASME A17.1/CSA B44, Section 2.14.2.1.

#### 2.8.3.1 Car Shell Return Panels, Entrance Columns, Cove Base, and Transom

Provide 14 Gauge minimum nonperforated steel. Apply sound-deadening mastic on all exterior components.

#### 2.8.3.2 Car Top

Provide reinforced 12 gauge minimum steel with hinged exit, operable by hand from car top only. Provide electrical contact which prevents operation of elevator when emergency exit is open. Provide sound-deadening mastic on all exterior components.

#### 2.8.3.3 Car Door

Provide 16 gauge minimum steel, sandwich construction without binder angles. Provide a minimum of 2 door guide assemblies per door panel, one guide at leading and one at trailing door edge with guides in the sill groove their entire length of travel.

#### 2.8.3.4 Car Entrance Sill

Hoistway sills are existing and are to remain.

### 2.9 PASSENGER ELEVATOR HOISTWAY DOORS AND ENTRANCES

ASME A17.1/CSA B44, Sections 2.11 and 2.13. Provide hoistway entrance assemblies with a minimum 1-1/2 hour fire rating.

#### 2.9.1 Hoistway Entrance Frames

Frames are stainless steel and are existing.

#### 2.9.2 Hoistway Entrance Sills

Sills currently exist.

#### 2.9.3 Hoistway Entrance Doors

Remove all existing hoistway doors/assemblies for Elevator 16, and replace with new 90-minute fire rated doors and assemblies. For new doors, comply with ASME A17.1/CSA B44, Section 2.11.11.5.8, hollow metal non-vision construction with flush surfaces on car and landing sides. Provide a minimum of 2 door guide assemblies per door panel, one guide at leading edge and one at trailing edge with guides in the sill groove the entire length of travel. Provide sheet metal hoistway door track dust covers at each landing. Dust covers must cover door locks and door roller tracks and extend the full width of the door track and associated hardware.

#### 2.9.4 Entrance Fascias and Dust Covers

ASME A17.1/CSA B44, Section 2.11.10.1.

### 2.10 HANDICAPPED (ADA) ACCESS AND TELEPHONE PROVISIONS

Comply with 36 CFR 1191, Sections 4.10 for Elevator, 4.30 for Signage, and 4.31 for Telephones.

### 2.11 ALTERNATE POWER OPERATION

The alternate power shall be capable of running both elevators. All existing elevators located in the VAB operate normally when on alternate power. Elevator shall resume normal operation after power outages associated with power system transfers without operator intervention.

## PART 3 EXECUTION

### 3.1 INSTALLATION

Install in accordance with manufacturer's instructions, ASME A17.1/CSA B44, 36 CFR 1191, and NFPA 70. Provide installation drawings with complete details of equipment design, layout and connections. Include foundation data consisting of plan dimensions, elevations, equipment weight and operating loads, horizontal and vertical loads, horizontal and vertical clearances for installation, and size and location of anchor bolts.

#### 3.1.1 Traveling Cables

Do not allow abrupt bending of traveling cables.

### 3.1.2 Structural Members

Do not cut or alter. Restore any damaged or defaced work to original condition.

### 3.1.3 Safety Guards

Selector cables or tapes exposed to possibility of accidental contact in machine room shall be completely enclosed with 16 gage sheet metal or expanded metal guards, both horizontally and vertically. Exposed gears, sprockets, tape or rope sheaves, floor controllers, or signal machines, and their driving ropes, chains or tapes, and selector drums shall be guarded from accidental contact in accordance with ASME A17.1/CSA B44.

### 3.1.4 Miscellaneous Requirements

Include recesses, cutouts, slots, holes, patching, grouting, and refinishing to accommodate elevator installation. Use core drilling to drill all new holes in concrete. Finish work to be straight, level, and plumb. During installation, protect machinery and equipment from dirt, water, or mechanical damage.

At completion, clean all work including all new steel, and paint or spot paint with a minimum of two (2) coats (1 prime and 1 finish) of rust-inhibiting paint.

### 3.1.5 Firefighters' Service

Firefighters' service shall be complete including installation and wiring of all smoke detectors in accordance with ASME A17.1/CSA B44, Sections 2.8.3.3.4 and 2.27.3. Coordinate smoke detector installation for Firefighters' Service.

## 3.2 FIELD QUALITY CONTROL

After completing elevators system installation, notify Contracting Officer that elevator system is ready for final inspection and acceptance test.

Contractor shall perform all required tests and demonstrate proper operation of each elevator system and prove that each system complies with contract requirements and ASME A17.1/CSA B44, and the applicable requirements of Part XI, "Engineering and Type Tests". Inspection procedures in ASME A17.2 form a part of this inspection and acceptance testing. All testing and inspections shall be conducted in the presence of the elevator inspector. Demonstrate the proper operation of all equipment at various date settings, selected by the elevator inspector, ranging from the date of contract award through 24 months from final acceptance.

Inspector shall complete, sign and post the Elevator Inspection Certificate after successful completion of inspection and testing.

### 3.2.1 Testing Materials and Instruments

Furnish testing materials and instruments required for final inspection. Include calibrated test weights, tachometer, 600-volt megohm meter, volt meter and ammeter, three Celsius calibrated thermometers, door pressure gage, spirit level, stop watch, dynamometer, and 100 foot tape measure.

### 3.2.2 Field Tests

#### 3.2.2.1 Endurance Tests

Test each elevator for a period of one hour continuous run, with specified rated load in car. Restart the one hour test period from beginning, following any shutdown or failure. During test run, stop car at each floor in both directions of travel for standing period of 10 seconds per floor. The requirements for Rated Speed, Leveling, Temperature Rise and Motor Amperes Test specified herein are to be met throughout the duration of the Endurance Test.

#### 3.2.2.2 Speed Tests

Determine actual speed of each elevator in both directions of travel with rated load and with no load in elevator car. Make Speed tests before and immediately after Endurance test. Determine speed by tachometer reading, excluding accelerating and slow-down zones per ASME A17.2. Minimum acceptable elevator speed is the Rated speed specified. Maximum acceptable elevator speed is 110 percent of Rated speed.

#### 3.2.2.3 Leveling Tests

Test elevator car leveling devices for landing accuracy of plus or minus 1/4 inch at each floor with no load in car, symmetrical load in car, and with rated load in car in both directions of travel. Determine accuracy of floor landing both before and immediately after endurance tests. For Class C2 landing, freight elevators shall comply with ASME A17.1/CSA B44, Section 2.16.2.2. The maximum load on car platform during loading or unloading shall not exceed 150 percent of rated load.

#### 3.2.2.4 Insulation Resistance Tests

Perform tests to ensure elevator wiring systems are free from short circuits and grounds. Minimum acceptable insulation resistance for electrical conductors is one megohm between each conductor and ground and between each conductor and other conductors. Prior to megohm meter test, make provisions to prevent damage to electronic devices.

#### 3.2.2.5 Brake Test

Conduct brake test with 125 percent of rated load in elevator. Verify that brakes stop and hold elevator with 125 percent of rated load.

#### 3.2.2.6 Buffer Tests

Test buffers for car and counterweight as outlined in ASME A17.1/CSA B44, Section 8.3.2.5.

#### 3.2.2.7 Temperature Rise Tests

Determine temperature rise of elevator hoisting motor and booster during full-load test run for one hour minimum. Under these conditions, maximum acceptable temperature rise shall not exceed acceptable temperature rise indicated on manufacturer's data plate. Start test only when equipment is within 5 degrees C of ambient temperature.

3.2.2.8 Balance Tests

Perform electrical and mechanical balance tests of car and counterweight.

3.2.2.9 Motor Ampere Tests

Measure and record motor amperage when motor is running and elevator is lifting at rated load and speed. Measure and record motor amperage at beginning and end of Endurance test.

3.2.2.10 KCCS Monitoring and Control Tests

All KCCS monitoring and control points shall be end-to-end tested for proper operation.

3.3 MAINTENANCE SERVICE TRAINING

Prior to Government acceptance of completed elevator systems, provide qualified representative of elevator manufacturer to instruct in two separate sessions up to ten Government personnel in care, adjustment, and maintenance of elevator equipment for a period of not less than 5 working days immediately following acceptance of elevator system.

Operations and maintenance data packages in accordance with Section 01 78 23 OPERATION AND MAINTENANCE DATA shall be submitted and approved prior to the Operation and Maintenance Training and used during the training sessions.

-- End of Section --

## SECTION 26 00 00.00 20

## BASIC ELECTRICAL MATERIALS AND METHODS

07/06

## PART 1 GENERAL

## 1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

## ASTM INTERNATIONAL (ASTM)

ASTM D 709 (2001; R 2007) Laminated Thermosetting Materials

## INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)

IEEE 100 (2000; Archived) The Authoritative Dictionary of IEEE Standards Terms

IEEE C2 (2012; Errata 2012; INT 1 2012; INT 2 2012) National Electrical Safety Code

IEEE C57.12.28 (2005; INT 3 2011) Standard for Pad-Mounted Equipment - Enclosure Integrity

IEEE C57.12.29 (2005) Standard for Pad-Mounted Equipment - Enclosure Integrity for Coastal Environments

## NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

NEMA 250 (2008) Enclosures for Electrical Equipment (1000 Volts Maximum)

## NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70 (2011; Errata 2 2012) National Electrical Code

## 1.2 RELATED REQUIREMENTS

This section applies to all sections of Division 26 and 14, ELECTRICAL, of this project specification unless specified otherwise in the individual sections.

## 1.3 DEFINITIONS

- a. Unless otherwise specified or indicated, electrical and electronics terms used in these specifications, and on the drawings, shall be as defined in IEEE 100.
- b. The technical sections referred to herein are those specification sections that describe products, installation procedures, and equipment operations and that refer to this section for detailed description of

submittal types.

- c. The technical paragraphs referred to herein are those paragraphs in PART 2 - PRODUCTS and PART 3 - EXECUTION of the technical sections that describe products, systems, installation procedures, equipment, and test methods.

#### 1.4 ELECTRICAL CHARACTERISTICS

Electrical characteristics for this project shall be 480Y/277 and 208Y/120 volts secondary, three phase, four wire. Where indicated control power systems shall be rated 120/240 volts secondary single phase, three wire. Final connections to the existing power distribution system shall be made by the Contractor in the locations indicated on the drawings.

#### 1.5 ADDITIONAL SUBMITTALS INFORMATION

Submittals required in other sections that refer to this section must conform to the following additional requirements as applicable.

##### 1.5.1 Shop Drawings (SD-02)

Include wiring diagrams and installation details of equipment indicating proposed location, layout and arrangement, control panels, accessories, piping, ductwork, and other items that must be shown to ensure a coordinated installation. Wiring diagrams shall identify circuit terminals and indicate the internal wiring for each item of equipment and the interconnection between each item of equipment. Drawings shall indicate adequate clearance for operation, maintenance, and replacement of operating equipment devices.

##### 1.5.2 Product Data (SD-03)

Submittal shall include performance and characteristic curves.

#### 1.6 QUALITY ASSURANCE

##### 1.6.1 Regulatory Requirements

In each of the publications referred to herein, consider the advisory provisions to be mandatory, as though the word, "shall" had been substituted for "should" wherever it appears. Interpret references in these publications to the "authority having jurisdiction," or words of similar meaning, to mean the Contracting Officer. Equipment, materials, installation, and workmanship shall be in accordance with the mandatory and advisory provisions of NFPA 70 unless more stringent requirements are specified or indicated.

##### 1.6.2 Standard Products

Provide materials and equipment that are products of manufacturers regularly engaged in the production of such products which are of equal material, design and workmanship. Products shall have been in satisfactory commercial or industrial use for 2 years prior to bid opening. The 2-year period shall include applications of equipment and materials under similar circumstances and of similar size. The product shall have been on sale on the commercial market through advertisements, manufacturers' catalogs, or brochures during the 2-year period. Where two or more items of the same class of equipment are required, these items shall be products of a single

manufacturer; however, the component parts of the item need not be the products of the same manufacturer unless stated in the technical section.

#### 1.6.2.1 Material and Equipment Manufacturing Date

Products manufactured more than 3 years prior to date of delivery to site shall not be used, unless specified otherwise.

#### 1.7 WARRANTY

The equipment items shall be supported by service organizations which are reasonably convenient to the equipment installation in order to render satisfactory service to the equipment on a regular and emergency basis during the warranty period of the contract.

#### 1.8 MANUFACTURER'S NAMEPLATE

Each item of equipment shall have a nameplate bearing the manufacturer's name, address, model number, and serial number securely affixed in a conspicuous place; the nameplate of the distributing agent will not be acceptable.

#### 1.9 FIELD FABRICATED NAMEPLATES

ASTM D 709. Provide laminated plastic nameplates for each equipment enclosure, relay, switch, and device; as specified in the technical sections or as indicated on the drawings. Each nameplate inscription shall identify the function and, when applicable, the position. Nameplates shall be melamine plastic, 0.125 inch thick, white with black center core. Surface shall be matte finish. Corners shall be square. Accurately align lettering and engrave into the core. Minimum size of nameplates shall be one by 2.5 inches. Lettering shall be a minimum of 0.25 inch high normal block style.

#### 1.10 WARNING SIGNS

Provide warning signs for the enclosures of electrical equipment including substations, pad-mounted transformers, pad-mounted switches, generators, and switchgear having a nominal rating exceeding 600 volts.

- a. When the enclosure integrity of such equipment is specified to be in accordance with IEEE C57.12.28 or IEEE C57.12.29, such as for pad-mounted transformers and pad-mounted SF6 insulated load-break and load-interrupter switches, provide self-adhesive warning signs on the outside of the high voltage compartment door(s). Sign shall be a decal and shall have nominal dimensions of 7 by 10 inches with the legend "DANGER HIGH VOLTAGE" printed in two lines of nominal 2 inch high letters. The word "DANGER" shall be in white letters on a red background and the words "HIGH VOLTAGE" shall be in black letters on a white background. Decal shall be Panduit No. PPS0710D72 or approved equal.

#### 1.11 ELECTRICAL REQUIREMENTS

Electrical installations shall conform to IEEE C2, NFPA 70, and requirements specified herein.

## 1.12 INSTRUCTION TO GOVERNMENT PERSONNEL

Where specified in the technical sections, furnish the services of competent instructors to give full instruction to designated Government personnel in the adjustment, operation, and maintenance of the specified systems and equipment, including pertinent safety requirements as required. Instructors shall be thoroughly familiar with all parts of the installation and shall be trained in operating theory as well as practical operation and maintenance work. Instruction shall be given prior to acceptance or turn over of the system to the Government for regular operation. The number of man-days (8 hours per day) of instruction furnished shall be as specified in the individual section. When more than 4 man-days of instruction are specified, use approximately half of the time for classroom instruction. Use other time for instruction with equipment or system. When significant changes or modifications in the equipment or system are made under the terms of the contract, provide additional instructions to acquaint the operating personnel with the changes or modifications.

## PART 2 PRODUCTS

## 2.1 FACTORY APPLIED FINISH

Electrical equipment shall have factory-applied painting systems which shall, as a minimum, meet the requirements of NEMA 250 corrosion-resistance test and the additional requirements specified in the technical sections.

## PART 3 EXECUTION

## 3.1 FIELD APPLIED PAINTING

Paint electrical equipment as required to match finish of adjacent surfaces or to meet the indicated or specified safety criteria. Where field painting of enclosures for panelboards, load centers or the like is specified to match adjacent surfaces, to correct damage to the manufacturer's factory applied coatings, or to meet the indicated or specified safety criteria, provide manufacturer's recommended coatings and apply in accordance to manufacturer's instructions.

## 3.2 FIELD FABRICATED NAMEPLATE MOUNTING

Provide number, location, and letter designation of nameplates as indicated. Fasten nameplates to the device with a minimum of two sheet-metal screws or two rivets.

## 3.3 WARNING SIGN MOUNTING

Provide the number of signs required to be readable from each accessible side, but space the signs a maximum of 30 feet apart.

-- End of Section --

## SECTION 26 05 63.00 98

## COORDINATED POWER SYSTEM PROTECTION AND ARC FLASH ANALYSIS

02/11

## PART 1 GENERAL

## 1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

## INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)

IEEE 1584	(2002, Am 1 2004, Int 1-3 2008) Guide for Performing Arc-Flash Hazard Calculations
IEEE 242	(2001; Errata 2003) Recommended Practice for Protection and Coordination of Industrial and Commercial Power Systems - Buff Book
IEEE 399	(1997) Brown Book IEEE Recommended Practice for Power Systems Analysis
IEEE C2	(2012; Errata 2012; INT 1 2012; INT 2 2012) National Electrical Safety Code

## INTERNATIONAL ELECTRICAL TESTING ASSOCIATION (NETA)

NETA ATS	(2009) Standard for Acceptance Testing Specifications for Electrical Power Equipment and Systems
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## NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

NEMA Z535.4	(2011) American National Standard for Product Safety Signs and Labels
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## NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70	(2011; Errata 2 2012) National Electrical Code
NFPA 70E	(2012) Standard for Electrical Safety in the Workplace

## 1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for Contractor Quality Control approval. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Fault Current and Arc Flash Analysis Review Submittals; G

Protective Device Coordination Study Review Submittals; G

Proposed Test Plan; G

SD-03 Product Data

Fault Current and Arc Flash Analysis; G

Protective Device Coordination Study; G

Equipment Data; G

System Coordinator; G

Protective Relays; G

Installation Procedures; G

SD-06 Test Reports

Field Testing; G

SD-07 Certificates

Certificates of Conformance for Devices and Equipment; G

1.3 ADMINISTRATIVE REQUIREMENTS

1.3.1 Pre-Installation Submittals and Meetings

No later than the first elevator design review submittal, submit the following to the Contracting Officer for review and approval:

- a. Fault Current and Arc Flash Analysis Review Submittals. Short circuit analysis shall be performed using the industry power system analysis software SKM or ETAP.
- b. Protective Device Coordination Study Review Submittals
- c. Proposed Test Plan

The Contractor and System Coordinator agree to attend a review meeting at a location designated by the Contracting Officer and provide review submittals as follows:

- a. 75 percent submittal and review meeting: Study is complete except for disposition of Government comments. Submit within 60 days after contract award.
- b. 100 percent submittal: Incorporates approved Government comments. Setting sheets and test procedures from these documents are to be used to implement protective device settings. Submit within 90 days after Contract award.

1.3.1.1 Proposed Test Plan

Submit a proposed test plan, consisting of complete field test procedure including tests to be performed, test equipment required, and tolerance

limits, including complete testing and verification of the ground fault protection equipment, where used.

#### 1.3.1.2 Review and Final Submittals Format

For review and final submittals, submit 5 bound copies and a PDF file formatted on Compact Disc (CD) and or electronic storage media. Also provide on a final submittal CD all power system analysis software data files necessary to restore and edit the model.

Submit performance test reports in booklet form showing all field tests performed to adjust each component and all field tests performed to prove compliance with the specified performance criteria, upon completion and testing of the installed system. Indicate in each test report the final position of controls.

##### a. Equipment data

Submit data consisting of manufacturer's time-current characteristic curves for individual protective devices, recommended settings of adjustable protective devices, and recommended ratings of non-adjustable protective devices.

Review protective device submittals of equipment to be provided and indicate any options or modifications required to achieve the requirements of this section. No time extensions or similar contract modifications will be granted for work arising out of the requirements for this study. The Government is not responsible for any changes to equipment, device ratings, settings, or additional labor for installation of equipment or devices ordered and/or procured prior to approval of the study.

##### b. Protective Relays

Submit data including calibration and testing procedures and instructions pertaining to the frequency of calibration, inspection, adjustment, cleaning, and lubrication.

##### c. Installation Procedures

Submit written description of procedures including diagrams, instructions, and precautions required to properly install, adjust, calibrate, and test the devices and equipment.

#### 1.3.2 Final Submittals

After completion of installation and testing submit the following to the Contracting Officer for review and approval:

Field Test Results - Submit in booklet form showing all field tests performed to adjust each component and all field tests performed to prove compliance with the specified performance criteria, upon completion and testing of the installed system. Indicate in each test report the final position of controls.

#### 1.3.3 Field Changes

If field changes are required due to discrepancies between the setting sheet documents and the available setting selections on the protective device, submit within 10 days after installation the following to the

Contracting Officer for review and approval:

- a. Fault Current and Arc Flash Analysis
- b. Protective Device Coordination Study

#### 1.4 QUALITY ASSURANCE

Ensure all work performed is in conformance with the following standards:

IEEE C2

IEEE 1584

NEMA Z535.4

NETA ATS

NFPA 70

NFPA 70E

##### 1.4.1 System Coordinator

Provide documentation verifying that system coordination, recommended ratings and settings of protective devices, and design analysis are prepared (performed/reviewed/approved) by a registered professional electrical power engineer with a minimum of 3 years of current experience in the coordination of electrical power systems.

##### 1.4.2 System Installer

Ensure all final calibration, testing, adjustment, and placing into service of the protective devices is accomplished by a manufacturer's product field service engineer or independent testing company with a minimum of two years of current product experience in protective devices.

#### 1.5 RELATED REQUIREMENTS

Section 26 08 00 APPARATUS INSPECTION AND TESTING applies to this Section.

### PART 2 PRODUCTS

#### 2.1 SYSTEM DESCRIPTION

The power system covered by this specification consists of one complete traction elevator as specified in Section 14 21 00.00 20.

The Government will provide the short circuit values for the following connection points on the electrical system: Automatic transfer switch ATS-07.

The Government will provide the existing protective device settings for devices on the existing electrical system which will impact this analysis. The Contractor shall verify that the protective device settings are in place.

## 2.2 ARC FLASH LABELS

Provide weatherproof detailed arc flash warning labels for all electrical equipment as required by NFPA 70 and NFPA 70E, including transformers, main breakers, enclosed breakers, safety switches, automatic transfer switches, control panels, and other equipment modified or installed by the project that is likely to require examination, adjustment, servicing, or maintenance while energized.

### 2.2.1 Label Format

Label format is to be NFPA 70E detailed format type. Conform in detail with samples provided at the time of award. Format includes different colors and formatting per NEMA Z535.4 for different hazard levels and the following information:

- a. Flash hazard boundary
- b. Incident energy
- c. Hazard Category and PPE
- d. Shock Voltage
- e. Minimum insulated glove rating
- f. Limited approach boundary distance
- g. Restricted approach boundary distance
- h. Prohibited approach boundary distance

### 2.2.2 Label Content

Ensure arc flash label content is based on the operational scenario, fault location, and fault type (arcing or bolted) that results in the highest incident energy.

## 2.3 COORDINATED POWER SYSTEM PROTECTION

Prepare and submit analyses to demonstrate that the equipment selected and system constructed meet the contract requirements for ratings, coordination, and protection. Include a fault current and arc flash analysis, equipment evaluation report, and a protective device coordination study.

Prepare and submit short circuit studies, load flow studies, and arc-flash hazard analysis in accordance with NETA ATS and as specified herein.

### 2.3.1 Scope of Analyses

Ensure the fault current and arc flash analysis, and protective device coordination study begin at:

The two (2) nearest upstream device in series (feeder-main) in the existing source system and extend through the downstream devices at the load end.

### 2.3.2 Determination of Facts

Perform field inspections to determine and document the time-current characteristics, features, and nameplate data for each existing protective device. Utilize the fault current availability indicated as a basis for fault current studies.

### 2.3.3 Single Line Diagram

Prepare a single line diagram to show the electrical system buses, devices, transformation points, and all sources of fault current (including generator and motor contributions). A fault-impedance diagram or a computer analysis diagram may be provided. Ensure each bus, device or transformation point has a unique identifier. If a fault-impedance diagram is provided, show impedance data. Show the location of switches, breakers, and circuit interrupting devices on the diagram together with available fault data, and the device interrupting rating.

### 2.3.4 Fault Current Analysis

#### 2.3.4.1 Method

Perform the fault current analysis in accordance with methods described in IEEE 242, and IEEE 399. Single line drawings based on existing hardware will be provided to the Contractor for reference. Utilize the specialized computer aided engineering software, SKM or ETAP, designed for fault current analysis, including the following capabilities:

From Source Feeder SS811 (Tower F, 32nd Floor Substation 811) Circuit 5B and from Source Feeder at Panel DP879 (Tower E, 32nd Floor) Circuits 26, 28, and 30.

Perform analysis and provide separate study report generated for each operational scenario.

#### 2.3.4.2 Data

Utilize actual hardware data in fault calculations. Ensure bus characteristics and transformer impedance are those proposed. Document all data in the report.

#### 2.3.4.3 Fault Current Availability

Provide balanced three-phase fault, bolted line-to-line fault, and line-to-ground fault current values at each voltage transformation point and at each power distribution bus. Show the maximum and minimum values of fault available at each location in tabular form on the diagram or in the report.

### 2.3.5 Coordination Study

Ensure the study demonstrates that the maximum possible degree of selectivity has been obtained between devices specified, consistent with protection of equipment and conductors from damage from overloads and fault conditions. Include a description of the coordination of the protective devices in this project. Provide a written narrative describing:

- a. Which devices may operate in the event of a fault at each bus; the logic used to arrive at device ratings and settings;

- b. Situations where system coordination is not achievable due to device limitations (an analysis of any device curves which overlap);
- c. Coordination between upstream and downstream devices; and relay settings.
- d. Provide recommendations to improve or enhance system reliability by reducing the incident energy level, and detail where such changes would involve additions or modifications to the contract and cost damages (addition or reduction).

Provide composite coordination plots on log-log graph paper.

- a. Provide separate plots for phase and ground faults.
- b. Include applicable cable and transformer damage curves on phase fault plots.
- c. Limit the number of protective device curves on any plot to 5.

#### 2.3.6 Study report

Include the following in the report:

- a. A cover sheet and table of contents. Provide separate sections with all applicable content, for all operating scenarios.
- b. A narrative describing:
  - 1. The analyses performed;
  - 2. The basis and methods used;
  - 3. The desired method of coordinated protection of the power system.
- c. Descriptive and technical data for existing devices and new protective devices proposed, including manufacturers published data, nameplate data, time-current curves, and definition of the fixed or adjustable features of the existing or new protective devices.
- d. Document existing power system data including time-current characteristic curves and protective device ratings and settings.
- e. Provide time-current characteristics curves for each bus in the system, as required to ensure coordinated power system protection between protective devices or equipment, including recommended ratings and settings of all protective devices in tabulated form.
- f. Provide all calculations performed for the analyses, including computer analysis programs utilized, the name of the software package, developer, and version number. Include all information input to (define) nodes such as cable data, conduit type, circuit length, transformer impedance, bus impedance, generator impedances, etc. For all nodes include phase fault short circuit levels and X/R ratios, ground fault short circuit levels and X/R ratios, load flow levels, arc flash energy (for both bolted and arcing short circuit levels), and motor starting studying results. Indicate which study options have been chosen which the SKM or ETAP software utilizes to generate the

Short Circuit Analysis and Arc Flash Hazard Analysis results; use preferred method below when available. Options included are, but not limited to the following:

1. Standard used for arc-flash calculations: (IEEE 1584 - preferred method).
  2. Motor fault contributions: (5 cycles preferred - motors with 50 hp or greater are to be evaluated).
  3. Flash Boundary Calculation Adjustments above 1kV, Trip Time less than =0.1s: (1.5 cal/square meter - preferred).
  4. Properly categorize all equipment types in Arc Flash Evaluation: (Ensure switchgear, panel boards have proper gap distance).
  5. Short Circuit Study Utilized: (Comprehensive-preferred).
  6. Fault types analyzed: Single line to ground, 3-phase fault, double line to ground fault and line to line fault.
- g. Single line diagram(s)
- h. Protective device setting sheets, as separate pages, suitable for use by installing technicians, separate from other report analysis and data. Include recommended changes to existing protective device settings and settings for all new protective devices. Provide all information to field install the settings, including settings or features not used or turned off.
- i. Tabulated Arc Flash data for all equipment requiring an arc flash warning label and all modified equipment also requiring an arc flash label.
- j. Equipment Evaluation Report (EER) showing the AIC/SCCR ratings for all equipment evaluated and the required rating for the application where the equipment is installed. Ensure the EER identifies underrated and marginally rated equipment. Underrated equipment is defined as equipment with actual AIC/SCCR ratings that do not meet the required AIC/SCCR rating for the application/installation. Marginally rated equipment is defined as equipment within 90 percent to 100 percent of the required rated AIC/SCCR for the application/installation.

## PART 3 EXECUTION

### 3.1 INSTALLATION

Install and test protective devices settings in accordance with the manufacturer's published instructions and in accordance with the protective device coordination study protective device setting sheets and test plan.

Affix detailed arc flash warning labels to all electrical equipment as required by NFPA 70 and NFPA 70E.

### 3.2 FIELD TESTING

#### 3.2.1 General

Section 26 08 00 APPARATUS INSPECTION AND TESTING, applies to this section,

with the additions and modifications specified herein. Submit Performance Test Reports in booklet form showing all field tests performed to adjust each component and all field tests performed to prove compliance with the specified performance criteria, upon completion and testing of the installed system. Indicate in each test report the final position of controls. Submit Certificates of Conformance for Devices and Equipment to the Contracting Officer, certifying that all devices or equipment meet the requirements of the contract documents.

### 3.2.2 Safety

Provide and use safety devices such as arc flash personal protective equipment, electrically insulating rubber gloves, protective barriers, and danger signs to protect and warn personnel in the test vicinity. Replace any devices or equipment which are damaged due to improper test procedures or handling.

### 3.2.3 Molded-Case Circuit Breakers

Visually inspect circuit breakers. Verify current ratings and adjustable settings incorporated in accordance with the coordination study.

### 3.2.4 Power Circuit Breakers

#### 3.2.4.1 General

Visually inspect the circuit breaker and implement settings in accordance with the coordination study.

-- End of Section --

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## SECTION 26 05 71.00 40

## LOW-VOLTAGE OVERCURRENT PROTECTIVE DEVICES

05/11

## PART 1 GENERAL

## 1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

## ASTM INTERNATIONAL (ASTM)

ASTM A167 (2011) Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip

## INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)

IEEE C57.13 (2008) Standard Requirements for Instrument Transformers

IEEE C63.2 (2009) Standard for Electromagnetic Noise and Field Strength Instrumentation, 10 Hz to 40 GHz - Specifications

IEEE C63.4 (2009) American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz

## INTERNATIONAL ELECTRICAL TESTING ASSOCIATION (NETA)

NETA ATS (2009) Standard for Acceptance Testing Specifications for Electrical Power Equipment and Systems

## IPC - ASSOCIATION CONNECTING ELECTRONICS INDUSTRIES (IPC)

IPC D330 (1992) Design Guide Manual

## NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

NEMA 107 (1987; R 1993) Methods of Measurement of Radio Influence Voltage (RIV) of High-Voltage Apparatus (inactive)

NEMA 250 (2008) Enclosures for Electrical Equipment (1000 Volts Maximum)

NEMA AB 3 (2006) Molded Case Circuit Breakers and Their Application

NEMA FU 1 (2002; R 2007) Low Voltage Cartridge Fuses

NEMA ICS 1	(2000; R 2005; R 2008) Standard for Industrial Control and Systems: General Requirements
NEMA ICS 2	(2000; R 2005; Errata 2008) Standard for Controllers, Contactors, and Overload Relays Rated 600 V
NEMA ICS 6	(1993; R 2011) Enclosures
NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)	
NFPA 70	(2011; Errata 2 2012) National Electrical Code
UNDERWRITERS LABORATORIES (UL)	
UL 1449	(2006; Reprint Feb 2011) Surge Protective Devices
UL 489	(2009; Reprint Jun 2011) Molded-Case Circuit Breakers, Molded-Case Switches, and Circuit-Breaker Enclosures
UL 50	(2007) Enclosures for Electrical Equipment, Non-environmental Considerations

## 1.2 SUBMITTALS

Where equipment specified by this section is installed in switchgear, switchboards, motor control centers or other similar equipment, coordinate and integrate drawing submittals with those of the other related specification sections.

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for Contractor Quality Control approval. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

### SD-02 Shop Drawings

Submit Connection Diagrams and Fabrication Drawings for the following items in accordance with paragraph entitled "General Requirements" of this section.

All Shop Drawings shall be computer aided design (CAD) generated. With each submittal provide a CD with a complete copy of the drawings in PDF format.

Submit Shop Drawings for approval prior to equipment manufacturing.

Submit "As-Built" Shop Drawings after installation, inspection and testing is complete which document all field changes made. Provide Digital media compact disc (CD) with all submittals including .DWG or .DXF CAD source files as well as PDF format files for all drawings.

Submit Installation drawings for the following items in accordance

with the paragraph entitled "Installation" of this section.

Control Devices; G  
Surge Protective Devices; G

#### SD-03 Product Data

Submit manufacturer's equipment and performance data for the following items including use life, system functional flows, safety features, and mechanical automated details.

Instrument Transformers; G  
Enclosures; G  
Circuit Breakers (including trip unit data and complete register list); G  
Fuses; G  
Control Devices; G  
Time Switches; G  
Surge Protective Devices; G  
Indicating Lights; G

#### SD-06 Test Reports

Submit test reports for the following tests in accordance with the paragraph entitled "Field Testing" of this section.

Factory tests; G  
Field testing; G

Submit test forms showing compliance with NETA ATS inspections and tests for approval prior to testing.

Submit completed test forms showing the results of all inspections and tests in accordance with NETA ATS inspections and tests after inspections and testing is complete.

#### SD-08 Manufacturer's Instructions

Submit manufacturer's instructions for the following items, including special provisions required to install equipment components and system packages. Provide detail on resistance impedances, hazards and safety precautions within the special notices.

Control Devices; G  
Circuit Breakers (including trip units); G  
Surge Protective Devices; G

#### SD-10 Operation and Maintenance Data

Submit Operation and Maintenance Manuals for the following equipment:

Circuit Breakers (including trip units); G  
Time Switches; G  
Surge Protective Devices; G

### 1.3 GENERAL REQUIREMENTS

Section 26 20 00 INTERIOR DISTRIBUTION SYSTEM applies to work specified in this section.

Section 26 08 00 APPARATUS INSPECTION AND TESTING applies to this section, with the additions and modifications specified herein.

Provide a power system study as specified in Section 26 05 63.00 98 COORDINATED POWER SYSTEM PROTECTION. Set protective devices in accordance with the approved study submittal.

Submit Connection Diagrams showing the relations and connections of control devices and protective devices by showing the general physical layout of all controls, the interconnection of one system (or portion of system) with another, interconnection of the substation control and monitor system with KCCS, and internal tubing, wiring, and other devices.

Submit Fabrication Drawings for control devices and protective devices consisting of fabrication and assembly details to be performed in the factory.

Provide products with continuous-current rating, interrupting rating, clearing time, and melting time, indicated herein and on the drawings. No change from the continuous-current rating, interrupting rating, clearing time, and melting time indicated herein and on the drawings shall be made unless written permission has first been secured from the Contracting Officer.

## PART 2 PRODUCTS

### 2.1 INSTRUMENT TRANSFORMERS

Comply with the interference requirements measured in accordance with IEEE C63.2, IEEE C63.4, and NEMA 107 for Instrument transformers.

#### 2.1.1 Current Transformers

Provide current transformers that conform to IEEE C57.13 for installation in metal-clad switchgear. Use standard multi-ratio 5-A secondary transformer.

Provide wound, bushing, bar and window type transformers as required.

Provide transformers that have single or double secondary winding as required.

Provide transformers that are complete with secondary short-circuiting device.

For low voltage window-type current transformers, provide indoor dry type construction with secondary current ratings as indicated, specified frequency, and minimum 10/100 accuracy.

#### 2.1.2 Potential Transformers

For potential transformers, provide fixed mount potential transformers as indicated or required for metering and relaying applications. Unless otherwise indicated, use three (3) standard 120-volt, 60-hertz grounded

secondary transformers for 3-phase applications.

Provide transformers that have single, tapped or double secondary as required.

Provide burden, frequency and accuracy as indicated on the drawings.

For low voltage switchgear bus tap power supply connections provide a fully enclosed pullout, dead-front type fuse block mounted in the metering compartment containing one fuse per phase.

Provide secondary fusing and pull-out type fuse block. Size fuses as recommended by the manufacturer.

## 2.2 ENCLOSURES

Provide enclosures for equipment in accordance with NEMA 250.

Contain equipment installed in clean, dry indoor locations in a NEMA Type 12 industrial use, sheet-steel enclosure, constructed to prevent the entrance of dust, lint, fibers, flyings, oil, and coolant seepage.

Fabricate sheet-steel enclosures from uncoated carbon-steel sheets of commercial quality, with box dimensions and thickness of sheet steel in accordance with UL 50.

Fabricate steel enclosures from corrosion-resistant, chromium-nickel steel sheet conforming to ASTM A167 Type 300 series with ASM No. 4 general-purpose polished finish, with box dimensions and thickness of sheet steel in accordance with UL 50.

## 2.3 CIRCUIT BREAKERS

Provide circuit breakers that conform to UL 489, and NEMA AB 3.

### 2.3.1 Molded-Case Circuit Breakers

For circuit breakers on frame sizes larger than 250 amperes, provide solid-state tripping mechanism with adjustable long-time, short-time, instantaneous, and ground fault trip settings. Such trip settings shall be accessible and adjustable from the front of the breaker.

For circuit breakers on frames size of 250 amperes, provide thermal-magnetic tripping mechanism with fixed inverse-time-delay thermal overload protection and instantaneous magnetic short-circuit protection. Locate the thermal-magnetic tripping mechanism elements in each pole of the breaker.

Size breaker as required for the continuous current rating of the circuit. Provide interrupting capacity indicated. Provide breaker class as required.

Provide sufficient interrupting capacity of the panel to successfully interrupt the maximum short-circuit current imposed on the circuit at the breaker terminals. Where not indicated, provide circuit breaker interrupting capacities with a minimum of 65 KAIC at 277/480V and 10 KAIC at 120/208V and that conform to NEMA AB 3. Series ratings of breakers is not permitted.

Provide shunt trip and lock out/tag-out attachments for all elevator

breakers.

Provide the common-trip type multi-pole circuit breakers having a single operating handle and a two-position on/off indication. Provide circuit breakers with temperature compensation for operation in an ambient temperature of 104 degrees F. Provide circuit breakers that have root mean square (rms) symmetrical interrupting ratings sufficient to protect the circuit being supplied. Interrupting ratings may have selective type tripping (time delay, magnetic, thermal, or ground fault).

Provide phenolic composition breaker body capable of having such accessories as handle-extension, handle-locking, and padlocking devices.

Provide circuit breakers used for meter circuit disconnects that meet the applicable requirements of NFPA 70 and that are of the motor-circuit protector type.

For circuit breakers used for service disconnection, provide an enclosed circuit-breaker type with external handle for manual operation. Provide sheet metal enclosures with a hinged cover suitable for surface mounting.

#### 2.3.2 Enclosed Molded-Case Circuit Breakers

For enclosed circuit breakers, provide thermal-magnetic molded-case circuit breakers in surface-mounted, non-ventilated enclosures conforming to the appropriate articles of NEMA 250 and UL 489.

Provide enclosures for units per the paragraph entitled "Equipment and Enclosures." Provide copper ground bus and, where indicated, a solid neutral.

#### 2.4 FUSES

Provide a complete set of fuses for power module panel. Provide fuses that have a voltage rating of not less than the circuit voltage.

Make no change in continuous-current rating, interrupting rating, and clearing or melting time of fuses unless written permission has first been secured.

Provide rejection type, high interrupting, current limiting, nonrenewable cartridge type fuses with time-delay dual elements, except where otherwise indicated. Conform to NEMA FU 1 for fuses.

Label fuses showing UL class, interrupting rating, and time-delay characteristics, when applicable. Additionally, clearly list fuse information on equipment drawings.

Provide dead-front pull-out type fuse holders when field-mounted in a cabinet or box. Do not use fuse holders made of such materials as ebony asbestos, Bakelite, or pressed fiber.

#### 2.5 CONTROL DEVICES

##### 2.5.1 Magnetic Contactors

Provide magnetic contactors in accordance with NEMA ICS 1 and NEMA ICS 2 as required for the control of low-voltage, 60-hertz, tungsten-lamp loads, fluorescent-lamp loads, resistance-heating loads, and the secondary

windings of low-voltage transformers.

Provide core-and-coil assembly that operates satisfactorily with coil voltage between 85 and 110 percent of its voltage rating.

Provide contactor that is designed with a normally open holding circuit auxiliary contact for control circuits, with a rating in accordance with NEMA ICS 1 and NEMA ICS 2.

Furnish solderless pressure wire terminal connectors, or make available for line-and-load connections to contactors in accordance with NEMA ICS 1 and NEMA ICS 2.

Provide magnetic contactors with a rating in accordance with NEMA ICS 1 and NEMA ICS 2.

#### 2.5.2 Control-Circuit Transformers

Provide control-circuit transformers within the enclosure of switchgear, magnetic contactors, and motor controllers when the line voltage is in excess of 120 volts. Provide encapsulated dry type, single-phase, 60-hertz transformer, with a 120-volt (or 120/240-volt where indicated) isolated secondary winding.

Do not provide a transformer with a rated primary voltage less than the rated voltage of the controller, or a rated secondary current less than the continuous-duty current of the control circuit.

Provide voltage regulation of the transformer such that, with rated primary voltage and frequency, the secondary voltage is not less than 95 percent nor more than 105 percent of rated secondary voltage.

Provide source of supply for control-circuit transformers at the load side of the main disconnecting device. Protect secondary winding of the transformer and control-circuit wiring against overloads and short circuits, with circuit breakers where indicated and, if not indicated, with fuses selected in accordance with NEMA ICS 6. Ground secondary winding of the control-circuit transformer in accordance with NEMA ICS 6.

#### 2.5.3 Magnetic Control Relays

Provide magnetic control relays for energizing and de-energizing the coils of magnetic contactors or other magnetically operated devices, in response to variations in the conditions of electric control devices in accordance with NEMA ICS 1, and NEMA ICS 2.

Provide core-and-coil assembly that operates satisfactorily with coil voltages between 85 and 110 percent of their voltage rating.

Provide relays that are designed to accommodate normally open and normally closed contacts.

Provide 120-volt, 60-hertz, Class AIB magnetic control relays with a continuous contact rating of 10 amperes, and with current-making and -breaking ability in accordance with NEMA ICS 1 and NEMA ICS 2, two normally open and two normally closed.

#### 2.5.4 Pushbuttons and Switches

##### 2.5.4.1 Pushbuttons

For pushbuttons for low-voltage ac full-voltage magnetic controllers, provide heavy-duty oiltight NEMA 250, Type 4, momentary-contact devices rated 600 volts, with pilot light, and with the number of buttons and the marking of identification plates as shown. Furnish pushbutton color code in accordance with NEMA ICS 6.

Provide pushbuttons that are designed with normally open, circuit-closing contacts; normally closed circuit-opening contacts; and two-circuit normally open and normally closed circuit-closing and -opening contacts. Provide pushbutton-contact ratings in accordance with NEMA ICS 1 and NEMA ICS 2 with contact designation A600.

Identify pushbuttons in remote control stations with identification plates affixed to front cover in a prominent location. Carry the identification of the system being controlled on the identification plate.

##### 2.5.4.2 Selector Switches

Provide heavy-duty oiltight maintained-contact selector switches for low-voltage control circuits, with the number of positions and the marking of identification plates in accordance with NEMA ICS 1 and NEMA ICS 2.

Identify selector switches in remote control stations with engraved identification plates affixed to front cover in a prominent location. Carry the identification of the system being controlled on the identification plate.

##### 2.5.4.3 Miscellaneous Switches

Provide float, limit, door, pressure, proximity, and other types of switches in accordance with IPC D330 and of the types and classes indicated.

##### 2.5.4.4 Test Switches

Provide test switches as indicated on the drawings. Test switches shall be ABB Type FT-1 or equal with clear covers, and shall be mounted on the door of the instrument compartment or as indicated.

#### 2.6 FACTORY TESTING

Perform factory tests on control and low voltage protective devices in accordance with the manufacturer's recommendations.

Conduct short-circuit tests in accordance with Section 2 of NEMA ICS 1.

Factory witness testing, at Government's option, shall take place at vendor's facility for circuit breakers, trip units, and KCCS communication.

Provide documentation on successful completion of factory tests for the above equipment prior to final activation at KSC.

#### 2.7 INDICATING LIGHTS

Provide transformer, push-to-test LED type, rated for 120 volts ac. Lights shall be capable of being relamped from the front.

## 2.8 SURGE PROTECTIVE DEVICES

Provide parallel type surge protective devices which comply with UL 1449 in the locations indicated on the drawings. Provide surge protectors in a NEMA Type enclosure per NEMA ICS 6. Provide the following modes of protection:

FOR SINGLE PHASE AND THREE PHASE WYE CONNECTED SYSTEMS -  
Each phase to neutral (L-N)  
Neutral to ground (N-G)  
Phase to ground (L-G)

Surge protective devices at the service entrance shall have a minimum surge current rating of 80,000 amperes per mode minimum and downstream protectors shall be rated 40,000 amperes per mode minimum. The maximum line to neutral (L-N) Suppressed Voltage Rating (SVR) shall be:

900V for 480Y/277V, three phase system

The minimum MCOV (Maximum Continuous Operating Voltage) rating shall be:

600/320V for 480Y/277V, three phase system

EMI/RFI filtering shall be provided for each mode with the capability to attenuate high frequency noise. Minimum attenuation shall be 20db.

## 2.9 FINISH

Protect metallic materials against corrosion. Provide equipment with the standard finish by the manufacturer for indoor installations.

## PART 3 EXECUTION

### 3.1 INSTALLATION

Install Control devices and protective devices that are not factory installed in equipment, in accordance with the manufacturer's recommendations and field adjusted and operation tested. Conform to NFPA 70, NEMA ICS 1 and NEMA ICS 2 requirements for installation of control and protective devices.

#### 3.1.1 Surge Protective Devices

Connect the surge protective devices in parallel to the power source, keeping the conductors as short and straight as practically possible.

### 3.2 FIELD TESTING

Demonstrate to operate as indicated control and protective devices not factory installed in equipment.

Ratio and verify tap settings of instrumentation, potential, and current transformers.

Perform all applicable inspections and electrical tests, including optional tests, in accordance with NETA ATS and Section 26 08 00 APPARATUS INSPECTION AND TESTING for all meter, over-current protective device, and relays including but not limited to the following:

- a. Circuit Breakers, Air, Insulated Case/Molded Case - Do not perform primary current injection tests.
- b. Instrument Transformers
- c. Low Voltage Ground Fault Protection Systems
- d. Surge Arresters, Low Voltage

Do not energize control and protective devices until recorded test data has been approved. Provide final test reports with a cover letter/sheet clearly marked with the System name, Date, and the words "Final Test Reports - Forward to the Systems Engineer/Condition Monitoring Office/Predictive Testing Group for inclusion in the Maintenance Database."

-- End of Section --

## SECTION 26 08 00

## APPARATUS INSPECTION AND TESTING

08/08

## PART 1 GENERAL

## 1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

## INTERNATIONAL ELECTRICAL TESTING ASSOCIATION (NETA)

NETA ATS	(2009) Standard for Acceptance Testing Specifications for Electrical Power Equipment and Systems
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## 1.2 RELATED REQUIREMENTS

Section 26 08 00 APPARATUS INSPECTION AND TESTING applies to this section with additions and modifications specified herein.

## 1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for Contractor Quality Control approval. The following shall be submitted in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

## SD-06 Test Reports

Acceptance tests and inspections procedures; G

Acceptance tests and inspections reports; G

## SD-07 Certificates

Qualifications of organization, and lead engineering technician; G

## 1.4 QUALITY ASSURANCE

## 1.4.1 Qualifications

Contractor shall engage the services of a qualified testing organization to provide inspection, testing, calibration, and adjustment of the electrical distribution system and generation equipment listed in paragraph entitled "Acceptance Tests and Inspections" herein. Organization shall be independent of the supplier, manufacturer, and installer of the equipment. The organization shall be a first tier subcontractor. No work required by this section of the specification shall be performed by a second tier subcontractor.

- a. Submit name and qualifications of organization. Organization shall have been regularly engaged in the testing of electrical materials, devices, installations, and systems for a minimum of 5 years. The organization shall have a calibration program, and test instruments

used shall be calibrated in accordance with NETA ATS.

- b. Submit name and qualifications of the lead engineering technician performing the required testing services. Include a list of three comparable jobs performed by the technician with specific names and telephone numbers for reference. Testing, inspection, calibration, and adjustments shall be performed by an engineering technician, certified by NETA or the National Institute for Certification in Engineering Technologies (NICET) with a minimum of 5 years' experience inspecting, testing, and calibrating electrical distribution and generation equipment, systems, and devices.

#### 1.4.2 Acceptance Tests and Inspections Reports

Submit certified copies of inspection reports and test reports. Reports shall include certification of compliance with specified requirements, identify deficiencies, and recommend corrective action when appropriate. Type and neatly bind test reports to form a part of the final record. Submit test reports documenting the results of each test not more than 10 days after test is completed.

#### 1.4.3 Acceptance Tests and Inspections Procedure

Submit test procedure reports for each item of equipment to be field tested at least 45 days prior to planned testing date. Do not perform testing until after test procedure has been approved.

## PART 2 PRODUCTS

Not used.

## PART 3 EXECUTION

### 3.1 ACCEPTANCE TESTS AND INSPECTIONS

Testing organization shall perform acceptance tests and inspections. Test methods, procedures, and test values shall be performed and evaluated in accordance with NETA ATS, the manufacturer's recommendations, and paragraph entitled "Field Quality Control" of each applicable specification section. Tests identified as optional in NETA ATS are not required unless otherwise specified. Equipment shall be placed in service only after completion of required tests and evaluation of the test results have been completed. Contractor shall supply to the testing organization complete sets of shop drawings, settings of adjustable devices, and other information necessary for an accurate test and inspection of the system prior to the performance of any final testing. Contracting Officer shall be notified at least 14 days in advance of when tests will be conducted by the testing organization. Perform acceptance tests and inspections on applicable equipment and systems shown on contract drawings specified in the following sections:

- a. Section 26 05 63.00 98 COORDINATED POWER SYSTEM PROTECTION AND ARC-FLASH ANALYSIS
- b. Section 26 05 71.00 40 LOW-VOLTAGE OVERCURRENT PROTECTIVE DEVICES
- c. Section 26 20 00 INTERIOR DISTRIBUTION SYSTEM
- d. Section 26 36 23.00 20 AUTOMATIC TRANSFER SWITCHES

3.2 SYSTEM ACCEPTANCE

Final acceptance of the system is contingent upon satisfactory completion of acceptance tests and inspections.

3.3 PLACING EQUIPMENT IN SERVICE

A representative of the approved testing organization shall be present when equipment tested by the organization is initially energized and placed in service.

-- End of Section --

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## SECTION 26 20 00

## INTERIOR DISTRIBUTION SYSTEM

08/08

## PART 1 GENERAL

## 1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

## ASTM INTERNATIONAL (ASTM)

ASTM B1	(2001; R 2007) Standard Specification for Hard-Drawn Copper Wire
ASTM B8	(2011) Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft
ASTM D 709	(2001; R 2007) Laminated Thermosetting Materials

## INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)

IEEE 100	(2000; Archived) The Authoritative Dictionary of IEEE Standards Terms
IEEE C2	(2012; Errata 2012; INT 1 2012; INT 2 2012) National Electrical Safety Code

## INTERNATIONAL ELECTRICAL TESTING ASSOCIATION (NETA)

NETA ATS	(2009) Standard for Acceptance Testing Specifications for Electrical Power Equipment and Systems
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## NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

ANSI C80.1	(2005) American National Standard for Electrical Rigid Steel Conduit (ERSC)
NEMA 250	(2008) Enclosures for Electrical Equipment (1000 Volts Maximum)
NEMA FU 1	(2002; R 2007) Low Voltage Cartridge Fuses
NEMA ICS 6	(1993; R 2011) Enclosures
NEMA KS 1	(2001; R 2006) Enclosed and Miscellaneous Distribution Equipment Switches (600 V Maximum)
NEMA ST 20	(1992; R 1997) Standard for Dry-Type Transformers for General Applications

NEMA TP 1 (2002) Guide for Determining Energy Efficiency for Distribution Transformers

NEMA WD 1 (1999; R 2005; R 2010) Standard for General Color Requirements for Wiring Devices

NEMA WD 6 (2002; R 2008) Wiring Devices Dimensions Specifications

## NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70 (2011; Errata 2 2012) National Electrical Code

NFPA 70E (2012) Standard for Electrical Safety in the Workplace

## U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

29 CFR 1910.147 Control of Hazardous Energy (Lock Out/Tag Out)

## UNDERWRITERS LABORATORIES (UL)

UL 1 (2005; Reprint Jul 2007) Standard for Flexible Metal Conduit

UL 1660 (2004; Reprint Apr 2008) Liquid-Tight Flexible Nonmetallic Conduit

UL 198M (2003; Reprint Oct 2007) Standard for Mine-Duty Fuses

UL 360 (2009; Reprint Jun 2009) Liquid-Tight Flexible Steel Conduit

UL 4248 (2007) UL Standard for Safety Fuseholders

UL 467 (2007) Grounding and Bonding Equipment

UL 486A-486B (2003; Reprint Feb 2010) Wire Connectors

UL 486C (2004; Reprint Feb 2010) Splicing Wire Connectors

UL 498 (2001; Reprint Apr 2010) Attachment Plugs and Receptacles

UL 50 (2007) Enclosures for Electrical Equipment, Non-environmental Considerations

UL 510 (2005; Reprint Apr 2008) Polyvinyl Chloride, Polyethylene and Rubber Insulating Tape

UL 514A (2004; Reprint Apr 2010) Metallic Outlet Boxes

UL 514B	(2004; Reprint Nov 2009) Conduit, Tubing and Cable Fittings
UL 514C	(1996; Reprint May 2011) Nonmetallic Outlet Boxes, Flush-Device Boxes, and Covers
UL 6	(2007; reprint Nov 2010) Electrical Rigid Metal Conduit-Steel
UL 67	(2009; Reprint Sep 2010) Standard for Panelboards
UL 817	(2001; Reprint Oct 2009) Standard for Cord Sets and Power-Supply Cords
UL 83	(2008) Thermoplastic-Insulated Wires and Cables
UL 869A	(2006) Reference Standard for Service Equipment
UL 870	(2008) Standard for Wireways, Auxiliary Gutters, and Associated Fittings
UL 943	(2006; Reprint May 2010) Ground-Fault Circuit-Interrupters

## 1.2 DEFINITIONS

Unless otherwise specified or indicated, electrical and electronics terms used in these specifications, and on the drawings, shall be as defined in IEEE 100.

## 1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for Contractor Quality Control approval. The following shall be submitted in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

### SD-02 Shop Drawings

Panelboards; G

Transformers; G

Wireways; G

### SD-03 Product Data

Conduit, raceways and fittings; G

Outlet boxes and covers; G

Cabinets, junction boxes, and pull boxes; G

Wire and cable; G

Splices and termination components; G

Receptacles; G

Device plates; G

Switches; G

Fuses; G

Transformers; G

Ground conductor; G

Ground connectors and fasteners; G

Surge protective devices; G

Submittals shall include performance and characteristic curves.

#### SD-06 Test Reports

600-volt wiring test; G

Grounding system test; G

Transformer test; G

Ground-fault receptacle test; G

### 1.4 QUALITY ASSURANCE

#### 1.4.1 Regulatory Requirements

In each of the publications referred to herein, consider the advisory provisions to be mandatory, as though the word, "shall" had been substituted for "should" wherever it appears. Interpret references in these publications to the "authority having jurisdiction," or words of similar meaning, to mean the Contracting Officer. Equipment, materials, installation, and workmanship shall be in accordance with the mandatory and advisory provisions of NFPA 70 unless more stringent requirements are specified or indicated.

#### 1.4.2 Standard Products

Provide materials and equipment that are products of manufacturers regularly engaged in the production of such products which are of equal material, design and workmanship. Products shall have been in satisfactory commercial or industrial use for 2 years prior to bid opening. The 2-year period shall include applications of equipment and materials under similar circumstances and of similar size. The product shall have been on sale on the commercial market through advertisements, manufacturers' catalogs, or brochures during the 2-year period. Where two or more items of the same class of equipment are required, these items shall be products of a single manufacturer.

##### 1.4.2.1 Material and Equipment Manufacturing Date

Products manufactured more than 3 years prior to date of delivery to site

shall not be used, unless specified otherwise.

## PART 2 PRODUCTS

### 2.1 MATERIALS AND EQUIPMENT

Materials, equipment, and devices shall, as a minimum, meet requirements of UL, and shall be UL labeled where UL standards are established for those items. Comply with the requirements of NFPA 70.

### 2.2 CONDUIT AND FITTINGS

Shall conform to the following:

#### 2.2.1 Rigid Metallic Conduit

##### 2.2.1.1 Rigid, Threaded Zinc-Coated Steel Conduit

ANSI C80.1, UL 6, hot dipped galvanized finish only.

##### 2.2.2 Flexible Metal Conduit

UL 1.

Provide galvanized steel type and use in dry locations only.

##### 2.2.2.1 Liquid-Tight Flexible Metal Conduit, Steel

UL 360.

Provide protective jacket of PVC extruded over a flexible interlocked galvanized steel core conduit to protect wiring against moisture, oil, chemicals, and corrosive fumes.

##### 2.2.3 Fittings for Metal Conduit and Flexible Metal Conduit

UL 514B. Ferrous fittings shall be cadmium- or zinc-coated in accordance with UL 514B.

##### 2.2.3.1 Fittings for Rigid Metal Conduit

Threaded-type. Split couplings unacceptable.

Provide fittings, (pulling-type) conduit bodies, bushings, locknuts and supports constructed of hot dipped galvanized malleable iron or steel.

Gaskets shall be the solid type. Conduit fittings with blank covers shall have gaskets, except in clean, dry areas or at the lowest point of a conduit run where drainage is required. Covers shall have captive screws and be accessible after the work has been completed.

Bushings shall be insulated type. Provide grounding type bushings at both ends on conduit containing service entrance conductors with lug suitable for a copper grounding conductor up to (4/0). Provide capped bushings for spare underground conduits.

Provide gasketed liquid-tight hubs with hot-dipped galvanized finish when connecting rigid steel conduit to steel enclosures in wet or damp locations.

#### 2.2.3.2 Fittings for EMT

Zinc coated steel compression type. Provide connectors with insulated throat.

#### 2.2.4 Liquid-Tight Flexible Nonmetallic Conduit

UL 1660.

Fitting for flexible nonmetallic conduit shall be hot dipped galvanized malleable iron. Provide external grounding lug for conduit sizes greater than (1-1/4 inch).

### 2.3 OUTLET BOXES AND COVERS

UL 514A, cadmium- or zinc-coated, if ferrous metal. UL 514C, if nonmetallic. Box type shall be suitable for mounting service installed. Provide required rings, covers, and device plates for all boxes.

### 2.4 CABINETS, JUNCTION BOXES, AND PULL BOXES

Volume greater than 100 cubic inches, UL 50 and NEMA 250.

Pull and junction boxes in dry locations shall be hot-dipped galvanized steel without knockouts and with screw fastened covers.

Cabinets or boxes installed in interior dry locations shall be rated NEMA 12.

Boxes with terminal strips or components installed shall include hinged covers, latch, pad-lock provisions, and interior mounting panel.

### 2.5 WIRES AND CABLES

Wires and cables shall meet applicable requirements of NFPA 70 and UL for type of insulation, jacket, and conductor specified or indicated. Wires and cables manufactured more than 12 months prior to date of delivery to site shall not be used.

#### 2.5.1 Conductors

Conductors No. 8 AWG and larger diameter shall be stranded. Conductors No. 10 AWG and smaller diameter shall be solid, except that conductors for remote control, alarm, and signal circuits, classes 1, 2, and 3, shall be stranded unless specifically indicated otherwise. Conductor sizes and capacities shown are based on copper, unless indicated otherwise. All conductors shall be copper.

##### 2.5.1.1 Minimum Conductor Sizes

Minimum size for branch circuits shall be No. 12 AWG; for Class 1 remote-control and signal circuits, No. 14 AWG; for Class 2 low-energy, remote-control and signal circuits, No. 16 AWG; and for Class 3 low-energy, remote-control, alarm and signal circuits, No. 22 AWG.

#### 2.5.2 Color Coding

Provide for service, feeder, branch, control, and signaling circuit conductors. Color shall be green for grounding conductors and white for

neutrals; except where neutrals of more than one system are installed in same raceway or box, other neutrals shall be white with a different colored (not green) stripe for each. Provide factory provided color insulation as follows: For conductors size 4/0 and smaller, the Contractor shall use colored insulation for 600VAC cable as identified for phase, grounded, and equipment grounding conductors noted in this specification. For sizes greater than 4/0, the Contractor may use black (non-colored) insulation, but must identify the cable with approved markings, as noted in this specification, at all terminations, junction boxes, and condulets as required by the latest edition of NFPA 70. Color of ungrounded conductors in different voltage systems shall be as follows:

- a. 208/120 volt, three-phase
  - (1) Phase A - black
  - (2) Phase B - red
  - (3) Phase C - blue
  - (4) Neutral - white
- b. 480/277 volt, three-phase
  - (1) Phase A - brown
  - (2) Phase B - orange
  - (3) Phase C - yellow
  - (4) Neutral - grey
- c. 120/240 volt, single phase
  - (1) Phase A - black
  - (2) Phase B - red
- d. DC
  - (1) Positive (+) - red
  - (2) Negative (-) - black
- e. Equipment Grounds - Green with yellow stripes

#### 2.5.3 Insulation

Unless specified or indicated otherwise or required by NFPA 70, power and lighting wires shall be 600-volt, Type THWN/THHN-2 conforming to UL 83, except that grounding wire may be type TW conforming to UL 83; remote-control and signal circuits shall be Type TW or TF, conforming to UL 83.

#### 2.5.4 Bonding Conductors

ASTM B1, solid bare copper wire for sizes No. 8 AWG and smaller diameter; ASTM B8, Class B, stranded bare copper wire for sizes No. 6 AWG and larger diameter.

### 2.5.5 Cable Tray Cable

UL listed; type TC.

### 2.5.6 Cord Sets and Power-Supply Cords

UL 817.

## 2.6 SPLICES AND TERMINATION COMPONENTS

UL 486A-486B for wire connectors and UL 510 for insulating tapes. Connectors for No. 10 AWG and smaller diameter wires shall be insulated, pressure-type in accordance with UL 486A-486B or UL 486C (twist-on splicing connector). Provide solderless terminal lugs on stranded conductors.

Make all splices in AWG No. 8 and larger with copper indentor crimp-type connectors and compression tools. Joints shall be factory insulated or wrapped with an insulating tape that has an insulation and temperature rating equivalent to that of the conductor.

Make terminations to NEMA type cable pads using copper 2-hole standard or long barrel (as required) indentor crimp-type lugs.

Manufacturer's required tooling and dies shall be used on indentor crimp-type lugs.

Vinyl electrical tape shall be 8.5-mil thickness suitable for high and low temperature use.

Rubber splicing tape shall be 30-mil Ethylene Propylene Rubber (EPR) rated (90 degrees C) 194 degrees F.

## 2.7 DEVICE PLATES

Provide UL listed, one-piece device plates for outlets to suit the devices installed. For metal outlet boxes, plates on unfinished walls shall be of zinc-coated sheet steel or cast metal having round or beveled edges. Plates on surface mounted boxes shall not extend past the box or box cover edge. For nonmetallic boxes and fittings, other suitable plates may be provided. Plates on finished walls shall be satin finish stainless steel, minimum 0.03 inch thick. Screws shall be machine-type with countersunk heads in color to match finish of plate. Sectional type device plates will not be permitted. Plates installed in wet locations shall be gasketed and UL listed for "wet locations."

## 2.8 SWITCHES

### 2.8.1 Disconnect Switches

NEMA KS 1. Where switches are rated higher than 240 volts, provide heavy duty type switches. Fused switches shall utilize Class R fuseholders and fuses, unless indicated otherwise. Switches serving as motor-disconnect means shall be horsepower rated.

Provide equipment ground bus bar for equipment grounding conductors and isolated neutral assembly for neutral conductors.

Provide switches in enclosures per NEMA ICS 6 as follows:

- a. Elevator Equipment Rooms - NEMA 12.

## 2.9 FUSES

NEMA FU 1. Provide complete set of fuses for each fusible switch. Time-current characteristics curves of fuses serving motors or connected in series with circuit breakers shall be coordinated for proper operation. Fuses shall have voltage rating not less than circuit voltage.

### 2.9.1 Fuseholders

Provide in accordance with UL 4248.

### 2.9.2 Cartridge Fuses, Current Limiting Type (Class R)

UL 198M, Class RK-5. Associated fuseholders shall be Class R only.

### 2.9.3 Cartridge Fuses, High-Interrupting Capacity, Current Limiting Type CC

UL 198M, Class CC for zero to 30 ampere control and instrumentation circuits.

## 2.10 RECEPTACLES

UL 498, hard use, heavy-duty, grounding-type. Ratings and configurations shall be as indicated on the drawings. Bodies shall be of brown as per NEMA WD 1. Face and body shall be thermoplastic supported on a metal mounting strap. Dimensional requirements shall be per NEMA WD 6. Provide screw-type, side-wired wiring terminals. Connect grounding pole to mounting strap. The receptacle shall contain triple-wipe power contacts and double or triple-wipe ground contacts.

### 2.10.1 Ground-Fault Circuit Interrupter Receptacles

UL 943, duplex type for mounting in standard outlet box. Device shall be capable of detecting current leak of 6 milliamperes or greater and tripping per requirements of UL 943 for Class A GFCI devices. Provide screw-type, side-wired wiring terminals or pre-wired (pigtail) leads.

## 2.11 PANELBOARDS

UL 67 and UL 50 having a short-circuit current rating as per Section 26 05 63.00 98 COORDINATED POWER SYSTEM PROTECTION AND ARC FLASH ANALYSIS. Panelboards for use as service disconnecting means shall additionally conform to UL 869A. Panelboards shall be bolt-on circuit breaker-equipped. Design shall be such that individual breakers can be removed without disturbing adjacent units or without loosening or removing supplemental insulation supplied as means of obtaining clearances as required by UL. "Specific breaker placement" is required in panelboards to match the breaker placement indicated in the panelboard schedule on the drawings. Use of "Subfeed Breakers" is not acceptable unless specifically indicated otherwise. Main breaker shall be top or bottom mounted as indicated with provisions for connecting the sizes and quantities on incoming cables indicated. Where "space only" is indicated, make provisions for future installation of breakers and shall be oriented for vertical up/down on/off operation. Directories shall indicate load served by each circuit in panelboard. Provide new directories for existing panels modified by this project as indicated on the drawings. Type directories

and mount in holder behind transparent protective covering. Panelboards shall be listed and labeled for their intended use. Panelboard shall have nameplates in accordance with paragraph "Field Fabricated Nameplates."

#### 2.11.1 Enclosure

Enclosures shall meet the requirements of UL 50. All cabinets shall be fabricated from sheet steel of not less than No. 10 gauge if flush-mounted or mounted outdoors, and not less than No. 12 gauge if surface-mounted indoors, with full seam-welded box ends. Indoor surface mounted or flush-mounted cabinets shall be hot-dipped galvanized after fabrication; cabinets shall be painted in accordance with paragraph "Painting." Front edges of cabinets shall be form-flanged or fitted with structural shapes welded or riveted to the sheet steel, for supporting the panelboard front. All cabinets shall be so fabricated that no part of any surface on the finished cabinet shall deviate from a true plane by more than (3 mm) 1/8 inch. Holes shall be provided in the back of indoor surface-mounted cabinets, with outside spacers and inside stiffeners, for mounting the cabinets with a (13 mm) 1/2 inch clear space between the back of the cabinet and the wall surface.

#### 2.11.2 Panelboard Buses

All panelboards buses shall be copper. Support bus bars on bases independent of circuit breakers. All circuit breakers shall have capabilities for lock out/tag-out attachment. Main buses and back pans shall be designed so that breakers may be changed without machining, drilling, or tapping. Provide top or bottom main-lug-only if indicated with provisions for connecting the sizes and quantities of incoming cables indicated. Provide isolated neutral bus in each panel for connection of circuit neutral conductors. Provide separate ground bus identified as equipment grounding bus per UL 67 for connecting grounding conductors; bond to steel cabinet.

#### 2.11.3 Circuit Breakers

Provide molded-case circuit breakers in accordance with Section 26 05 71.00 40 LOW-VOLTAGE OVERCURRENT PROTECTIVE DEVICES.

#### 2.12 ENCLOSED CIRCUIT BREAKERS

Provide enclosed molded-case circuit breakers in accordance with Section 26 05 71.00 40 LOW-VOLTAGE OVERCURRENT PROTECTIVE DEVICES.

#### 2.13 TRANSFORMERS

NEMA ST 20, general purpose, dry-type, self-cooled, ventilated. Provide transformers in NEMA 1 enclosures. Transformer shall have (220 degrees C) 428 degrees F insulation system for transformers 15 kVA and greater, and shall have (180 degrees C) 356 degrees F insulation for transformers rated 10 kVA and less, with temperature rise not exceeding (80 degrees C) 176 degrees F under full-rated load in maximum ambient of (40 degrees C) 104 degrees F. Transformer of (80 degrees C) 176 degrees F temperature rise shall be capable of carrying continuously 130 percent of nameplate kVA without exceeding insulation rating. Transformers shall be quiet type with maximum sound level at least 3 decibels less than NEMA standard level for transformer ratings indicated. Transformers shall meet all applicable requirements of the elevator manufacturer.

### 2.13.1 Specified Transformer Efficiency

Transformers shall be energy efficient type. Minimum efficiency, based on factory test results, shall not be less than NEMA Class 1 efficiency as defined by NEMA TP 1.

### 2.14 LOCKOUT REQUIREMENTS

Provide disconnecting means capable of being locked out for machines and other equipment to prevent unexpected startup or release of stored energy in accordance with 29 CFR 1910.147.

### 2.15 GROUNDING AND BONDING EQUIPMENT

Ground bond equipment to the nearest building steel.

#### 2.15.1 Connectors and Fasteners

Grounding and bonding fasteners above ground must be copper or bronze and conform to the requirements of UL 467.

Ground connections to building steel shall be made by exothermic weld process. Within the welding procedure, include the proper mold and powder charge and conform to the manufacturer's recommendations.

Bonding straps and jumpers must be copper and size must be in accordance with the grounding requirements of NFPA 70. Minimum size shall be No. 4 unless otherwise indicated.

### 2.16 MANUFACTURER'S NAMEPLATE

Each item of equipment shall have a nameplate bearing the manufacturer's name, address, model number, and serial number securely affixed in a conspicuous place; the nameplate of the distributing agent will not be acceptable.

### 2.17 FIELD FABRICATED NAMEPLATES

ASTM D 709. Provide laminated plastic nameplates for each equipment enclosure, relay, switch, and device; as specified herein and as indicated on the drawings. Each nameplate inscription shall identify the function and, when applicable, the position. Nameplates shall be melamine plastic, (3 mm) 0.125 inch thick, white with black center core. Provide red laminated plastic label with white center core where indicated on the drawings. Surface shall be matte finish. Corners shall be square. Accurately align lettering and engrave into the core. Minimum size of nameplates shall be (25 by 64 mm) one by 2.5 inches. Lettering shall be a minimum of (6 mm) 0.25 inch high normal block style.

### 2.18 WARNING SIGNS

Provide warning signs for flash protection in accordance with Section 26 05 63.00 98 COORDINATED POWER SYSTEM PROTECTION AND ARC FLASH ANALYSIS for panelboards and industrial control panels. The Contractor shall assume that panelboards and industrial control panels will likely require examination, adjustment, servicing, or maintenance while energized. Provide field installed signs to warn qualified persons of potential electric arc flash hazards when warning signs are not provided by the manufacturer. The marking shall be clearly visible to qualified persons

before examination, adjustment, servicing, or maintenance of the equipment.

## 2.19 FIRESTOPPING MATERIALS

Provide firestopping around electrical penetrations as indicated.

## 2.20 WIREWAYS

UL 870. Material shall be steel galvanized 16 gauge for heights and depths up to (150 by 150 mm) 6 by 6 inches, and 14 gauge for heights and depths up to (305 by 305 mm) 12 by 12 inches. Provide in lengths as indicated on the drawings with hinged-cover NEMA Type enclosure and rated per NEMA ICS 6 as follows:

- a. Mechanical and Elevator Equipment Rooms - NEMA 12.

## 2.21 FACTORY APPLIED FINISH

Indoor electrical equipment shall have factory-applied painting systems which shall, as a minimum, meet the requirements of NEMA 250 corrosion-resistance test and the additional requirements as specified herein. Interior and exterior steel surfaces of equipment enclosures shall be thoroughly cleaned and then receive a rust-inhibitive phosphatizing or equivalent treatment prior to painting. Interior surfaces shall receive not less than one coat of corrosion-resisting paint in accordance with the manufacturer's standard practice. Equipment located indoors shall be ANSI Light Gray. Provide manufacturer's coatings for touch-up work and as specified in paragraph "Field Applied Painting."

## PART 3 EXECUTION

### 3.1 INSTALLATION

Electrical installations shall conform to requirements of NFPA 70 and IEEE C2 and to requirements specified herein.

#### 3.1.1 Wiring Methods

Provide insulated conductors installed in rigid steel conduit, except where specifically indicated or specified otherwise or required by NFPA 70 to be installed otherwise. EMT, not to exceed (19 mm) 3/4 inches trade size, may be used in dry indoor locations for feeder and branch circuit wiring not to exceed 240Vac phase-to-phase. Grounding conductor shall be separate from electrical system neutral conductor. Provide insulated green equipment grounding conductor for circuit(s) installed in conduit and raceways. Minimum conduit size shall be (13 mm) 1/2 inch in diameter for low voltage lighting and power circuits. Vertical distribution in multiple story buildings shall be made with metal conduit in fire-rated shafts. Metal conduit shall extend through shafts for minimum distance of (150 mm) 6 inches. Conduit which penetrates fire-rated walls, fire-rated partitions, or fire-rated floors shall be firestopped as indicated.

##### 3.1.1.1 Pull Wire

Install pull wires in empty conduits. Pull wire shall be plastic having minimum (91kg) 200-pound force tensile strength. Leave minimum (915 mm) 36 inches of slack at each end of pull wire.

### 3.1.2 Conduit Installation

Unless indicated otherwise, conceal conduit under floor slabs and within finished walls, ceilings, and floors. Keep conduit minimum (150 mm) 6 inches away from parallel runs of flues and steam or hot water pipes. Install conduit parallel with or at right angles to ceilings, walls, and structural members where located above accessible ceilings and where conduit will be visible after completion of project.

Conduit runs between outlet and outlet, between fitting and fitting, or between outlet and fitting shall not contain more than the equivalent of three 90-degree bends, including those bends located immediately at the outlet or fitting.

Do not install crushed, corroded or deformed conduit. Avoid trapped conduit runs where possible. Take care to prevent the lodgment of foreign material in the conduit, boxes, fittings, and equipment during the course of construction. Clear any clogged conduit of obstructions. Replace clogged conduit that cannot be cleared of obstructions with new.

#### 3.1.2.1 Rigid Steel Conduit

Make field-made bends and offsets with approved hickey or conduit bending machine. Conduit elbows larger than 2-1/2 inches shall be long radius.

#### 3.1.2.2 Flexible Metallic Conduit

Use flexible metallic conduit to connect recessed fixtures from outlet boxes in ceilings, transformers, and other approved assemblies.

Bonding wires shall be used in flexible conduit as specified in NFPA 70, for all circuits. Flexible conduit shall not be considered a ground conductor.

Electrical connections to vibration-isolated equipment shall be made with flexible metallic conduit.

Liquidtight flexible metallic conduit shall be used in wet and oily locations and to complete the connections to motor-driven equipment.

#### 3.1.2.3 Restrictions Applicable to Flexible Conduit

Use only as specified in paragraph "Flexible Connections."

#### 3.1.2.4 Conduit Through Concrete Slabs

Where conduits rise through concrete slabs, curved portion of bends shall not be visible above finished slab.

#### 3.1.2.5 Conduit Support

Support conduit by pipe straps, wall brackets, hangers, or ceiling trapeze. Fasten by toggle bolts on hollow masonry units; by concrete inserts or expansion bolts on concrete or brick; and by machine screws, beam clamps, or spring-tension clamps on steel work. Threaded C-clamps may be used on rigid steel conduit only. Do not weld conduits or pipe straps to steel structures. Load applied to fasteners shall not exceed one-fourth proof test load. Fasteners attached to concrete ceiling shall be vibration resistant and shock-resistant. Holes cut to depth of more than (38 mm) 1

1/2 inches in reinforced concrete beams or to depth of more than (19 mm) 3/4 inch in concrete joints shall not cut main reinforcing bars. Fill unused holes. In partitions of light steel construction, use sheet metal screws. Supporting means shall not be shared between electrical raceways and mechanical piping or ducts. Installation shall be coordinated with above-ceiling mechanical systems to assure maximum accessibility to all systems. Where conduit crosses building expansion joints, provide suitable expansion fitting that maintains conduit electrical continuity by bonding jumpers or other means. For conduits greater than (64 mm) 2 1/2 inches inside diameter, provide supports to resist forces of 0.5 times the equipment weight in any direction and 1.5 times the equipment weight in the downward direction.

#### 3.1.2.6 Directional Changes in Conduit Runs

Make changes in direction of runs with symmetrical bends or cast-metal fittings. Make field-made bends and offsets with hickey or conduit-bending machine.

#### 3.1.2.7 Locknuts and Bushings

Fasten conduits to sheet metal boxes and cabinets with two locknuts where required by NFPA 70, where insulated bushings are used, and where bushings cannot be brought into firm contact with the box; otherwise, use at least minimum single locknut and bushing. Locknuts shall have sharp edges for digging into wall of metal enclosures. Install bushings on ends of conduits where required by NFPA 70.

#### 3.1.2.8 Flexible Connections

Provide flexible steel conduit between (915 and 1829 mm) 3 and 6 feet in length for recessed and semi-recessed lighting fixtures; for equipment subject to vibration, noise transmission, or movement; and for motors. Install flexible conduit to allow 20 percent slack. Minimum flexible steel conduit size shall be (19 mm) 1/2 inch diameter. Provide liquidtight flexible conduit for equipment subject to vibration, noise transmission, movement or motors. Provide separate ground conductor across flexible connections.

#### 3.1.3 Boxes, Outlets, and Supports

Provide boxes in wiring and raceway systems wherever required for pulling of wires, making connections, and mounting of devices or fixtures. Boxes for metallic raceways shall be cast-metal, hub-type when located in wet locations, when surface mounted on outside of exterior surfaces, or when surface mounted on interior walls exposed up to (2134 mm) 7 feet above floors and walkways, and where indicated on the drawings. Boxes in other locations shall be sheet steel. Each box shall have volume required by NFPA 70 for number of conductors enclosed in box. Boxes for mounting lighting fixtures shall be minimum (100 mm) 4 inches square, or octagonal, except that smaller boxes may be installed as required by fixture configurations, as approved. Fasten boxes with bolts and expansion shields on concrete or brick, with toggle bolts on hollow masonry units, and with beam clamps on steel. In open overhead spaces, cast boxes threaded to raceways need not be separately supported; support sheet metal boxes directly from building structure or by bar hangers. Where bar hangers are used, attach bar to raceways on opposite sides of box, and support raceway with approved-type fastener maximum (610 mm) 24 inches from box. When penetrating reinforced concrete members, avoid cutting reinforcing steel.

### 3.1.3.1 Boxes

Boxes for use with raceway systems shall be minimum (38 mm) 1 1/2 inches deep, except where shallower boxes required by structural conditions are approved. Boxes shall be minimum (100 mm) 4 inches square, except that (100 by 50 mm) 4 by 2 inch boxes may be used where only one raceway enters outlet. Mount outlet boxes flush in finished walls.

### 3.1.3.2 Pull Boxes

Construct of at least minimum size required by NFPA 70. Where several feeders pass through common pull box, tag feeders to indicate clearly electrical characteristics, circuit number, and panel designation.

### 3.1.3.3 Extension Rings

Extension rings are not permitted for new construction. Use only on existing boxes in concealed conduit systems where wall is furred out for new finish.

### 3.1.4 Mounting Heights

Mount panelboards, enclosed circuit breakers, motor controller and disconnecting switches so height of operating handle at its highest position is maximum (1981 mm) 78 inches above floor. Mount other devices as indicated. Measure mounting heights of wiring devices and outlets in non-hazardous areas to center of device or outlet.

### 3.1.5 Conductor Identification

Provide conductor identification within each enclosure where tap, splice, or termination is made. For conductors No. 2 AWG and smaller diameter, color coding shall be by factory-applied, color-impregnated insulation. For conductors No. 4 AWG and larger diameter, color coding shall be by plastic-coated, self-sticking markers; colored nylon cable ties and plates; or heat shrink-type sleeves.

### 3.1.6 Splices

Make splices in accessible locations. Make splices in conductors No. 10 AWG and smaller diameter with insulated, pressure-type connector. Make all splices in AWG No. 8 and larger with indenter crimp-type connectors and compression tools. Joints shall be wrapped with an insulating tape that has an insulation and temperature rating equivalent to that of the conductor.

### 3.1.7 Covers and Device Plates

Install with edges in continuous contact with finished wall surfaces without use of mats or similar devices. Plaster fillings are not permitted. Install plates with alignment tolerance of (1.6 mm) 1/16 inch. Use of sectional-type device plates are not permitted.

### 3.1.8 Electrical Penetrations

Seal openings around electrical penetrations through fire resistance-rated walls, partitions, floors, or ceilings as indicated.

### 3.1.9 Grounding and Bonding

Provide in accordance with NFPA 70 and as indicated on the drawings. Ground exposed, non-current-carrying metallic parts of electrical equipment, metallic raceway systems, grounding conductor in metallic and nonmetallic raceways, and neutral conductor of wiring systems. Make ground connection at main service equipment as indicated. Make ground connection to interior metallic beam structure. Interconnect all grounding media in or on the structure to provide a common ground potential. Where ground fault protection is employed, ensure that connection of ground and neutral does not interfere with correct operation of fault protection.

#### 3.1.9.1 Grounding and Bonding Connections

- a. Make grounding connections to building steel by exothermic weld. Make exothermic welds strictly in accordance with the weld manufacturer's written recommendations. Welds which are "puffed up" or which show convex surfaces indicating improper cleaning are not acceptable.
- b. Bond metallic enclosures, raceway systems, and all electrical equipment to equipment and earth grounds.
- c. Conduits entering boxes and enclosures must be bonded to the box with locknuts and grounding-type bushings connected to the equipment and earth ground systems. Provide adequate bushing ground lug size to accept bonding conductors sized in accordance with NFPA 70.
- d. Flexible conduit must have an integral grounding conductor.
- e. Make compression connections using a hydraulic compression tool to provide the correct circumferential pressure. Tools and dies shall be as recommended by the manufacturer. An embossing die code or other standard method shall provide visible indication that a connector has been adequately compressed on the ground wire.

#### 3.1.10 Equipment Connections

Provide power wiring for the connection of motors and control equipment under this section of the specification. Except as otherwise specifically noted or specified, automatic control wiring, control devices, and protective devices within the control circuitry are not included in this section of the specifications but shall be provided under the section specifying the associated equipment.

#### 3.1.11 Repair of Existing Work

##### 3.1.11.1 Workmanship

Lay out work in advance. Exercise care where cutting, channeling, chasing, or drilling of floors, walls, partitions, ceilings, or other surfaces is necessary for proper installation, support, or anchorage of conduit, raceways, or other electrical work. Repair damage to buildings, piping, and equipment using skilled craftsmen of trades involved.

##### 3.1.11.2 Existing Concealed Wiring to be Removed

Existing concealed wiring to be removed shall be disconnected from its source. Remove conductors; cut conduit flush with floor, underside of floor, and through walls; and seal openings.

### 3.1.11.3 Removal of Existing Electrical Distribution System

Removal of existing electrical distribution system equipment shall include equipment's associated wiring, including conductors, cables, exposed conduit, surface metal raceways, boxes, and fittings, back to equipment's power source and as indicated on the drawings.

### 3.1.11.4 Continuation of Service

Maintain continuity of existing circuits of equipment to remain. Existing circuits of equipment shall remain energized. Circuits which are to remain but were disturbed during demolition shall have circuits wiring and power restored back to original condition.

### 3.1.12 Surge Protective Devices

Connect the surge protective devices in parallel to the power source, keeping the conductors as short and straight as practically possible.

## 3.2 FIELD FABRICATED NAMEPLATE MOUNTING

Provide number, location, and letter designation of nameplates as indicated. Fasten nameplates to the device with a minimum of two sheet-metal screws or two rivets.

## 3.3 WARNING SIGN MOUNTING

Provide the number of signs required to be readable from each accessible side. Space the signs in accordance with NFPA 70E.

## 3.4 FIELD APPLIED PAINTING

Paint electrical equipment as required to match finish of adjacent surfaces or to meet the indicated or specified safety criteria. Where field painting of enclosures for panelboards, load centers or the like is specified to match adjacent surfaces, to correct damage to the manufacturer's factory applied coatings, or to meet the indicated or specified safety criteria, provide manufacturer's recommended coatings and apply in accordance to manufacturer's instructions.

## 3.5 FIELD QUALITY CONTROL

Furnish test equipment and personnel and submit written copies of test results. Give Contracting Officer 14 calendar working days' notice prior to each test.

Section 26 08 00 APPARATUS INSPECTION AND TESTING applies to this section, with the additions and modifications specified herein.

Perform all applicable inspections and electrical tests, including optional tests unless indicated otherwise, in accordance with NETA ATS for all equipment provided including but not limited to:

1. Transformers
2. Circuit Breakers, Air, Insulated-Case/Molded-Case - Do not perform current injection trip tests.

### 3. Grounding Systems

#### 4. Low Voltage Conductors

##### 3.5.1 Conductors

After completion of the installation and splicing, and prior to energizing the conductors, perform wire and cable continuity and insulation tests as herein specified before the conductors are energized.

Isolate completely all wire and cable from all extraneous electrical connections at cable terminations and joints. Substation and switchboard feeder breakers, disconnects in combination motor starters, circuit breakers in panelboards, and other disconnecting devices shall be used to isolate the circuits under test.

Perform Insulation-Resistance Test on each field-installed conductor with respect to ground and adjacent conductors. Applied potential shall be 500 volts dc for 300 volt rated cable and 1000 volts dc for 600 volt rated cable. Take readings after 1 minute and until the reading is constant for 15 seconds. Minimum insulation-resistance values shall not be less than 25 Megohms for 300 volt rated cable and 100 Megohms for 600 volt rated cable. For circuits with conductor sizes 8 AWG and smaller insulation resistance testing is not required.

Perform Continuity Test to insure correct cable connection (i.e., correct phase conductor, grounded conductor, and grounding conductor wiring) end-to-end. Any damage to existing or new electrical equipment resulting from Contractor mis-wiring will be repaired and re-verified at the Contractor's expense. All repairs shall be approved by the Contracting Officer prior to acceptance of the repair.

##### 3.5.2 Panelboards

Panelboards shall be given continuity and insulation tests after the installation has been completed and before the panelboard is energized.

Conduct insulation tests on 480-volt panelboards using a 1,000-volt insulation-resistance test set. Record readings every minute until three equal and consecutive readings have been obtained. Resistance between phase conductors and between phase conductors and ground shall be not less than 50 megohms.

Conduct insulation tests on panelboards rated 300 volts or less using a 500-volt minimum insulation-resistance test set. Record readings after 1 minute and until the reading is constant for 15 seconds. Resistance between phase conductors and between phase conductors and ground shall be not less than 25 megohms.

Record test data and include the location and identification of panelboards and megohm readings versus time.

Conduct Phase-Rotation Tests on all three-phase circuits using a phase-rotation indicating instrument. Perform phase rotation of electrical connections to connected equipment clockwise, facing the source.

Final acceptance will depend upon the successful performance of wire and cable under test. Do not energize any conductor until the final test reports are reviewed and approved by the Contracting Officer.

3.5.3 Ground-Fault Receptacle Test

Test ground-fault receptacles with a tester that trips the receptacle.  
Verify receptacle is reset after tester is removed.

-- End of Section --

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## SECTION 26 36 23.00 20

## AUTOMATIC TRANSFER SWITCHES

04/06

## PART 1 GENERAL

## 1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

## INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)

IEEE 802.3 (2008; AT 2009; AV 2009; BC 2009; Corr 1 2009; INT 1 2010; BA 2010; AZ 2010; BG 2011; BF 2011; BD 2011) Standard Information Technology--Telecommunications and Information Exchange Between Systems--Specific Requirements Part 3: CSMA/CD Access Method and Physical Layer Specifications

## INTERNATIONAL ELECTRICAL TESTING ASSOCIATION (NETA)

NETA ATS (2009) Standard for Acceptance Testing Specifications for Electrical Power Equipment and Systems

## NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70 (2011; Errata 2 2012) National Electrical Code

## UNDERWRITERS LABORATORIES (UL)

UL 1008 (2012) Transfer Switch Equipment

UL 508 (1999; Reprint Apr 2010) Industrial Control Equipment

## 1.2 RELATED REQUIREMENTS

Section 26 05 00.00 40 COMMON WORK RESULTS FOR ELECTRICAL, and Section 26 08 00 APPARATUS INSPECTION AND TESTING, apply to this section, with the additions and modifications specified herein.

## 1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Automatic Transfer Switch Drawings; G

KCCS Monitoring and Control Systems; G  
Include hardware, software, and interconnection drawings which include details of the power sources and communications pathways for devices accessed by KCCS. Submit read/write register list that is available through TCP/IP Modbus and/or RS-485 Modbus for remote KCCS monitoring.

SD-03 Product Data

Automatic Transfer Switches; G  
Product Catalog Data Sheets  
Product Technical Data Sheets  
Replacement Parts List

SD-06 Test Reports

Submit procedures for approval prior to testing. Submit procedures with final results after testing is complete.

Acceptance Checks and Tests; G

Functional Acceptance Tests; G

SD-07 Certificates

Proof of UL Listing; G

Controls Specialist Qualifications; G  
Include the qualifications of the controls engineer that will perform the KCCS system integration and overall system validation.

SD-08 Manufacturer's Instructions

Automatic Transfer Switch Instructions; G  
Include installation and operation and maintenance instructions

SD-10 Operation and Maintenance Data

Automatic Transfer Switches, Data Package 5; G

Submit in accordance with Section 01 78 23 OPERATION AND MAINTENANCE DATA.

Include final as-built read/write register list that is available through TCP/IP Modbus and/or RS-485 Modbus for remote KCCS monitoring.

Submit one unbound and five bound copies to include as-built documentation for all previously submitted documentation including Shop Drawings, Product Data, Test Reports, Manufacturer's Instructions, and Certificates. Include an Adobe pdf file of the entire manual data package on a compact disc.

#### 1.4 QUALITY ASSURANCE

##### 1.4.1 Proof of Listing

Submit proof of listing by UL 1008.

##### 1.4.2 Automatic Transfer Switch Drawings

Drawings shall include outline, arrangement, and detail drawings. Detail drawings shall include manufacturer's name and catalog number, electrical ratings, total system transfer and re-transfer sequence of operation statement, reduced normal supply voltage at which transfer to the alternate supply is initiated, transfer delay times, short-circuit current rating, control wiring diagrams, power wiring diagrams showing all phases (including neutral and ground), detail of all control and power interconnections, testing instructions, acceptable conductor type for terminals, tightening torque for each wire connector, and other required UL 1008 markings.

#### 1.5 DEFINITIONS

The Kennedy Complex Control System (KCCS) is a combination of hardware and software components that are used to monitor and control Power, HVAC, Water and Waste and Pneumatic Utilities across the Kennedy Space Center.

CITECT is an Industrial Controls, Supervisory Control and Data Acquisition (SCADA) software application that is used to monitor and control the I/O devices connected to the KCCS network. The CITECT application provides the Human Machine Interface (HMI) to display, trend, alarm, control and/or monitor the I/O points connected to or through the I/O devices. Information is transferred to and from the CITECT server over a dedicated Ethernet controls network using Modbus TCP/IP as the transportation protocol.

#### 1.6 ENGINEERING SERVICES

The Contractor shall provide a Controls Specialist to oversee the integration and validation of the integration of the automatic transfer switch control system into the KCCS system. Submit the qualifications of the controls engineer for approval.

### PART 2 PRODUCTS

#### 2.1 AUTOMATIC TRANSFER SWITCHES

Provide three-pole, 2-position; mechanically held and interlocked automatic transfer switches for use in emergency systems in accordance with UL 1008. Both the normal and emergency source will be normally energized and utility supplied. Each automatic transfer switch shall be rated for total system transfer and have the current and voltage ratings as indicated. The rating of the switch shall be adequate for withstanding the effects of the indicated RMS symmetrical fault current when protected by the indicated over-current device without contact welding.

Switch communications mechanism shall comply with IEEE 802.3.

The switch operating mechanism shall be electrically operated from the source to which it is transferring, shall have quick-make, quick-break, load break contacts, and shall be mechanically held in both positions.

Provide switches utilizing circuit breakers rated for continuous duty, bolted in place, and capable of transferring in 100 milliseconds or less.

Switch shall utilize molded- or insulated-case switches with no over-current trip functions.

Transfer switches shall have manual operating means provided for maintenance and servicing and externally operable without opening the enclosure. The manual operating means shall affect the opening and closing of the switch contacts at the same rate of speed as that caused by the automatic operation of the switch.

The switch enclosure shall comply with UL 508, NEMA Type 12, and shall be equipped with an equipment ground bus.

#### 2.1.1 Automatic Transfer Switch Controls

Provide all necessary controls operable by a front panel user interface. Load current and source voltages shall be displayed via front panel and remotely via the KCCS interface.

#### 2.1.2 Controls for Preferred Utility Source Automatic Transfer Switch

Provide all the necessary controls to transfer the load to the alternate utility source upon loss of the preferred utility source and re-transfer the load to the preferred utility source when the preferred utility source returns.

The switch shall include the following control features.

- a. Three-phase preferred and alternate source voltage sensing circuit with adjustable dropout, 75-98 percent of nominal, and pick-up, 85-100 percent of nominal.
- b. Re-transfer to normal source time delay, adjustable 1-30 minutes. Switch shall re-transfer to normal source immediately upon its return if the alternate source has failed.
- c. Adjustable time delay transition or in-phase monitor feature for indicated transfer switches to allow safe transfer of highly inductive loads between two non-synchronized sources.

#### 2.1.3 Front Panel Devices

Provide devices mounted on cabinet front consisting of:

- a. Mode selector switch with the following positions and associated functions;
  1. TEST - Simulates loss of normal/preferred source system operation.
  2. NORMAL - Transfers system to normal/preferred source bypassing re-transfer time delay.
- b. Lamps or display indicating connected source and normal/preferred source are available.
- c. Auxiliary contacts for indicating connected source and normal/preferred source are available.

- d. For dual utility source transfer switches provide preferred source selector switch with the following positions and associated functions.
  - 1. Source 1 - Selects Source 1 as the source to which the automatic transfer switch will transfer if that source is available.
  - 2. Source 2 - Selects source 2 as the source to which the automatic transfer switch will transfer if that source is available.
  - 3. None - Switch remains on currently connected source unless it fails.
- e. Lamps or display indicating that the by-pass/isolation switch is in the "normal by-pass", "alternate by-pass", or "isolated" position.

#### 2.1.4 Control Contacts and Remote Monitoring

- a. Auxiliary contacts and control transfer relay contacts shall have a minimum continuous current rating of not less than 10-amperes inductive at 120 volts ac. Provide the following auxiliary contacts wired to a common output terminal board:
  - 1. Alternate control contacts, normally open, that close on under-voltage or loss of normal power as specified, remaining closed until transfer back to normal power.
  - 2. Alternate position contacts, normally open when the switch is in the normal position, that close when the switch is in the alternate position.
  - 3. Normal position contacts, normally closed when the switch is in the normal position, that open when the switch is in the alternate position.
  - 4. Alternate source contacts, normally open when the alternate source is de-energized that close when the alternate source is available.
  - 5. Normal source contacts, normally open when the normal source is de-energized that close when the normal source is available.
  - 6. ATS Fault condition.
- b. Provide an integrated TCP/IP MODBUS hardware as part of the ATS controller.
  - 1. This system must comply with the applicable portions of Std. IEEE 802.3. The manufacturer must demonstrate that the communications system provided under this project will communicate efficiently with the latest version of CITECT software. Efficiently implies that the data will be transmitted and received such that the response time to the KCCS workstation will be less than 4 seconds. Provide all required communications and a laptop with KCCS CITECT software.
  - 2. The interface shall provide the following status points as a minimum - NORMAL SOURCE AVAILABLE, ALTERNATE SOURCE AVAILABLE, POSITION STATUS, and FAULT CONDITION.

3. The Government will develop the CITECT GUI screens to monitor and control the new data points on any new or modified ATS's that communicate to KCCS. A Government sample will be provided to the Contractor to use for development of CITECT interface. The Government will integrate new screens into the existing KCCS network.
4. A programming/interface software, installation and programming instruction manuals, hardware, jumpers and/or plugs required to make customer field configuration and establish KCCS communications shall be provided with each switch.

### PART 3 EXECUTION

#### 3.1 INSTALLATION

Installation shall conform to the requirements of NFPA 70 and manufacturer's recommendation.

#### 3.2 PREREQUISITES FOR FUNCTIONAL ACCEPTANCE TESTING

Completion of the following requirements is mandatory prior to scheduling functional acceptance tests for the automatic transfer switch.

##### 3.2.1 Manufacturers O&M Information

The manufacturers O&M information required by the paragraph entitled "SD-10 Operation and Maintenance Data", shall have been submitted to and approved by the Contracting Officer.

##### 3.2.2 Test Equipment

All test equipment and instruments shall be on hand prior to scheduling field tests, or subject to Contracting Officer's approval. Evidence shall be provided to show that arrangements have been made to have the necessary equipment and instruments on site prior to field testing.

#### 3.3 FIELD QUALITY CONTROL

Give Contracting Officer 15 day's notice of dates and times scheduled for tests which require the presence of the Contracting Officer. The Contracting Officer will coordinate with the using activity and schedule a time that will eliminate or minimize interruptions and interference with the activity operations. The Contractor shall be responsible for costs associated with conducting tests outside of normal working hours and with incorporating special arrangements and procedures, including temporary power conditions. The Contractor shall provide labor, equipment, apparatus, including test load, and consumables required for the specified tests. Calibration of all measuring devices and indicating devices shall be certified. The test load shall be the normal connected facility load. Perform the following field tests in accordance with the manufacturer's recommendations and include the following visual and mechanical inspections and electrical tests, performed in accordance with NETA ATS.

##### 3.3.1 Automatic Transfer Switch Acceptance Checks and Tests

###### a. Visual and Mechanical Inspection

1. Compare equipment nameplate data with specifications and approved

shop drawings.

2. Inspect physical and mechanical condition.
3. Confirm correct application of manufacturer's recommended lubricants.
4. Verify that manual transfer warnings are attached and visible.
5. Verify tightness of all control connections.
6. Verify tightness of accessible bolted connections by calibrated torque-wrench method. Thermographic survey is not required.
7. Perform manual transfer operations.
8. Verify positive mechanical interlocking between normal and alternate sources.

b. Electrical Tests

1. Measure contact-resistance.
2. Perform insulation-resistance on each pole, phase-to-phase and phase-to-ground with switch closed, and across each open pole for one minute. Perform tests in both source positions.
3. Verify settings and operations of control devices.
4. Calibrate and set all relays and timers.

3.3.2 Functional Acceptance Tests

Functional Acceptance Tests shall include simulating power failure and demonstrating the following operations for each automatic transfer switch. Contractor shall show by demonstration in service that the automatic transfer switches are in good operating condition, and function not less than five times.

a. Perform automatic transfer tests:

1. Simulate loss of normal/preferred power.
2. Return to normal/preferred power.
3. Simulate loss of alternate power.
4. Simulate all forms of single-phase conditions.
5. Verify with a laptop that all listed registers are able to effectively communicate with no noticeable time delay to KCCS using CITECT.

b. Verify correct operation and timing of the following functions:

1. Normal source voltage-sensing relays.
2. Time delay upon transfer.

3. Alternate source voltage-sensing relays.
  4. Automatic transfer operation.
  5. Interlocks and limit switch function.
  6. Time delay and retransfer upon normal power restoration.
- End of Section --

## SECTION 28 31 00.00 98

## FIRE DETECTION AND ALARM

09/09

## PART 1 GENERAL

## 1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

## ASME INTERNATIONAL (ASME)

ASME A17.1 (2010) Safety Code for Elevators and Escalators

## FM GLOBAL (FM)

FM APP GUIDE (updated on-line) Approval Guide  
<http://www.approvalguide.com/>

## NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 101 (2012; Amendment 1 2012) Life Safety Code

NFPA 70 (2011; Errata 2 2012) National Electrical Code

NFPA 72 (2010; TIA 10-4) National Fire Alarm and Signaling Code

NFPA 75 (2009; TIA 12-1) Standard for the Protection of Information Technology Equipment

NFPA 90A (2012) Standard for the Installation of Air Conditioning and Ventilating Systems

## NATIONAL INSTITUTE FOR CERTIFICATION IN ENGINEERING TECHNOLOGIES (NICET)

NICET 1016-2 (2007) Program Detail Manual Fire Alarm Systems, 8th Edition

## U.S. GENERAL SERVICES ADMINISTRATION (GSA)

FED-STD-595 (Rev C; Notice 1) Colors Used in Government Procurement

## UNDERWRITERS LABORATORIES (UL)

UL 268 (2009) Smoke Detectors for Fire Alarm Systems

UL 521 (1999; Reprint May 2010) Heat Detectors for Fire Protective Signaling Systems

UL 2196 (2008) UL Standard for Tests for Fire Resistive Cables, 1st Edition

UL Fire Prot Dir (2012) Fire Protection Equipment Directory

## 1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for Contractor Quality Control approval. Submit the following in accordance with Section 01 33 00  
SUBMITTAL PROCEDURES:

### SD-01 Preconstruction Submittals

Submit Evidence of the Contractor's State Certification; G to the Contracting Officer for approval, prior to any work being started on the Fire Alarm System, in accordance with paragraph entitled "Services of a Certified Fire Alarm Specialist".

### SD-02 Shop Drawings

Submit the following in accordance with the paragraph entitled, "General Requirements," of this section:

Connection Drawings; G

Module Schematic Drawings; G

Record Drawings; G (As-Built Drawings after completion of the final acceptance test)

### SD-03 Product Data

Where multiple types of the same item are required (Example: indoor, weatherproof, and explosion-proof types) provide separate Catalog Data for each type of device. Submit Manufacturer's Catalog Data for the following items:

Addressable Modules/Devices; G

Heat-Actuated Detectors; G

Smoke Detectors; G

### SD-05 Design Data

Smoke and Heat Detectors; G

Submit list of parts and components; G for the installed system by manufacturer's name, part number, and nomenclature, and recommended stock level required for normal maintenance and unscheduled repairs.

### SD-06 Test Reports

Fire Alarm System Acceptance Test Procedures; G (For Both Preliminary and Final Tests)

## SD-07 Certificates

Submit Quality Assurance Plan; G consisting of the following in accordance with the paragraph entitled, "Quality Assurance Plan," of this section:

Submit listing and/or approval documentation; G that all components are Underwriter Laboratory (UL) UL Fire Prot Dir listed or Factory Mutual (FM) FM APP GUIDE approved for their intended use and function.

Submit Contractor Readiness Affirmation - For Preliminary Fire Alarm Testing; G in accordance with the paragraph entitled, "Field Testing" of this section.

Submit KSC - Transfer of Responsibility; G for the designated portion of the Fire Alarm System; in accordance with the paragraph entitled, "Installation," of this section.

Submit NFPA 72 Fire Alarm System Record of Completion; G in accordance with paragraph entitled, "Field Testing" of this section.

## SD-10 Operation and Maintenance Data

Submit Operation and Maintenance Manuals; G bound in manual format and grouped by technical sections consisting of manufacturer's standard brochures, schematics, procedures, recommended spare parts, recommended test equipment, and safety precautions. Submit this information prior to acceptance tests being performed. Provide one single .pdf format of the O&M Manual on a single CD.

## 1.3 GENERAL REQUIREMENTS

Section 26 20 00 INTERIOR DISTRIBUTION SYSTEM specified in this section.

Submit submittals for approval in the following sequence with each approved prior to the next submittal:

- a. Sign and submit the KSC Transfer of Responsibility form no later than 30 days after notice to proceed.
- b. Submit Product Data (Catalog Data), Contractor's Certifications, and Quality Assurance Plan, within 30 days after notice to proceed.
- c. Submit Connection Drawings, Module Schematic Drawings, Design Analysis and Battery Calculations within 30 days after notice to proceed.
- d. Submit revised existing Fire Alarm Control Panel (FACP) and Network Software Program information no later than 60 days prior to the scheduled preliminary test. Provide two completed sets minimum of the Record Drawings and documentation and make available for reference at the preliminary test.
- e. Submit Acceptance Test Procedures no later than 60 days prior to the scheduled preliminary test.
- f. Sign and submit the Readiness Affirmation form no later than 5 days prior to the scheduled preliminary test.

- g. Submit Record Shop Drawings, Panel and Network software programs, and Battery Calculations for approval no later than 30 days prior to the scheduled final acceptance test. Provide two completed sets minimum of the Record drawings (As-built condition) and documentation and the NFPA 72 Fire Alarm System Record of Completion Form and make available for reference at the final test. Include submittal of listing and/or approval documentation
- h. Submit Operation and Maintenance Manuals 14 days after the final test has been complete and approved.
- i. Include in the Record drawing submittal all Shop Drawings, Panel and Network software programs, Completed Final Test Procedures, NFPA 72 Fire Alarm System Record of Completion Form and submit within 14 days after completion of the final acceptance test. Include in this submittal two (2) sets of CD ROM digital media of all the record drawings, Design Analysis, Battery Calculations and Program software information.

Prepare and submit all drawings generated by computer aided design (CAD). Include in digital media compact disc (CD) submittals .DWG or .DXF format files for all drawings: Connection Diagrams, Module Schematics, Battery Calculations, Floor plans and Fire Service Floor Plans. Also on this CD provide a complete copy of the aforementioned drawings in PDF format.

Provide Connection drawings consisting of point-to-point wiring diagrams of internal and external wiring including, but not limited to, all fire alarm field devices, zone adapter module wiring, and interconnection between components and the fire alarm system. Indicate wire label designations matching the field installation on these drawings.

Include in Connection drawings Floor Plan Drawings that indicate equipment locations, device locations with address designation, and conduit/wiring routing from the FACP(s) components to all field devices including looped Class A circuit routing requirements. Also include typical mounting requirements for each type of initiation, signaling, notification and control device. Include riser diagram and sequence of operations in an input/output matrix format that clearly shows interaction of system components.

Provide Module schematic drawings minimum size 8-1/2 by 11 inch prior to system acceptance testing.

Provide software programs, both hard copy and compact disc, for all new and/or existing programmable FACP(s) affected by the project. Provide system executable file and report file on the compact disc. Program information for FACP including program listings, system point summary, and addressable device switch settings. Include in corrected program information panel and network programs and sequence of operations in matrix format that clearly shows interaction of system components.

Conduct tests in accordance with approved Fire Alarm System Acceptance Test Procedures, and in accordance with the paragraph entitled "Field Testing" in this specification. Prepare a test procedure and test record form for conducting complete tests on control panels, reporting systems, wiring systems, and field devices installed in accordance with the manufacturer's requirements and these specifications. Identify each device and circuit to be tested in the test procedure, describe the initial condition, each step

or function in the test, required test result, and equipment to be employed. Test procedures are to be written to minimally disrupt facility operations (minimize activation of evacuation notification appliances, AHU shutdown, etc.) in support of testing requirements. Ensure test forms have suitable space for recording test results on all equipment, devices, and wiring to be tested. Provide test record forms with identified spaces for verification signatures of official witnesses and dates of the test.

Clearly indicate on Fire Service Floor Plans the location of the FACP, all initiating and auxiliary control devices, signaling line devices, notification appliances, detection systems, and all other equipment associated with the fire alarm system(s). Also, annotate the location and address setting for each multiplexed addressable device (when used). Do not place borders or title blocks on the Fire Service Floor Plan. Provide a symbol legend, which clearly identifies each device shown on the Fire Service Floor Plan. Install an updated copy of the Fire Service Floor Plan, minimum size 18 by 24 inch in a painted metal frame with a Plexiglas cover. Submit the floor plan and it's location for approval, to the Contracting Officer, prior to installation.

Submit list of parts and components in accordance with the paragraph entitled "System Requirements," of this section.

#### 1.4 SYSTEM REQUIREMENTS

Provide fire alarm devices and equipment as indicated on contract drawings.

Ensure the system conforms to all the applicable requirements of NFPA 70, NFPA 72, NFPA 75, NFPA 90A, and NFPA 101.

Ensure fire alarm systems contain all of the equipment, devices, programming and circuits required for system operation in accordance with NFPA Codes and KSC requirements, including remote reporting to and remote control from existing equipment.

Provide all additional equipment, cabinets, conduit, and labor to meet the requirements and intent of this specification.

Components installed under this contract can not be more than one (1) year older than the date of installation.

#### 1.5 QUALITY ASSURANCE PLAN

Provide manufactured fire-alarm equipment which meets the requirements of the paragraph entitled, "System Requirements," of the latest standard design, and listed by Underwriters' Laboratories or approved by Factory Mutual and be suitable for it's intended service. Ensure all devices installed function with the control panel without interference of the operation of the control panel.

#### 1.6 SERVICES OF A CERTIFIED FIRE ALARM SPECIALIST

Provide Services of a Certified Specialist thoroughly experienced in fire detection and alarm work on site, to perform or directly supervise the installation, make all necessary adjustments, and perform all tests on the fire alarm system at the site.

A Fire Alarm specialist is considered certified when the specialist holds a valid Fire Alarm System, Level III Certification from the National

Institute for Certification in Engineering Technologies NICET 1016-2; or a valid Level III Fire Alarm Engineering Technician Certification from the International Municipal Signal Association (IMSA); or is licensed by the State of Florida as a Fire Alarm Contractor I in accordance with Florida State Statute, Chapter 489, Part II.

Certification of other recognized agencies with equivalent requirements will be considered. Provide Evidence of the Contractor's State Certification and the basis of certification to the Contracting Officer and secure Contracting Officer approval prior to any work being performed at Kennedy Space Center.

## PART 2 PRODUCTS

### 2.1 ADDRESSABLE MODULES/DEVICES

Provide solid-state addressable modules compatible with the FACP. Provide modules which are suitable for individual outlet box mounting or group mounting within a control enclosure. Install modules in NEMA-4 enclosures with a neoprene gasket protected from corrosion.

Provide field addressable modules to individually communicate with the FACP using multiplexed communication techniques. Provide communication circuit wiring connections suitable for supervised Class A, Style 6 operation. Derive module power from the communication circuit or 24 V(DC) power supply supervised by the FACP. Ensure invalid address setting, component failure, or power failure initiates a trouble signal at the FACP.

Provide manufacturer's standard outlet box for enclosure housing a single isolated module (not grouped with other modules or no other modules nearby).

Provide enclosures housing more than one addressable module with hinged door type with back panel for module mounting. Provide hinged cover(s) with an integral pin-tumbler cylinder lock (Mortise or Standard Rim Cylinder from Best Access Systems) with removable core that accepts the key presently in use with other fire alarm control units at KSC; lock core will be provided by the government. Provide adequately sized enclosure to allow a minimum of 2-inch wiring space around the cabinet perimeter to include all module termination points. Provide additional spare space for 2 future modules. Provide terminal strips with 25-percent spare capacity for interfacing all module connections to field wiring. Paint enclosures with a prime coat and one or more finish coats of red enamel to provide a smooth, hard, and durable finish. Provide enclosures with an engraved phenolic nameplate labeled, "FIRE ALARM ZAM CABINET, Address."

Provide supervised addressable modules for initiation circuits, 4-wire Class A type, unless otherwise indicated. Two-wire Class B modules are acceptable when installed in the same box or enclosure as the connected initiating device.

Provide supervised addressable modules for notification appliance circuits with parallel wired Class A type unless otherwise indicated. Ensure module is suitable for use with bells, strobes, and relays.

Provide addressable relay modules for control and/or remote reporting circuits (addressable relays), including 2 separate fused Form-C contacts rated at 2 Amperes for 28 V(DC) or 120 V(AC).

## 2.2 HEAT-ACTUATED DETECTORS

Provide heat-actuated detectors with alarm-initiating devices designed for use with automatic/manual fire alarm systems in accordance with UL 521.

Provide heat-actuated detectors rated at 136 degrees F fixed temperature with 15 degree F per minute rate-of-rise feature unless otherwise indicated. Provide only fixed temperature type detectors at the top of elevator shafts.

Provide self-restorable detectors for the rate-of-rise feature and non-restorable for the fixed temperature feature. Ensure detectors have a rate-of-rise principle of operation, which uses an air chamber, a vent and a flexible metal diaphragm, and a fixed temperature principle of operation using a fusible solder joint.

## 2.3 SMOKE DETECTORS

Provide alarm initiating smoke detectors designed for use with automatic/manual fire alarm systems in accordance with UL 268.

Provide 2.5 percent per foot nominal obscuration (photo-electric) type smoke detectors, listed for use with FACP installed, including all required accessories, rust and corrosion resistant. Ensure detector head is a plug-in unit, that detector contains no moving parts, nor requires readjustment or removal to resume normal operation after an alarm. Provide all detector openings with screen to prevent the entry of insects and debris.

Provide detector head that plugs into a separate receptacle type base, with base screw terminals suitable for No. 18 through No. 14 AWG diameter solid copper conductors for all wiring connections required. Ensure base is supervised to initiate a trouble signal at the fire alarm control panel if the detector is removed, and a light emitting diode indicator to provide a visual indication when the detector initiates an alarm.

Provide smoke detectors which are individually addressable by connection to addressable modules. Provide addressable modules in accordance with the paragraph entitled, "Addressable Modules/Devices," of this section.

## 2.4 REMOTE AUXILIARY CONTROL RELAYS

Provide remote control relays with continuous duty coils rated 24 V(DC). Where relays are used on Class A parallel wired supervised circuits, ensure coils incorporate supervisory current blocking diode. Provide relays with a minimum of 2 single pole, double throw contacts rated 5 amps at 28 V(DC) or 250 V(AC). Where auxiliary control circuits connected to the relay are protected at a higher ampacity than the relay contacts are rated, provide fusing rated to protect the relay contacts in the relay enclosure.

Provide addressable type relays, where indicated, in accordance with the paragraph entitled, "Addressable Modules/Devices," of this section.

Mount remote auxiliary control relays in enclosures indicated, or if not indicated, in manufacturer's required enclosure. Install outdoor relays in a weatherproof enclosure with a neoprene gasket and protection against corrosion.

In hazardous locations, install relays with enclosures UL listed or FM

approved for the hazardous location classification indicated. Provide seal-off conduit fittings at each conduit connection to the explosion-proof enclosure in accordance with NFPA 70.

Paint enclosures with a prime coat and one or more finish coats of red enamel to provide a smooth, hard, and durable finish. Label enclosure with an engraved phenolic nameplate stating, "F/A RELAY."

Mount remote auxiliary control relays and supervise within 3 feet of the controlled device in accordance with NFPA 101.

## 2.5 WIRING

Provide copper conductor wiring in accordance with NFPA 70 and NFPA 72. Connect all devices to Class A, parallel-wired circuits, per NFPA 72, with the wire types specified in this section, unless specifically noted otherwise in the paragraph entitled, "Wiring (Wire and Multi-Conductor Cable)." For 120 V(AC) circuits, use No. 12 AWG minimum.

Ensure all conductors installed on fire alarm systems are solid copper with an insulation rating of not less than 300 volts, permanently marked with the size, voltage rating and manufacturer's name on the conductor jacket at no less than 2 feet intervals. Conductor sizes are listed below.

Where modifications are made to existing systems, match the new or added conductors to the size and color-coding of the existing system. Conductor AWG diameter and Insulation Type are listed below. Required wire colors are listed in the paragraph entitled, "Wiring (Wire and Multi-Conductor Cable)," of this section.

Provide solid copper, shielded, twisted pairs, meeting UL 2196 requirements, for conductors in multiplexed communication circuits, signaling line circuits, speaker audio circuits, remote phone circuits, and remote reporting circuits. Ensure cable is listed as Type FPL, Power-Limited Fire Protective Signaling Cable, with conductor size less than No. 16 AWG diameter for data circuits and No. 14 AWG diameter for audio circuits.

Provide direct current auxiliary control device circuit conductor size of not less than No. 14 AWG diameter, with insulation Type THHN/THWN for No. 14 AWG diameter and larger.

## PART 3 EXECUTION

### 3.1 SYSTEM SEQUENCE OF OPERATION

#### 3.1.1 Normal Operation

Ensure all new and existing switches are in the normal position; available power lamp is on, the trouble and detector identification lamps are off, and all circuits are electrically supervised.

#### 3.1.2 Supervisory Condition

Per system conditions identified in the paragraph entitled, "Fire Alarm Control Panel," of this section, ensure that a supervisory signal is transmitted to the existing Central Fire Monitoring System, device indication is provided, a supervisory signal is activated in the FACP, and input is provided to remote annunciators (when used). Ensure supervisory

signal in the alarm control unit is comprised of visual and audible indications and is self-restoring.

### 3.1.3 Trouble Condition

Per system conditions identified in the paragraph entitled, "Fire Alarm Control Panel," of this section, ensure that a trouble signal is transmitted to the remote reporting device of the Central Fire Monitoring System, providing zone indication, activating a trouble signal in the existing FACP, and providing input to remote annunciators (when used). Ensure trouble signal in the alarm-control unit provides visual and audible indications.

### 3.1.4 Alarm Condition

Ensure activation of initiating devices closes a contact that activates the appropriate FACP. FACP transmits a signal to the remote reporting device of the Central Fire Monitor System, activates the facility indicating appliances, provides zone identification, controls air handling and ventilating units, provides an input to remote annunciators (when used), and provides indication or control to devices or other systems.

## 3.2 INSTALLATION

Install all equipment in accordance with manufacturer's recommendations and requirements of this Section.

### 3.2.1 Heat-Actuated Detectors

Ceiling mount detectors unless otherwise indicated. Location, number, and general arrangement to be as indicated. Provide field installation locations complying with NFPA 72.

Locate electronic, addressable detectors no closer than 1 foot from any part of lighting fixtures. Space separation from lighting fixture in accordance with the manufacturer's requirements, but no closer than 1 foot. Mount detectors no closer than 3 feet from any supply or return diffuser.

### 3.2.2 Smoke Detectors

Provide smoke detector location, number, and general arrangement as indicated. Ensure field installation in accordance with NFPA 72. Do not install detectors until the work of other trades is complete.

Locate detectors no closer than 6 feet from a fluorescent light fixture. Locate detectors no closer than 3 feet from any return air diffuser and no closer than 6 feet from any supply diffuser. Ensure detectors installed in areas subject to moisture or exterior atmospheric conditions are UL listed or FM approved for such locations.

### 3.2.3 Auxiliary Control Relays

Install and supervise remote control relays in accessible locations within 3 feet of the device to be controlled.

### 3.2.4 Wiring (Wire and Multi-Conductor Cable)

Provide wiring conforming to the requirements of NFPA 70 and the following special requirements:

Install fire alarm system circuits in a separate raceway system. Route each circuit type (Initiating, Notification, Signaling, and Control) through a dedicated separate conduit or raceway system configured to comply with NFPA 72 Class "A" conduit system requirements. Do not allow 60-Hertz power circuits to enter enclosures containing fire alarm circuits except where required to connect to the fire alarm system.

Provide continuous conductors from a terminal point at one device to a terminal point at the next device and from a device to the FACP. Break wires at each terminal; do not loop wires over a terminal. Terminate approved explosion proof devices, provided with pigtail wiring connection leads, on a field installed terminal strip installed in the box on which the device is mounted. Install solderless ring tongue terminal lugs with manufacturer's required tooling on the device wiring connection leads. Use this ring type lug on stranded wire only. Terminate solid wire on compression or screw type terminals. When screw type terminals are used, capture the conductor under 80 percent of the screw head surface. Identify all circuit conductors within each enclosure where a tap, splice, or termination is made. Provide conductor identification by heat-shrink-type sleeves or other approved method. Use point destination type conductor labels to indicate cabinet, circuit board, terminal block and screw terminal location for each individual conductor.

Provide conductor colors as listed below and in accordance with FED-STD-595. Where modifications are made to existing systems, match the new or added conductors to the size and color-coding of the existing system.

Mark conductors for multiplexed communication circuits, speaker audio circuits, remote phone circuits, and remote station signaling circuits with circuit designation, and maintain consistent color-coding for the positive and negative loops throughout the cable system.

Install direct current initiating device circuits as Class A, parallel-wired circuits per NFPA 72. Ensure the positive loop conductor is colored blue, Color No. 15102, and the negative loop conductor is colored black, Color No. 17038.

Install power leads from the control panel for product-of-combustion detectors as Class A, parallel-wired circuits per NFPA 72. Ensure the positive conductor is be colored white, Color No. 17877, and the negative conductor is colored black, Color No. 17038.

Install direct current notification appliance (bells, strobes) circuits as Class A, parallel-wired circuits per NFPA 72. Ensure the positive conductor is colored red, Color No. 11105, and the negative conductor is colored orange, Color No. 12473.

Install direct current auxiliary device control device circuits (AHU shutdown relay) as Class A, parallel-wired circuits per NFPA 72. Ensure the positive conductor is colored yellow, Color No. 13591, and the negative conductor is colored brown, Color No. 10055.

Install solenoid valve control circuits as Class B circuits per NFPA 72. Ensure the positive conductor is colored yellow, Color No. 13591, and the negative conductor is colored violet, Color No. 37100.

### 3.2.4.1 Installation in Cabinets and Boxes

Install wiring in control cabinets and boxes in a neat and orderly manner with wire properly grouped, tie-wrapped, or laced parallel and perpendicular to the major axis, supported and identified. Provide continuous control wiring from device to device with no splices unless otherwise indicated. Permanently mark all wires entering or leaving control cabinets, boxes, and devices and terminate on screw terminals. Ensure marking is consistent throughout the fire alarm system and is the same as the identification shown on the connection drawings.

Ensure wire labels correspond to the approved connection drawings and use a method indicating the destination of the other end of the wire. Provide labels in control panel equipment or between fire alarm terminal cabinets which indicate the destination of the other end by cabinet designation-terminal strip designation-terminal number. Provide labels in fire alarm terminal cabinets indicating connection in control panel equipment by fire alarm cabinet designation-module identifier-module terminal strip identifier-terminal number. Provide conductor labels with legible machine-printed black lettering on white background using indelible ink. Ensure labels are heat shrink or wrap around type.

### 3.2.5 Conduit and Raceways

Minimum size for fire alarm system initiating, notification, signaling line and control circuit conduits and raceways is 3/4-inch. Install in accordance with NFPA 70. Ensure all Class A initiating device, signaling line, notification appliance and control circuits use diverse routing in accordance with NFPA 72. Do not run outgoing and return redundant circuit conductors in the same cable assembly, enclosure or raceway. The outgoing and return circuit conductors are only permitted to be run in a single conduit or raceway for drops that enter or exit an initiating device, notification appliance, or control unit enclosure.

Install rigid galvanized steel conduit in all locations, exterior locations where the conduit is exposed above grade, interior exposed locations from finished floor to 1 foot above finished ceiling unless otherwise shown on the drawings. Use flexible metal conduit, maximum length 6 feet, as the final connecting raceway to a fire alarm device mounted on vibrating equipment or on a suspended ceiling.

Where devices, junction boxes, and cabinets are installed outdoors, arrange conduit systems to drain away from the box; ensure conduit enters the box side or bottom only and drain type fittings are installed.

Ensure conduit installed in a vertical position is parallel with walls and perpendicular with the floor and ceiling, and that conduit installed in a horizontal position is parallel with the floor and ceiling and perpendicular to the walls. Make changes in direction of runs with symmetrical bends. For bends of over 1-inch in diameter, provide factory made elbows.

### 3.2.6 Elevators

Ensure initiating devices to effect control of the elevator(s) in an alarm condition report through the existing facility fire alarm system and initiate the following actions in the elevator controls in accordance with ASME A17.1 and NFPA 72:

- a. Primary Fire Fighter Recall.
- b. Secondary Fire Fighter Recall.
- c. Power Feed Shunt-Trip.
- d. "Do Not Use Elevator" Warning.

### 3.3 FIELD TESTING

After complete installation of the equipment and at such time as directed by the Contracting Officer, conduct tests to demonstrate that the installation requirements of this specification have been met and that the sequential functions of the system comply with the requirements specified herein. Perform the Tests covered in the following paragraphs in two parts:

- a. Contractor Checkout - Perform this test to remove all troubles, ground faults, ensure all devices are fully functional and operational, and test the programming to ensure the installation meets the contract drawings and specifications.

For modification and rehabilitation work, the Contractor is not responsible for existing troubles and ground faults that are not in contract scope. Clearly convey the existing troubles and ground faults that are not in contract scope in the Transfer of Responsibility form. Upon successful completion of Contractor Checkout, submit Contractor Readiness Affirmation - For Preliminary Fire Alarm Testing prior to requesting the preliminary test. Also submit KSC - Transfer of Responsibility; and draft of NFPA 72 Fire Alarm System Record of Completion. Contractor Readiness Affirmation - For Preliminary Fire Alarm Testing and KSC - Transfer of Responsibility forms can be found in the "Special Conditions" documentation associated with this project.

- b. Preliminary - Perform this test using the approved test procedure and witnessed by the Government construction inspectors. Verify Record (as-built) fire alarm system drawings against the system installed, annotate all red-lines, and summarize on a single set of record (as-built) drawings. Follow the test procedures as written and annotate all red-lines on a single Test Procedure. Secure the initials and date on the summarized set of drawings and test procedures from the construction inspector and the fire alarm vendor. The Preliminary test is not considered complete until all steps in the test procedure have been satisfactorily completed. This includes any additional steps required to complete 100 percent testing of the fire alarm system and its associated functionality.
- c. Final Acceptance - After the successful completion of the preliminary test, schedule a Final Acceptance test. Incorporate the final acceptance test procedure and record (as-built) drawings including all red lines from the preliminary test. Provide a copy of the consolidated redlines for the record (as-built) drawings and preliminary test procedures from the preliminary test. Ensure the Contracting Officer and the Authority Having Jurisdiction or their designee(s) witness the final acceptance test for the fire alarm system. During the Final Acceptance Test, provide two corrected as-built drawings and Final Acceptance Test Procedures for use in conducting the final acceptance test. Upon completion of the Final Acceptance Test, provide the following documentation to the Contracting Officer; a copy of the Final Acceptance Test procedure (with all steps

annotated as complete), a corrected set of as-built drawings and a signed and completed NFPA 72 Fire Alarm System Record of Completion form.

On both preliminary and final tests, follow the approved testing procedures.

### 3.3.1 External System Wiring

Perform the following tests on the external system wiring before connection to the control panel:

Check continuity of circuits with an ohmmeter. Insert temporary jumpers in appropriate sockets of missing detectors and install the end-of line resistor when this test is performed. Verify resistance reading for each circuit is the value of the end-of-line resistor, plus or minus 10 percent.

Check each wire for grounds with 300-volt and 500-volt insulation resistance test set. Ensure resistance to ground is not less than 20 megohms. Isolate each wire tested from ground, with all other wires within the same conduit grounded. Verify that the conduit system is grounded prior to insulation resistance testing by verifying a short circuit between the conduit and earth ground.

### 3.3.2 Fire Alarm System Acceptance Test Procedures (For Both Preliminary and Final Tests)

After completion of the above tests, connect the external system wires to the appropriate terminals in the control panel and perform the following tests:

With the control panel energized, demonstrate the proper operation of all indicating lights and alarms.

Demonstrate each annunciator panel lamp to operate when its associated device or zone is activated.

Activate each manual pull station to demonstrate proper operation.

Activate each smoke detector in accordance with the manufacturer's instructions, to demonstrate proper operation; both alarm and trouble.

Each time an initiating or supervisory circuit is activated, verify that the associated device address, notification appliances circuits, auxiliary control circuits, and alarm reporting to the Central Fire Monitoring System is activated and the correct information is displayed by the color graphics units.

Remove and ground one lead at each alarm initiating device, to demonstrate circuit trouble, ground fault, and then alarm over ground fault with an open circuit. Alternate between positive (plus) and negative (minus) leads during the device testing process.

Turn off power to each separately powered panel or device to simulate loss of power and to demonstrate operation of the trouble alarm.

Test the rate-of-rise function on each heat-actuated detector in each zone by application of heat from a heat lamp or hand held hot air blower. Ensure detectors initiate an alarm to the system, sustain

repeated tests of the rate-of-rise function without damage to the fixed temperature function. Replace heat-actuated detectors (HADS) subject to operation from body temperature.

Demonstrate each alarm initiating circuit to operate its associated alarm-control and auxiliary control units and remote reporting.

Remove and ground one lead at each notification appliance and auxiliary control device to demonstrate open circuit trouble, ground fault trouble, and then operation over ground fault with an open circuit. Alternate between positive (plus) and negative (minus) leads during the device testing process.

Demonstrate each alarm control unit to operate in all modes.

Demonstrate all circuits interconnecting with other systems fire protection, smoke control, HVAC, security and safety, elevators, etc., to operate as specified on alarm from the associated zone or zones.

Verify all maintenance bypass functions operate as specified. Independently verify each device or circuit controlled by the bypass function.

### 3.3.3 Reacceptance System Tests

Perform reacceptance testing after system components are added or deleted; after any modification, repair, or adjustment to system hardware or wiring; or after any change to software. Test all components, circuits, systems operations, or site specific software functions known to be affected by the change or identified by a means that indicates the system operational changes are 100 percent tested. In addition, also test 10 percent of the initiating devices that are not directly affected by the change and verify proper system operation.

Changes to all control units connected or controlled by the system executive software require a 10 percent functional test of the system, including a test of at least one device on each input and output circuit to verify proper system operation.

Upon completion of the modification, functionally test the existing devices that were reinstalled and test the devices that are on both sides of the point of connection of the new devices. Test all newly installed devices in accordance with the paragraph entitled, "Fire Alarm System Acceptance Test Procedures (For Both Preliminary and Final Tests)," of this section.

After final acceptance testing has been successfully completed, submit test data under the terms of the "GENERAL REQUIREMENTS" clause of this contract.

### 3.4 OPERATION AND MAINTENANCE MANUALS

Submit Operation and Maintenance Manuals. Bind information in manual format and group by technical sections consisting of manufacturer's standard brochures, schematics, procedures, recommended spare parts, recommended test equipment, and safety precautions. Submit this information prior to acceptance tests being performed.

### 3.5 PAINTING

Bring all manufacturer's standard finish equipment surfaces, damaged during

construction, to as-new condition by touchup or repainting to the satisfaction of the Contracting Officer, or replace with new undamaged equipment at no additional cost to the Government.

Paint all fire alarm conduit fittings, junction boxes, and junction box covers red, Color No. 11105 in accordance with FED-STD-595. Mark conduit with a minimum 1-inch wide band every 20 feet.

-- End of Section --

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# **APPENDIX A**

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# **PbO<sub>3</sub>** ENVIRONMENTAL TESTING & SVC. Co. **INCORPORATED**

Report No: ACM -811-11-13-12-02

November 13, 2012

Client: URS Corporation  
7650 W. Courtney Campbell Causeway  
Tampa, FL 33607

Attn: John J. Calamari, P.E.  
Senior Project Manager

Project: Limited Asbestos Survey-Tower F Elevator Doors  
Project No.: 12010773.00000  
Vehicle Assembly Building (VAB) Tower F Elevator  
Kennedy Space Center, FL

According to your instructions **PbO<sub>3</sub>** Environmental Testing & Service Co., Inc. has completed a limited asbestos survey at the subject property (Project). The following pages of this report contain the results of this inspection. This limited asbestos inspection report presents data that describes the location of asbestos-containing material (ACM) identified only within the project scope. This report is to be used as a program-planning tool for the proposed renovation activities scheduled at this facility. This survey was conducted on site by EPA/AHERA trained professional inspector.

Suspect materials not previously identified in this report may be encountered during any renovation and/or maintenance activities. These materials should be assumed asbestos containing material until sample collection and subsequent analysis prove otherwise.

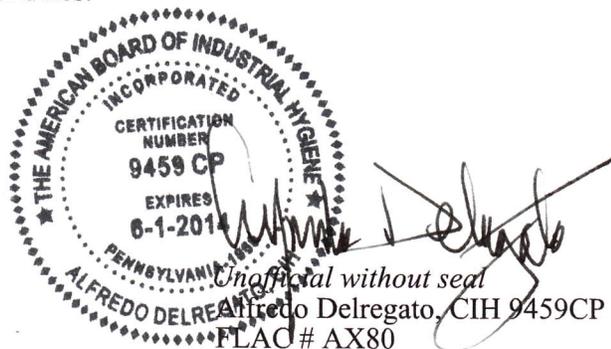
This report is intended for the exclusive use of our client. The findings are relevant to the conditions observed during the physical process of performing the inspection. These findings should not be treated as absolute nor should they be relied upon to represent conditions at significantly later dates.

**PbO<sub>3</sub>** Environmental Testing & Service Co., Inc.



Dave Mederer  
Project Manager

Asbestos License # ZA 0000205



Limited Asbestos Survey-Tower F Elevator Doors  
Project No.: 12010773.00000  
Vehicle Assembly Building (VAB) Tower F Elevator  
Kennedy Space Center, FL

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Limited Asbestos Survey-Tower F Elevator Doors  
Project No.: 12010773.00000  
Vehicle Assembly Building (VAB) Tower F Elevator  
Kennedy Space Center, FL

## **1.0 EXECUTIVE SUMMARY**

### Sample Collection Date

October 18<sup>th</sup> and 19<sup>th</sup>, 2012

### Inspector:

Kevin O'Malley, Asbestos Building Inspector    Certification No. 154429

### Licensed Asbestos Consultant

Alfredo Delregato, CIH 9459CP  
FLAC # AX80

### State Licenses and/or Certifications

Asbestos License No. ZA 0000205

### Limited Confirmatory Asbestos Sampling for Asbestos Containing Materials –Elevator Doors Tower F

#### Overview

PbO3 Environmental Testing & Service Co., Inc. was contracted by the URS Corporation to provide limited testing services for suspect asbestos containing materials as designated by our client. The sampling was to confirm the presence of asbestos containing material inside the elevator doors, as the doors are currently labeled as an asbestos containing material.

There was a total of five (5) confirmatory samples (including sub-samples) analyzed by EPA Method 600/R-93/116.

Based upon our visual observations, bulk sampling of suspect materials, and subsequent microscopic analysis, we have confirmed that the interior cores of the elevator doors sampled are **Asbestos Containing Material**. All elevator doors should be assumed an asbestos containing material.

Limited Asbestos Survey-Tower F Elevator Doors  
 Project No.: 12010773.00000  
 Vehicle Assembly Building (VAB) Tower F Elevator  
 Kennedy Space Center, FL

**2.0 SUMMARY- SAMPLE RESULTS**

*Asbestos Containing Material* was detected in the following samples:

Sample No.	Component	Sample Identification	LayerID	MacroDescription	Asbestos Material	Asbestos Qty	Friable
VAB.20.01	Elevator Door Core	Tower F-Level 20	Core-Interior	Gray, Fibrous	CHRYSTILE	55%	YES*
VAB.25.02	Elevator Door Core	Tower F-Level 25	Core-Interior	Gray, Fibrous	CHRYSTILE	55%	YES*
VAB.31.03	Elevator Door Core	Tower F-Level 31	Core-Interior	Gray, Fibrous	CHRYSTILE	55%	YES*
VAB.3.04	Elevator Door Core	Tower F-Level 03	Core-Interior	Gray, Fibrous	CHRYSTILE	55%	YES*
VAB.1.05	Elevator Door Core	Tower F-Level 01	Core-Interior	Gray, Fibrous	CHRYSTILE	55%	YES*

\*Friable asbestos-containing material (ACM), is defined by the EPA-"National Emission Standards for Hazardous Air Pollutants" (NESHAP) regulation as any material containing more than one percent (1%) asbestos when dry, can be crumbled, pulverized or reduced to powder by hand pressure.

All elevator doors should be assumed an asbestos containing material.

Limited Asbestos Survey-Tower F Elevator Doors  
Project No.: 12010773.00000  
Vehicle Assembly Building (VAB) Tower F Elevator  
Kennedy Space Center, FL

**LABORATORY REPORTS**

# SCHNEIDER LABORATORIES GLOBAL

INCORPORATED

2512 W. Cary Street • Richmond, Virginia • 23220-5117  
804-353-6778 • 800-785-LABS (5227) • (FAX) 804-359-1475

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## LABORATORY ANALYSIS REPORT

Asbestos Identification by EPA Method<sup>1</sup> 600/R-93/116

Using SLI A6

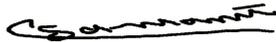
**ACCOUNT #:** 1491-12-3229  
**CLIENT:** PbO3 ENV TESTING & SERVICES INC  
**ADDRESS:** 473 N PINE MEADOW DR  
DEBARY, FL 32713

**DATE COLLECTED:** 10/18/2012  
**DATE RECEIVED:** 10/19/2012  
**DATE ANALYZED:** 10/22/2012  
**DATE REPORTED:** 10/23/2012

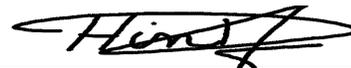
**PROJECT NAME:** URS  
**JOB LOCATION:** VAB-KSC  
**PROJECT NO.:** Tower F  
**PO NO.:**

**SampleType:** BULK

Client Sample No.	SLI Sample/ Layer ID	Sample Identification/ Layer Name	PLM Analysis Results	
			Asbestos Fibers	Other Materials
VAB.20.01	31655754	Elevator Door Core Lvl 20		
Layer 1:	Fibrous Material Gray, Fibrous		55% CHRYSOTILE	35% CELLULOSE FIBER 10% NON FIBROUS MATERIAL
VAB.25.02	31655755	Elevator Door Core Lvl 25		
Layer 1:	Fibrous Material Gray, Fibrous		55% CHRYSOTILE	35% CELLULOSE FIBER 10% NON FIBROUS MATERIAL
VAB.31.03	31655756	Elevator Door Core Lvl 31		
Layer 1:	Fibrous Material Gray, Fibrous		55% CHRYSOTILE	30% CELLULOSE FIBER 15% NON FIBROUS MATERIAL
VAB.3.04	31655757	Elevator Door Core Lvl 03		
Layer 1:	Fibrous Material Gray, Fibrous		55% CHRYSOTILE	35% CELLULOSE FIBER 10% NON FIBROUS MATERIAL
VAB.1.05	31655758	Elevator Door Core Lvl 01		
Layer 1:	Fibrous Material Gray, Fibrous		55% CHRYSOTILE	35% CELLULOSE FIBER 10% NON FIBROUS MATERIAL



**Analyst:** SAMANI ABDELFADEL



**Reviewed By:** Hind Eldanaf, Microscopy Supervisor

**Total Number of Pages in Report: 1**

Results relate only to samples as received by the laboratory.

Visit [www.slabin.com](http://www.slabin.com) for current certifications.

*Samples analyzed by the EPA Test Method are subject to the limitations of light microscopy including matrix interference. Gravimetric reduction and correlative analyses are recommended for all non-friable, organically bound materials. This method has a reporting limit of 1% or greater. Visual estimation contains an inherent range of uncertainty. This report must not be reproduced except in full with the approval of the lab, and must not be used to claim NVLAP or other gov't agency endorsement.*



Limited Asbestos Survey-Tower F Elevator Doors  
Project No.: 12010773.00000  
Vehicle Assembly Building (VAB) Tower F Elevator  
Kennedy Space Center, FL

#### **4.0 RECOMMENDATIONS**

The EPA's National Emission Standard for Hazardous Air Pollutants (NESHAP) regulations and the Florida Department of Environmental Protection (FDEP) Asbestos program regulate the removal and disposal of asbestos-containing building materials. The Florida Department of Environmental Protection (DEP) administers an asbestos removal program under Chapter 62-257, Florida Administrative Code. The Asbestos NESHAP has been adopted by reference in section 62-204.800, Florida Administrative Code. The program's intent is to minimize the release of asbestos fibers during activities involving the processing, handling, and disposal of asbestos-containing material.

29 CFR 1926.1101- OSHA's Asbestos Standard for the Construction Industry does apply to the demolition/renovation of all facilities identified with asbestos containing material. The contractor will need to comply with the specific **training, duties** and **responsibilities** outlined in this CFR.

All Asbestos abatement projects must in compliance with Florida Statute Title XXXII Chapter 469. Only a Florida licensed asbestos contractor using properly trained, certified, and licensed asbestos workers can perform asbestos removal projects in Florida.

The regulations of these agencies require the removal of friable asbestos-containing materials prior to extensive renovation or demolition projects, and the removal of non-friable asbestos-containing materials that may be rendered friable in the course of renovation or demolition projects.

Florida requires the submission of a 10-Day Notification for all renovations and demolitions of facilities with at least 260 linear feet of regulated asbestos-containing materials (RACM), 160 square feet of regulated asbestos containing materials on other facility components, or at least one cubic meter (35 cubic feet) off facility components. Asbestos waste requires disposal at an approved solid waste disposal facility. Local agencies may also have specific requirements for demolition/renovation projects involving asbestos-containing building materials.

OSHA 29 CFR 1910.1001 requires the communication of information concerning asbestos hazards. Employees engaged in work activities with installed ACM may be exposed to asbestos fibers. The owner or operator should take the necessary steps to reduce the potential for disturbance.

Suspect materials not previously identified in this report may be encountered during any renovation and/or maintenance activities. If encountered all work in the immediate area shall cease. These materials should be assumed asbestos containing material until sample collection and subsequent analysis prove otherwise.

Limited Asbestos Survey-Tower F Elevator Doors  
Project No.: 12010773.00000  
Vehicle Assembly Building (VAB) Tower F Elevator  
Kennedy Space Center, FL

### Inspection Limits

**PbO<sub>3</sub>** has performed the Client requested tasks in a thorough and professional manner consistent with commonly accepted standard industry practices, using state of the art practices and best available known technology, as of the date of the assessment. **PbO<sub>3</sub>** cannot guarantee and does not warrant that this limited Asbestos Survey has identified all adverse environmental factors and/or conditions affecting the subject properties on the date of the Assessment. **PbO<sub>3</sub>** cannot and will not warrant that this limited Asbestos Survey that was requested by the client will satisfy the dictates of, or provide a legal defense in connection with, any environmental laws or regulations. It is the responsibility of the client to know and abide by all applicable laws, regulations, and standards. The results reported and conclusions reached by **PbO<sub>3</sub>** are solely for the benefit of the client. The results and opinions in this report, based solely upon the conditions found on the property as of the date of the Assessment, will be valid only as of the date of the Assessment. This limited asbestos survey was not intended to be definitive study of the presence of asbestos on the subject property since it is limited to select areas scheduled for renovation. Other locations of asbestos may exist at the subject property, and the levels may vary from those stated in this report. There may be variations in the composition of materials which appear similar. Materials may be hidden from view and not accessible. This is an occupied structure where damage and invasive sampling needed to be minimized (such as structures not owned by our client). Hypothetical examples include floor tile hidden under carpeting, and not detected by our typical examination of the area under the carpet at a corner(s) or existing hole(s), an abandoned length of insulated pipe hidden within a finished wall, an asbestos-cement sewer vent pipe in the wall behind a toilet, asbestos paper/felt between hardwood flooring and the sub-floor or old vinyl floor tile covered over with plywood and newer flooring materials. No attempt was made to disassemble equipment or demolish structural elements and finishes as this is beyond the scope of our authorized services. Visual observations were made only at convenient locations, due to these limitations, wall voids, flooring under carpet, building cavities and mechanical equipment, and other areas may contain unreported asbestos-containing materials. This report has been prepared for the exclusive use of our client, for the expressed purpose of providing them with an understanding of the potential for the presence of asbestos at the assessed property. PbO<sub>3</sub> has relied upon state-of-the-art information in this report, and accepts no responsibility for any deficiencies, mis-statements or inaccuracies in the report as a result of mis-statements, omissions, misrepresentations, fraudulent, or inaccurate information provided. We are not responsible for changes in applicable regulatory standards, practices, or regulations following performance of services. All fire doors should be assumed asbestos containing material since disassembly of locks and/or other work to access the door insulation is not possible. We generally assume that roofing material contains asbestos, as asbestos roofing material is very common. Location and sampling of underground items, such as asbestos-cement pipes, would have been outside of the scope.

Limited Asbestos Survey-Tower F Elevator Doors  
Project No.: 12010773.00000  
Vehicle Assembly Building (VAB) Tower F Elevator  
Kennedy Space Center, FL

**5.0 CERTIFICATIONS**

# Asbestos Consulting & Training Systems

39674.5748CERT/BIR

900 N.W. 5TH Avenue, Fort Lauderdale, Florida 33311 (954) 524-7208

**This is to Certify that  
Kevin X O'Malley**

Processed By:



XXX-XX-0544

625 Merritt Ave # C, Merritt Island, FL

## Seagull

To Authenticate Certificate:  
[www.seagulltraining.com](http://www.seagulltraining.com)  
1-800-966-9939

**has successfully completed an English  
Asbestos Building Inspection Refresher**

**14-Aug-12 TO 14-Aug-12**

Individual above has completed the requisite training for accreditation under TSCA Title II

Meets state requirements of FL49-0001020/CN-0006273.

NDAAC Provider #451      Trainer(s): Alberto A. Ania  
Training Address: 2233 Park Avenue Suite 406, Orange Park, FL, 32073

Successful course completion based on exam score on: 14-Aug-12

**This Certificate Expires:**

**14-Aug-13**



08 / 14 / 13

UNDER CIVIL AND CRIMINAL PENALTIES OF FEDERAL LAW FOR MAKING OR  
ISSUING A FALSE OR FRAUDULENT STATEMENT OR  
CERTIFICATE IN VIOLATION OF 18 U.S.C. § 1001 AND 18 U.S.C. § 1011  
BY THE ABOVE TRAINING COMPANY WITH ANY APPLICABLE  
STATE REQUIREMENTS OF TITLE 49, CHAPTER 75, AND  
CHAPTER 40 CFR PART 75, AND ANY OTHER APPLICABLE  
FEDERAL, STATE, OR LOCAL REQUIREMENTS.



**James F. Stump, Course Sponsor**

Certificate Number..... 154429

Course Number JE1233



STATE OF FLORIDA

DEPARTMENT OF BUSINESS AND PROFESSIONAL REGULATION

ASBESTOS LICENSING UNIT
1940 NORTH MONROE STREET
TALLAHASSEE FL 32399-0783

(850) 487-1395

PBO3 ENVIRONMENTAL TESTING & SVC COMPANY, INC
PETER C. SWARR
473 N.PINE MEADOW DR
DEBARY FL 32713

Congratulations! With this license you become one of the nearly one million Floridians licensed by the Department of Business and Professional Regulation.

Every day we work to improve the way we do business in order to serve you better. For information about our services, please log onto www.myfloridalicense.com.

Our mission at the Department is: License Efficiently, Regulate Fairly. We constantly strive to serve you better so that you can serve your customers.

License card for ASBESTOS BUSINESS ORGANIZATION, PBO3 ENVIRONMENTAL TESTING & SVC, PETER C. SWARR. Includes AC# 5754934, license number ZA0000205, and expiration date NOV 30, 2013.

DETACH HERE

THIS DOCUMENT HAS A COLORED BACKGROUND • MICROPRINTING • LINEMARK™ PATENTED PAPER

AC# 5754934

STATE OF FLORIDA

DEPARTMENT OF BUSINESS AND PROFESSIONAL REGULATION
ASBESTOS LICENSING UNIT

SEQ# L11091603036

Table with 3 columns: DATE, BATCH NUMBER, LICENSE NBR. Row 1: 09/16/2011, 110104006, ZA0000205

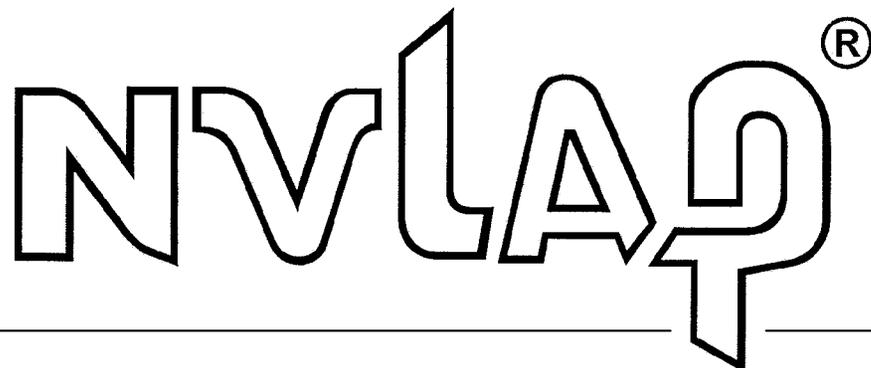
The ASBESTOS BUSINESS ORGANIZATION Named below IS LICENSED Under the provisions of Chapter 469 FS. Expiration date: NOV 30, 2013

PBO3 ENVIRONMENTAL TESTING & SVC COMPANY, INC
PETER C. SWARR
473 N.PINE MEADOW DR
DEBARY FL 32713

RICK SCOTT GOVERNOR

KEN LAWSON SECRETARY

United States Department of Commerce  
National Institute of Standards and Technology



---

**Certificate of Accreditation to ISO/IEC 17025:2005**

---

NVLAP LAB CODE: 101150-0

**Schneider Laboratories Global, Inc.**  
Richmond, VA

*is accredited by the National Voluntary Laboratory Accreditation Program for specific services,  
listed on the Scope of Accreditation, for:*

**BULK ASBESTOS FIBER ANALYSIS**

*This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2005.  
This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality  
management system (refer to joint ISO-ILAC-IAF Communique dated January 2009).*

2012-04-01 through 2013-03-31

*Effective dates*



*David F. Alderman*

*For the National Institute of Standards and Technology*



**National Voluntary  
Laboratory Accreditation Program**



**SCOPE OF ACCREDITATION TO ISO/IEC 17025:2005**

**Schneider Laboratories Global, Inc.**

2512 W. Cary Street

Richmond, VA 23220-5117

Mr. Raja Abouzaki, PhD

Phone: 804-353-6778 Fax: 804-359-1138

E-Mail: RAbouzaki@slabinc.com

URL: <http://www.slabinc.com>

**BULK ASBESTOS FIBER ANALYSIS (PLM)**

**NVLAP LAB CODE 101150-0**

*NVLAP Code    Designation / Description*

18/A01            EPA-600/M4-82-020: Interim Method for the Determination of Asbestos in Bulk Insulation Samples

2012-04-01 through 2013-03-31

*Effective dates*

*David F. Alderman*

*For the National Institute of Standards and Technology*

# **APPENDIX B**

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**ENVIRONMENTAL TESTING & SVC. CO.**

Report No: MTL -811-11-13-12-01

November 13, 2012

Client: URS Corporation  
7650 W. Courtney Campbell Causeway  
Tampa, FL 33607

Attn: John J. Calamari, P.E.  
Senior Project Manager

Project: Paint Analysis for Total Metals-RCRA Eight (8) Metals  
Project No.: 12010773.00000  
Vehicle Assembly Building (VAB) Tower F Elevator  
Kennedy Space Center, FL

According to your instructions **PbO<sub>3</sub>** Environmental Testing & Service Co., Inc. has completed a limited testing survey for metals at the subject property (Project). The following pages of this report contain the results of this testing. This report is to be used as a program-planning tool for the proposed renovation activities scheduled at this facility. This survey was conducted on site by Florida EPA Certified Lead-Based Paint Risk Assessor and EPA/AHERA trained Asbestos Inspector.

This report is intended for the exclusive use of our client. The findings are relevant to the conditions observed during the physical process of performing the Inspection. These findings should not be treated as absolute nor should they be relied upon to represent conditions at significantly later dates.

**PbO<sub>3</sub>** Environmental Testing & Service Co., Inc.

A handwritten signature in black ink, appearing to be 'DM' or similar initials, written in a cursive style.

Dave Mederer  
Project Manager

Paint Analysis for Total Metals- RCRA Eight (8) Metals  
Project No.: 12010773.00000  
Vehicle Assembly Building (VAB) Tower F Elevator  
Kennedy Space Center, FL

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3.0 LABORATORY REPORTS .....	12

Paint Analysis for Total Metals- RCRA Eight (8) Metals  
Project No.: 12010773.00000  
Vehicle Assembly Building (VAB) Tower F Elevator  
Kennedy Space Center, FL

## 1.0 EXECUTIVE SUMMARY

### Sample Collection Dates

October 17<sup>th</sup> and 18<sup>th</sup>, 2012

### State Licenses and/or Certifications

U.S. EPA Certified Lead-Based Paint Activities Firm No. FL-2418-2  
Asbestos License # ZA 0000205

### Inspector:

Kevin O'Malley, Florida EPA Certified Lead-Based Paint Risk Assessor FL-R-345-3  
Asbestos Building Inspector Certification No. 154429

Paint Chip Samples for Total Metals-RCRA Eight (8) Metals were collected from representative elevator doors on Tower F of the Vehicle Assembly Building.

### Overview

According to your instructions **PbO<sub>3</sub>** Environmental Testing & Service Co., Inc. has collected twenty-four (24) representative paint chip samples of exposed painted components as designated by our client.

The samples were analyzed for Total Metals by EPA Method 6010C for Barium, Cadmium, Chromium, Lead, Silver Arsenic, Selenium and EPA Method 7471B for Mercury.

**2.0 DETAILED FINDINGS**

Project Number	Sample Number	Component	Location	Periodic Name	PPM
Tower F-Elevator Doors	VAB-5-F-01	Front Door	Level 5 Front	Silver	< 6
Tower F-Elevator Doors	VAB-5-F-01	Front Door	Level 5 Front	Arsenic	< 6
Tower F-Elevator Doors	VAB-5-F-01	Front Door	Level 5 Front	Barium	42,196
Tower F-Elevator Doors	VAB-5-F-01	Front Door	Level 5 Front	Cadmium	1,669
Tower F-Elevator Doors	VAB-5-F-01	Front Door	Level 5 Front	Chromium	22,635
Tower F-Elevator Doors	VAB-5-F-01	Front Door	Level 5 Front	Mercury	1
Tower F-Elevator Doors	VAB-5-F-01	Front Door	Level 5 Front	Lead	102,499
Tower F-Elevator Doors	VAB-5-F-01	Front Door	Level 5 Front	Selenium	247
Tower F-Elevator Doors	VAB-7-F-02	Front Door	Level 7 Front	Silver	< 6
Tower F-Elevator Doors	VAB-7-F-02	Front Door	Level 7 Front	Arsenic	< 6
Tower F-Elevator Doors	VAB-7-F-02	Front Door	Level 7 Front	Barium	24,358
Tower F-Elevator Doors	VAB-7-F-02	Front Door	Level 7 Front	Cadmium	466
Tower F-Elevator Doors	VAB-7-F-02	Front Door	Level 7 Front	Chromium	15,933
Tower F-Elevator Doors	VAB-7-F-02	Front Door	Level 7 Front	Mercury	< 1
Tower F-Elevator Doors	VAB-7-F-02	Front Door	Level 7 Front	Lead	69,725
Tower F-Elevator Doors	VAB-7-F-02	Front Door	Level 7 Front	Selenium	43
Tower F-Elevator Doors	VAB-9.F-03	Front Door	Level 9 Front	Silver	< 6
Tower F-Elevator Doors	VAB-9.F-03	Front Door	Level 9 Front	Arsenic	< 6
Tower F-Elevator Doors	VAB-9.F-03	Front Door	Level 9 Front	Barium	33,253
Tower F-Elevator Doors	VAB-9.F-03	Front Door	Level 9 Front	Cadmium	2,393
Tower F-Elevator Doors	VAB-9.F-03	Front Door	Level 9 Front	Chromium	23,933
Tower F-Elevator Doors	VAB-9.F-03	Front Door	Level 9 Front	Mercury	< 1
Tower F-Elevator Doors	VAB-9.F-03	Front Door	Level 9 Front	Lead	103,946
Tower F-Elevator Doors	VAB-9.F-03	Front Door	Level 9 Front	Selenium	430
Tower F-Elevator Doors	VAB-7-R-04	Rear Door	Level 7 Rear	Silver	< 6
Tower F-Elevator Doors	VAB-7-R-04	Rear Door	Level 7 Rear	Arsenic	< 6
Tower F-Elevator Doors	VAB-7-R-04	Rear Door	Level 7 Rear	Barium	28,013
Tower F-Elevator Doors	VAB-7-R-04	Rear Door	Level 7 Rear	Cadmium	1,108
Tower F-Elevator Doors	VAB-7-R-04	Rear Door	Level 7 Rear	Chromium	22,075
Tower F-Elevator Doors	VAB-7-R-04	Rear Door	Level 7 Rear	Mercury	< 1
Tower F-Elevator Doors	VAB-7-R-04	Rear Door	Level 7 Rear	Lead	99,705
Tower F-Elevator Doors	VAB-7-R-04	Rear Door	Level 7 Rear	Selenium	134
Tower F-Elevator Doors	VAB-10-F-05	Front Door	Level 10 Front	Silver	< 6
Tower F-Elevator Doors	VAB-10-F-05	Front Door	Level 10 Front	Arsenic	11
Tower F-Elevator Doors	VAB-10-F-05	Front Door	Level 10 Front	Barium	27,739
Tower F-Elevator Doors	VAB-10-F-05	Front Door	Level 10 Front	Cadmium	2,062
Tower F-Elevator Doors	VAB-10-F-05	Front Door	Level 10 Front	Chromium	14,167

Paint Analysis for Total Metals- RCRA Eight (8) Metals  
 Project No.: 12010773.00000  
 Vehicle Assembly Building (VAB) Tower F Elevator  
 Kennedy Space Center, FL

Project Number	Sample Number	Component	Location	Periodic Name	PPM
Tower F-Elevator Doors	VAB-10-F-05	Front Door	Level 10 Front	Mercury	3
Tower F-Elevator Doors	VAB-10-F-05	Front Door	Level 10 Front	Lead	60,430
Tower F-Elevator Doors	VAB-10-F-05	Front Door	Level 10 Front	Selenium	473
Tower F-Elevator Doors	VAB-13-F-06	Front Door	Level 13 Front	Silver	< 6
Tower F-Elevator Doors	VAB-13-F-06	Front Door	Level 13 Front	Arsenic	12
Tower F-Elevator Doors	VAB-13-F-06	Front Door	Level 13 Front	Barium	29,497
Tower F-Elevator Doors	VAB-13-F-06	Front Door	Level 13 Front	Cadmium	1,468
Tower F-Elevator Doors	VAB-13-F-06	Front Door	Level 13 Front	Chromium	15,224
Tower F-Elevator Doors	VAB-13-F-06	Front Door	Level 13 Front	Mercury	< 1
Tower F-Elevator Doors	VAB-13-F-06	Front Door	Level 13 Front	Lead	65,519
Tower F-Elevator Doors	VAB-13-F-06	Front Door	Level 13 Front	Selenium	285
Tower F-Elevator Doors	VAB-PB-R-07	Rear Door	Platform B Rear	Silver	< 5
Tower F-Elevator Doors	VAB-PB-R-07	Rear Door	Platform B Rear	Arsenic	10
Tower F-Elevator Doors	VAB-PB-R-07	Rear Door	Platform B Rear	Barium	26,698
Tower F-Elevator Doors	VAB-PB-R-07	Rear Door	Platform B Rear	Cadmium	< 5
Tower F-Elevator Doors	VAB-PB-R-07	Rear Door	Platform B Rear	Chromium	11,871
Tower F-Elevator Doors	VAB-PB-R-07	Rear Door	Platform B Rear	Mercury	1
Tower F-Elevator Doors	VAB-PB-R-07	Rear Door	Platform B Rear	Lead	51,236
Tower F-Elevator Doors	VAB-PB-R-07	Rear Door	Platform B Rear	Selenium	< 5
Tower F-Elevator Doors	VAB-14-F-08	Front Door	Level 14 Front	Silver	< 6
Tower F-Elevator Doors	VAB-14-F-08	Front Door	Level 14 Front	Arsenic	11
Tower F-Elevator Doors	VAB-14-F-08	Front Door	Level 14 Front	Barium	28,760
Tower F-Elevator Doors	VAB-14-F-08	Front Door	Level 14 Front	Cadmium	3,409
Tower F-Elevator Doors	VAB-14-F-08	Front Door	Level 14 Front	Chromium	14,291
Tower F-Elevator Doors	VAB-14-F-08	Front Door	Level 14 Front	Mercury	< 1
Tower F-Elevator Doors	VAB-14-F-08	Front Door	Level 14 Front	Lead	62,530
Tower F-Elevator Doors	VAB-14-F-08	Front Door	Level 14 Front	Selenium	802
Tower F-Elevator Doors	VAB-PE-R-09	Rear Door	Platform E Rear	Silver	< 6
Tower F-Elevator Doors	VAB-PE-R-09	Rear Door	Platform E Rear	Arsenic	11
Tower F-Elevator Doors	VAB-PE-R-09	Rear Door	Platform E Rear	Barium	34,308
Tower F-Elevator Doors	VAB-PE-R-09	Rear Door	Platform E Rear	Cadmium	1,337
Tower F-Elevator Doors	VAB-PE-R-09	Rear Door	Platform E Rear	Chromium	14,365
Tower F-Elevator Doors	VAB-PE-R-09	Rear Door	Platform E Rear	Mercury	< 1
Tower F-Elevator Doors	VAB-PE-R-09	Rear Door	Platform E Rear	Lead	62,221
Tower F-Elevator Doors	VAB-PE-R-09	Rear Door	Platform E Rear	Selenium	262
Tower F-Elevator Doors	VAB-16-F-10	Front Door	Level 16 Front	Silver	< 5
Tower F-Elevator Doors	VAB-16-F-10	Front Door	Level 16 Front	Arsenic	9
Tower F-Elevator Doors	VAB-16-F-10	Front Door	Level 16 Front	Barium	27,998
Tower F-Elevator Doors	VAB-16-F-10	Front Door	Level 16 Front	Cadmium	49

Paint Analysis for Total Metals- RCRA Eight (8) Metals  
 Project No.: 12010773.00000  
 Vehicle Assembly Building (VAB) Tower F Elevator  
 Kennedy Space Center, FL

Project Number	Sample Number	Component	Location	Periodic Name	PPM
Tower F-Elevator Doors	VAB-16-F-10	Front Door	Level 16 Front	Chromium	10,019
Tower F-Elevator Doors	VAB-16-F-10	Front Door	Level 16 Front	Mercury	< 1
Tower F-Elevator Doors	VAB-16-F-10	Front Door	Level 16 Front	Lead	42,027
Tower F-Elevator Doors	VAB-16-F-10	Front Door	Level 16 Front	Selenium	11
Tower F-Elevator Doors	VAB-19-F-11	Front Door	Level 19 Front	Silver	< 6
Tower F-Elevator Doors	VAB-19-F-11	Front Door	Level 19 Front	Arsenic	11
Tower F-Elevator Doors	VAB-19-F-11	Front Door	Level 19 Front	Barium	26,901
Tower F-Elevator Doors	VAB-19-F-11	Front Door	Level 19 Front	Cadmium	2,588
Tower F-Elevator Doors	VAB-19-F-11	Front Door	Level 19 Front	Chromium	14,297
Tower F-Elevator Doors	VAB-19-F-11	Front Door	Level 19 Front	Mercury	< 1
Tower F-Elevator Doors	VAB-19-F-11	Front Door	Level 19 Front	Lead	62,729
Tower F-Elevator Doors	VAB-19-F-11	Front Door	Level 19 Front	Selenium	586
Tower F-Elevator Doors	VAB-PC-R-12	Rear Door	Platform C	Silver	< 6
Tower F-Elevator Doors	VAB-PC-R-12	Rear Door	Platform C	Arsenic	15
Tower F-Elevator Doors	VAB-PC-R-12	Rear Door	Platform C	Barium	28,574
Tower F-Elevator Doors	VAB-PC-R-12	Rear Door	Platform C	Cadmium	2,470
Tower F-Elevator Doors	VAB-PC-R-12	Rear Door	Platform C	Chromium	18,178
Tower F-Elevator Doors	VAB-PC-R-12	Rear Door	Platform C	Mercury	< 1
Tower F-Elevator Doors	VAB-PC-R-12	Rear Door	Platform C	Lead	77,979
Tower F-Elevator Doors	VAB-PC-R-12	Rear Door	Platform C	Selenium	492
Tower F-Elevator Doors	VAB-20-F-13	Front Door	Level 20	Silver	< 6
Tower F-Elevator Doors	VAB-20-F-13	Front Door	Level 20	Arsenic	12
Tower F-Elevator Doors	VAB-20-F-13	Front Door	Level 20	Barium	39,534
Tower F-Elevator Doors	VAB-20-F-13	Front Door	Level 20	Cadmium	2,426
Tower F-Elevator Doors	VAB-20-F-13	Front Door	Level 20	Chromium	17,364
Tower F-Elevator Doors	VAB-20-F-13	Front Door	Level 20	Mercury	< 1
Tower F-Elevator Doors	VAB-20-F-13	Front Door	Level 20	Lead	76,965
Tower F-Elevator Doors	VAB-20-F-13	Front Door	Level 20	Selenium	398
Tower F-Elevator Doors	VAB-22-F-14	Front Door	Level 22	Silver	< 6
Tower F-Elevator Doors	VAB-22-F-14	Front Door	Level 22	Arsenic	14
Tower F-Elevator Doors	VAB-22-F-14	Front Door	Level 22	Barium	29,336
Tower F-Elevator Doors	VAB-22-F-14	Front Door	Level 22	Cadmium	1,320
Tower F-Elevator Doors	VAB-22-F-14	Front Door	Level 22	Chromium	16,469
Tower F-Elevator Doors	VAB-22-F-14	Front Door	Level 22	Mercury	< 1
Tower F-Elevator Doors	VAB-22-F-14	Front Door	Level 22	Lead	74,685
Tower F-Elevator Doors	VAB-22-F-14	Front Door	Level 22	Selenium	257
Tower F-Elevator Doors	VAB-25-F-15	Front Door	Level 25	Silver	< 6
Tower F-Elevator Doors	VAB-25-F-15	Front Door	Level 25	Arsenic	11
Tower F-Elevator Doors	VAB-25-F-15	Front Door	Level 25	Barium	34,339

Paint Analysis for Total Metals- RCRA Eight (8) Metals  
 Project No.: 12010773.00000  
 Vehicle Assembly Building (VAB) Tower F Elevator  
 Kennedy Space Center, FL

Project Number	Sample Number	Component	Location	Periodic Name	PPM
Tower F-Elevator Doors	VAB-25-F-15	Front Door	Level 25	Cadmium	1,089
Tower F-Elevator Doors	VAB-25-F-15	Front Door	Level 25	Chromium	13,357
Tower F-Elevator Doors	VAB-25-F-15	Front Door	Level 25	Mercury	< 1
Tower F-Elevator Doors	VAB-25-F-15	Front Door	Level 25	Lead	61,942
Tower F-Elevator Doors	VAB-25-F-15	Front Door	Level 25	Selenium	208
Tower F-Elevator Doors	VAB-27-F-16	Front Door	Level 27	Silver	< 6
Tower F-Elevator Doors	VAB-27-F-16	Front Door	Level 27	Arsenic	11
Tower F-Elevator Doors	VAB-27-F-16	Front Door	Level 27	Barium	30,887
Tower F-Elevator Doors	VAB-27-F-16	Front Door	Level 27	Cadmium	1,297
Tower F-Elevator Doors	VAB-27-F-16	Front Door	Level 27	Chromium	13,126
Tower F-Elevator Doors	VAB-27-F-16	Front Door	Level 27	Mercury	< 1
Tower F-Elevator Doors	VAB-27-F-16	Front Door	Level 27	Lead	57,574
Tower F-Elevator Doors	VAB-27-F-16	Front Door	Level 27	Selenium	251
Tower F-Elevator Doors	VAB-28-F-17	Front Door	Level 28	Silver	< 6
Tower F-Elevator Doors	VAB-28-F-17	Front Door	Level 28	Arsenic	11
Tower F-Elevator Doors	VAB-28-F-17	Front Door	Level 28	Barium	33,374
Tower F-Elevator Doors	VAB-28-F-17	Front Door	Level 28	Cadmium	2,345
Tower F-Elevator Doors	VAB-28-F-17	Front Door	Level 28	Chromium	13,887
Tower F-Elevator Doors	VAB-28-F-17	Front Door	Level 28	Mercury	< 1
Tower F-Elevator Doors	VAB-28-F-17	Front Door	Level 28	Lead	60,746
Tower F-Elevator Doors	VAB-28-F-17	Front Door	Level 28	Selenium	445
Tower F-Elevator Doors	VAB-31-F-18	Front Door	Level 31	Silver	< 5
Tower F-Elevator Doors	VAB-31-F-18	Front Door	Level 31	Arsenic	11
Tower F-Elevator Doors	VAB-31-F-18	Front Door	Level 31	Barium	24,440
Tower F-Elevator Doors	VAB-31-F-18	Front Door	Level 31	Cadmium	2,353
Tower F-Elevator Doors	VAB-31-F-18	Front Door	Level 31	Chromium	13,370
Tower F-Elevator Doors	VAB-31-F-18	Front Door	Level 31	Mercury	< 1
Tower F-Elevator Doors	VAB-31-F-18	Front Door	Level 31	Lead	59,128
Tower F-Elevator Doors	VAB-31-F-18	Front Door	Level 31	Selenium	461
Tower F-Elevator Doors	VAB-32-F-19	Front Door	Level 32	Silver	< 6
Tower F-Elevator Doors	VAB-32-F-19	Front Door	Level 32	Arsenic	11
Tower F-Elevator Doors	VAB-32-F-19	Front Door	Level 32	Barium	29,594
Tower F-Elevator Doors	VAB-32-F-19	Front Door	Level 32	Cadmium	1,431
Tower F-Elevator Doors	VAB-32-F-19	Front Door	Level 32	Chromium	12,676
Tower F-Elevator Doors	VAB-32-F-19	Front Door	Level 32	Mercury	< 1
Tower F-Elevator Doors	VAB-32-F-19	Front Door	Level 32	Lead	54,184
Tower F-Elevator Doors	VAB-32-F-19	Front Door	Level 32	Selenium	273
Tower F-Elevator Doors	VAB-34-F-20	Front Door	Level 34	Silver	< 5
Tower F-Elevator Doors	VAB-34-F-20	Front Door	Level 34	Arsenic	16

Paint Analysis for Total Metals- RCRA Eight (8) Metals  
 Project No.: 12010773.00000  
 Vehicle Assembly Building (VAB) Tower F Elevator  
 Kennedy Space Center, FL

Project Number	Sample Number	Component	Location	Periodic Name	PPM
Tower F-Elevator Doors	VAB-34-F-20	Front Door	Level 34	Barium	22,895
Tower F-Elevator Doors	VAB-34-F-20	Front Door	Level 34	Cadmium	2,099
Tower F-Elevator Doors	VAB-34-F-20	Front Door	Level 34	Chromium	19,069
Tower F-Elevator Doors	VAB-34-F-20	Front Door	Level 34	Mercury	< 1
Tower F-Elevator Doors	VAB-34-F-20	Front Door	Level 34	Lead	85,328
Tower F-Elevator Doors	VAB-34-F-20	Front Door	Level 34	Selenium	496
Tower F-Elevator Doors	VAB-3-F-21	Front Door	Level 3	Silver	< 6
Tower F-Elevator Doors	VAB-3-F-21	Front Door	Level 3	Arsenic	13
Tower F-Elevator Doors	VAB-3-F-21	Front Door	Level 3	Barium	29,449
Tower F-Elevator Doors	VAB-3-F-21	Front Door	Level 3	Cadmium	676
Tower F-Elevator Doors	VAB-3-F-21	Front Door	Level 3	Chromium	15,106
Tower F-Elevator Doors	VAB-3-F-21	Front Door	Level 3	Mercury	< 1
Tower F-Elevator Doors	VAB-3-F-21	Front Door	Level 3	Lead	66,147
Tower F-Elevator Doors	VAB-3-F-21	Front Door	Level 3	Selenium	132
Tower F-Elevator Doors	VAB-2-F-22	Front Door	Level 2	Silver	< 6
Tower F-Elevator Doors	VAB-2-F-22	Front Door	Level 2	Arsenic	11
Tower F-Elevator Doors	VAB-2-F-22	Front Door	Level 2	Barium	33,563
Tower F-Elevator Doors	VAB-2-F-22	Front Door	Level 2	Cadmium	190
Tower F-Elevator Doors	VAB-2-F-22	Front Door	Level 2	Chromium	12,004
Tower F-Elevator Doors	VAB-2-F-22	Front Door	Level 2	Mercury	< 1
Tower F-Elevator Doors	VAB-2-F-22	Front Door	Level 2	Lead	49,198
Tower F-Elevator Doors	VAB-2-F-22	Front Door	Level 2	Selenium	43
Tower F-Elevator Doors	VAB-1-R-23	Rear Door	Level 1	Silver	< 6
Tower F-Elevator Doors	VAB-1-R-23	Rear Door	Level 1	Arsenic	16
Tower F-Elevator Doors	VAB-1-R-23	Rear Door	Level 1	Barium	35,173
Tower F-Elevator Doors	VAB-1-R-23	Rear Door	Level 1	Cadmium	1,671
Tower F-Elevator Doors	VAB-1-R-23	Rear Door	Level 1	Chromium	17,996
Tower F-Elevator Doors	VAB-1-R-23	Rear Door	Level 1	Mercury	< 1
Tower F-Elevator Doors	VAB-1-R-23	Rear Door	Level 1	Lead	79,662
Tower F-Elevator Doors	VAB-1-R-23	Rear Door	Level 1	Selenium	323
Tower F-Elevator Doors	VAB-1-F-24	Front Door	Level 1	Silver	< 6
Tower F-Elevator Doors	VAB-1-F-24	Front Door	Level 1	Arsenic	11
Tower F-Elevator Doors	VAB-1-F-24	Front Door	Level 1	Barium	40,161
Tower F-Elevator Doors	VAB-1-F-24	Front Door	Level 1	Cadmium	188
Tower F-Elevator Doors	VAB-1-F-24	Front Door	Level 1	Chromium	12,938
Tower F-Elevator Doors	VAB-1-F-24	Front Door	Level 1	Mercury	< 1
Tower F-Elevator Doors	VAB-1-F-24	Front Door	Level 1	Lead	57,391
Tower F-Elevator Doors	VAB-1-F-24	Front Door	Level 1	Selenium	44

Paint Analysis for Total Metals- RCRA Eight (8) Metals  
Project No.: 12010773.00000  
Vehicle Assembly Building (VAB) Tower F Elevator  
Kennedy Space Center, FL

### **3.0 LABORATORY REPORTS**

# SCHNEIDER LABORATORIES GLOBAL

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## LABORATORY ANALYSIS REPORT

**ACCOUNT #:** 1491-12-3228 **DATE COLLECTED:** 10/17/2012  
**CLIENT:** PbO3 ENV TESTING & SERVICES INC **DATE RECEIVED:** 10/19/2012  
**ADDRESS:** 473 N PINE MEADOW DR **DATE ANALYZED:** 10/23/2012  
DEBARY, FL 32713 **DATE REPORTED:** 10/23/2012  
**PROJECT NAME:** URS  
**JOB LOCATION:** VAB KSC  
**PROJECT NO.:** Tower F  
**PO NO.:** **Sample Type:** PAINT

**SLI ID:** 31655487 **Client ID:** VAB-5-F-01 **Description:** Level 5 Front  
**Date Collected:** 10/17/2012

Analyte	Sample Wt(mg)	Total (µg)*	Conc. (% by wt)	Conc. PPM	Analysis Method	MRL** (µg)
Silver (Ag)	331	< 2.0	< 0.001	< 6	EPA 6010C	2.0
Arsenic (As)	331	< 2.0	< 0.001	< 6	EPA 6010C	2.0
Barium (Ba)	331	13,966.9	4.220	42,196	EPA 6010C	2.0
Cadmium (Cd)	331	552.4	0.167	1,669	EPA 6010C	2.0
Chromium (Cr)	331	7,492.1	2.263	22,635	EPA 6010C	5.0
Mercury (Hg)	138	0.088	< 0.001	1	EPA 7471B	0.075
Lead (Pb)	331	33,927.04	10.250	102,499	EPA 6010C	2.00
Selenium (Se)	331	81.7	0.025	247	EPA 6010C	2.0

### Total Number of Pages in Report: 9

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SLI ID: 31655488		Client ID: VAB-7-F-02		Description: Level 7 Front		
Date Collected: 10/17/2012						
Analyte	Sample Wt(mg)	Total (µg)*	Conc. (% by wt)	Conc. PPM	Analysis Method	MRL** (µg)
Silver (Ag)	352	< 2.0	< 0.001	< 6	EPA 6010C	2.0
Arsenic (As)	352	< 2.0	< 0.001	< 6	EPA 6010C	2.0
Barium (Ba)	352	8,573.9	2.436	24,358	EPA 6010C	2.0
Cadmium (Cd)	352	164.2	0.047	466	EPA 6010C	2.0
Chromium (Cr)	352	5,608.3	1.593	15,933	EPA 6010C	5.0
Mercury (Hg)	156	< 0.075	< 0.001	< 1	EPA 7471B	0.075
Lead (Pb)	352	24,543.13	6.972	69,725	EPA 6010C	2.00
Selenium (Se)	352	15.2	0.004	43	EPA 6010C	2.0

SLI ID: 31655489		Client ID: VAB-9.F-03		Description: Level 9 Front		
Date Collected: 10/17/2012						
Analyte	Sample Wt(mg)	Total (µg)*	Conc. (% by wt)	Conc. PPM	Analysis Method	MRL** (µg)
Silver (Ag)	333	< 2.0	< 0.001	< 6	EPA 6010C	2.0
Arsenic (As)	333	< 2.0	< 0.001	< 6	EPA 6010C	2.0
Barium (Ba)	333	11,073.2	3.325	33,253	EPA 6010C	2.0
Cadmium (Cd)	333	796.8	0.239	2,393	EPA 6010C	2.0
Chromium (Cr)	333	7,969.7	2.393	23,933	EPA 6010C	5.0
Mercury (Hg)	148	< 0.075	< 0.001	< 1	EPA 7471B	0.075
Lead (Pb)	333	34,613.90	10.395	103,946	EPA 6010C	2.00
Selenium (Se)	333	143.3	0.043	430	EPA 6010C	2.0

SLI ID: 31655490		Client ID: VAB-7-R-04		Description: Level 7 Rear		
Date Collected: 10/17/2012						
Analyte	Sample Wt(mg)	Total (µg)*	Conc. (% by wt)	Conc. PPM	Analysis Method	MRL** (µg)
Silver (Ag)	338	< 2.0	< 0.001	< 6	EPA 6010C	2.0
Arsenic (As)	338	< 2.0	< 0.001	< 6	EPA 6010C	2.0
Barium (Ba)	338	9,468.6	2.801	28,013	EPA 6010C	2.0
Cadmium (Cd)	338	374.6	0.111	1,108	EPA 6010C	2.0
Chromium (Cr)	338	7,461.5	2.208	22,075	EPA 6010C	5.0
Mercury (Hg)	129	< 0.075	< 0.001	< 1	EPA 7471B	0.075
Lead (Pb)	338	33,700.17	9.970	99,705	EPA 6010C	2.00
Selenium (Se)	338	45.4	0.013	134	EPA 6010C	2.0

**Total Number of Pages in Report: 9**

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<b>SLI ID:</b> 31655491		<b>Client ID:</b> VAB-10-F-05		<b>Description:</b> Level 10 Front		
<b>Date</b> 10/17/2012						
<b>Collected:</b>						
<b>Analyte</b>	<b>Sample Wt(mg)</b>	<b>Total (µg)*</b>	<b>Conc. (% by wt)</b>	<b>Conc. PPM</b>	<b>Analysis Method</b>	<b>MRL** (µg)</b>
Silver (Ag)	361	< 2.0	< 0.001	< 6	EPA 6010C	2.0
Arsenic (As)	361	3.8	0.001	11	EPA 6010C	2.0
Barium (Ba)	361	10,013.8	2.774	27,739	EPA 6010C	2.0
Cadmium (Cd)	361	744.5	0.206	2,062	EPA 6010C	2.0
Chromium (Cr)	361	5,114.5	1.417	14,167	EPA 6010C	5.0
Mercury (Hg)	135	0.356	< 0.001	3	EPA 7471B	0.075
Lead (Pb)	361	21,815.30	6.043	60,430	EPA 6010C	2.00
Selenium (Se)	361	170.7	0.047	473	EPA 6010C	2.0

<b>SLI ID:</b> 31655492		<b>Client ID:</b> VAB-13-F-06		<b>Description:</b> Level 13 Front		
<b>Date</b> 10/17/2012						
<b>Collected:</b>						
<b>Analyte</b>	<b>Sample Wt(mg)</b>	<b>Total (µg)*</b>	<b>Conc. (% by wt)</b>	<b>Conc. PPM</b>	<b>Analysis Method</b>	<b>MRL** (µg)</b>
Silver (Ag)	340	< 2.0	< 0.001	< 6	EPA 6010C	2.0
Arsenic (As)	340	4.0	0.001	12	EPA 6010C	2.0
Barium (Ba)	340	10,029.1	2.950	29,497	EPA 6010C	2.0
Cadmium (Cd)	340	499.2	0.147	1,468	EPA 6010C	2.0
Chromium (Cr)	340	5,176.3	1.522	15,224	EPA 6010C	5.0
Mercury (Hg)	163	< 0.075	< 0.001	< 1	EPA 7471B	0.075
Lead (Pb)	340	22,276.35	6.552	65,519	EPA 6010C	2.00
Selenium (Se)	340	96.8	0.028	285	EPA 6010C	2.0

<b>SLI ID:</b> 31655493		<b>Client ID:</b> VAB-PB-R-07		<b>Description:</b> Platform B Rear		
<b>Date</b> 10/17/2012						
<b>Collected:</b>						
<b>Analyte</b>	<b>Sample Wt(mg)</b>	<b>Total (µg)*</b>	<b>Conc. (% by wt)</b>	<b>Conc. PPM</b>	<b>Analysis Method</b>	<b>MRL** (µg)</b>
Silver (Ag)	365	< 2.0	< 0.001	< 5	EPA 6010C	2.0
Arsenic (As)	365	3.7	0.001	10	EPA 6010C	2.0
Barium (Ba)	365	9,744.7	2.670	26,698	EPA 6010C	2.0
Cadmium (Cd)	365	< 2.0	< 0.001	< 5	EPA 6010C	2.0
Chromium (Cr)	365	4,333.0	1.187	11,871	EPA 6010C	5.0
Mercury (Hg)	158	0.077	< 0.001	1	EPA 7471B	0.075
Lead (Pb)	365	18,701.25	5.124	51,236	EPA 6010C	2.00
Selenium (Se)	365	< 2.0	< 0.001	< 5	EPA 6010C	2.0

**Total Number of Pages in Report: 9**

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<b>SLI ID:</b> 31655494		<b>Client ID:</b> VAB-14-F-08		<b>Description:</b> Level 14 Front		
<b>Date</b> 10/17/2012						
<b>Collected:</b>						
<b>Analyte</b>	<b>Sample Wt(mg)</b>	<b>Total (µg)*</b>	<b>Conc. (% by wt)</b>	<b>Conc. PPM</b>	<b>Analysis Method</b>	<b>MRL** (µg)</b>
Silver (Ag)	334	< 2.0	< 0.001	< 6	EPA 6010C	2.0
Arsenic (As)	334	3.8	0.001	11	EPA 6010C	2.0
Barium (Ba)	334	9,606.0	2.876	28,760	EPA 6010C	2.0
Cadmium (Cd)	334	1,138.5	0.341	3,409	EPA 6010C	2.0
Chromium (Cr)	334	4,773.3	1.429	14,291	EPA 6010C	5.0
Mercury (Hg)	186	< 0.075	< 0.001	< 1	EPA 7471B	0.075
Lead (Pb)	334	20,884.93	6.253	62,530	EPA 6010C	2.00
Selenium (Se)	334	267.7	0.080	802	EPA 6010C	2.0

<b>SLI ID:</b> 31655495		<b>Client ID:</b> VAB-PE-R-09		<b>Description:</b> Platform E Rear		
<b>Date</b> 10/17/2012						
<b>Collected:</b>						
<b>Analyte</b>	<b>Sample Wt(mg)</b>	<b>Total (µg)*</b>	<b>Conc. (% by wt)</b>	<b>Conc. PPM</b>	<b>Analysis Method</b>	<b>MRL** (µg)</b>
Silver (Ag)	313	< 2.0	< 0.001	< 6	EPA 6010C	2.0
Arsenic (As)	313	3.6	0.001	11	EPA 6010C	2.0
Barium (Ba)	313	10,738.5	3.431	34,308	EPA 6010C	2.0
Cadmium (Cd)	313	418.4	0.134	1,337	EPA 6010C	2.0
Chromium (Cr)	313	4,496.3	1.437	14,365	EPA 6010C	5.0
Mercury (Hg)	139	< 0.075	< 0.001	< 1	EPA 7471B	0.075
Lead (Pb)	313	19,475.19	6.222	62,221	EPA 6010C	2.00
Selenium (Se)	313	81.9	0.026	262	EPA 6010C	2.0

<b>SLI ID:</b> 31655496		<b>Client ID:</b> VAB-16-F-10		<b>Description:</b> Level 16 Front		
<b>Date</b> 10/17/2012						
<b>Collected:</b>						
<b>Analyte</b>	<b>Sample Wt(mg)</b>	<b>Total (µg)*</b>	<b>Conc. (% by wt)</b>	<b>Conc. PPM</b>	<b>Analysis Method</b>	<b>MRL** (µg)</b>
Silver (Ag)	372	< 2.0	< 0.001	< 5	EPA 6010C	2.0
Arsenic (As)	372	3.3	< 0.001	9	EPA 6010C	2.0
Barium (Ba)	372	10,415.3	2.800	27,998	EPA 6010C	2.0
Cadmium (Cd)	372	18.3	0.005	49	EPA 6010C	2.0
Chromium (Cr)	372	3,727.0	1.002	10,019	EPA 6010C	5.0
Mercury (Hg)	170	< 0.075	< 0.001	< 1	EPA 7471B	0.075
Lead (Pb)	372	15,634.06	4.203	42,027	EPA 6010C	2.00
Selenium (Se)	372	3.9	0.001	11	EPA 6010C	2.0

**Total Number of Pages in Report: 9**

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<b>SLI ID:</b> 31655497		<b>Client ID:</b> VAB-19-F-11		<b>Description:</b> Level 19 Front		
<b>Date</b> 10/17/2012						
<b>Collected:</b>						
<b>Analyte</b>	<b>Sample Wt(mg)</b>	<b>Total (µg)*</b>	<b>Conc. (% by wt)</b>	<b>Conc. PPM</b>	<b>Analysis Method</b>	<b>MRL** (µg)</b>
Silver (Ag)	339	< 2.0	< 0.001	< 6	EPA 6010C	2.0
Arsenic (As)	339	3.7	0.001	11	EPA 6010C	2.0
Barium (Ba)	339	9,119.4	2.690	26,901	EPA 6010C	2.0
Cadmium (Cd)	339	877.3	0.259	2,588	EPA 6010C	2.0
Chromium (Cr)	339	4,846.8	1.430	14,297	EPA 6010C	5.0
Mercury (Hg)	150	< 0.075	< 0.001	< 1	EPA 7471B	0.075
Lead (Pb)	339	21,265.20	6.273	62,729	EPA 6010C	2.00
Selenium (Se)	339	198.6	0.059	586	EPA 6010C	2.0

<b>SLI ID:</b> 31655498		<b>Client ID:</b> VAB-PC-R-12		<b>Description:</b> Platform C		
<b>Date</b> 10/17/2012						
<b>Collected:</b>						
<b>Analyte</b>	<b>Sample Wt(mg)</b>	<b>Total (µg)*</b>	<b>Conc. (% by wt)</b>	<b>Conc. PPM</b>	<b>Analysis Method</b>	<b>MRL** (µg)</b>
Silver (Ag)	336	< 2.0	< 0.001	< 6	EPA 6010C	2.0
Arsenic (As)	336	5.0	0.002	15	EPA 6010C	2.0
Barium (Ba)	336	9,601.0	2.857	28,574	EPA 6010C	2.0
Cadmium (Cd)	336	829.9	0.247	2,470	EPA 6010C	2.0
Chromium (Cr)	336	6,107.7	1.818	18,178	EPA 6010C	5.0
Mercury (Hg)	180	< 0.075	< 0.001	< 1	EPA 7471B	0.075
Lead (Pb)	336	26,200.84	7.798	77,979	EPA 6010C	2.00
Selenium (Se)	336	165.3	0.049	492	EPA 6010C	2.0

<b>SLI ID:</b> 31655499		<b>Client ID:</b> VAB-20-F-13		<b>Description:</b> Level 20		
<b>Date</b> 10/17/2012						
<b>Collected:</b>						
<b>Analyte</b>	<b>Sample Wt(mg)</b>	<b>Total (µg)*</b>	<b>Conc. (% by wt)</b>	<b>Conc. PPM</b>	<b>Analysis Method</b>	<b>MRL** (µg)</b>
Silver (Ag)	327	< 2.0	< 0.001	< 6	EPA 6010C	2.0
Arsenic (As)	327	3.8	0.001	12	EPA 6010C	2.0
Barium (Ba)	327	12,927.6	3.953	39,534	EPA 6010C	2.0
Cadmium (Cd)	327	793.3	0.243	2,426	EPA 6010C	2.0
Chromium (Cr)	327	5,678.1	1.736	17,364	EPA 6010C	5.0
Mercury (Hg)	132	< 0.075	< 0.001	< 1	EPA 7471B	0.075
Lead (Pb)	327	25,167.70	7.697	76,965	EPA 6010C	2.00
Selenium (Se)	327	130.1	0.040	398	EPA 6010C	2.0

**Total Number of Pages in Report: 9**

Results relate only to samples as received by the laboratory.

Soil samples are tested as received unless noted as "Dried before analysis." Equivalent units: PPM = mg/kg. \*\*MRL=Minimum Reporting Limit. Quality Control data available upon request. Unusual sample conditions, if any, are described. All testing is performed in strict accordance with Schneider Laboratories, Inc. protocol.

SLI ID: 31655500		Client ID: VAB-22-F-14		Description: Level 22		
Date Collected: 10/17/2012						
Analyte	Sample Wt(mg)	Total (µg)*	Conc. (% by wt)	Conc. PPM	Analysis Method	MRL** (µg)
Silver (Ag)	350	< 2.0	< 0.001	< 6	EPA 6010C	2.0
Arsenic (As)	350	4.8	0.001	14	EPA 6010C	2.0
Barium (Ba)	350	10,267.6	2.934	29,336	EPA 6010C	2.0
Cadmium (Cd)	350	462.0	0.132	1,320	EPA 6010C	2.0
Chromium (Cr)	350	5,764.1	1.647	16,469	EPA 6010C	5.0
Mercury (Hg)	141	< 0.075	< 0.001	< 1	EPA 7471B	0.075
Lead (Pb)	350	26,139.77	7.469	74,685	EPA 6010C	2.00
Selenium (Se)	350	89.9	0.026	257	EPA 6010C	2.0

SLI ID: 31655501		Client ID: VAB-25-F-15		Description: Level 25		
Date Collected: 10/17/2012						
Analyte	Sample Wt(mg)	Total (µg)*	Conc. (% by wt)	Conc. PPM	Analysis Method	MRL** (µg)
Silver (Ag)	323	< 2.0	< 0.001	< 6	EPA 6010C	2.0
Arsenic (As)	323	3.5	0.001	11	EPA 6010C	2.0
Barium (Ba)	323	11,091.4	3.434	34,339	EPA 6010C	2.0
Cadmium (Cd)	323	351.9	0.109	1,089	EPA 6010C	2.0
Chromium (Cr)	323	4,314.3	1.336	13,357	EPA 6010C	5.0
Mercury (Hg)	184	< 0.075	< 0.001	< 1	EPA 7471B	0.075
Lead (Pb)	323	20,007.15	6.194	61,942	EPA 6010C	2.00
Selenium (Se)	323	67.0	0.021	208	EPA 6010C	2.0

SLI ID: 31655502		Client ID: VAB-27-F-16		Description: Level 27		
Date Collected: 10/17/2012						
Analyte	Sample Wt(mg)	Total (µg)*	Conc. (% by wt)	Conc. PPM	Analysis Method	MRL** (µg)
Silver (Ag)	341	< 2.0	< 0.001	< 6	EPA 6010C	2.0
Arsenic (As)	341	3.7	0.001	11	EPA 6010C	2.0
Barium (Ba)	341	10,532.4	3.089	30,887	EPA 6010C	2.0
Cadmium (Cd)	341	442.3	0.130	1,297	EPA 6010C	2.0
Chromium (Cr)	341	4,475.9	1.313	13,126	EPA 6010C	5.0
Mercury (Hg)	157	< 0.075	< 0.001	< 1	EPA 7471B	0.075
Lead (Pb)	341	19,632.78	5.757	57,574	EPA 6010C	2.00
Selenium (Se)	341	85.5	0.025	251	EPA 6010C	2.0

**Total Number of Pages in Report: 9**

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<b>SLI ID:</b> 31655503		<b>Client ID:</b> VAB-28-F-17		<b>Description:</b> Level 28		
<b>Date</b> 10/17/2012						
<b>Collected:</b>						
<b>Analyte</b>	<b>Sample Wt(mg)</b>	<b>Total (µg)*</b>	<b>Conc. (% by wt)</b>	<b>Conc. PPM</b>	<b>Analysis Method</b>	<b>MRL** (µg)</b>
Silver (Ag)	337	< 2.0	< 0.001	< 6	EPA 6010C	2.0
Arsenic (As)	337	3.8	0.001	11	EPA 6010C	2.0
Barium (Ba)	337	11,247.0	3.337	33,374	EPA 6010C	2.0
Cadmium (Cd)	337	790.2	0.234	2,345	EPA 6010C	2.0
Chromium (Cr)	337	4,680.1	1.389	13,887	EPA 6010C	5.0
Mercury (Hg)	159	< 0.075	< 0.001	< 1	EPA 7471B	0.075
Lead (Pb)	337	20,471.39	6.075	60,746	EPA 6010C	2.00
Selenium (Se)	337	150.0	0.045	445	EPA 6010C	2.0

<b>SLI ID:</b> 31655504		<b>Client ID:</b> VAB-31-F-18		<b>Description:</b> Level 31		
<b>Date</b> 10/17/2012						
<b>Collected:</b>						
<b>Analyte</b>	<b>Sample Wt(mg)</b>	<b>Total (µg)*</b>	<b>Conc. (% by wt)</b>	<b>Conc. PPM</b>	<b>Analysis Method</b>	<b>MRL** (µg)</b>
Silver (Ag)	371	< 2.0	< 0.001	< 5	EPA 6010C	2.0
Arsenic (As)	371	4.2	0.001	11	EPA 6010C	2.0
Barium (Ba)	371	9,067.1	2.444	24,440	EPA 6010C	2.0
Cadmium (Cd)	371	873.0	0.235	2,353	EPA 6010C	2.0
Chromium (Cr)	371	4,960.4	1.337	13,370	EPA 6010C	5.0
Mercury (Hg)	162	< 0.075	< 0.001	< 1	EPA 7471B	0.075
Lead (Pb)	371	21,936.44	5.913	59,128	EPA 6010C	2.00
Selenium (Se)	371	171.1	0.046	461	EPA 6010C	2.0

<b>SLI ID:</b> 31655505		<b>Client ID:</b> VAB-32-F-19		<b>Description:</b> Level 32		
<b>Date</b> 10/17/2012						
<b>Collected:</b>						
<b>Analyte</b>	<b>Sample Wt(mg)</b>	<b>Total (µg)*</b>	<b>Conc. (% by wt)</b>	<b>Conc. PPM</b>	<b>Analysis Method</b>	<b>MRL** (µg)</b>
Silver (Ag)	358	< 2.0	< 0.001	< 6	EPA 6010C	2.0
Arsenic (As)	358	3.8	0.001	11	EPA 6010C	2.0
Barium (Ba)	358	10,594.7	2.959	29,594	EPA 6010C	2.0
Cadmium (Cd)	358	512.4	0.143	1,431	EPA 6010C	2.0
Chromium (Cr)	358	4,537.8	1.268	12,676	EPA 6010C	5.0
Mercury (Hg)	147	< 0.075	< 0.001	< 1	EPA 7471B	0.075
Lead (Pb)	358	19,397.75	5.418	54,184	EPA 6010C	2.00
Selenium (Se)	358	97.7	0.027	273	EPA 6010C	2.0

**Total Number of Pages in Report: 9**

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<b>SLI ID:</b> 31655506		<b>Client ID:</b> VAB-34-F-20		<b>Description:</b> Level 34		
<b>Date Collected:</b> 10/17/2012						
<b>Analyte</b>	<b>Sample Wt(mg)</b>	<b>Total (µg)*</b>	<b>Conc. (% by wt)</b>	<b>Conc. PPM</b>	<b>Analysis Method</b>	<b>MRL** (µg)</b>
Silver (Ag)	368	< 2.0	< 0.001	< 5	EPA 6010C	2.0
Arsenic (As)	368	5.7	0.002	16	EPA 6010C	2.0
Barium (Ba)	368	8,425.5	2.290	22,895	EPA 6010C	2.0
Cadmium (Cd)	368	772.3	0.210	2,099	EPA 6010C	2.0
Chromium (Cr)	368	7,017.2	1.907	19,069	EPA 6010C	5.0
Mercury (Hg)	152	< 0.075	< 0.001	< 1	EPA 7471B	0.075
Lead (Pb)	368	31,400.81	8.533	85,328	EPA 6010C	2.00
Selenium (Se)	368	182.5	0.050	496	EPA 6010C	2.0

<b>SLI ID:</b> 31655507		<b>Client ID:</b> VAB-3-F-21		<b>Description:</b> Level 3		
<b>Date Collected:</b> 10/17/2012						
<b>Analyte</b>	<b>Sample Wt(mg)</b>	<b>Total (µg)*</b>	<b>Conc. (% by wt)</b>	<b>Conc. PPM</b>	<b>Analysis Method</b>	<b>MRL** (µg)</b>
Silver (Ag)	361	< 2.0	< 0.001	< 6	EPA 6010C	2.0
Arsenic (As)	361	4.6	0.001	13	EPA 6010C	2.0
Barium (Ba)	361	10,631.2	2.945	29,449	EPA 6010C	2.0
Cadmium (Cd)	361	244.1	0.068	676	EPA 6010C	2.0
Chromium (Cr)	361	5,453.1	1.511	15,106	EPA 6010C	5.0
Mercury (Hg)	148	< 0.075	< 0.001	< 1	EPA 7471B	0.075
Lead (Pb)	361	23,879.15	6.615	66,147	EPA 6010C	2.00
Selenium (Se)	361	47.5	0.013	132	EPA 6010C	2.0

<b>SLI ID:</b> 31655508		<b>Client ID:</b> VAB-2-F-22		<b>Description:</b> Level 2		
<b>Date Collected:</b> 10/17/2012						
<b>Analyte</b>	<b>Sample Wt(mg)</b>	<b>Total (µg)*</b>	<b>Conc. (% by wt)</b>	<b>Conc. PPM</b>	<b>Analysis Method</b>	<b>MRL** (µg)</b>
Silver (Ag)	319	< 2.0	< 0.001	< 6	EPA 6010C	2.0
Arsenic (As)	319	3.4	0.001	11	EPA 6010C	2.0
Barium (Ba)	319	10,706.7	3.356	33,563	EPA 6010C	2.0
Cadmium (Cd)	319	60.5	0.019	190	EPA 6010C	2.0
Chromium (Cr)	319	3,829.4	1.200	12,004	EPA 6010C	5.0
Mercury (Hg)	143	< 0.075	< 0.001	< 1	EPA 7471B	0.075
Lead (Pb)	319	15,694.09	4.920	49,198	EPA 6010C	2.00
Selenium (Se)	319	13.6	0.004	43	EPA 6010C	2.0

**Total Number of Pages in Report: 9**

Results relate only to samples as received by the laboratory.

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SLI ID: 31655509		Client ID: VAB-1-R-23		Description: Level 1		
Date Collected: 10/17/2012						
Analyte	Sample Wt(mg)	Total (µg)*	Conc. (% by wt)	Conc. PPM	Analysis Method	MRL** (µg)
Silver (Ag)	317	< 2.0	< 0.001	< 6	EPA 6010C	2.0
Arsenic (As)	317	4.9	0.002	16	EPA 6010C	2.0
Barium (Ba)	317	11,149.9	3.517	35,173	EPA 6010C	2.0
Cadmium (Cd)	317	529.8	0.167	1,671	EPA 6010C	2.0
Chromium (Cr)	317	5,704.9	1.800	17,996	EPA 6010C	5.0
Mercury (Hg)	144	< 0.075	< 0.001	< 1	EPA 7471B	0.075
Lead (Pb)	317	25,252.78	7.966	79,662	EPA 6010C	2.00
Selenium (Se)	317	102.3	0.032	323	EPA 6010C	2.0

SLI ID: 31655510		Client ID: VAB-1-F-24		Description: Level 1		
Date Collected: 10/17/2012						
Analyte	Sample Wt(mg)	Total (µg)*	Conc. (% by wt)	Conc. PPM	Analysis Method	MRL** (µg)
Silver (Ag)	318	< 2.0	< 0.001	< 6	EPA 6010C	2.0
Arsenic (As)	318	3.5	0.001	11	EPA 6010C	2.0
Barium (Ba)	318	12,771.1	4.016	40,161	EPA 6010C	2.0
Cadmium (Cd)	318	59.7	0.019	188	EPA 6010C	2.0
Chromium (Cr)	318	4,114.2	1.294	12,938	EPA 6010C	5.0
Mercury (Hg)	149	< 0.075	< 0.001	< 1	EPA 7471B	0.075
Lead (Pb)	318	18,250.31	5.739	57,391	EPA 6010C	2.00
Selenium (Se)	318	13.9	0.004	44	EPA 6010C	2.0

**Analyst: ABISOLA O. KASALI**

**Total Number of Pages in Report: 9**

Results relate only to samples as received by the laboratory.

Reviewed By  **Mohammed Eltilib, Metals Team Leader**  
Visit [www.slabinc.com](http://www.slabinc.com) for current certifications.

*Soil samples are tested as received unless noted as "Dried before analysis." Equivalent units: PPM = mg/kg. \*\*MRL=Minimum Reporting Limit. Quality Control data available upon request. Unusual sample conditions, if any, are described. All testing is performed in strict accordance with Schneider Laboratories, Inc. protocol.*

### SAMPLE LOG

<b>PbO3 ENVIRONMENTAL, INC.</b> 473 N. PINE MEADOW DR. DEBARY, FL. 32713 Phone 386-668-4545 Fax 386-668-4566 Pbo3@comcast.net  5 day TAT	PROJECT NAME: URS JOB LOCATION: VAB KSC PROJECT #: Tower F PO NO.: DATE: 10/17/12  RCRA8 Totals / PCB <u>1</u> OF <u>2</u> <b>SAMPLE LOG</b> ASBESTOS _____ LEAD _____ OTHER <u>X</u>
---	---

SAMPLE NUMBER	DESCRIPTION	LOCATION
VAB-5-F.01	elevator Door Paint	Level 5 front
VAB.7.F.02		7 front
VAB.9.F.03		9 front
VAB.7.R.04		7 rear
VAB.10.F.05		10 front
VAB.13.F.06		13 front
VAB.PB.R.07		Platform B rear
VAB.14.F.08		Level 14 front
VAB.PE.R.09		Platform E rear
VAB.16.F.10		Level 16 front
VAB.19.F.11		19 front
VAB-PC-R.12		Platform C
VAB.20.F.13		Level 20
VAB.22.F.14		22
VAB.25.F.15		25
VAB.27.F.16		27
VAB.28.F.17		28
VAB.31.F.18		31
VAB.32.F.19		32
WorkOrderKey  V : \ 917 \ 917526		
Done 10/18/12		

Fax: 10/19/12



# APPENDIX C

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**ENVIRONMENTAL TESTING & SVC. CO.**

Report No: PCB -811-11-13-12-03

November 13, 2012

Client: URS Corporation  
7650 W. Courtney Campbell Causeway  
Tampa, FL 33607

Attn: John J. Calamari, P.E.  
Senior Project Manager

Project: Polychlorinated Biphenyl (PCB) Testing – Paint Chip Samples –Tower F Elevator Doors  
Project No.: 12010773.00000  
Vehicle Assembly Building (VAB) Tower F Elevator  
Kennedy Space Center, FL

According to your instructions **PbO<sub>3</sub>** Environmental Testing & Service Co., Inc. has completed a limited PCB testing survey at the subject property (Project). The following pages of this report contain the results of this testing. This limited PCB testing report presents data that describes the location of the Polychlorinated Biphenyl's (PCB's) identified only within the project scope. This report is to be used as a program-planning tool for the proposed renovation activities scheduled at this facility. This survey was conducted on site by Florida EPA Certified Lead-Based Paint Risk Assessor and EPA/AHERA trained Asbestos Inspector.

This report is intended for the exclusive use of our client. The findings are relevant to the conditions observed during the physical process of performing the Inspection. These findings should not be treated as absolute nor should they be relied upon to represent conditions at significantly later dates.

**PbO<sub>3</sub>** Environmental Testing & Service Co., Inc.

A handwritten signature in black ink, appearing to be 'DM' or similar initials.

Dave Mederer  
Project Manager

Polychlorinated Biphenyl (PCB) Testing – Paint Chip Samples –Tower F Elevator Doors  
Project No.: 12010773.00000  
Vehicle Assembly Building (VAB) Tower F Elevator  
Kennedy Space Center, FL

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Polychlorinated Biphenyl (PCB) Testing – Paint Chip Samples – Tower F Elevator Doors  
Project No.: 12010773.00000  
Vehicle Assembly Building (VAB) Tower F Elevator  
Kennedy Space Center, FL

## 1.0 EXECUTIVE SUMMARY

### Sample Collection Dates

October 17<sup>th</sup> and 18<sup>th</sup>, 2012

### State Licenses and/or Certifications

U.S. EPA Certified Lead-Based Paint Activities Firm No. FL-2418-2  
Asbestos License # ZA 0000205

### Inspector:

Kevin O'Malley, Florida EPA Certified Lead-Based Paint Risk Assessor FL-R-345-3  
Asbestos Building Inspector Certification No. 154429

Polychlorinated Biphenyl (PCB) paint chip samples were collected from representative elevator doors on Tower F of the Vehicle Assembly Building.

### Overview

According to your instructions **PbO<sub>3</sub>** Environmental Testing & Service Co., Inc. has collected twenty-four (24) representative paint chip samples of exposed painted components as designated by our client.

The samples were analyzed by Method SW846 8082 for Polychlorinated Biphenyls (PCBs).

Based upon our visual observations, bulk sampling of suspect materials, and subsequent laboratory analysis, we have determined that PCB's were detected in one (1) component paint chip sample.

Job Location	Sample No.	Sample Description	Location	Aroclor-1260	PCBs $\geq$ 50 ppm
<b>Tower F-Elevator Door</b>	<b>VAB-34-F-20</b>	<b>Front Door</b>	<b>Level 34</b>	<b>66.475</b>	<b>Yes*</b>

\*All materials with PCB concentrations greater than or equal to 50 ppm are regulated by and shall be managed in accordance with the requirements specified in 40 CFR 761. Requirements for managing and disposing of PCBs are found in Kennedy NASA Procedural Requirements (KNPR) 8500.1 Chapter 19.

**2.0 DETAILED FINDINGS**

Job Location	Sample No.	Sample Description	Location	Aroclor-1254	Aroclor-1260	PCBs $\geq$ 50 ppm
Tower F-Elevator Door	VAB-5-F-01	Front Door	Level 5	4.78	BQL	No
Tower F-Elevator Door	VAB-7-F-02	Front Door	Level 7	BQL	5.384	No
Tower F-Elevator Door	VAB-9-F-03	Front Door	Level 9	BQL	6.234	No
Tower F-Elevator Door	VAB-7-R-04	Rear Door	Level 7	BQL	BQL	No
Tower F-Elevator Door	VAB-10-F-05	Front Door	Level 10	2.621	BQL	No
Tower F-Elevator Door	VAB-13-F-06	Front Door	Level 13	4.439	BQL	No
Tower F-Elevator Door	VAB-PB-R-07	Rear Door	Platform B	1.327	BQL	No
Tower F-Elevator Door	VAB-14-F-08	Front Door	Level 14	BQL	11.159	No
Tower F-Elevator Door	VAB-PE-R-09	Rear Door	Platform E	1.986	BQL	No
Tower F-Elevator Door	VAB-16-F-10	Front Door	Level 16	1.362	BQL	No
Tower F-Elevator Door	VAB-19-F-11	Front Door	Level 19	4.451	BQL	No
Tower F-Elevator Door	VAB-PC-R-12	Rear Door	Platform C	BQL	2.205	No
Tower F-Elevator Door	VAB-20-F-13	Front Door	Level 20	BQL	3.109	No
Tower F-Elevator Door	VAB-22-F-14	Front Door	Level 22	2.542	BQL	No
Tower F-Elevator Door	VAB-25-F-15	Front Door	Level 25	BQL	3.406	No
Tower F-Elevator Door	VAB-27-F-16	Front Door	Level 27	3.308	BQL	No
Tower F-Elevator Door	VAB-28-F-17	Front Door	Level 28	BQL	2.589	No
Tower F-Elevator Door	VAB-31-F-18	Front Door	Level 31	BQL	7.83	No
Tower F-Elevator Door	VAB-32-F-19	Front Door	Level 32	4.2	BQL	No
Tower F-Elevator Door	VAB-34-F-20	Front Door	Level 34	BQL	66.475	Yes
Tower F-Elevator Door	VAB-3-F-21	Front Door	Level 3	BQL	6.224	No
Tower F-Elevator Door	VAB-2-F-22	Front Door	Level 2	4.735	BQL	No
Tower F-Elevator Door	VAB-1-R-23	Rear Door	Level 1	BQL	1.266	No
Tower F-Elevator Door	VAB-1-F-24	Front Door	Level 1	4.72	BQL	No

BQL =Below Quantitation Limit

Polychlorinated Biphenyl (PCB) Testing – Paint Chip Samples –Tower F Elevator Doors  
Project No.: 12010773.00000  
Vehicle Assembly Building (VAB) Tower F Elevator  
Kennedy Space Center, FL

### **3.0 LABORATORY REPORTS**

# SCHNEIDER LABORATORIES GLOBAL

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## LABORATORY ANALYSIS REPORT

**Account:** 1491-12-3227  
**Client:** PbO3 ENV TESTING & SERVICES INC  
**Address:** 473 N PINE MEADOW DR  
DEBARY, FL 32713  
**Project Name:** URS  
**Project No.:** Tower F  
**Job Location:** VAB KSC  
**P.O.#:**  
**Sample Description:** Level 5 Front

**Date/Time Collected:** 10/17/2012  
**Date/Time Received:** 10/19/2012 1:00 PM  
**Date Reported:** 10/24/2012  
**Receipt Temp., °C:**  
**Sample Matrix:** BULK

**SLI Sample No.:** 31655450  
**Client Sample No.:** VAB-5-F-01

Analyte	Analysis Result	Quantitation Limit	Units	Dilution Factor	Analysis Date/Time	Analyst
<b>Polychlorinated Biphenyls based on SW846 8082 using SLI O17</b>						
Aroclor - 1016	BQL	419	µg/kg	1	10/24/2012	APS
Aroclor - 1221	BQL	419	µg/kg	1	10/24/2012	APS
Aroclor - 1232	BQL	419	µg/kg	1	10/24/2012	APS
Aroclor - 1242	BQL	419	µg/kg	1	10/24/2012	APS
Aroclor - 1248	BQL	419	µg/kg	1	10/24/2012	APS
Aroclor - 1254	4781	419	µg/kg	1	10/24/2012	APS
Aroclor - 1260	BQL	419	µg/kg	1	10/24/2012	APS
Aroclor - 1268	BQL	419	µg/kg	1	10/24/2012	APS
Aroclor - 1262	BQL	419	µg/kg	1	10/24/2012	APS

**Polychlorinated Biphenyls based on SW846 8082 -- Surrogate Recoveries using SLI O17**

Surrogate	Recovery
DCB	168%
TCMX	127%

*M. Mishra*

Reviewed By: Mandapi Mishra, Organics QC Rep.

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AIHA/ELLAP 100527, ISO/IEC 17025, NVLAP 101150-0, NYELAP 11413, VELAP/NELAC 460135

## LABORATORY ANALYSIS REPORT

**Account:** 1491-12-3227  
**Client:** PbO3 ENV TESTING & SERVICES INC  
**Address:** 473 N PINE MEADOW DR  
DEBARY, FL 32713  
**Project Name:** URS  
**Project No.:** Tower F  
**Job Location:** VAB KSC  
**P.O.#:**  
**Sample Description:** Level 7 Front

**Date/Time Collected:** 10/17/2012  
**Date/Time Received:** 10/19/2012 1:00 PM  
**Date Reported:** 10/24/2012  
**Receipt Temp., °C:**  
**Sample Matrix:** BULK

**SLI Sample No.:** 31655451  
**Client Sample No.:** VAB-7-F-02

Analyte	Analysis Result	Quantitation Limit	Units	Dilution Factor	Analysis Date/Time	Analyst
<b><u>Polychlorinated Biphenyls based on SW846 8082 using SLI O17</u></b>						
Aroclor - 1016	BQL	462	µg/kg	1	10/24/2012	APS
Aroclor - 1221	BQL	462	µg/kg	1	10/24/2012	APS
Aroclor - 1232	BQL	462	µg/kg	1	10/24/2012	APS
Aroclor - 1242	BQL	462	µg/kg	1	10/24/2012	APS
Aroclor - 1248	BQL	462	µg/kg	1	10/24/2012	APS
Aroclor - 1254	BQL	462	µg/kg	1	10/24/2012	APS
Aroclor - 1260	5384	462	µg/kg	1	10/24/2012	APS
Aroclor - 1268	BQL	462	µg/kg	1	10/24/2012	APS
Aroclor - 1262	BQL	462	µg/kg	1	10/24/2012	APS
<b><u>Polychlorinated Biphenyls based on SW846 8082 -- Surrogate Recoveries using SLI O17</u></b>						
<b>Surrogate</b>	<b>Recovery</b>					
DCB	116%					
TCMX	137%					

*M. Mishra*

Reviewed By: Mandapi Mishra, Organics QC Rep.

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## LABORATORY ANALYSIS REPORT

**Account:** 1491-12-3227  
**Client:** PbO3 ENV TESTING & SERVICES INC  
**Address:** 473 N PINE MEADOW DR  
DEBARY, FL 32713  
**Project Name:** URS  
**Project No.:** Tower F  
**Job Location:** VAB KSC  
**P.O.#:**

**Date/Time Collected:** 10/17/2012  
**Date/Time Received:** 10/19/2012 1:00 PM  
**Date Reported:** 10/24/2012  
**Receipt Temp., °C:**  
**Sample Matrix:** BULK

**Sample Description:** Level 9 Front  
**SLI Sample No.:** 31655452  
**Client Sample No.:** VAB-9.F-03

Analyte	Analysis Result	Quantitation Limit	Units	Dilution Factor	Analysis Date/Time	Analyst
<b><u>Polychlorinated Biphenyls based on SW846 8082 using SLI O17</u></b>						
Aroclor - 1016	BQL	472	µg/kg	1	10/24/2012	APS
Aroclor - 1221	BQL	472	µg/kg	1	10/24/2012	APS
Aroclor - 1232	BQL	472	µg/kg	1	10/24/2012	APS
Aroclor - 1242	BQL	472	µg/kg	1	10/24/2012	APS
Aroclor - 1248	BQL	472	µg/kg	1	10/24/2012	APS
Aroclor - 1254	BQL	472	µg/kg	1	10/24/2012	APS
Aroclor - 1260	6234	472	µg/kg	1	10/24/2012	APS
Aroclor - 1268	BQL	472	µg/kg	1	10/24/2012	APS
Aroclor - 1262	BQL	472	µg/kg	1	10/24/2012	APS

**Polychlorinated Biphenyls based on SW846 8082 -- Surrogate Recoveries using SLI O17**

Surrogate	Recovery
DCB	137%
TCMX	MI

*M. Mishra*

Reviewed By: Mandapi Mishra, Organics QC Rep.

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## LABORATORY ANALYSIS REPORT

**Account:** 1491-12-3227  
**Client:** PbO3 ENV TESTING & SERVICES INC  
**Address:** 473 N PINE MEADOW DR  
DEBARY, FL 32713  
**Project Name:** URS  
**Project No.:** Tower F  
**Job Location:** VAB KSC  
**P.O.#:**

**Date/Time Collected:** 10/17/2012  
**Date/Time Received:** 10/19/2012 1:00 PM  
**Date Reported:** 10/24/2012  
**Receipt Temp., °C:**  
**Sample Matrix:** BULK

**Sample Description:** Level 7 Rear  
**SLI Sample No.:** 31655453  
**Client Sample No.:** VAB-7-R-04

Analyte	Analysis Result	Quantitation Limit	Units	Dilution Factor	Analysis Date/Time	Analyst
<b><u>Polychlorinated Biphenyls based on SW846 8082 using SLI 017</u></b>						
Aroclor - 1016	BQL	431	µg/kg	1	10/24/2012	APS
Aroclor - 1221	BQL	431	µg/kg	1	10/24/2012	APS
Aroclor - 1232	BQL	431	µg/kg	1	10/24/2012	APS
Aroclor - 1242	BQL	431	µg/kg	1	10/24/2012	APS
Aroclor - 1248	BQL	431	µg/kg	1	10/24/2012	APS
Aroclor - 1254	BQL	431	µg/kg	1	10/24/2012	APS
Aroclor - 1260	BQL	431	µg/kg	1	10/24/2012	APS
Aroclor - 1268	BQL	431	µg/kg	1	10/24/2012	APS
Aroclor - 1262	BQL	431	µg/kg	1	10/24/2012	APS

**Polychlorinated Biphenyls based on SW846 8082 -- Surrogate Recoveries using SLI 017**

Surrogate	Recovery
DCB	85%
TCMX	80%

*M. Mishra*

Reviewed By: Mandapi Mishra, Organics QC Rep.

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## LABORATORY ANALYSIS REPORT

**Account:** 1491-12-3227  
**Client:** PbO3 ENV TESTING & SERVICES INC  
**Address:** 473 N PINE MEADOW DR  
DEBARY, FL 32713  
**Project Name:** URS  
**Project No.:** Tower F  
**Job Location:** VAB KSC  
**P.O.#:**

**Date/Time Collected:** 10/17/2012  
**Date/Time Received:** 10/19/2012 1:00 PM  
**Date Reported:** 10/24/2012  
**Receipt Temp., °C:**  
**Sample Matrix:** BULK

**Sample Description:** Level 10 Front  
**SLI Sample No.:** 31655454  
**Client Sample No.:** VAB-10-F-05

Analyte	Analysis Result	Quantitation Limit	Units	Dilution Factor	Analysis Date/Time	Analyst
<b><u>Polychlorinated Biphenyls based on SW846 8082 using SLI 017</u></b>						
Aroclor - 1016	BQL	458	µg/kg	1	10/24/2012	APS
Aroclor - 1221	BQL	458	µg/kg	1	10/24/2012	APS
Aroclor - 1232	BQL	458	µg/kg	1	10/24/2012	APS
Aroclor - 1242	BQL	458	µg/kg	1	10/24/2012	APS
Aroclor - 1248	BQL	458	µg/kg	1	10/24/2012	APS
Aroclor - 1254	2621	458	µg/kg	1	10/24/2012	APS
Aroclor - 1260	BQL	458	µg/kg	1	10/24/2012	APS
Aroclor - 1268	BQL	458	µg/kg	1	10/24/2012	APS
Aroclor - 1262	BQL	458	µg/kg	1	10/24/2012	APS
<b><u>Polychlorinated Biphenyls based on SW846 8082 -- Surrogate Recoveries using SLI 017</u></b>						
<b>Surrogate</b>	<b>Recovery</b>					
DCB	MI					
TCMX	MI					



Reviewed By: Mandapi Mishra, Organics QC Rep.

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## LABORATORY ANALYSIS REPORT

**Account:** 1491-12-3227  
**Client:** PbO3 ENV TESTING & SERVICES INC  
**Address:** 473 N PINE MEADOW DR  
DEBARY, FL 32713  
**Project Name:** URS  
**Project No.:** Tower F  
**Job Location:** VAB KSC  
**P.O.#:**

**Date/Time Collected:** 10/17/2012  
**Date/Time Received:** 10/19/2012 1:00 PM  
**Date Reported:** 10/24/2012  
**Receipt Temp., °C:**  
**Sample Matrix:** BULK

**Sample Description:** Level 13 Front

**SLI Sample No.:** 31655455  
**Client Sample No.:** VAB-13-F-06

Analyte	Analysis Result	Quantitation Limit	Units	Dilution Factor	Analysis Date/Time	Analyst
<b><u>Polychlorinated Biphenyls based on SW846 8082 using SLI O17</u></b>						
Aroclor - 1016	BQL	451	µg/kg	1	10/24/2012	APS
Aroclor - 1221	BQL	451	µg/kg	1	10/24/2012	APS
Aroclor - 1232	BQL	451	µg/kg	1	10/24/2012	APS
Aroclor - 1242	BQL	451	µg/kg	1	10/24/2012	APS
Aroclor - 1248	BQL	451	µg/kg	1	10/24/2012	APS
Aroclor - 1254	4439	451	µg/kg	1	10/24/2012	APS
Aroclor - 1260	BQL	451	µg/kg	1	10/24/2012	APS
Aroclor - 1268	BQL	451	µg/kg	1	10/24/2012	APS
Aroclor - 1262	BQL	451	µg/kg	1	10/24/2012	APS
<b><u>Polychlorinated Biphenyls based on SW846 8082 -- Surrogate Recoveries using SLI O17</u></b>						
<b>Surrogate</b>	<b>Recovery</b>					
DCB	MI					
TCMX	MI					

*M. Mishra*

Reviewed By: Mandapi Mishra, Organics QC Rep.

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## LABORATORY ANALYSIS REPORT

**Account:** 1491-12-3227  
**Client:** PbO3 ENV TESTING & SERVICES INC  
**Address:** 473 N PINE MEADOW DR  
DEBARY, FL 32713  
**Project Name:** URS  
**Project No.:** Tower F  
**Job Location:** VAB KSC  
**P.O.#:**

**Date/Time Collected:** 10/17/2012  
**Date/Time Received:** 10/19/2012 1:00 PM  
**Date Reported:** 10/24/2012  
**Receipt Temp., °C:**  
**Sample Matrix:** BULK

**Sample Description:** Platform B Rear

**SLI Sample No.:** 31655456  
**Client Sample No.:** VAB-PB-R-07

Analyte	Analysis Result	Quantitation Limit	Units	Dilution Factor	Analysis Date/Time	Analyst
<b><u>Polychlorinated Biphenyls based on SW846 8082 using SLI O17</u></b>						
Aroclor - 1016	BQL	424	µg/kg	1	10/24/2012	APS
Aroclor - 1221	BQL	424	µg/kg	1	10/24/2012	APS
Aroclor - 1232	BQL	424	µg/kg	1	10/24/2012	APS
Aroclor - 1242	BQL	424	µg/kg	1	10/24/2012	APS
Aroclor - 1248	BQL	424	µg/kg	1	10/24/2012	APS
Aroclor - 1254	1327	424	µg/kg	1	10/24/2012	APS
Aroclor - 1260	BQL	424	µg/kg	1	10/24/2012	APS
Aroclor - 1268	BQL	424	µg/kg	1	10/24/2012	APS
Aroclor - 1262	BQL	424	µg/kg	1	10/24/2012	APS

**Polychlorinated Biphenyls based on SW846 8082 -- Surrogate Recoveries using SLI O17**

Surrogate	Recovery
DCB	MI
TCMX	MI

*M. Mishra*

Reviewed By: Mandapi Mishra, Organics QC Rep.

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## LABORATORY ANALYSIS REPORT

**Account:** 1491-12-3227  
**Client:** PbO3 ENV TESTING & SERVICES INC  
**Address:** 473 N PINE MEADOW DR  
DEBARY, FL 32713  
**Project Name:** URS  
**Project No.:** Tower F  
**Job Location:** VAB KSC  
**P.O.#:**

**Date/Time Collected:** 10/17/2012  
**Date/Time Received:** 10/19/2012 1:00 PM  
**Date Reported:** 10/24/2012  
**Receipt Temp., °C:**  
**Sample Matrix:** BULK

**Sample Description:** Level 14 Front

**SLI Sample No.:** 31655457  
**Client Sample No.:** VAB-14-F-08

Analyte	Analysis Result	Quantitation Limit	Units	Dilution Factor	Analysis Date/Time	Analyst
<b><u>Polychlorinated Biphenyls based on SW846 8082 using SLI O17</u></b>						
Aroclor - 1016	BQL	478	µg/kg	1	10/24/2012	APS
Aroclor - 1221	BQL	478	µg/kg	1	10/24/2012	APS
Aroclor - 1232	BQL	478	µg/kg	1	10/24/2012	APS
Aroclor - 1242	BQL	478	µg/kg	1	10/24/2012	APS
Aroclor - 1248	BQL	478	µg/kg	1	10/24/2012	APS
Aroclor - 1254	BQL	478	µg/kg	1	10/24/2012	APS
Aroclor - 1260	11159	478	µg/kg	1	10/24/2012	APS
Aroclor - 1268	BQL	478	µg/kg	1	10/24/2012	APS
Aroclor - 1262	BQL	478	µg/kg	1	10/24/2012	APS
<b><u>Polychlorinated Biphenyls based on SW846 8082 -- Surrogate Recoveries using SLI O17</u></b>						
<b>Surrogate</b>	<b>Recovery</b>					
DCB	MI					
TCMX	MI					



Reviewed By: Mandapi Mishra, Organics QC Rep.

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## LABORATORY ANALYSIS REPORT

**Account:** 1491-12-3227  
**Client:** PbO3 ENV TESTING & SERVICES INC  
**Address:** 473 N PINE MEADOW DR  
DEBARY, FL 32713  
**Project Name:** URS  
**Project No.:** Tower F  
**Job Location:** VAB KSC  
**P.O.#:**

**Date/Time Collected:** 10/17/2012  
**Date/Time Received:** 10/19/2012 1:00 PM  
**Date Reported:** 10/24/2012  
**Receipt Temp., °C:**  
**Sample Matrix:** BULK

**Sample Description:** Platform E Rear  
**SLI Sample No.:** 31655458  
**Client Sample No.:** VAB-PE-R-09

Analyte	Analysis Result	Quantitation Limit	Units	Dilution Factor	Analysis Date/Time	Analyst
<b>Polychlorinated Biphenyls based on SW846 8082 using SLI 017</b>						
Aroclor - 1016	BQL	494	µg/kg	1	10/24/2012	APS
Aroclor - 1221	BQL	494	µg/kg	1	10/24/2012	APS
Aroclor - 1232	BQL	494	µg/kg	1	10/24/2012	APS
Aroclor - 1242	BQL	494	µg/kg	1	10/24/2012	APS
Aroclor - 1248	BQL	494	µg/kg	1	10/24/2012	APS
Aroclor - 1254	1986	494	µg/kg	1	10/24/2012	APS
Aroclor - 1260	BQL	494	µg/kg	1	10/24/2012	APS
Aroclor - 1268	BQL	494	µg/kg	1	10/24/2012	APS
Aroclor - 1262	BQL	494	µg/kg	1	10/24/2012	APS
<b>Polychlorinated Biphenyls based on SW846 8082 -- Surrogate Recoveries using SLI 017</b>						
<b>Surrogate</b>	<b>Recovery</b>					
DCB	MI					
TCMX	157%					

*M. Mishra*

Reviewed By: Mandapi Mishra, Organics QC Rep.

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## LABORATORY ANALYSIS REPORT

**Account:** 1491-12-3227  
**Client:** PbO3 ENV TESTING & SERVICES INC  
**Address:** 473 N PINE MEADOW DR  
DEBARY, FL 32713  
**Project Name:** URS  
**Project No.:** Tower F  
**Job Location:** VAB KSC  
**P.O.#:**  
**Sample Description:** Level 16 Front  
**Date/Time Collected:** 10/17/2012  
**Date/Time Received:** 10/19/2012 1:00 PM  
**Date Reported:** 10/24/2012  
**Receipt Temp., °C:**  
**Sample Matrix:** BULK  
**SLI Sample No.:** 31655459  
**Client Sample No.:** VAB-16-F-10

Analyte	Analysis Result	Quantitation Limit	Units	Dilution Factor	Analysis Date/Time	Analyst
<b><u>Polychlorinated Biphenyls based on SW846 8082 using SLI O17</u></b>						
Aroclor - 1016	BQL	475	µg/kg	1	10/24/2012	APS
Aroclor - 1221	BQL	475	µg/kg	1	10/24/2012	APS
Aroclor - 1232	BQL	475	µg/kg	1	10/24/2012	APS
Aroclor - 1242	BQL	475	µg/kg	1	10/24/2012	APS
Aroclor - 1248	BQL	475	µg/kg	1	10/24/2012	APS
Aroclor - 1254	1362	475	µg/kg	1	10/24/2012	APS
Aroclor - 1260	BQL	475	µg/kg	1	10/24/2012	APS
Aroclor - 1268	BQL	475	µg/kg	1	10/24/2012	APS
Aroclor - 1262	BQL	475	µg/kg	1	10/24/2012	APS
<b><u>Polychlorinated Biphenyls based on SW846 8082 -- Surrogate Recoveries using SLI O17</u></b>						
<b>Surrogate</b>	<b>Recovery</b>					
DCB	MI					
TCMX	MI					

*M. Mishra*

Reviewed By: Mandapi Mishra, Organics QC Rep.

All samples for organics testing should be shipped in cool conditions, 1 to 6°C. Quality Control Data available upon request. Sample concentrations below the Quantitation Limit are noted as BQL (Below Quantitation Limit) or ND (None Detected) or with a "less than" (<) sign. Values designated with a "B" indicate presence of the analyte in the laboratory blank at a concentration above the Quantitation Limit. Surrogate Spike results designated with "D" indicate that the analyte was diluted out. "MI" indicates matrix interference. Soil results are reported on a dry weight basis. Results relate only to samples as received by the laboratory. Unusual sample conditions, if any, are described. All testing is done in strict accordance with SLI. protocol. Visit [www.slabinc.com](http://www.slabinc.com) for current certifications.

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AIHA/ELLAP 100527, ISO/IEC 17025, NVLAP 101150-0, NYELAP 11413, VELAP/NELAC 460135

## LABORATORY ANALYSIS REPORT

**Account:** 1491-12-3227  
**Client:** PbO3 ENV TESTING & SERVICES INC  
**Address:** 473 N PINE MEADOW DR  
DEBARY, FL 32713  
**Project Name:** URS  
**Project No.:** Tower F  
**Job Location:** VAB KSC  
**P.O.#:**

**Date/Time Collected:** 10/17/2012  
**Date/Time Received:** 10/19/2012 1:00 PM  
**Date Reported:** 10/24/2012  
**Receipt Temp., °C:**  
**Sample Matrix:** BULK

**Sample Description:** Level 19 Front  
**SLI Sample No.:** 31655460  
**Client Sample No.:** VAB-19-F-11

Analyte	Analysis Result	Quantitation Limit	Units	Dilution Factor	Analysis Date/Time	Analyst
<b>Polychlorinated Biphenyls based on SW846 8082 using SLI O17</b>						
Aroclor - 1016	BQL	474	µg/kg	1	10/24/2012	APS
Aroclor - 1221	BQL	474	µg/kg	1	10/24/2012	APS
Aroclor - 1232	BQL	474	µg/kg	1	10/24/2012	APS
Aroclor - 1242	BQL	474	µg/kg	1	10/24/2012	APS
Aroclor - 1248	BQL	474	µg/kg	1	10/24/2012	APS
Aroclor - 1254	4451	474	µg/kg	1	10/24/2012	APS
Aroclor - 1260	BQL	474	µg/kg	1	10/24/2012	APS
Aroclor - 1268	BQL	474	µg/kg	1	10/24/2012	APS
Aroclor - 1262	BQL	474	µg/kg	1	10/24/2012	APS
<b>Polychlorinated Biphenyls based on SW846 8082 -- Surrogate Recoveries using SLI O17</b>						
<b>Surrogate</b>	<b>Recovery</b>					
DCB	MI					
TCMX	126%					



Reviewed By: Mandapi Mishra, Organics QC Rep.

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## LABORATORY ANALYSIS REPORT

**Account:** 1491-12-3227  
**Client:** PbO3 ENV TESTING & SERVICES INC  
**Address:** 473 N PINE MEADOW DR  
DEBARY, FL 32713  
**Project Name:** URS  
**Project No.:** Tower F  
**Job Location:** VAB KSC  
**P.O.#:**

**Date/Time Collected:** 10/17/2012  
**Date/Time Received:** 10/19/2012 1:00 PM  
**Date Reported:** 10/24/2012  
**Receipt Temp., °C:**  
**Sample Matrix:** BULK

**Sample Description:** Platform C  
**SLI Sample No.:** 31655461  
**Client Sample No.:** VAB-PC-R-12

Analyte	Analysis Result	Quantitation Limit	Units	Dilution Factor	Analysis Date/Time	Analyst
<b><u>Polychlorinated Biphenyls based on SW846 8082 using SLI O17</u></b>						
Aroclor - 1016	BQL	442	µg/kg	1	10/24/2012	APS
Aroclor - 1221	BQL	442	µg/kg	1	10/24/2012	APS
Aroclor - 1232	BQL	442	µg/kg	1	10/24/2012	APS
Aroclor - 1242	BQL	442	µg/kg	1	10/24/2012	APS
Aroclor - 1248	BQL	442	µg/kg	1	10/24/2012	APS
Aroclor - 1254	BQL	442	µg/kg	1	10/24/2012	APS
Aroclor - 1260	2205	442	µg/kg	1	10/24/2012	APS
Aroclor - 1268	BQL	442	µg/kg	1	10/24/2012	APS
Aroclor - 1262	BQL	442	µg/kg	1	10/24/2012	APS

**Polychlorinated Biphenyls based on SW846 8082 -- Surrogate Recoveries using SLI O17**

Surrogate	Recovery
DCB	148%
TCMX	MI

*M Mishra*

Reviewed By: Mandapi Mishra, Organics QC Rep.

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## LABORATORY ANALYSIS REPORT

**Account:** 1491-12-3227  
**Client:** PbO3 ENV TESTING & SERVICES INC  
**Address:** 473 N PINE MEADOW DR  
DEBARY, FL 32713  
**Project Name:** URS  
**Project No.:** Tower F  
**Job Location:** VAB KSC  
**P.O.#:**

**Date/Time Collected:** 10/17/2012  
**Date/Time Received:** 10/19/2012 1:00 PM  
**Date Reported:** 10/24/2012  
**Receipt Temp., °C:**  
**Sample Matrix:** BULK

**Sample Description:** Level 20  
**SLI Sample No.:** 31655462  
**Client Sample No.:** VAB-20-F-13

Analyte	Analysis Result	Quantitation Limit	Units	Dilution Factor	Analysis Date/Time	Analyst
<b><u>Polychlorinated Biphenyls based on SW846 8082 using SLI O17</u></b>						
Aroclor - 1016	BQL	474	µg/kg	1	10/24/2012	APS
Aroclor - 1221	BQL	474	µg/kg	1	10/24/2012	APS
Aroclor - 1232	BQL	474	µg/kg	1	10/24/2012	APS
Aroclor - 1242	BQL	474	µg/kg	1	10/24/2012	APS
Aroclor - 1248	BQL	474	µg/kg	1	10/24/2012	APS
Aroclor - 1254	BQL	474	µg/kg	1	10/24/2012	APS
Aroclor - 1260	3109	474	µg/kg	1	10/24/2012	APS
Aroclor - 1268	BQL	474	µg/kg	1	10/24/2012	APS
Aroclor - 1262	BQL	474	µg/kg	1	10/24/2012	APS
<b><u>Polychlorinated Biphenyls based on SW846 8082 -- Surrogate Recoveries using SLI O17</u></b>						
<b>Surrogate</b>	<b>Recovery</b>					
DCB	114%					
TCMX	125%					

*M. Mishra*

Reviewed By: Mandapi Mishra, Organics QC Rep.

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## LABORATORY ANALYSIS REPORT

**Account:** 1491-12-3227  
**Client:** PbO3 ENV TESTING & SERVICES INC  
**Address:** 473 N PINE MEADOW DR  
DEBARY, FL 32713  
**Project Name:** URS  
**Project No.:** Tower F  
**Job Location:** VAB KSC  
**P.O.#:**

**Date/Time Collected:** 10/17/2012  
**Date/Time Received:** 10/19/2012 1:00 PM  
**Date Reported:** 10/24/2012  
**Receipt Temp., °C:**  
**Sample Matrix:** BULK

**Sample Description:** Level 22  
**SLI Sample No.:** 31655463  
**Client Sample No.:** VAB-22-F-14

Analyte	Analysis Result	Quantitation Limit	Units	Dilution Factor	Analysis Date/Time	Analyst
<b><u>Polychlorinated Biphenyls based on SW846 8082 using SLI O17</u></b>						
Aroclor - 1016	BQL	444	µg/kg	1	10/24/2012	APS
Aroclor - 1221	BQL	444	µg/kg	1	10/24/2012	APS
Aroclor - 1232	BQL	444	µg/kg	1	10/24/2012	APS
Aroclor - 1242	BQL	444	µg/kg	1	10/24/2012	APS
Aroclor - 1248	BQL	444	µg/kg	1	10/24/2012	APS
Aroclor - 1254	2542	444	µg/kg	1	10/24/2012	APS
Aroclor - 1260	BQL	444	µg/kg	1	10/24/2012	APS
Aroclor - 1268	BQL	444	µg/kg	1	10/24/2012	APS
Aroclor - 1262	BQL	444	µg/kg	1	10/24/2012	APS
<b><u>Polychlorinated Biphenyls based on SW846 8082 -- Surrogate Recoveries using SLI O17</u></b>						
<b>Surrogate</b>	<b>Recovery</b>					
DCB	MI					
TCMX	120%					

*M. Mishra*

Reviewed By: Mandapi Mishra, Organics QC Rep.

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## LABORATORY ANALYSIS REPORT

**Account:** 1491-12-3227  
**Client:** PbO3 ENV TESTING & SERVICES INC  
**Address:** 473 N PINE MEADOW DR  
DEBARY, FL 32713  
**Project Name:** URS  
**Project No.:** Tower F  
**Job Location:** VAB KSC  
**P.O.#:**

**Date/Time Collected:** 10/17/2012  
**Date/Time Received:** 10/19/2012 1:00 PM  
**Date Reported:** 10/24/2012  
**Receipt Temp., °C:**  
**Sample Matrix:** BULK

**Sample Description:** Level 25  
**SLI Sample No.:** 31655464  
**Client Sample No.:** VAB-25-F-15

Analyte	Analysis Result	Quantitation Limit	Units	Dilution Factor	Analysis Date/Time	Analyst
<b><u>Polychlorinated Biphenyls based on SW846 8082 using SLI O17</u></b>						
Aroclor - 1016	BQL	443	µg/kg	1	10/24/2012	APS
Aroclor - 1221	BQL	443	µg/kg	1	10/24/2012	APS
Aroclor - 1232	BQL	443	µg/kg	1	10/24/2012	APS
Aroclor - 1242	BQL	443	µg/kg	1	10/24/2012	APS
Aroclor - 1248	BQL	443	µg/kg	1	10/24/2012	APS
Aroclor - 1254	BQL	443	µg/kg	1	10/24/2012	APS
Aroclor - 1260	3406	443	µg/kg	1	10/24/2012	APS
Aroclor - 1268	BQL	443	µg/kg	1	10/24/2012	APS
Aroclor - 1262	BQL	443	µg/kg	1	10/24/2012	APS
<b><u>Polychlorinated Biphenyls based on SW846 8082 -- Surrogate Recoveries using SLI O17</u></b>						
<b>Surrogate</b>	<b>Recovery</b>					
DCB	121%					
TCMX	124%					

*M. Mishra*

Reviewed By: Mandapi Mishra, Organics QC Rep.

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## LABORATORY ANALYSIS REPORT

**Account:** 1491-12-3227  
**Client:** PbO3 ENV TESTING & SERVICES INC  
**Address:** 473 N PINE MEADOW DR  
DEBARY, FL 32713  
**Project Name:** URS  
**Project No.:** Tower F  
**Job Location:** VAB KSC  
**P.O.#:**

**Date/Time Collected:** 10/17/2012  
**Date/Time Received:** 10/19/2012 1:00 PM  
**Date Reported:** 10/24/2012  
**Receipt Temp., °C:**  
**Sample Matrix:** BULK

**Sample Description:** Level 27  
**SLI Sample No.:** 31655465  
**Client Sample No.:** VAB-27-F-16

Analyte	Analysis Result	Quantitation Limit	Units	Dilution Factor	Analysis Date/Time	Analyst
<b><u>Polychlorinated Biphenyls based on SW846 8082 using SLI O17</u></b>						
Aroclor - 1016	BQL	485	µg/kg	1	10/24/2012	APS
Aroclor - 1221	BQL	485	µg/kg	1	10/24/2012	APS
Aroclor - 1232	BQL	485	µg/kg	1	10/24/2012	APS
Aroclor - 1242	BQL	485	µg/kg	1	10/24/2012	APS
Aroclor - 1248	BQL	485	µg/kg	1	10/24/2012	APS
Aroclor - 1254	3308	485	µg/kg	1	10/24/2012	APS
Aroclor - 1260	BQL	485	µg/kg	1	10/24/2012	APS
Aroclor - 1268	BQL	485	µg/kg	1	10/24/2012	APS
Aroclor - 1262	BQL	485	µg/kg	1	10/24/2012	APS
<b><u>Polychlorinated Biphenyls based on SW846 8082 -- Surrogate Recoveries using SLI O17</u></b>						
<b>Surrogate</b>	<b>Recovery</b>					
DCB	MI					
TCMX	MI					

*M. Mishra*

Reviewed By: Mandapi Mishra, Organics QC Rep.

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## LABORATORY ANALYSIS REPORT

**Account:** 1491-12-3227  
**Client:** PbO3 ENV TESTING & SERVICES INC  
**Address:** 473 N PINE MEADOW DR  
DEBARY, FL 32713  
**Project Name:** URS  
**Project No.:** Tower F  
**Job Location:** VAB KSC  
**P.O.#:**

**Date/Time Collected:** 10/17/2012  
**Date/Time Received:** 10/19/2012 1:00 PM  
**Date Reported:** 10/24/2012  
**Receipt Temp., °C:**  
**Sample Matrix:** BULK

**Sample Description:** Level 28  
**SLI Sample No.:** 31655466  
**Client Sample No.:** VAB-28-F-17

Analyte	Analysis Result	Quantitation Limit	Units	Dilution Factor	Analysis Date/Time	Analyst
<b><u>Polychlorinated Biphenyls based on SW846 8082 using SLI O17</u></b>						
Aroclor - 1016	BQL	416	µg/kg	1	10/24/2012	APS
Aroclor - 1221	BQL	416	µg/kg	1	10/24/2012	APS
Aroclor - 1232	BQL	416	µg/kg	1	10/24/2012	APS
Aroclor - 1242	BQL	416	µg/kg	1	10/24/2012	APS
Aroclor - 1248	BQL	416	µg/kg	1	10/24/2012	APS
Aroclor - 1254	BQL	416	µg/kg	1	10/24/2012	APS
Aroclor - 1260	2589	416	µg/kg	1	10/24/2012	APS
Aroclor - 1268	BQL	416	µg/kg	1	10/24/2012	APS
Aroclor - 1262	BQL	416	µg/kg	1	10/24/2012	APS
<b><u>Polychlorinated Biphenyls based on SW846 8082 -- Surrogate Recoveries using SLI O17</u></b>						
<b>Surrogate</b>	<b>Recovery</b>					
DCB	147%					
TCMX	MI					

*M. Mishra*

Reviewed By: Mandapi Mishra, Organics QC Rep.

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## LABORATORY ANALYSIS REPORT

**Account:** 1491-12-3227  
**Client:** PbO3 ENV TESTING & SERVICES INC  
**Address:** 473 N PINE MEADOW DR  
DEBARY, FL 32713  
**Project Name:** URS  
**Project No.:** Tower F  
**Job Location:** VAB KSC  
**P.O.#:**

**Date/Time Collected:** 10/17/2012  
**Date/Time Received:** 10/19/2012 1:00 PM  
**Date Reported:** 10/24/2012  
**Receipt Temp., °C:**  
**Sample Matrix:** BULK

**Sample Description:** Level 31  
**SLI Sample No.:** 31655467  
**Client Sample No.:** VAB-31-F-18

Analyte	Analysis Result	Quantitation Limit	Units	Dilution Factor	Analysis Date/Time	Analyst
<b><u>Polychlorinated Biphenyls based on SW846 8082 using SLI O17</u></b>						
Aroclor - 1016	BQL	449	µg/kg	1	10/24/2012	APS
Aroclor - 1221	BQL	449	µg/kg	1	10/24/2012	APS
Aroclor - 1232	BQL	449	µg/kg	1	10/24/2012	APS
Aroclor - 1242	BQL	449	µg/kg	1	10/24/2012	APS
Aroclor - 1248	BQL	449	µg/kg	1	10/24/2012	APS
Aroclor - 1254	BQL	449	µg/kg	1	10/24/2012	APS
Aroclor - 1260	7830	449	µg/kg	1	10/24/2012	APS
Aroclor - 1268	BQL	449	µg/kg	1	10/24/2012	APS
Aroclor - 1262	BQL	449	µg/kg	1	10/24/2012	APS
<b><u>Polychlorinated Biphenyls based on SW846 8082 -- Surrogate Recoveries using SLI O17</u></b>						
<b>Surrogate</b>	<b>Recovery</b>					
DCB	139%					
TCMX	132%					

*M. Mishra*

Reviewed By: Mandapi Mishra, Organics QC Rep.

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AIHA/ELLAP 100527, ISO/IEC 17025, NVLAP 101150-0, NYELAP 11413, VELAP/NELAC 460135

## LABORATORY ANALYSIS REPORT

**Account:** 1491-12-3227  
**Client:** PbO3 ENV TESTING & SERVICES INC  
**Address:** 473 N PINE MEADOW DR  
DEBARY, FL 32713  
**Project Name:** URS  
**Project No.:** Tower F  
**Job Location:** VAB KSC  
**P.O.#:**  
**Sample Description:** Level 32

**Date/Time Collected:** 10/17/2012  
**Date/Time Received:** 10/19/2012 1:00 PM  
**Date Reported:** 10/24/2012  
**Receipt Temp., °C:**  
**Sample Matrix:** BULK

**SLI Sample No.:** 31655468  
**Client Sample No.:** VAB-32-F-19

Analyte	Analysis Result	Quantitation Limit	Units	Dilution Factor	Analysis Date/Time	Analyst
<b>Polychlorinated Biphenyls based on SW846 8082 using SLI O17</b>						
Aroclor - 1016	BQL	454	µg/kg	1	10/24/2012	APS
Aroclor - 1221	BQL	454	µg/kg	1	10/24/2012	APS
Aroclor - 1232	BQL	454	µg/kg	1	10/24/2012	APS
Aroclor - 1242	BQL	454	µg/kg	1	10/24/2012	APS
Aroclor - 1248	BQL	454	µg/kg	1	10/24/2012	APS
Aroclor - 1254	4200	454	µg/kg	1	10/24/2012	APS
Aroclor - 1260	BQL	454	µg/kg	1	10/24/2012	APS
Aroclor - 1268	BQL	454	µg/kg	1	10/24/2012	APS
Aroclor - 1262	BQL	454	µg/kg	1	10/24/2012	APS

### Polychlorinated Biphenyls based on SW846 8082 -- Surrogate Recoveries using SLI O17

Surrogate	Recovery
DCB	MI
TCMX	131%

*M. Mishra*

Reviewed By: Mandapi Mishra, Organics QC Rep.

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804-353-6778 • 800-785-LABS (5227) • (Fax) 804-359-1475

Over 25 Years of Excellence in Service and Technology

AIHA/ELLAP 100527, ISO/IEC 17025, NVLAP 101150-0, NYELAP 11413, VELAP/NELAC 460135

## LABORATORY ANALYSIS REPORT

**Account:** 1491-12-3227  
**Client:** PbO3 ENV TESTING & SERVICES INC  
**Address:** 473 N PINE MEADOW DR  
DEBARY, FL 32713  
**Project Name:** URS  
**Project No.:** Tower F  
**Job Location:** VAB KSC  
**P.O.#:**

**Date/Time Collected:** 10/17/2012  
**Date/Time Received:** 10/19/2012 1:00 PM  
**Date Reported:** 10/24/2012  
**Receipt Temp., °C:**  
**Sample Matrix:** BULK

**Sample Description:** Level 35  
**SLI Sample No.:** 31655469  
**Client Sample No.:** VAB-34-F-20

Analyte	Analysis Result	Quantitation Limit	Units	Dilution Factor	Analysis Date/Time	Analyst
<b><u>Polychlorinated Biphenyls based on SW846 8082 using SLI O17</u></b>						
Aroclor - 1016	BQL	8867	µg/kg	20	10/24/2012	APS
Aroclor - 1221	BQL	8867	µg/kg	20	10/24/2012	APS
Aroclor - 1232	BQL	8867	µg/kg	20	10/24/2012	APS
Aroclor - 1242	BQL	8867	µg/kg	20	10/24/2012	APS
Aroclor - 1248	BQL	8867	µg/kg	20	10/24/2012	APS
Aroclor - 1254	BQL	8867	µg/kg	20	10/24/2012	APS
Aroclor - 1260	66475	8867	µg/kg	20	10/24/2012	APS
Aroclor - 1268	BQL	8867	µg/kg	20	10/24/2012	APS
Aroclor - 1262	BQL	8867	µg/kg	20	10/24/2012	APS
<b><u>Polychlorinated Biphenyls based on SW846 8082 -- Surrogate Recoveries using SLI O17</u></b>						
<b>Surrogate</b>	<b>Recovery</b>					
DCB	MI					
TCMX	MI					



Reviewed By: Mandapi Mishra, Organics QC Rep.

All samples for organics testing should be shipped in cool conditions, 1 to 6°C. Quality Control Data available upon request. Sample concentrations below the Quantitation Limit are noted as BQL (Below Quantitation Limit) or ND (None Detected) or with a "less than" (<) sign. Values designated with a "B" indicate presence of the analyte in the laboratory blank at a concentration above the Quantitation Limit. Surrogate Spike results designated with "D" indicate that the analyte was diluted out. "MI" indicates matrix interference. Soil results are reported on a dry weight basis. Results relate only to samples as received by the laboratory. Unusual sample conditions, if any, are described. All testing is done in strict accordance with SLI. protocol. Visit [www.slabin.com](http://www.slabin.com) for current certifications.

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## LABORATORY ANALYSIS REPORT

**Account:** 1491-12-3227  
**Client:** PbO3 ENV TESTING & SERVICES INC  
**Address:** 473 N PINE MEADOW DR  
DEBARY, FL 32713  
**Project Name:** URS  
**Project No.:** Tower F  
**Job Location:** VAB KSC  
**P.O.#:**

**Date/Time Collected:** 10/17/2012  
**Date/Time Received:** 10/19/2012 1:00 PM  
**Date Reported:** 10/24/2012  
**Receipt Temp., °C:**  
**Sample Matrix:** BULK

**Sample Description:** Level 3  
**SLI Sample No.:** 31655470  
**Client Sample No.:** VAB-3-F-21

Analyte	Analysis Result	Quantitation Limit	Units	Dilution Factor	Analysis Date/Time	Analyst
<b><u>Polychlorinated Biphenyls based on SW846 8082 using SLI O17</u></b>						
Aroclor - 1016	BQL	412	µg/kg	1	10/24/2012	APS
Aroclor - 1221	BQL	412	µg/kg	1	10/24/2012	APS
Aroclor - 1232	BQL	412	µg/kg	1	10/24/2012	APS
Aroclor - 1242	BQL	412	µg/kg	1	10/24/2012	APS
Aroclor - 1248	BQL	412	µg/kg	1	10/24/2012	APS
Aroclor - 1254	BQL	412	µg/kg	1	10/24/2012	APS
Aroclor - 1260	6224	412	µg/kg	1	10/24/2012	APS
Aroclor - 1268	BQL	412	µg/kg	1	10/24/2012	APS
Aroclor - 1262	BQL	412	µg/kg	1	10/24/2012	APS

**Polychlorinated Biphenyls based on SW846 8082 -- Surrogate Recoveries using SLI O17**

Surrogate	Recovery
DCB	143%
TCMX	MI

*M. Mishra*

Reviewed By: Mandapi Mishra, Organics QC Rep.

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## LABORATORY ANALYSIS REPORT

**Account:** 1491-12-3227  
**Client:** PbO3 ENV TESTING & SERVICES INC  
**Address:** 473 N PINE MEADOW DR  
DEBARY, FL 32713  
**Project Name:** URS  
**Project No.:** Tower F  
**Job Location:** VAB KSC  
**P.O.#:**

**Date/Time Collected:** 10/17/2012  
**Date/Time Received:** 10/19/2012 1:00 PM  
**Date Reported:** 10/24/2012  
**Receipt Temp., °C:**  
**Sample Matrix:** BULK

**Sample Description:** Level 2  
**SLI Sample No.:** 31655471  
**Client Sample No.:** VAB-2-F-22

Analyte	Analysis Result	Quantitation Limit	Units	Dilution Factor	Analysis Date/Time	Analyst
<b><u>Polychlorinated Biphenyls based on SW846 8082 using SLI O17</u></b>						
Aroclor - 1016	BQL	458	µg/kg	1	10/24/2012	APS
Aroclor - 1221	BQL	458	µg/kg	1	10/24/2012	APS
Aroclor - 1232	BQL	458	µg/kg	1	10/24/2012	APS
Aroclor - 1242	BQL	458	µg/kg	1	10/24/2012	APS
Aroclor - 1248	BQL	458	µg/kg	1	10/24/2012	APS
Aroclor - 1254	4735	458	µg/kg	1	10/24/2012	APS
Aroclor - 1260	BQL	458	µg/kg	1	10/24/2012	APS
Aroclor - 1268	BQL	458	µg/kg	1	10/24/2012	APS
Aroclor - 1262	BQL	458	µg/kg	1	10/24/2012	APS

**Polychlorinated Biphenyls based on SW846 8082 -- Surrogate Recoveries using SLI O17**

Surrogate	Recovery
DCB	MI
TCMX	MI



Reviewed By: Mandapi Mishra, Organics QC Rep.

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## LABORATORY ANALYSIS REPORT

**Account:** 1491-12-3227  
**Client:** PbO3 ENV TESTING & SERVICES INC  
**Address:** 473 N PINE MEADOW DR  
DEBARY, FL 32713  
**Project Name:** URS  
**Project No.:** Tower F  
**Job Location:** VAB KSC  
**P.O.#:**

**Date/Time Collected:** 10/17/2012  
**Date/Time Received:** 10/19/2012 1:00 PM  
**Date Reported:** 10/24/2012  
**Receipt Temp., °C:**  
**Sample Matrix:** BULK

**Sample Description:** Level 1  
**SLI Sample No.:** 31655472  
**Client Sample No.:** VAB-1-R-23

Analyte	Analysis Result	Quantitation Limit	Units	Dilution Factor	Analysis Date/Time	Analyst
<b><u>Polychlorinated Biphenyls based on SW846 8082 using SLI O17</u></b>						
Aroclor - 1016	BQL	414	µg/kg	1	10/24/2012	APS
Aroclor - 1221	BQL	414	µg/kg	1	10/24/2012	APS
Aroclor - 1232	BQL	414	µg/kg	1	10/24/2012	APS
Aroclor - 1242	BQL	414	µg/kg	1	10/24/2012	APS
Aroclor - 1248	BQL	414	µg/kg	1	10/24/2012	APS
Aroclor - 1254	BQL	414	µg/kg	1	10/24/2012	APS
Aroclor - 1260	1266	414	µg/kg	1	10/24/2012	APS
Aroclor - 1268	BQL	414	µg/kg	1	10/24/2012	APS
Aroclor - 1262	BQL	414	µg/kg	1	10/24/2012	APS

**Polychlorinated Biphenyls based on SW846 8082 -- Surrogate Recoveries using SLI O17**

Surrogate	Recovery
DCB	116%
TCMX	135%

*M Mishra*

Reviewed By: Mandapi Mishra, Organics QC Rep.

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## LABORATORY ANALYSIS REPORT

**Account:** 1491-12-3227  
**Client:** PbO3 ENV TESTING & SERVICES INC  
**Address:** 473 N PINE MEADOW DR  
DEBARY, FL 32713  
**Project Name:** URS  
**Project No.:** Tower F  
**Job Location:** VAB KSC  
**P.O.#:**

**Date/Time Collected:** 10/17/2012  
**Date/Time Received:** 10/19/2012 1:00 PM  
**Date Reported:** 10/24/2012  
**Receipt Temp., °C:**  
**Sample Matrix:** BULK

**Sample Description:** Level 1

**SLI Sample No.:** 31655473  
**Client Sample No.:** VAB-1-F-24

Analyte	Analysis Result	Quantitation Limit	Units	Dilution Factor	Analysis Date/Time	Analyst
<b><u>Polychlorinated Biphenyls based on SW846 8082 using SLI O17</u></b>						
Aroclor - 1016	BQL	476	µg/kg	1	10/24/2012	APS
Aroclor - 1221	BQL	476	µg/kg	1	10/24/2012	APS
Aroclor - 1232	BQL	476	µg/kg	1	10/24/2012	APS
Aroclor - 1242	BQL	476	µg/kg	1	10/24/2012	APS
Aroclor - 1248	BQL	476	µg/kg	1	10/24/2012	APS
Aroclor - 1254	4720	476	µg/kg	1	10/24/2012	APS
Aroclor - 1260	BQL	476	µg/kg	1	10/24/2012	APS
Aroclor - 1268	BQL	476	µg/kg	1	10/24/2012	APS
Aroclor - 1262	BQL	476	µg/kg	1	10/24/2012	APS

**Polychlorinated Biphenyls based on SW846 8082 -- Surrogate Recoveries using SLI O17**

Surrogate	Recovery
DCB	MI
TCMX	MI



Reviewed By: Mandapi Mishra, Organics QC Rep.

All samples for organics testing should be shipped in cool conditions, 1 to 6°C. Quality Control Data available upon request. Sample concentrations below the Quantitation Limit are noted as BQL (Below Quantitation Limit) or ND (None Detected) or with a "less than" (<) sign. Values designated with a "B" indicate presence of the analyte in the laboratory blank at a concentration above the Quantitation Limit. Surrogate Spike results designated with "D" indicate that the analyte was diluted out. "MI" indicates matrix interference. Soil results are reported on a dry weight basis. Results relate only to samples as received by the laboratory. Unusual sample conditions, if any, are described. All testing is done in strict accordance with SLI protocol. Visit [www.slabinc.com](http://www.slabinc.com) for current certifications.

### SAMPLE LOG

<b>PbO3 ENVIRONMENTAL, INC.</b> 473 N. PINE MEADOW DR. DEBARY, FL. 32713 Phone 386-668-4545 Fax 386-668-4566 Pbo3@comcast.net  5 day TAT	PROJECT NAME: URS JOB LOCATION: VAB KSC PROJECT #: Tower F PO NO.: DATE: 10/17/12 <hr/> RCRA8 Totals / PCB <u>1</u> OF <u>2</u> <b>SAMPLE LOG</b> ASBESTOS _____ LEAD _____ OTHER <u>X</u>
---	---

SAMPLE NUMBER	DESCRIPTION	LOCATION
VAB-5-F-01	elevator Door Paint	Level 5 front
VAB-7-F-02		7 front
VAB-9-F-03		9 front
VAB-7-R-04		7 rear
VAB-10-F-05		10 front
VAB-13-F-06		13 front
VAB-13-R-07		Platform B rear
VAB-14-F-08		Level 14 front
VAB-15-R-09		Platform E rear
VAB-16-F-10		Level 16 front
VAB-19-F-11		19 front
VAB-19-R-12		Platform C
VAB-20-F-13		Level 20
VAB-22-F-14		22
VAB-25-F-15		25
VAB-27-F-16		27
VAB-28-F-17		28
VAB-31-F-18		31
VAB-32-F-19		32
WorkOrderKey  V: \ 917 \ 917577		
10/18/12		

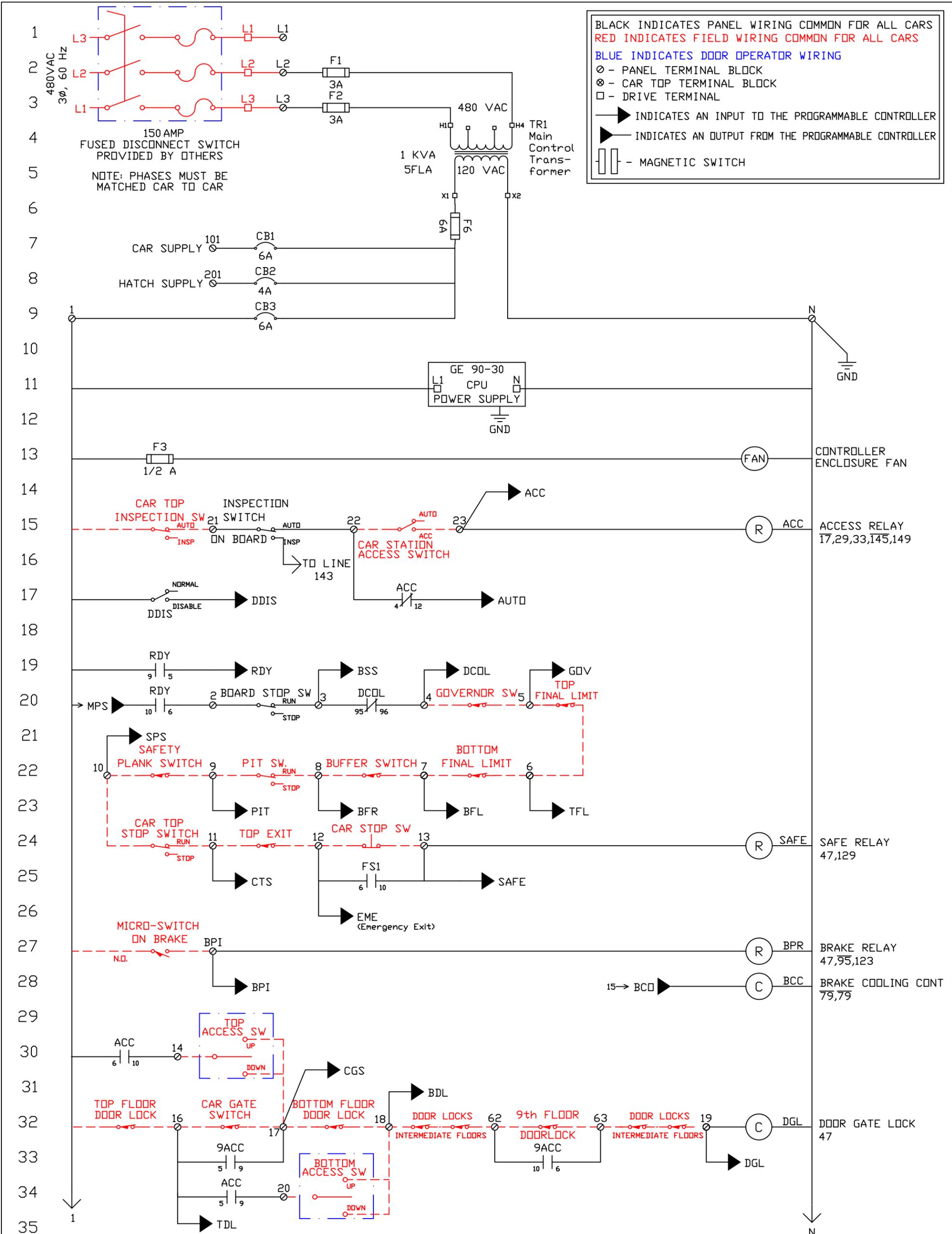
Fad: 10/19/12



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# APPENDIX D

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BLACK INDICATES PANEL WIRING COMMON FOR ALL CARS  
 RED INDICATES FIELD WIRING COMMON FOR ALL CARS  
 BLUE INDICATES DOOR OPERATOR WIRING

⊗ - PANEL TERMINAL BLOCK  
 ⊙ - CAR TOP TERMINAL BLOCK  
 □ - DRIVE TERMINAL

▶ INDICATES AN INPUT TO THE PROGRAMMABLE CONTROLLER  
 ◀ INDICATES AN OUTPUT FROM THE PROGRAMMABLE CONTROLLER

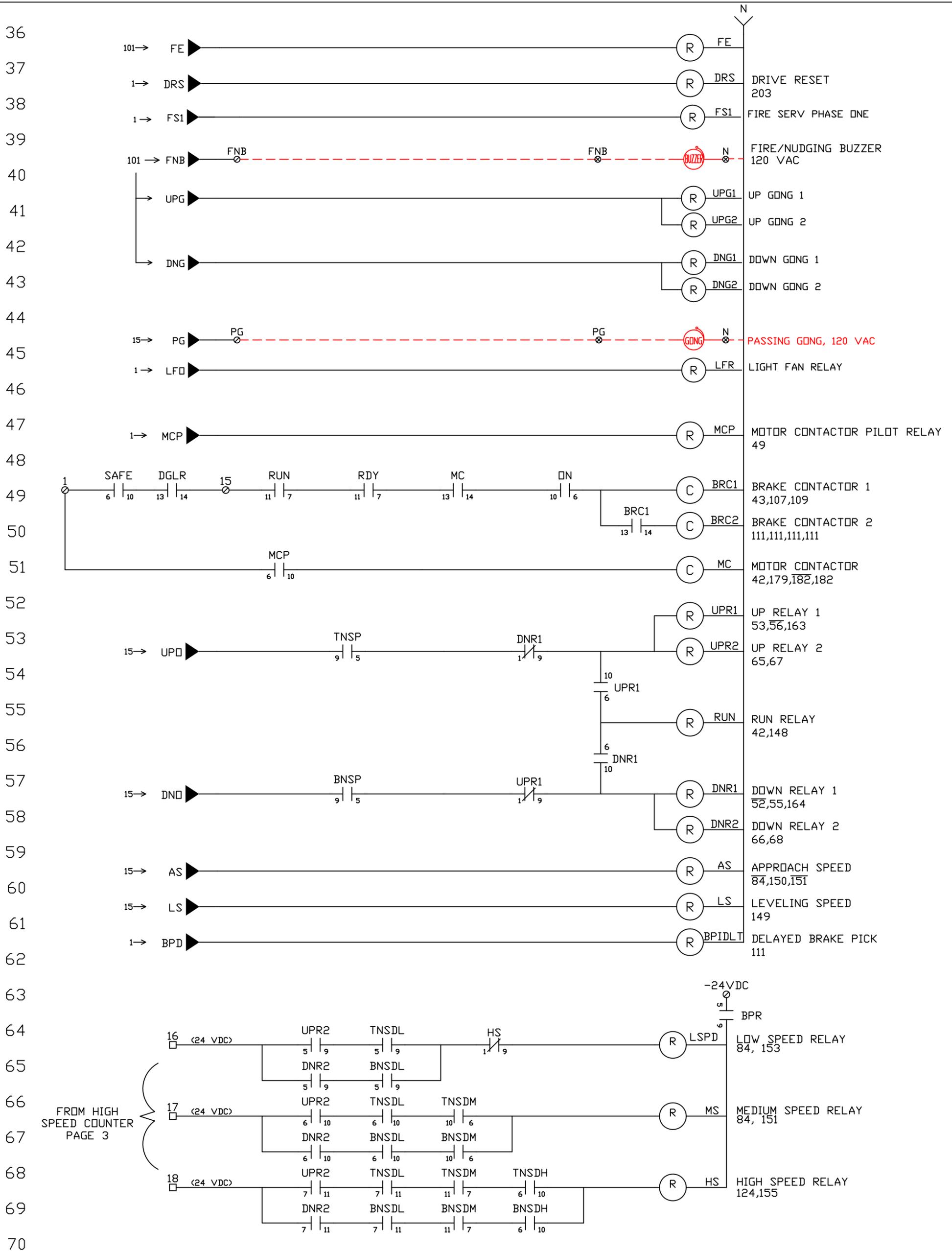
⎓ - MAGNETIC SWITCH

Mid-American Elevator Inc.  
 820 N. Wolcott Ave.  
 Chicago, IL 60622  
 773.486.6900 fax 773.486.2438

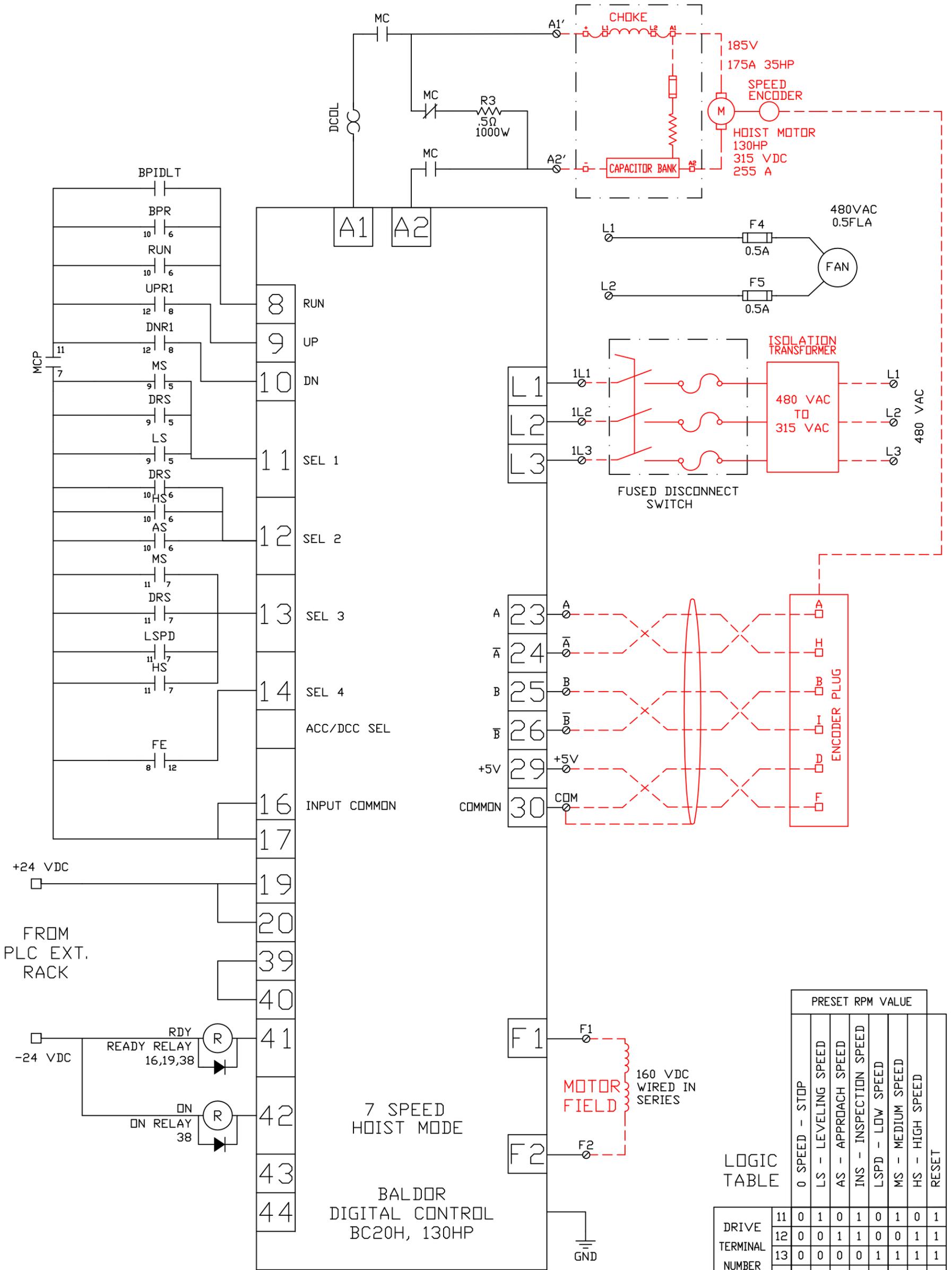
ALL DRAWINGS ARE THE PROPERTY OF MID-AMERICAN ELEVATOR CO., INC  
 DO NOT DUPLICATE WITHOUT WRITTEN PERMISSION OF MID-AMERICAN ELEVATOR

Kennedy Space Center  
 Vehicle Assembly Building - Car #15  
 Simplex, 8000 Lbs.  
 700 fpm

DRAWING NUMBER:	E829201B
DRAWING DATE:	April 7, 1997
DRAFTER/ENGINEER:	Robby
CONTRACT NUMBER(S):	8292



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LOGIC TABLE

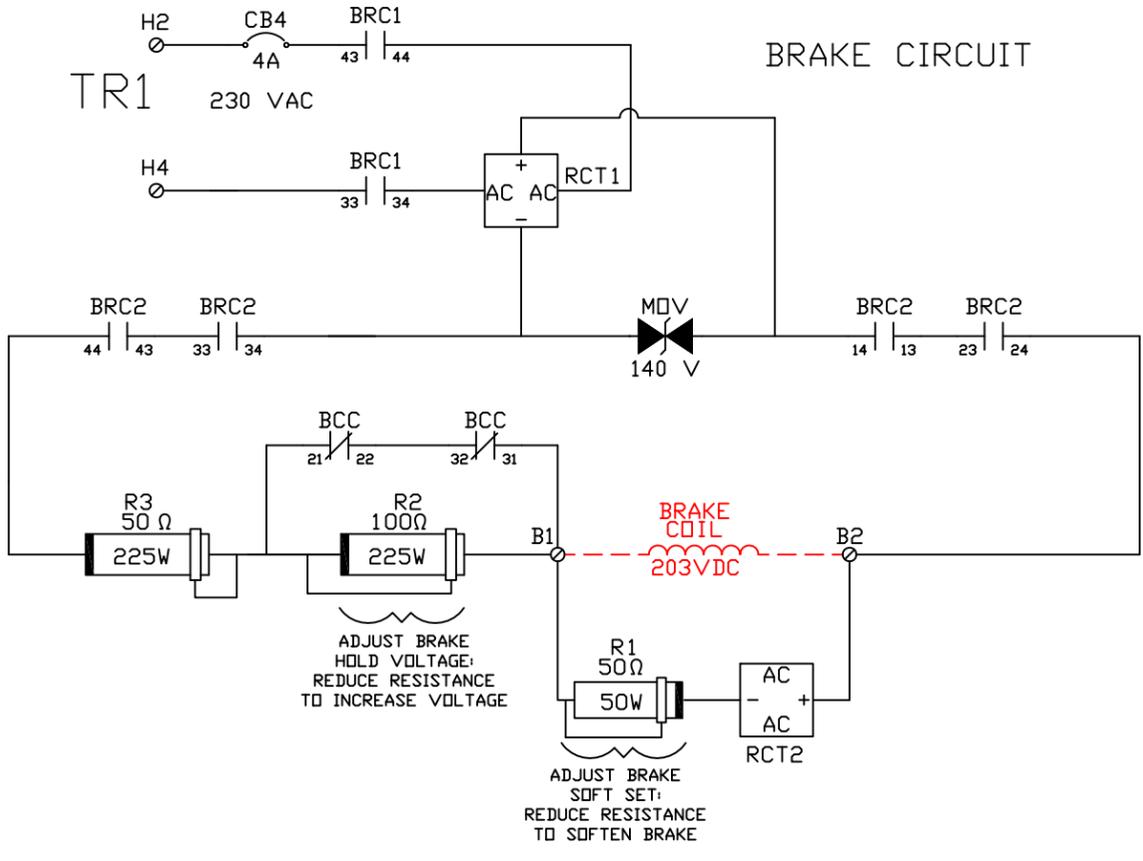
DRIVE TERMINAL NUMBER	PRESET RPM VALUE						
	0 SPEED - STOP	LS - LEVELING SPEED	AS - APPROACH SPEED	INS - INSPECTION SPEED	LSPD - LOW SPEED	MS - MEDIUM SPEED	HS - HIGH SPEED
11	0	1	0	1	0	1	0
12	0	0	1	1	0	0	1
13	0	0	0	0	1	1	1
14	0	0	0	0	0	0	1
PRESET SPEED	1	2	3	4	5	6	7

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 820 N. Wolcott Ave.  
 Chicago, IL 60622  
 773.486.6900 fax 773.486.2438  
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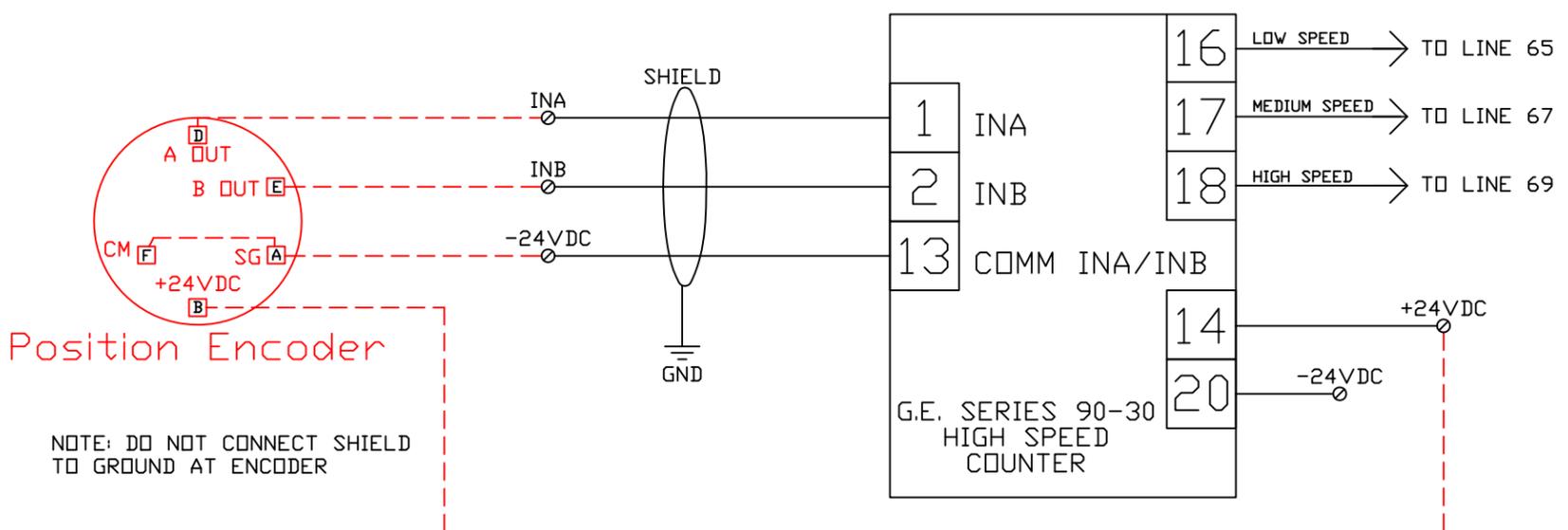
Kennedy Space Center  
 Vehicle Assembly Building - Car #15  
 DC SCR Drive

DRAWING NUMBER: E829203B  
 DRAWING DATE: April 25, 1997  
 DRAFTER/ENGINEER: Robby  
 CONTRACT NUMBER(S): 8292

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HIGH SPEED COUNTER



NOTE: DO NOT CONNECT SHIELD TO GROUND AT ENCODER

Mid-American Elevator Inc.  
820 N. Wolcott Ave.  
Chicago, IL 60622  
773.486.6900 fax 773.486.2438

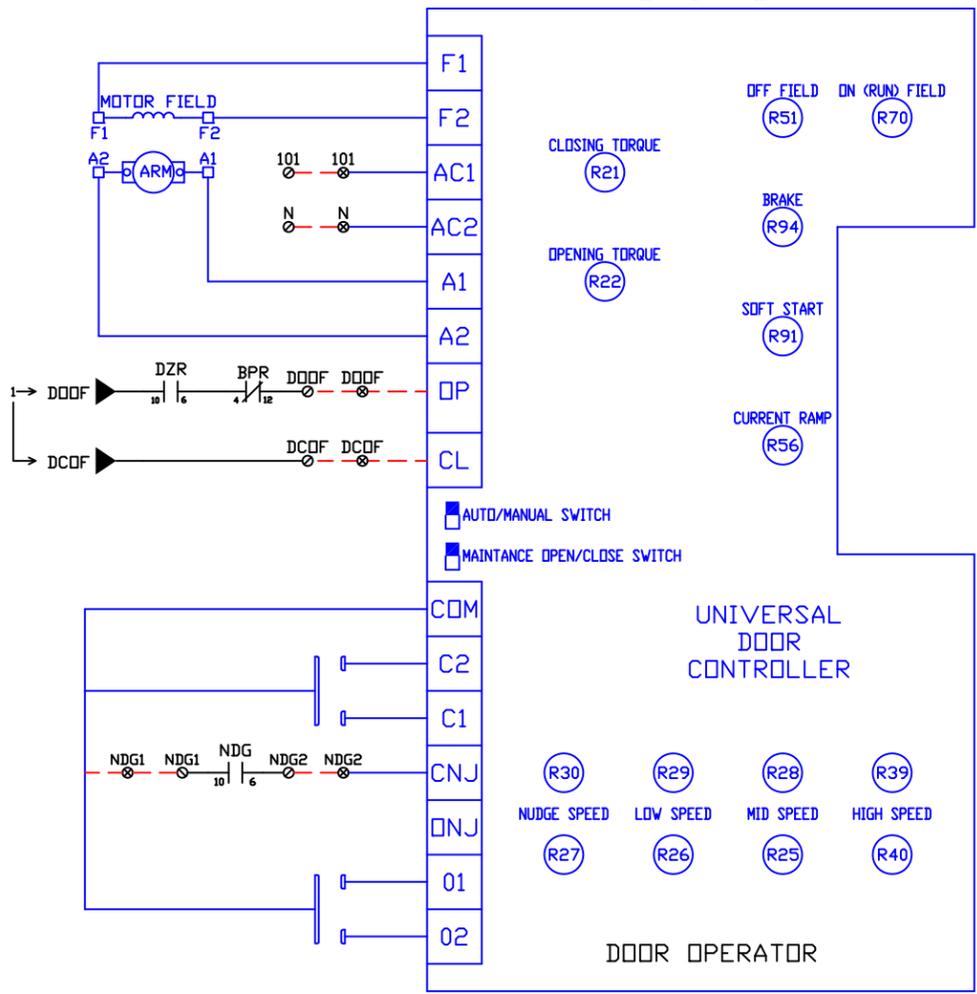
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Kennedy Space Center  
Vehicle Assembly Building - Car #15  
Control/Brake Wiring  
High Speed Counter

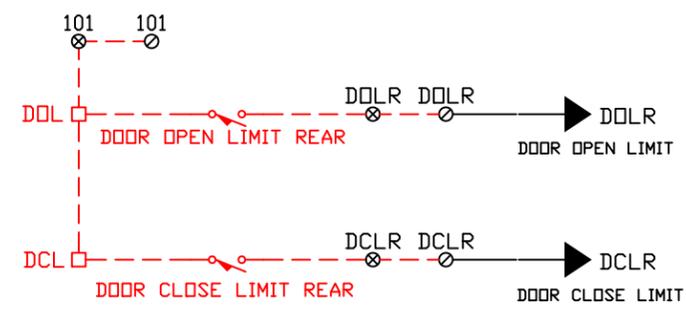
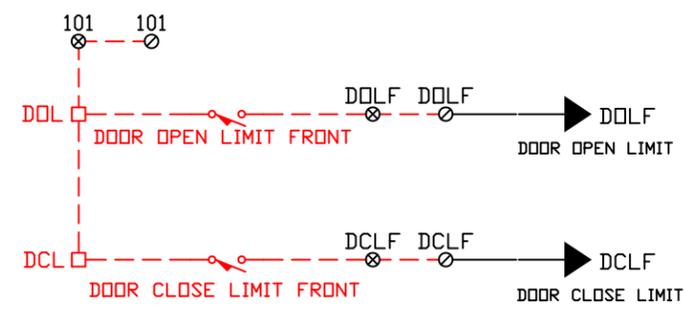
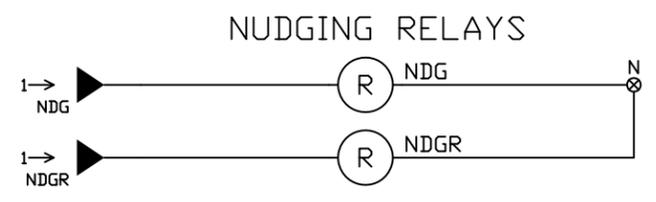
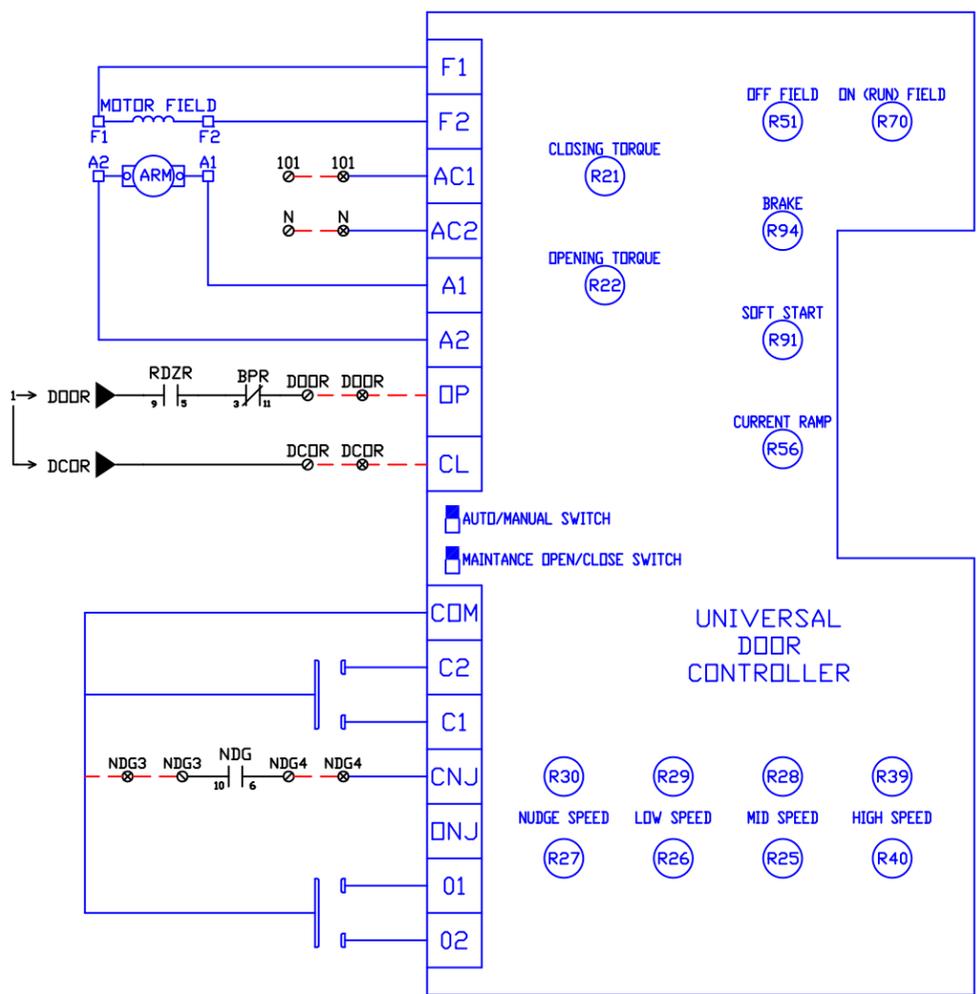
DRAWING NUMBER:	E829204B
DRAWING DATE:	April 7, 1997
DRAFTER/ENGINEER:	Robby
CONTRACT NUMBER(S):	8292

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FRONT DOOR OPERATOR  
ON CARTOP



REAR DOOR OPERATOR  
ON CARTOP



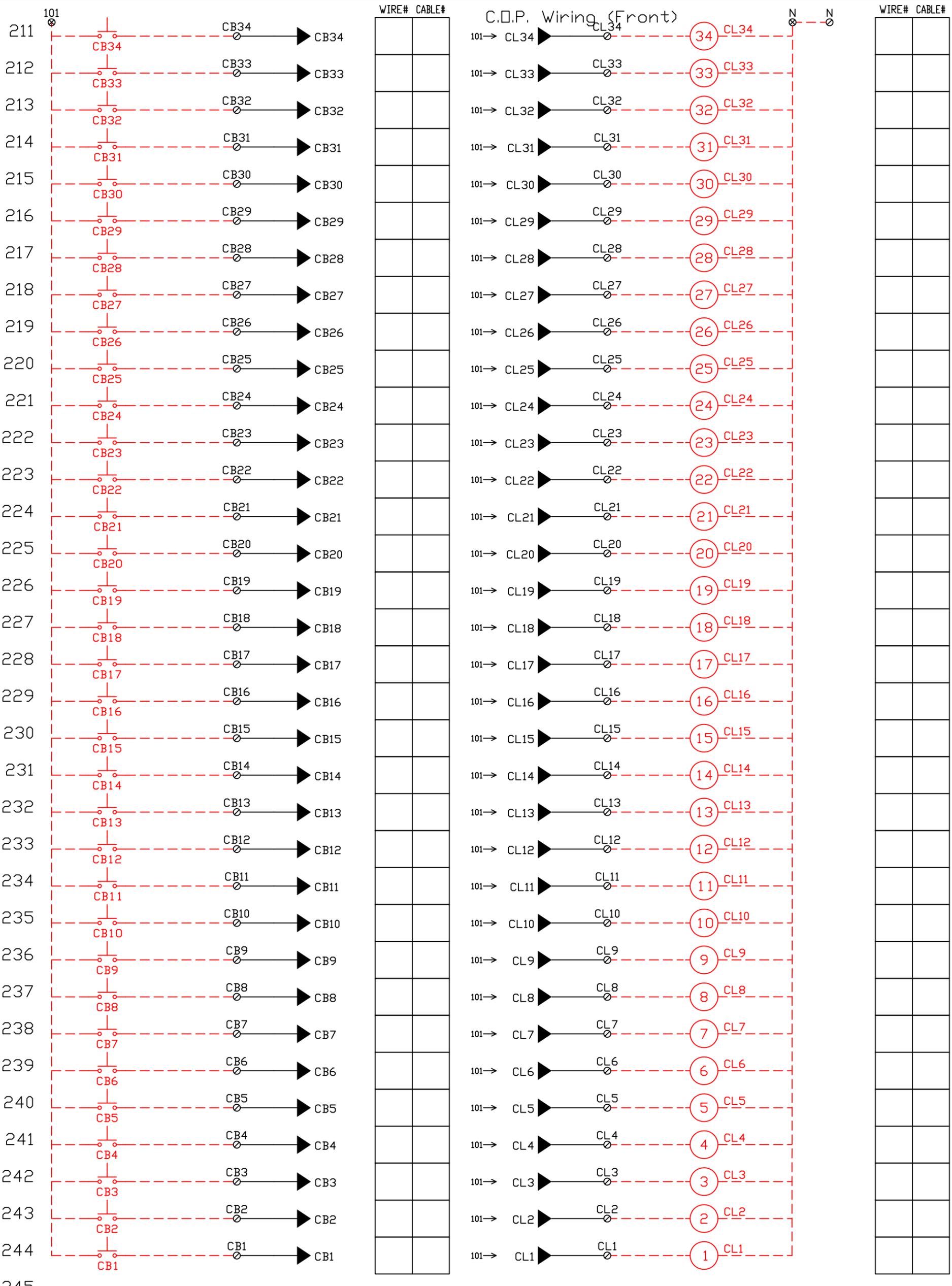
Mid-American Elevator Inc.  
820 N. Wolcott Ave.  
Chicago, IL 60622  
773.486.6900 fax 773.486.2438

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Kennedy Space Center  
Vehicle Assembly Building - Car #15  
Door Operator

DRAWING NUMBER:	E829205B
DRAWING DATE:	April 7, 1997
DRAFTER/ENGINEER:	Robby
CONTRACT NUMBER(S):	8292



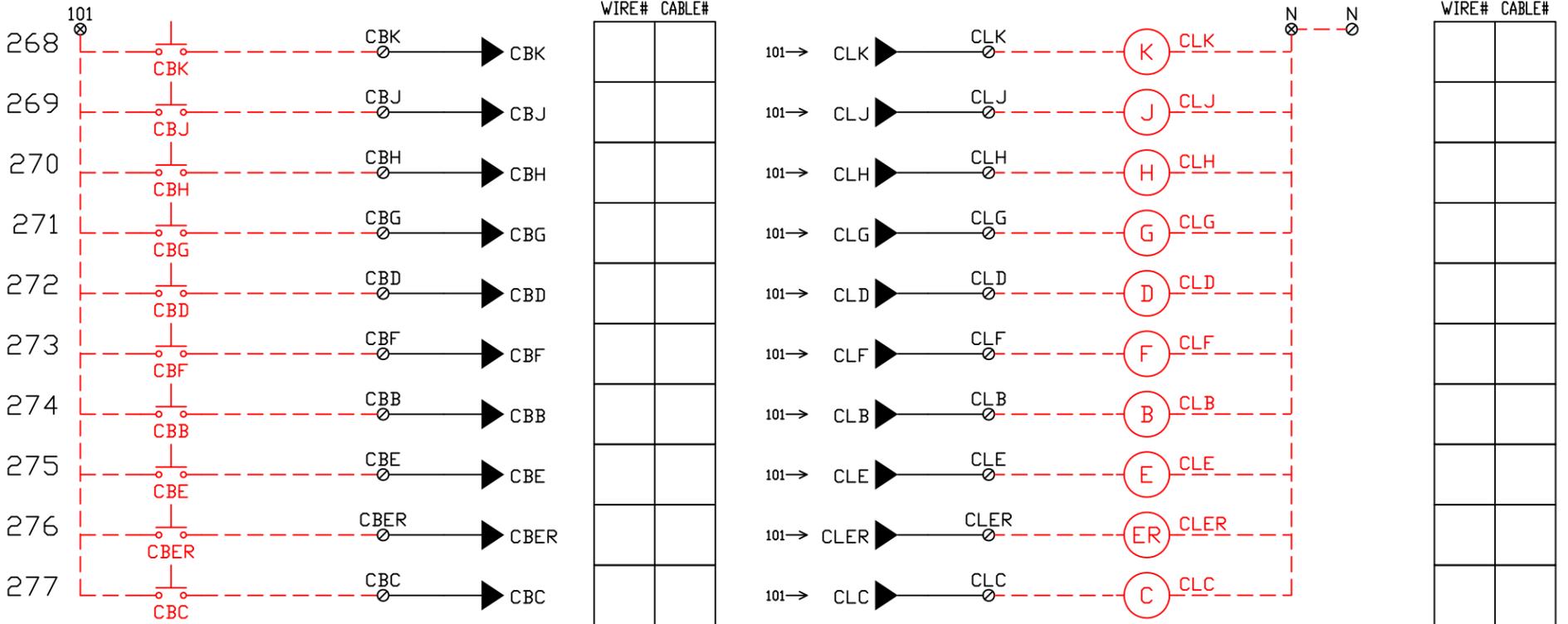
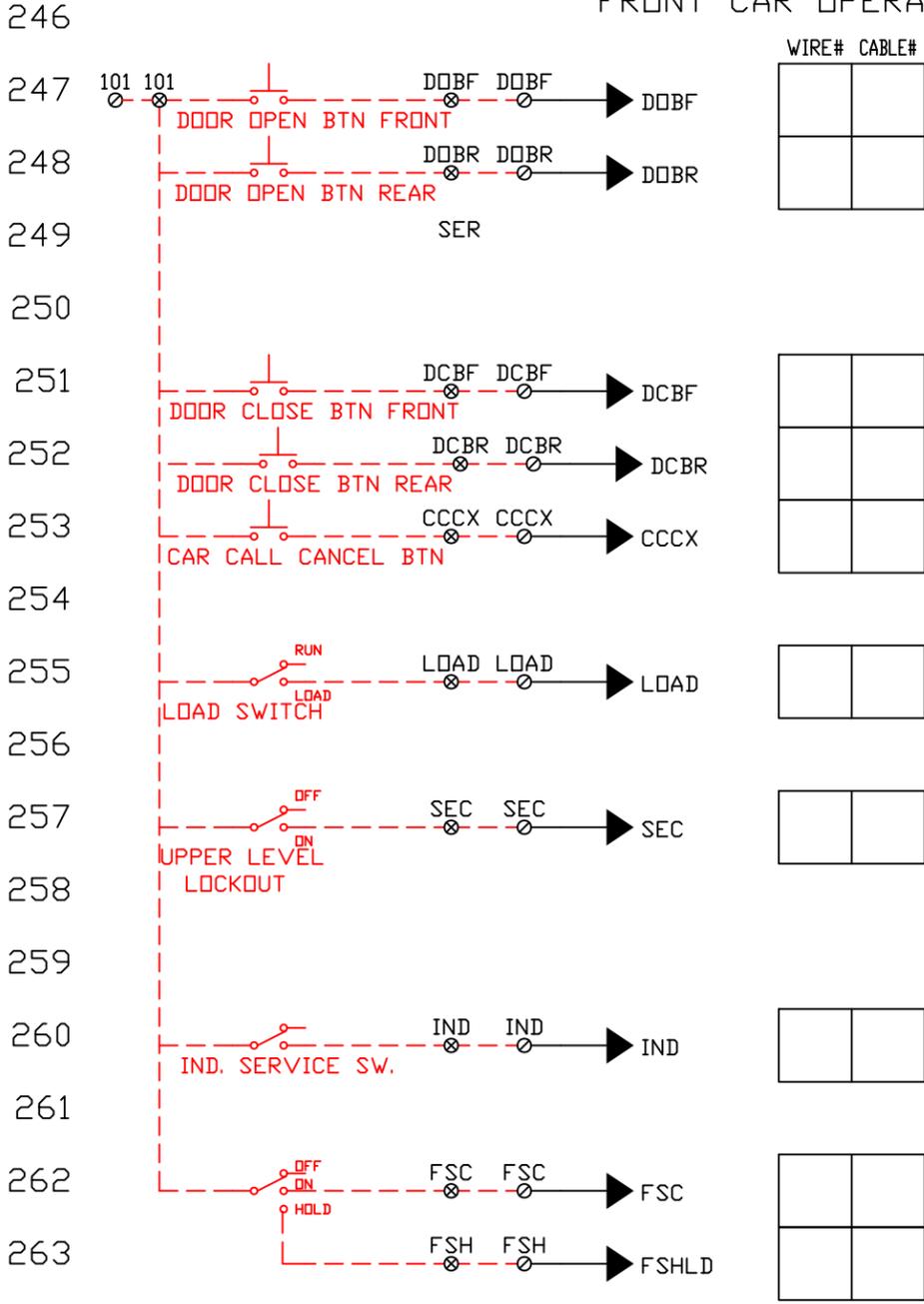


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Kennedy Space Center  
 Vehicle Assembly Building - Car #15  
 Front COP Wiring

DRAWING NUMBER:	E829207B
DRAWING DATE:	April 29, 1997
DRAFTER/ENGINEER:	Robby
CONTRACT NUMBER(S):	8292

FRONT CAR OPERATING PANEL WIRING



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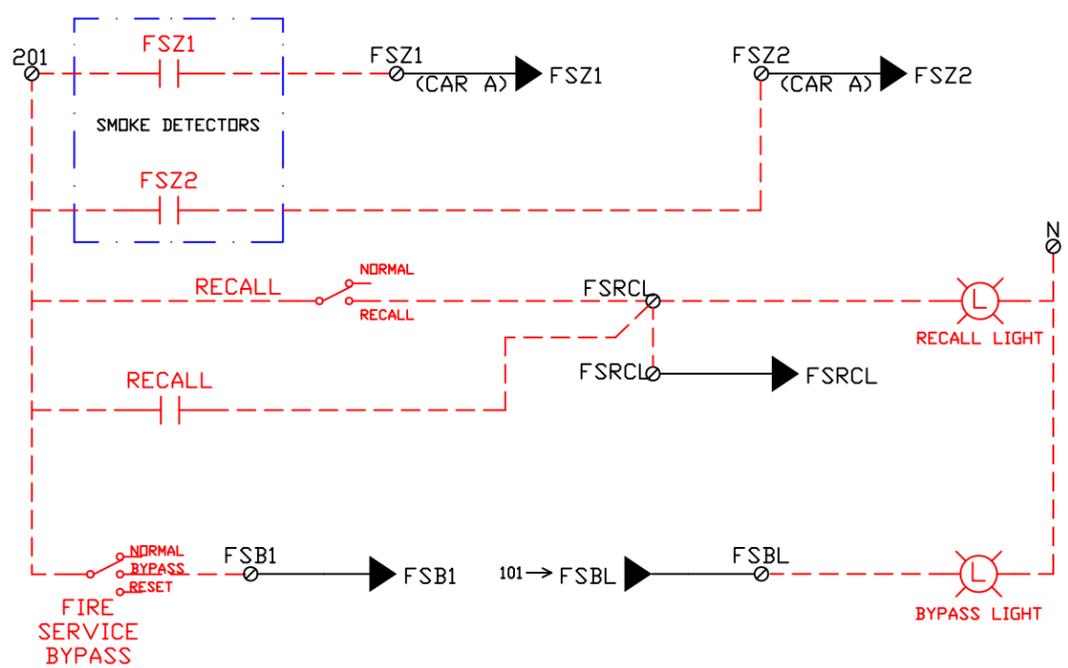
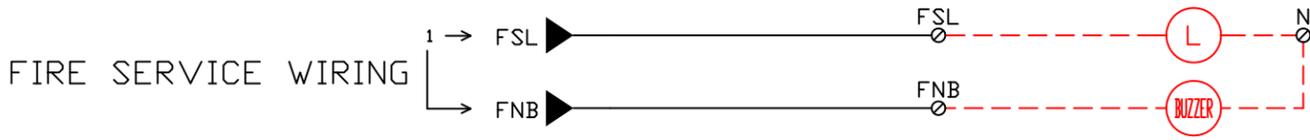
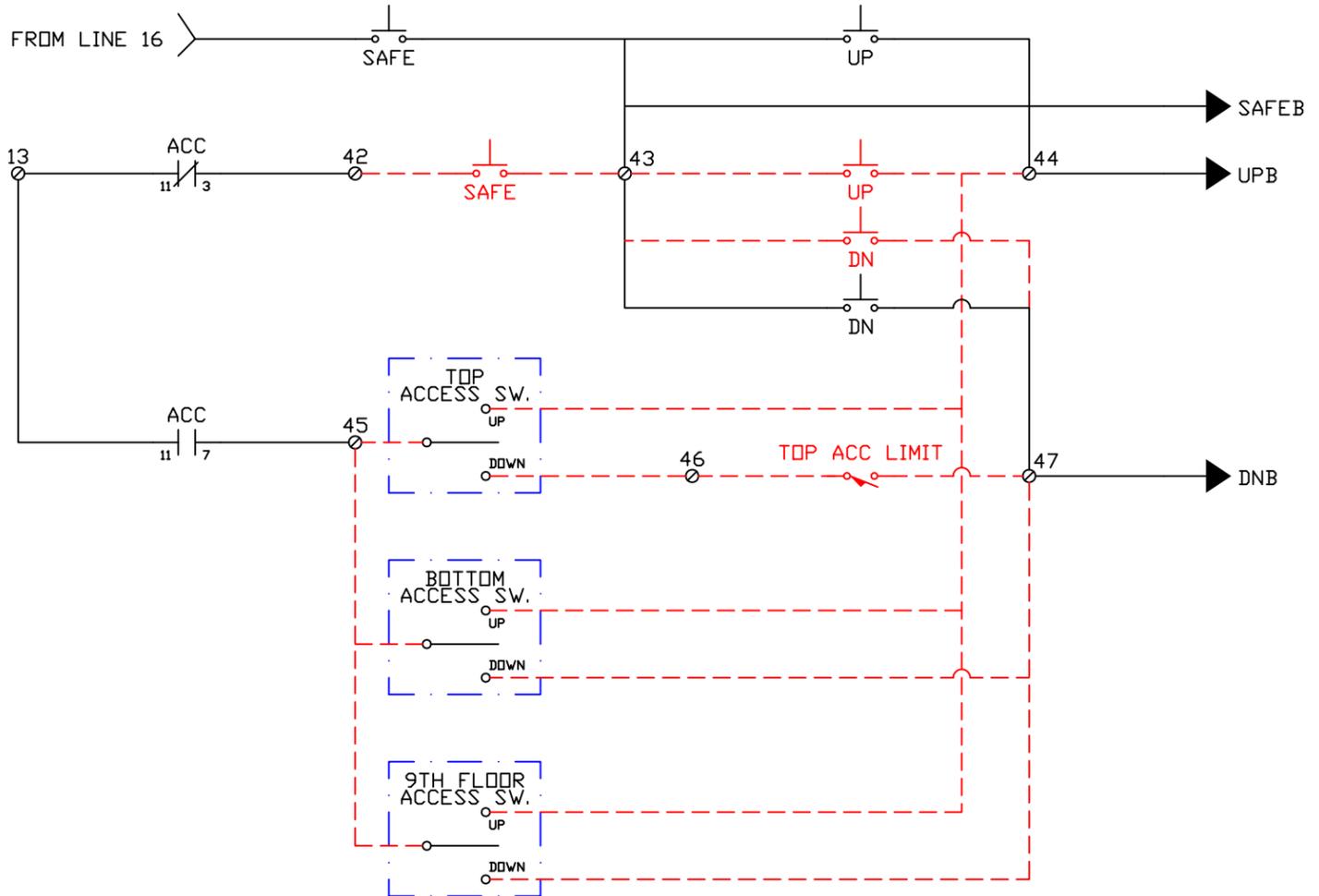
Kennedy Space Center  
 Vehicle Assembly Building - Car #15  
 Car Wiring

DRAWING NUMBER:	E829208B
DRAWING DATE:	April 25, 1997
DRAFTER/ENGINEER:	Robby
CONTRACT NUMBER(S):	8292

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# HOISTWAY ACCESS WIRING



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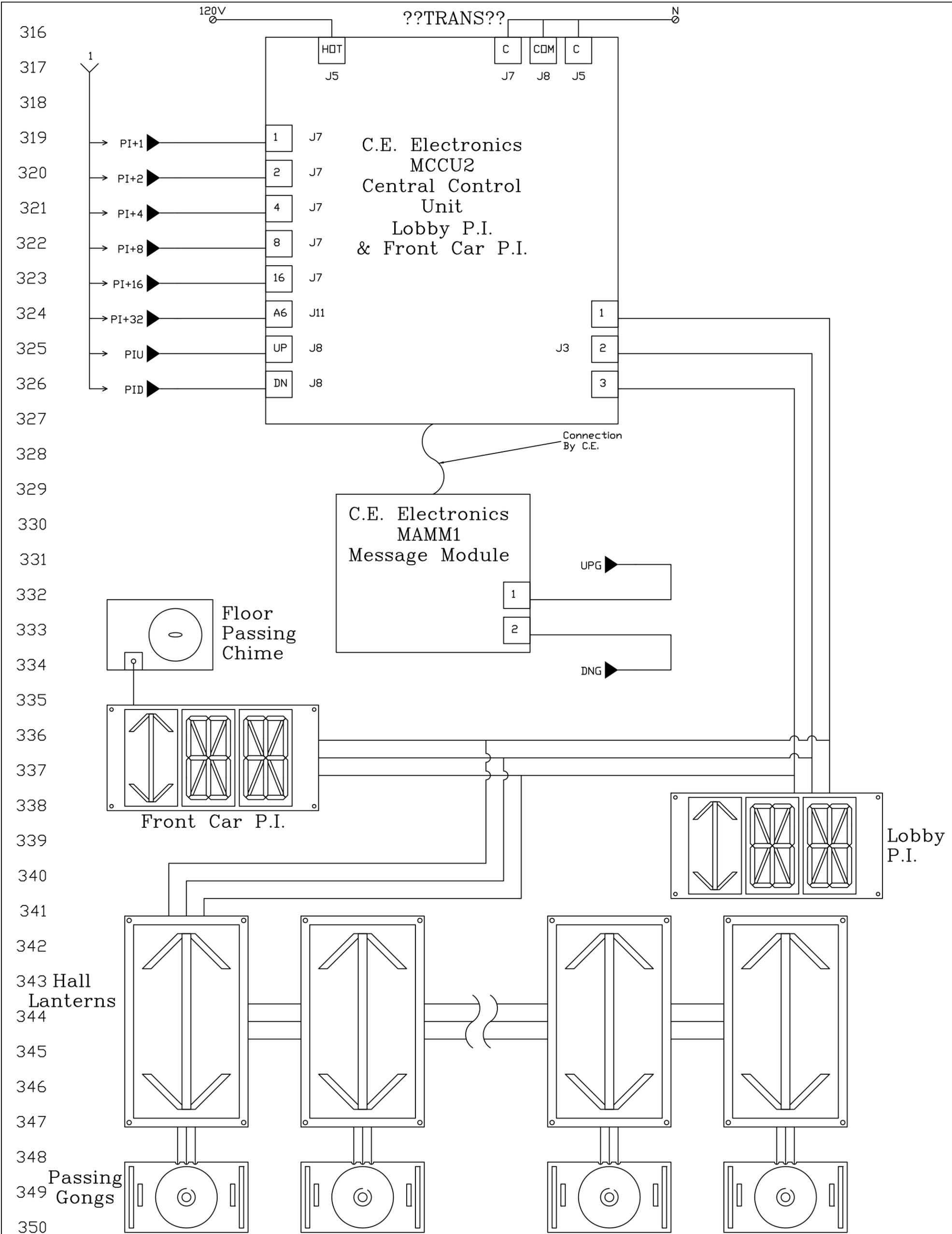
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Kennedy Space Center  
Vehicle Assembly Building - Car #15

Fire Service

Page 285

DRAWING NUMBER:	E829209B
DRAWING DATE:	April 17, 1997
DRAFTER/ENGINEER:	Robby
CONTRACT NUMBER(S):	8292



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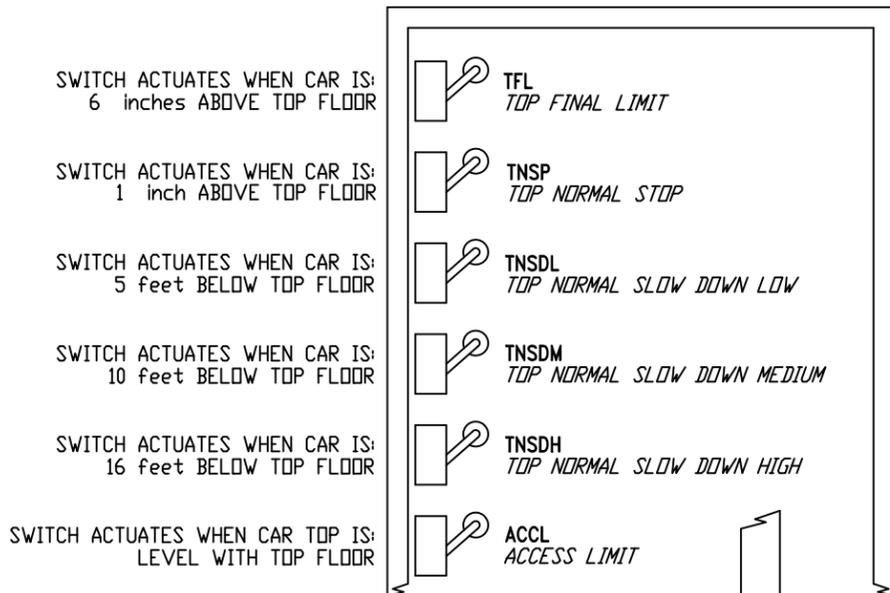
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Kennedy Space Center  
Vehicle Assembly Building - Car #15  
Position Indicators  
Gongs

DRAWING NUMBER:	E829210A
DRAWING DATE:	Feb 28, 1997
DRAFTER/ENGINEER:	Robby
CONTRACT NUMBER(S):	8292

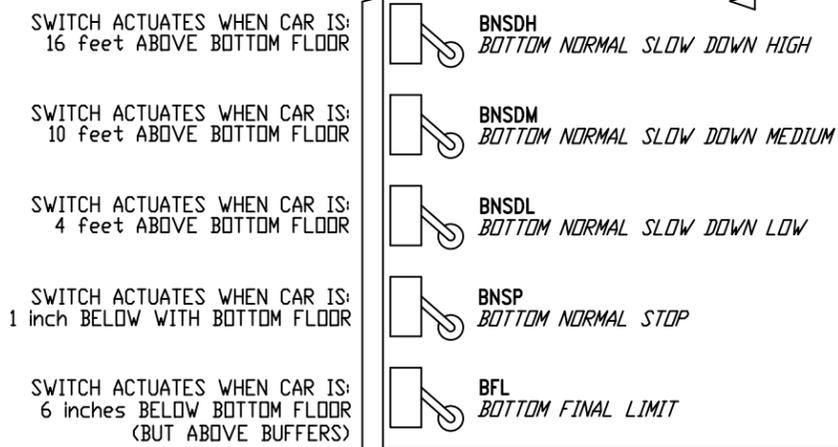
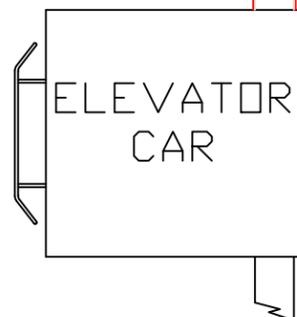
## HOISTWAY LIMIT SWITCHES

## CARTOP LEVELING SYSTEM

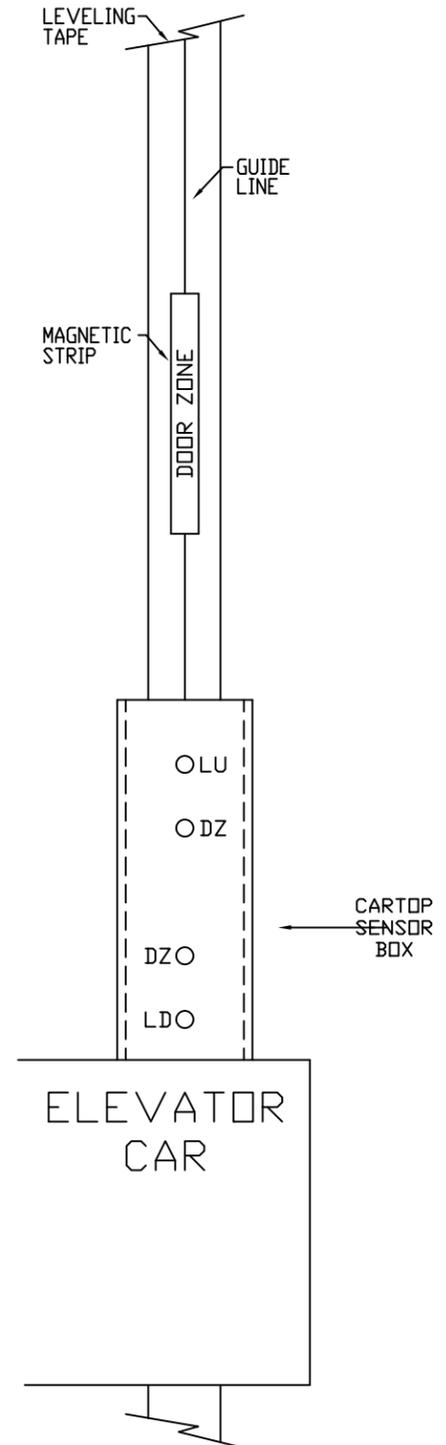


SEE NOTE AND DETAIL VIEW

NOTE: POSITION THE MAGNETIC STRIP AT EACH FLOOR SO THAT IT IS CENTERED BETWEEN THE UPLS (UP LEVELING SWITCH) AND THE DNSL (DOWN LEVELING SWITCH). LEVELING SWITCH SHOULD BE OFF THE MAGNETIC STRIP ELECTRICALLY APPROXIMATELY 1/4 INCH. THE DZR (DOOR ZONE SWITCH) SHOULD BE CENTERED ON THE MAGNETIC STRIP.



NOTE: REUSE EXISTING otis "Music Box"



NOTE: Install Leveling Magnet at all 35 Stops for Set-Up Procedure. When adjustment is complete remove magnets at all floors where there is no door opening.

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Vehicle Assembly Building - Car #15  
Limit Switch Layout

Page 287

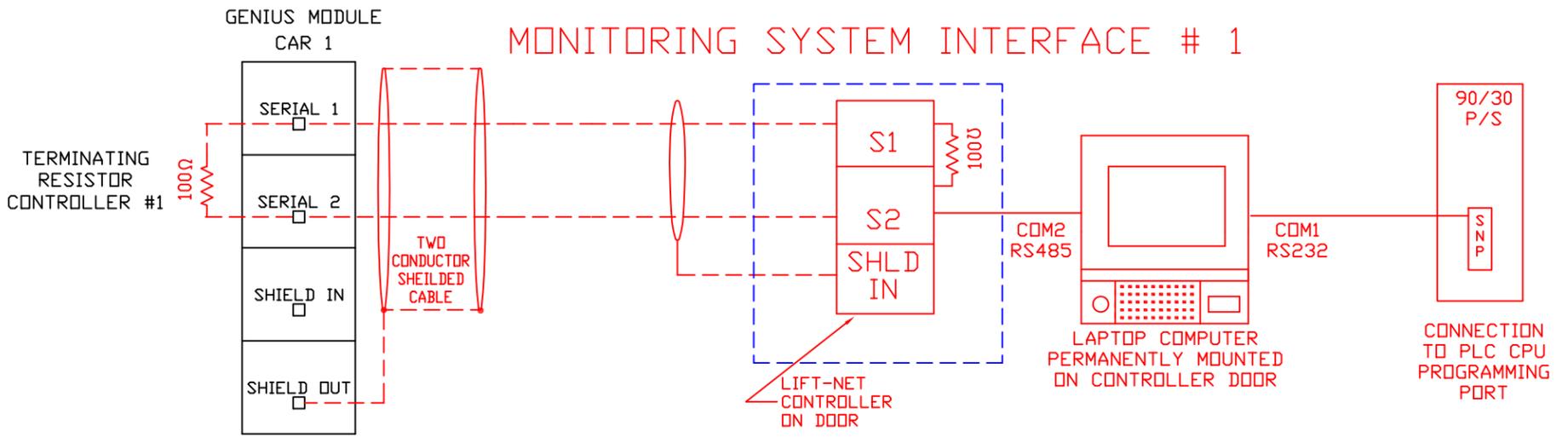
DRAWING NUMBER: E829211B

DRAWING DATE: April 7, 1997

DRAFTER/ENGINEER: Robby

CONTRACT NUMBER(S): 8292

## CONTROLLER CROSS CONNECTIONS

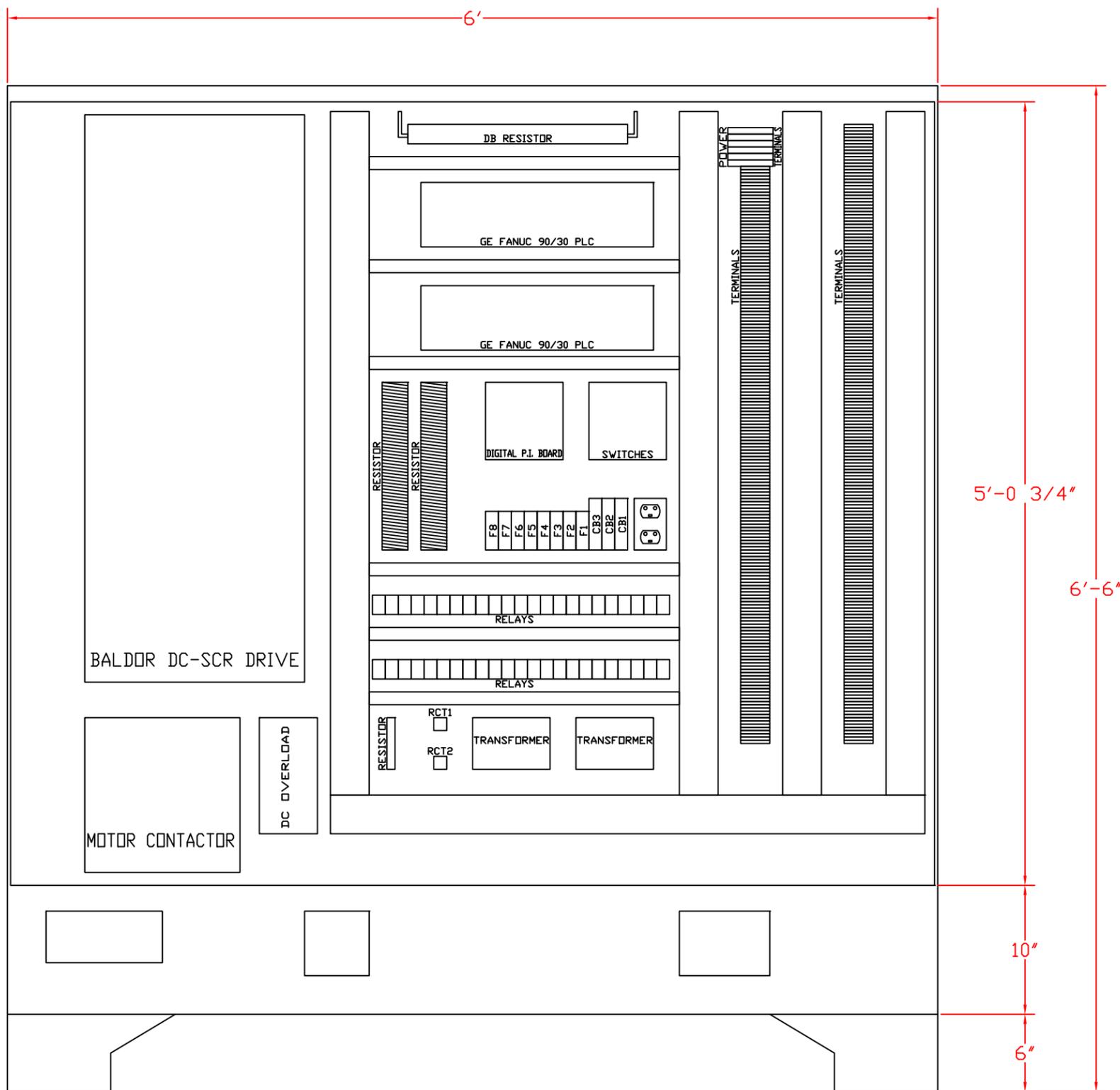


- CONNECTION SHOULD BE MADE USING A TWO WIRE TWISTED AND SHIELDED CABLE.
- THE COMMUNICATION CABLE SHOULD BE RUN IN A SEPARATED CONDUIT.
- THE GENIUS BUS MUST BE TERMINATED AT BOTH ENDS BY A 100 RESISTOR.
- THE RESISTORS ARE FURNISHED BY MID-AMERICAN ELEVATOR.

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Kennedy Space Center  
 Vehicle Assembly Building - Car #15  
 PLC to Monitoring System  
 Cross Connection

DRAWING NUMBER:	E829212B
DRAWING DATE:	April 7, 1997
DRAFTER/ENGINEER	Robby
CONTRACT NUMBER(S):	8292



NEMA 12 Enclosure 16" Deep  
 Blue Epoxy Paint Finish  
 Two Doors  
 Padlocking Handle  
 Filtered Fan Forced Ventilation

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Kennedy Space Center  
 Vehicle Assembly Building - Car #15  
 Controller Layout

DRAWING NUMBER:	E829213B
DRAWING DATE:	April 7, 1997
DRAFTER/ENGINEER	Robby
CONTRACT NUMBER(S):	8292

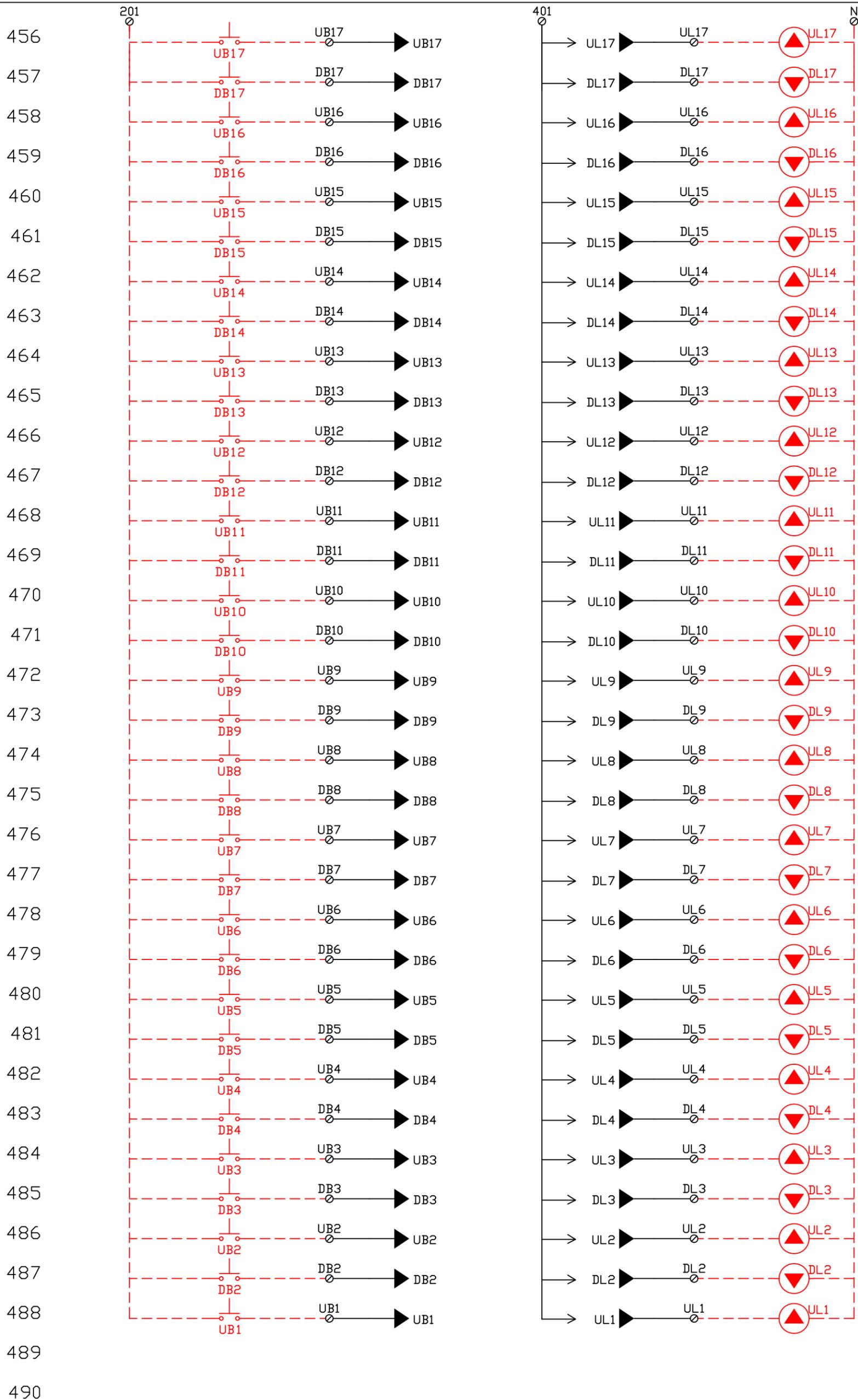


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 Vehicle Assembly Building - Car #15  
 Hall Wiring

DRAWING NUMBER:	E829214B
DRAWING DATE:	April 17, 1997
DRAFTER/ENGINEER:	Robby
CONTRACT NUMBER(S):	8292

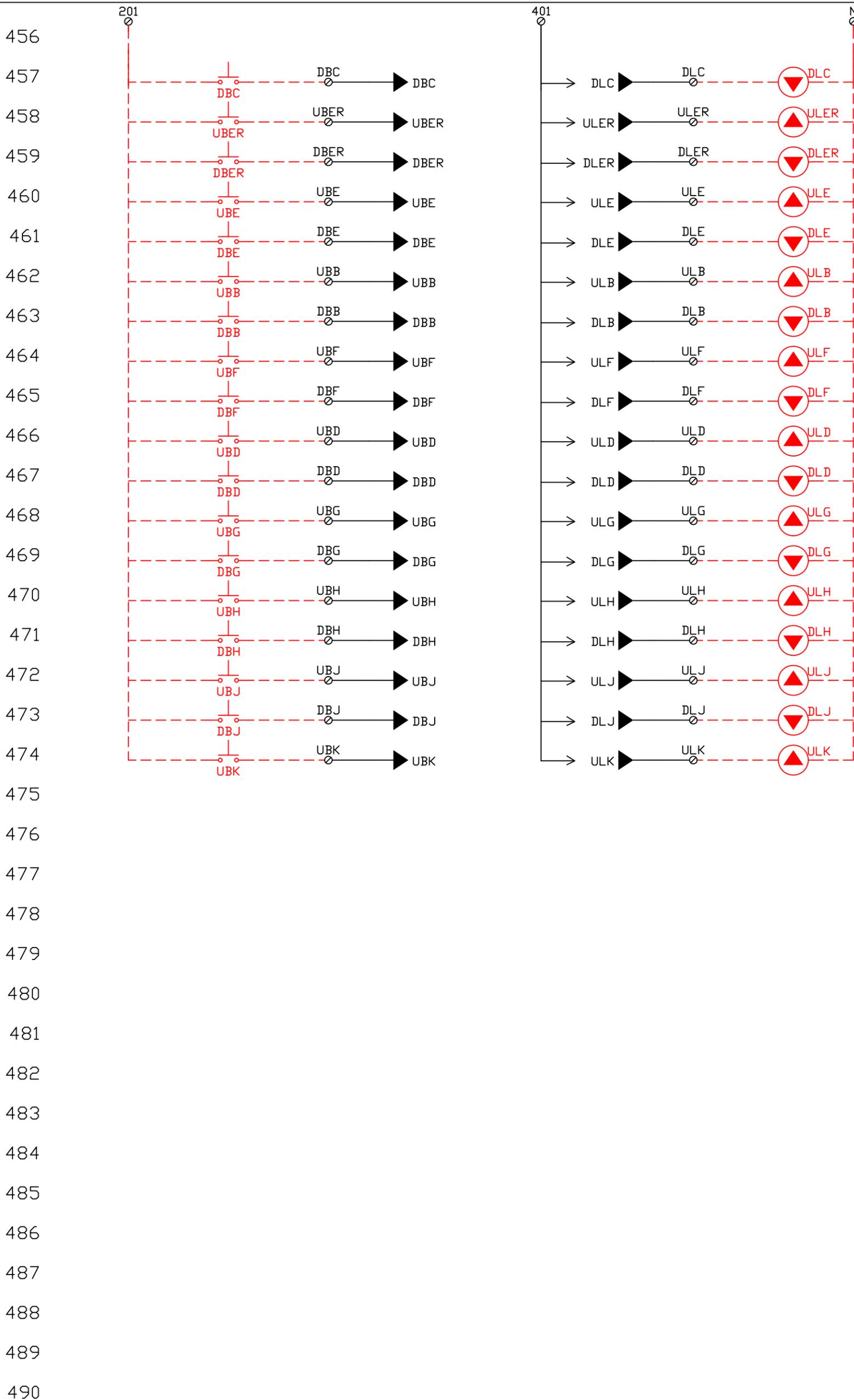


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Kennedy Space Center  
 Vehicle Assembly Building - Car #15  
 Hall Wiring

DRAWING NUMBER:	E829215B
DRAWING DATE:	April 17, 1997
DRAFTER/ ENGINEER	Robby
CONTRACT NUMBER(S):	8292

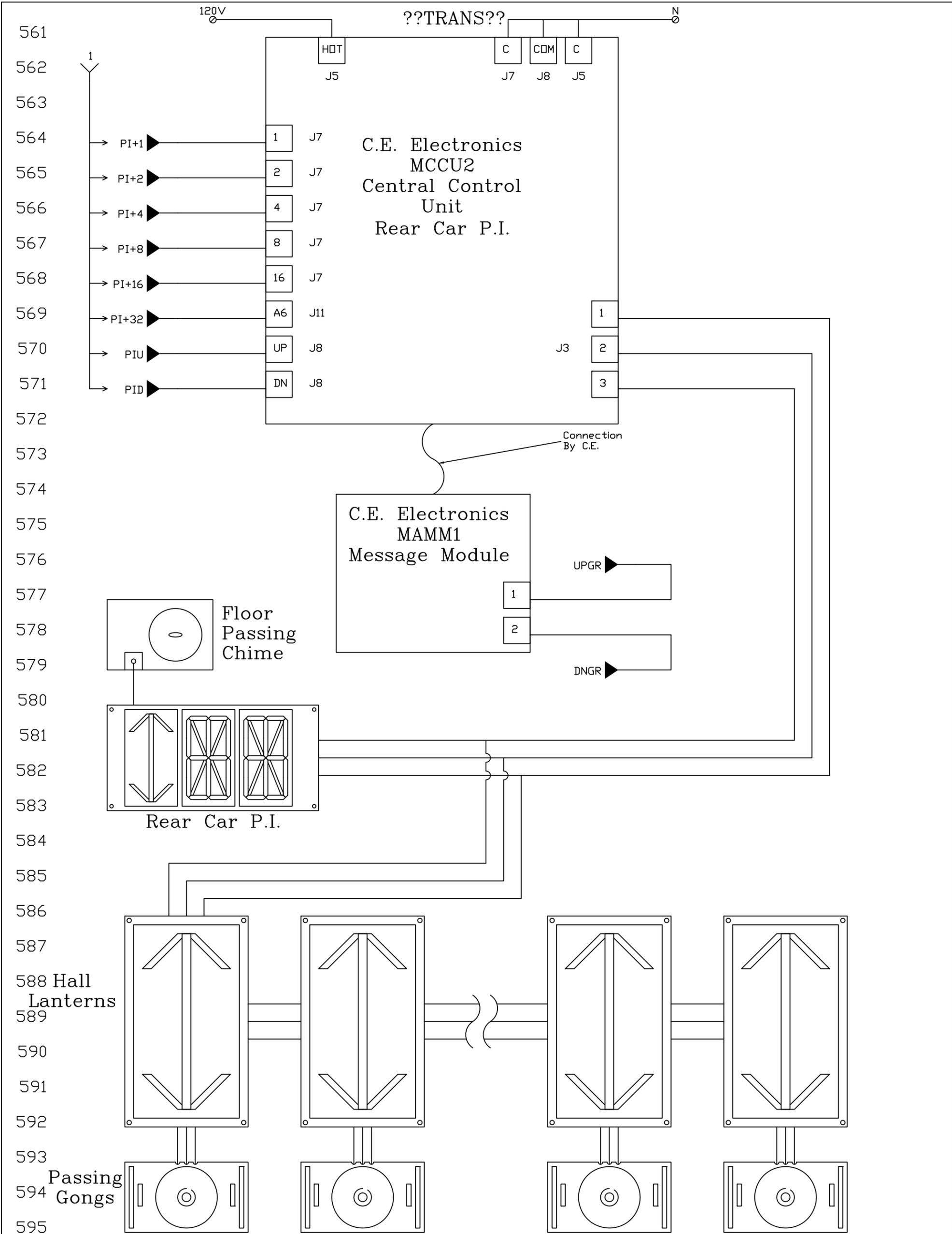


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Kennedy Space Center  
 Vehicle Assembly Building - Car #15  
 Hall Wiring

DRAWING NUMBER:	E829216B
DRAWING DATE:	April 17, 1997
DRAFTER/ENGINEER:	Robby
CONTRACT NUMBER(S):	8292

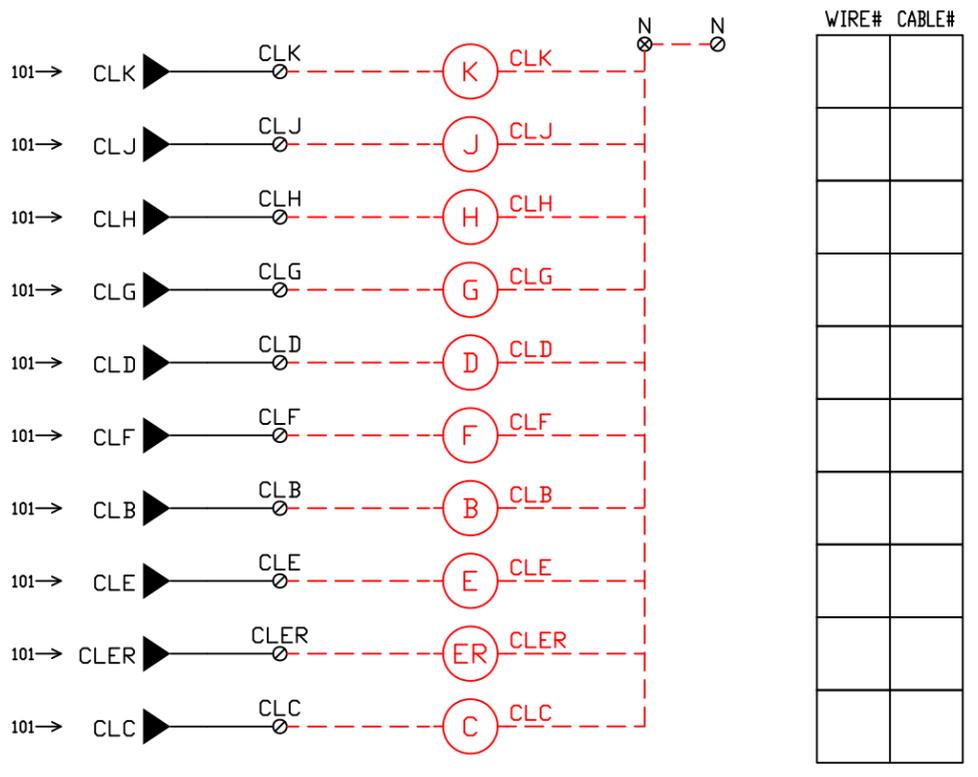
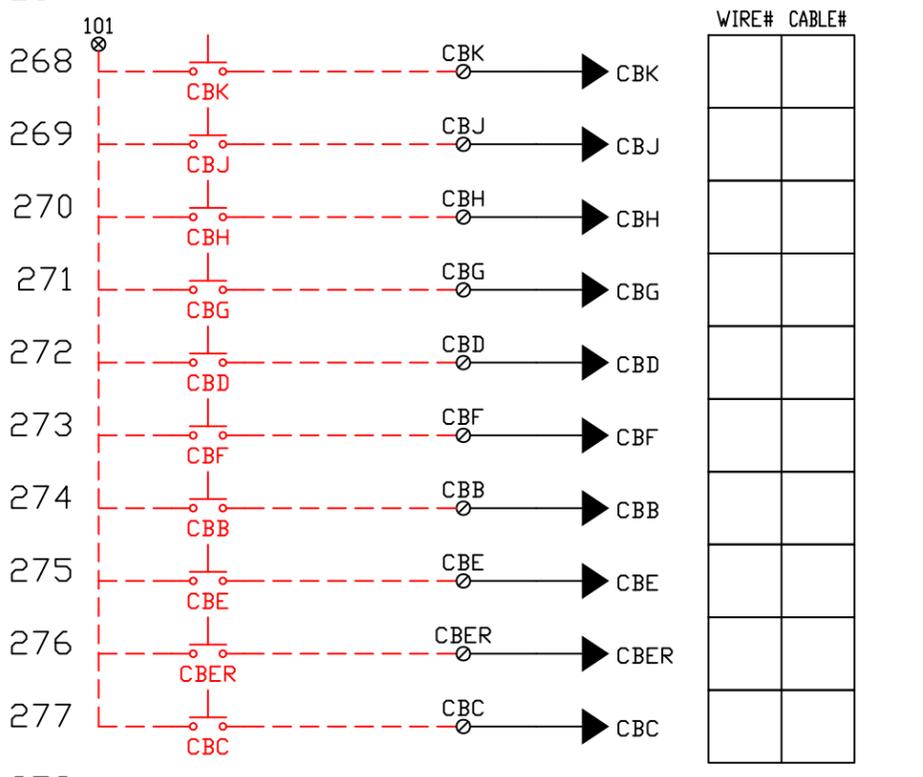
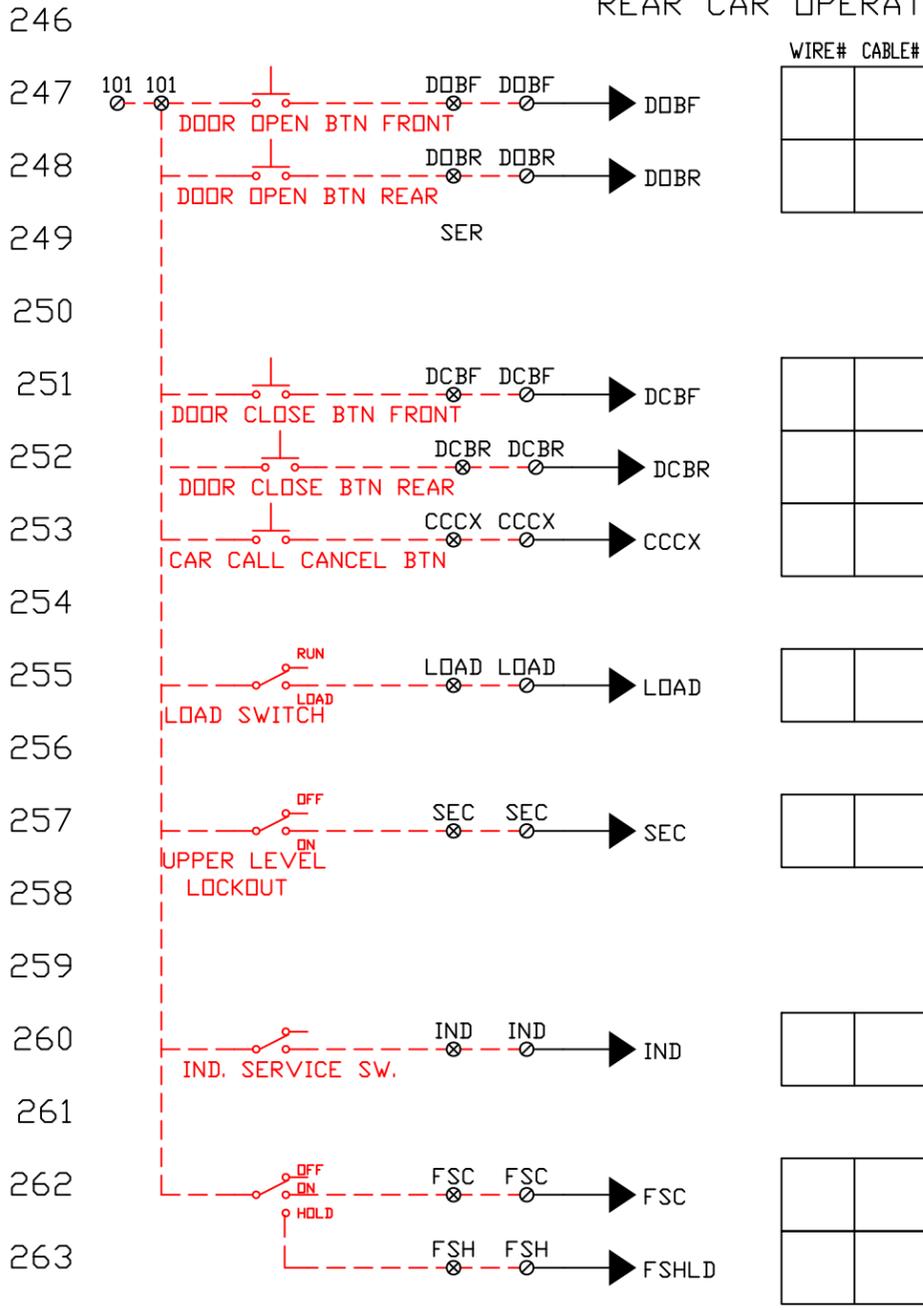


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 Vehicle Assembly Building - Car #15  
 Rear Car P.I.

DRAWING NUMBER:	E829217B
DRAWING DATE:	April 25, 1997
DRAFTER/ENGINEER:	Robby
CONTRACT NUMBER(S):	8292

REAR CAR OPERATING PANEL WIRING



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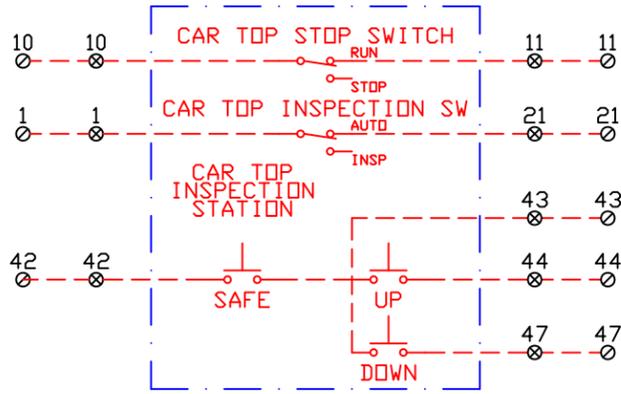
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Kennedy Space Center  
 Vehicle Assembly Building - Car #15  
 Rear Car Wiring

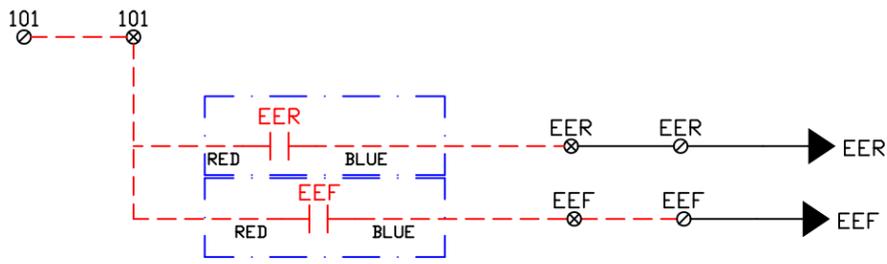
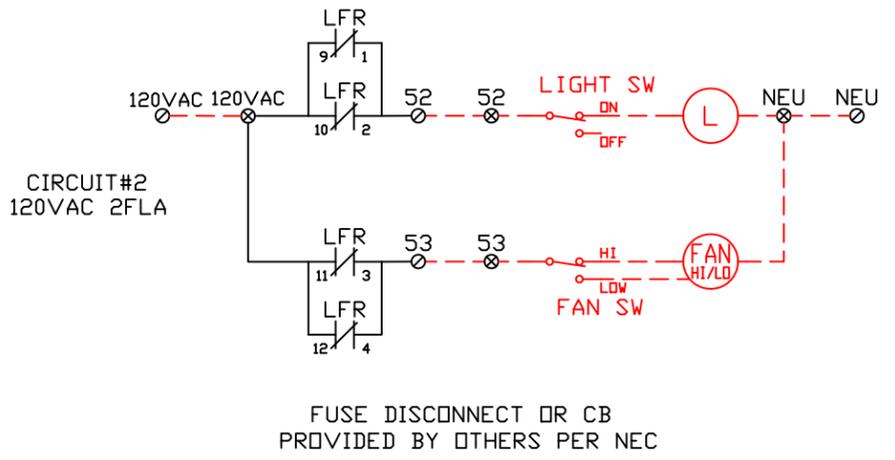
DRAWING NUMBER:	E829218B
DRAWING DATE:	April 25, 1997
DRAFTER/ENGINEER:	Robby
CONTRACT NUMBER(S):	8292

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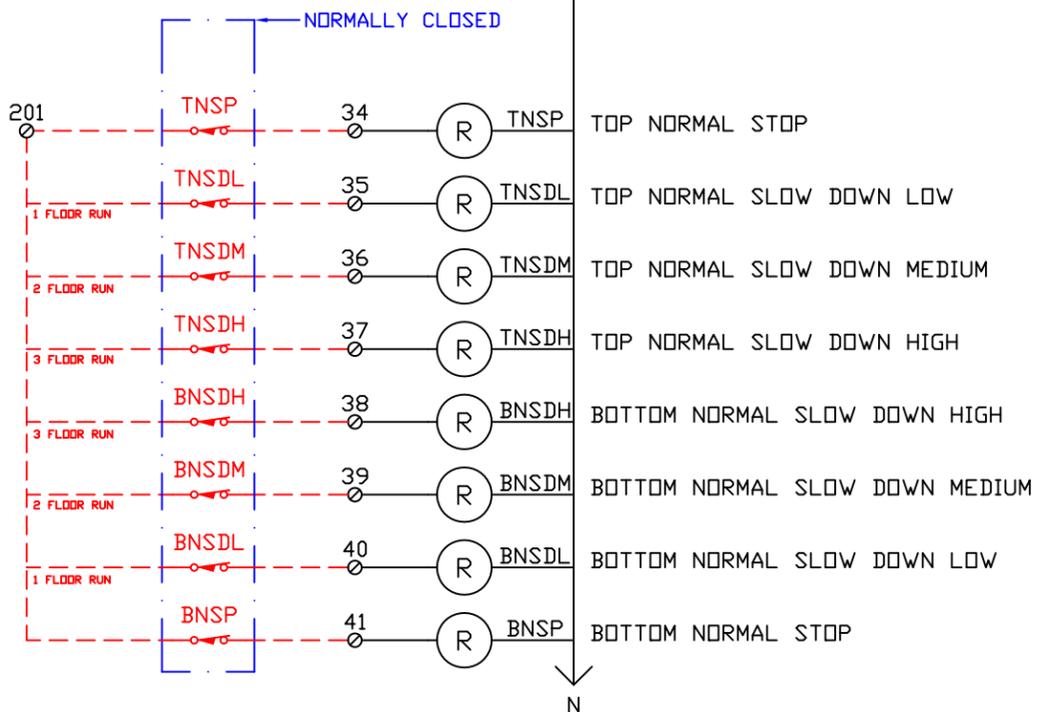
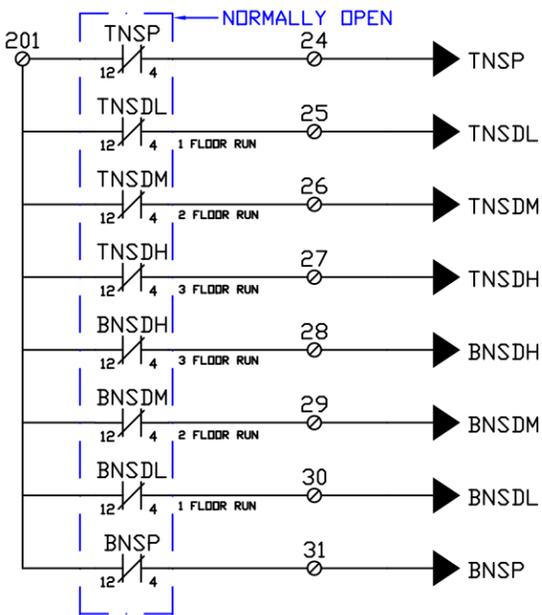
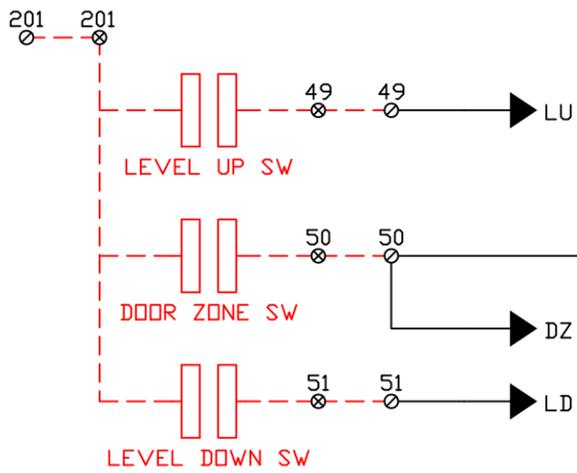
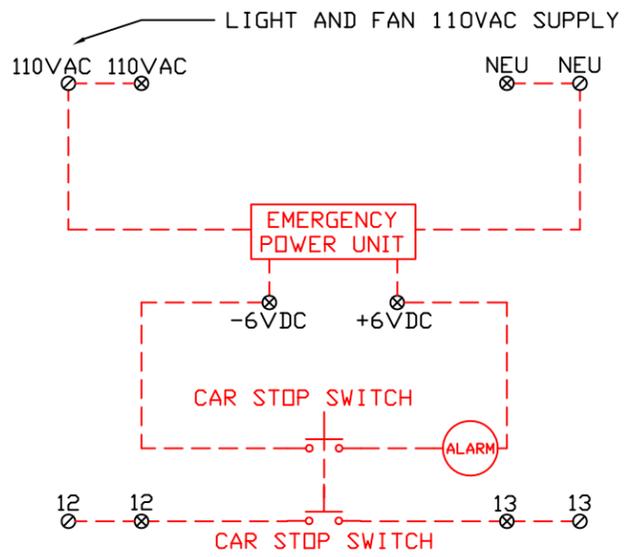
CAR STATION WIRING



LIGHT FAN WIRING



ENCLOSED AREA AND WIRE COLORS REFER TO INNOVATION INDUSTRIES MODEL 1009-A ELECTRIC EYE



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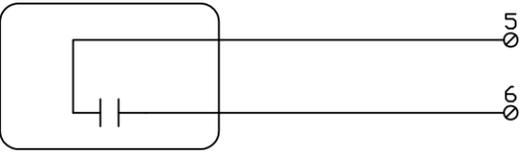
Kennedy Space Center  
Vehicle Assembly Building - Car #15  
Car Top Wiring

DRAWING NUMBER:	E829219B
DRAWING DATE:	April 25, 1997
DRAFTER/ENGINEER:	Robby
CONTRACT NUMBER(S):	8292

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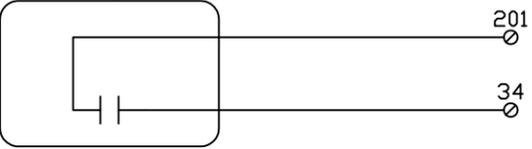
TOP FLOOR

TOP FINAL LIMIT

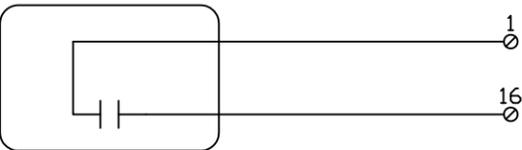


TERMINAL#	WIRE#	CABLE#

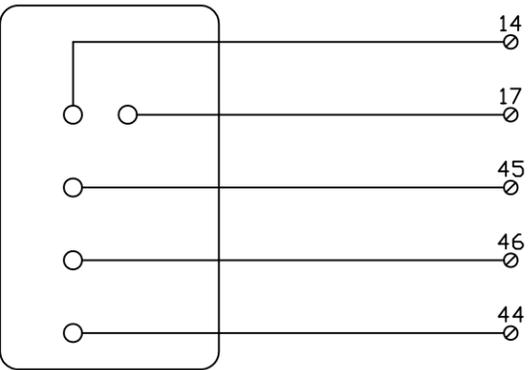
TOP NORMAL STOP  
TNSP



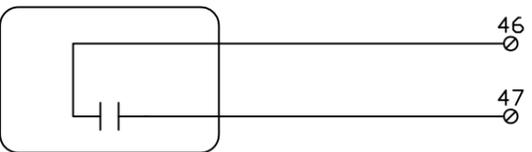

TOP DOOR LOCK



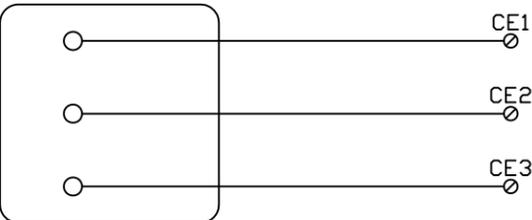

TOP ACCESS KESWITCH



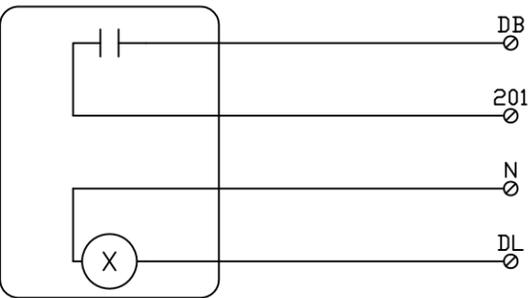

TOP ACCESS LIMIT




TOP FLOOR HALL LANTERN




TOP HALL BUTTUN




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Kennedy Space Center  
 Vehicle Assembly Building - Car #15  
 Hoistway Pony Diagram  
 Top Floor  
 Page 1296

DRAWING NUMBER:	E829220B
DRAWING DATE:	April 29, 1997
DRAFTER/ENGINEER	Robby
CONTRACT NUMBER(S):	8292

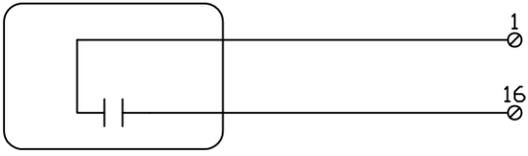
246

33rd FLOOR

247

DOOR LOCK

248



249

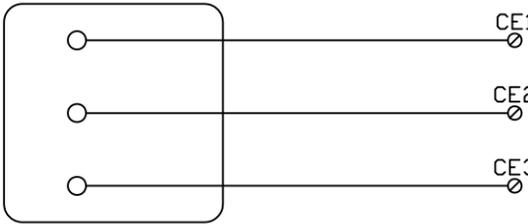
TERMINAL#	WIRE #	CABLE#
		LOOP TO FLOOR ABOVE

		LOOP TO FLOOR BELOW
--	--	---------------------

250

HALL LANTERN

251



252

		LOOP TO FLOOR ABOVE & BELOW
--	--	-----------------------------

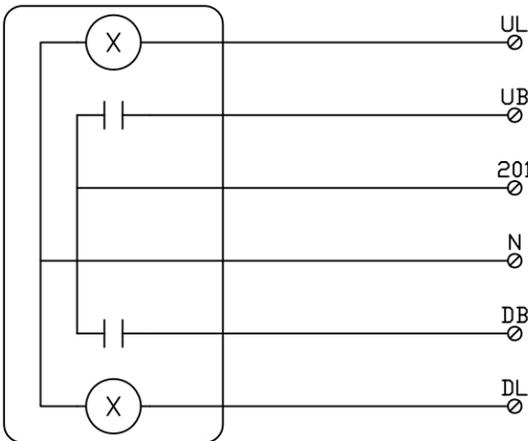
253

		LOOP TO FLOOR ABOVE & BELOW
--	--	-----------------------------

254

HALL BUTTON

255



256

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257

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258

		LOOP TO FLOOR ABOVE & BELOW
--	--	-----------------------------

259

		LOOP TO FLOOR ABOVE & BELOW
--	--	-----------------------------

260

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261

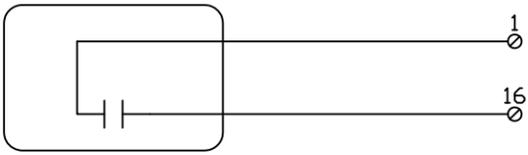
262

32nd FLOOR

263

DOOR LOCK

264



265

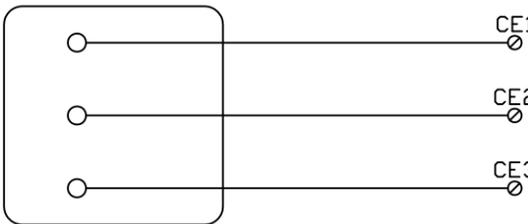
TERMINAL#	WIRE #	CABLE#
		LOOP TO FLOOR ABOVE

		LOOP TO FLOOR BELOW
--	--	---------------------

266

HALL LANTERN

267



268

		LOOP TO FLOOR ABOVE & BELOW
--	--	-----------------------------

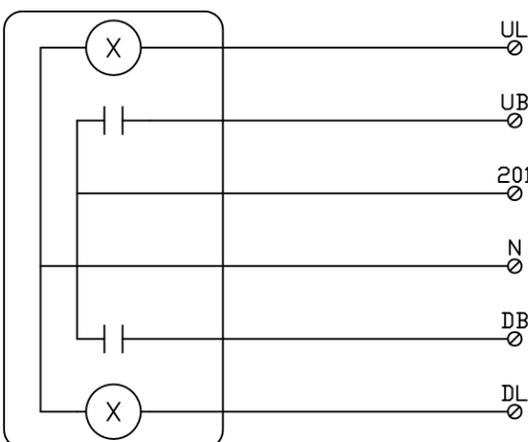
269

		LOOP TO FLOOR ABOVE & BELOW
--	--	-----------------------------

270

HALL BUTTON

271



272

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273

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274

		LOOP TO FLOOR ABOVE & BELOW
--	--	-----------------------------

275

		LOOP TO FLOOR ABOVE & BELOW
--	--	-----------------------------

276

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Kennedy Space Center  
 Vehicle Assembly Building - Car #15  
 Hoistway Pony Diagram  
 Intermediate Floors

DRAWING NUMBER:	E829221B
DRAWING DATE:	April 29, 1997
DRAFTER/ENGINEER	Robby
CONTRACT NUMBER(S):	8292

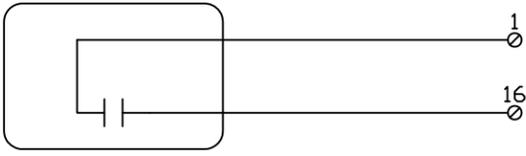
246

31st FLOOR

247

DOOR LOCK

248



249

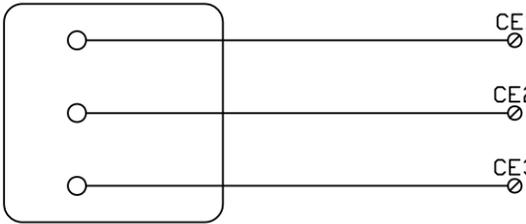
TERMINAL#	WIRE #	CABLE#
		LOOP TO FLOOR ABOVE

		LOOP TO FLOOR BELOW
--	--	---------------------

250

HALL LANTERN

251



252

		LOOP TO FLOOR ABOVE & BELOW
--	--	-----------------------------

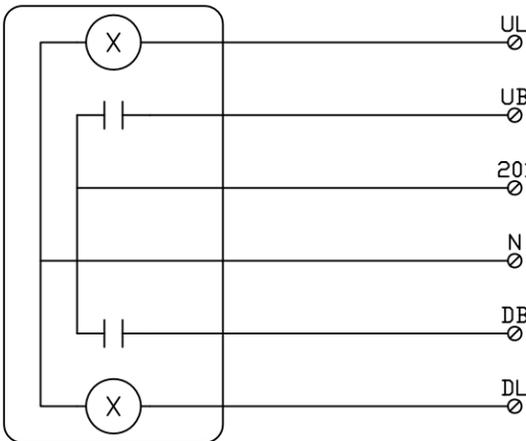
253

		LOOP TO FLOOR ABOVE & BELOW
--	--	-----------------------------

254

HALL BUTTON

255



256

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257

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258

		LOOP TO FLOOR ABOVE & BELOW
--	--	-----------------------------

259

		LOOP TO FLOOR ABOVE & BELOW
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260

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261

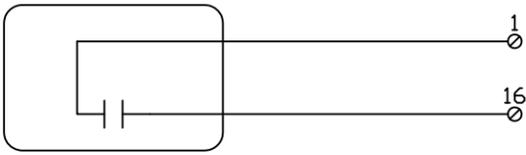
262

30th FLOOR

263

DOOR LOCK

264



265

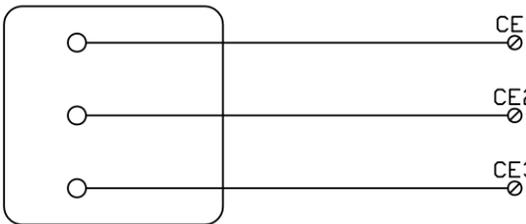
TERMINAL#	WIRE #	CABLE#
		LOOP TO FLOOR ABOVE

		LOOP TO FLOOR BELOW
--	--	---------------------

266

HALL LANTERN

267



268

		LOOP TO FLOOR ABOVE & BELOW
--	--	-----------------------------

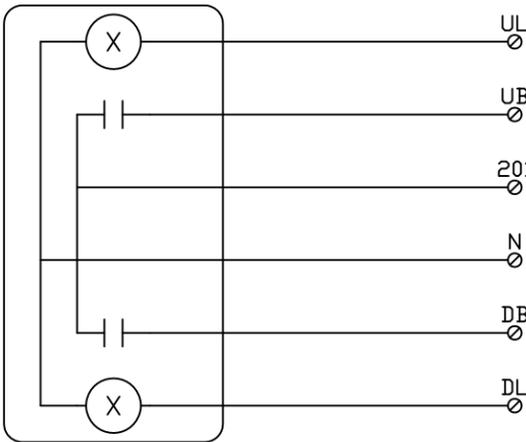
269

		LOOP TO FLOOR ABOVE & BELOW
--	--	-----------------------------

270

HALL BUTTON

271



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		LOOP TO FLOOR ABOVE & BELOW
--	--	-----------------------------

275

		LOOP TO FLOOR ABOVE & BELOW
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 Vehicle Assembly Building - Car #15  
 Hoistway Pony Diagram  
 Intermediate Floors

DRAWING NUMBER:	E829222B
DRAWING DATE:	April 29, 1997
DRAFTER/ENGINEER	Robby
CONTRACT NUMBER(S):	8292

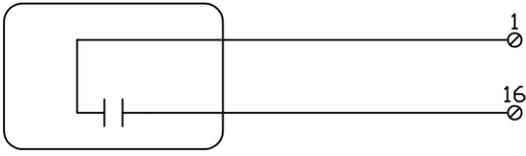
246

29th FLOOR

247

DOOR LOCK

248

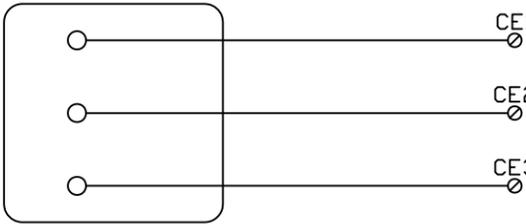


249

250

HALL LANTERN

251



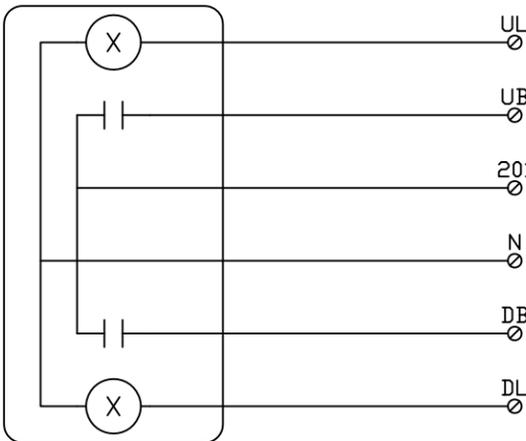
252

253

254

HALL BUTTON

255



256

257

258

259

260

261

TERMINAL#	WIRE #	CABLE#
		LOOP TO FLOOR ABOVE

		LOOP TO FLOOR BELOW
--	--	---------------------

		LOOP TO FLOOR ABOVE & BELOW
--	--	-----------------------------

		LOOP TO FLOOR ABOVE & BELOW
--	--	-----------------------------

		LOOP TO FLOOR ABOVE & BELOW
--	--	-----------------------------

--	--	--

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		LOOP TO FLOOR ABOVE & BELOW
--	--	-----------------------------

		LOOP TO FLOOR ABOVE & BELOW
--	--	-----------------------------

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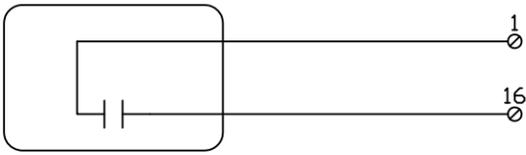
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28th FLOOR

263

DOOR LOCK

264

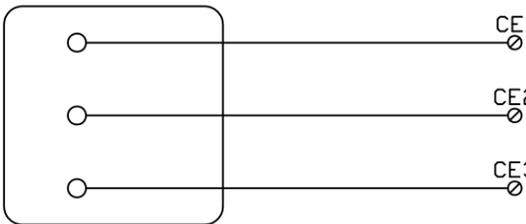


265

266

HALL LANTERN

267



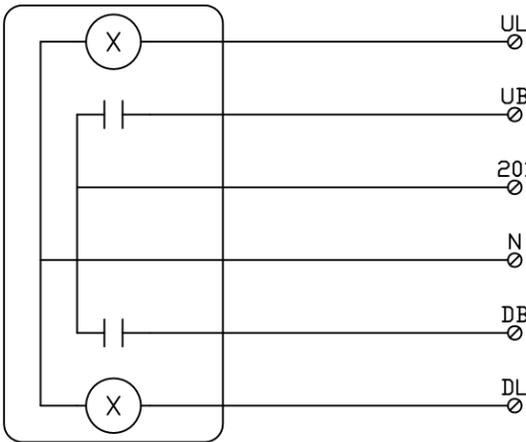
268

269

270

HALL BUTTON

271



272

273

274

275

276

277

278

279

280

TERMINAL#	WIRE #	CABLE#
		LOOP TO FLOOR ABOVE

		LOOP TO FLOOR BELOW
--	--	---------------------

		LOOP TO FLOOR ABOVE & BELOW
--	--	-----------------------------

		LOOP TO FLOOR ABOVE & BELOW
--	--	-----------------------------

		LOOP TO FLOOR ABOVE & BELOW
--	--	-----------------------------

--	--	--

--	--	--

		LOOP TO FLOOR ABOVE & BELOW
--	--	-----------------------------

		LOOP TO FLOOR ABOVE & BELOW
--	--	-----------------------------

--	--	--

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 Intermediate Floors

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DRAWING DATE:	April 29, 1997
DRAFTER/ENGINEER	Robby
CONTRACT NUMBER(S):	8292

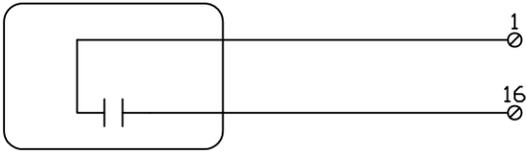
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27th FLOOR

247

DOOR LOCK

248

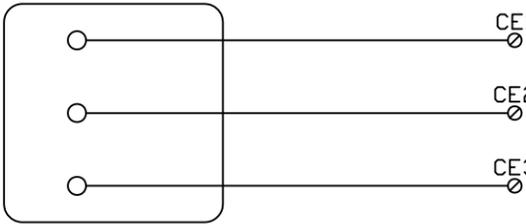


249

250

HALL LANTERN

251



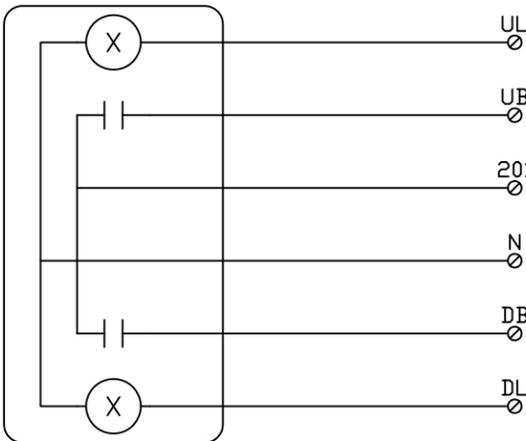
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253

254

HALL BUTTON

255



256

257

258

259

260

261

TERMINAL#	WIRE #	CABLE#
		LOOP TO FLOOR ABOVE

		LOOP TO FLOOR BELOW
--	--	---------------------

		LOOP TO FLOOR ABOVE & BELOW
--	--	-----------------------------

		LOOP TO FLOOR ABOVE & BELOW
--	--	-----------------------------

		LOOP TO FLOOR ABOVE & BELOW
--	--	-----------------------------

--	--	--

--	--	--

		LOOP TO FLOOR ABOVE & BELOW
--	--	-----------------------------

		LOOP TO FLOOR ABOVE & BELOW
--	--	-----------------------------

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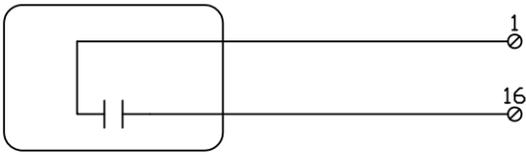
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26th FLOOR

263

DOOR LOCK

264

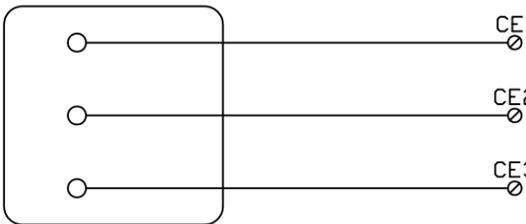


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266

HALL LANTERN

267



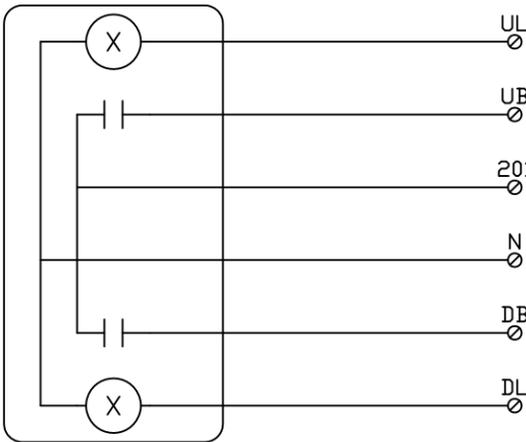
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269

270

HALL BUTTON

271



272

273

274

275

276

277

278

279

280

TERMINAL#	WIRE #	CABLE#
		LOOP TO FLOOR ABOVE

		LOOP TO FLOOR BELOW
--	--	---------------------

		LOOP TO FLOOR ABOVE & BELOW
--	--	-----------------------------

		LOOP TO FLOOR ABOVE & BELOW
--	--	-----------------------------

		LOOP TO FLOOR ABOVE & BELOW
--	--	-----------------------------

--	--	--

--	--	--

		LOOP TO FLOOR ABOVE & BELOW
--	--	-----------------------------

		LOOP TO FLOOR ABOVE & BELOW
--	--	-----------------------------

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DRAWING NUMBER:	E829224B
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DRAFTER/ENGINEER	Robby
CONTRACT NUMBER(S):	8292

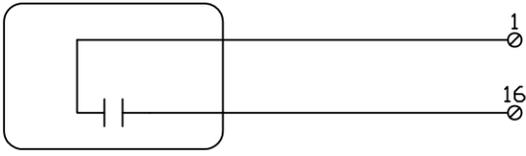
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25th FLOOR

247

DOOR LOCK

248

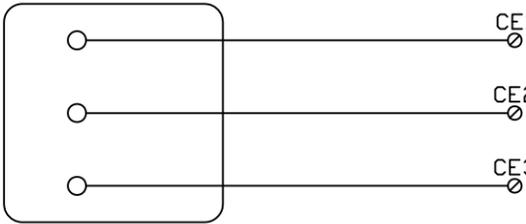


249

250

HALL LANTERN

251



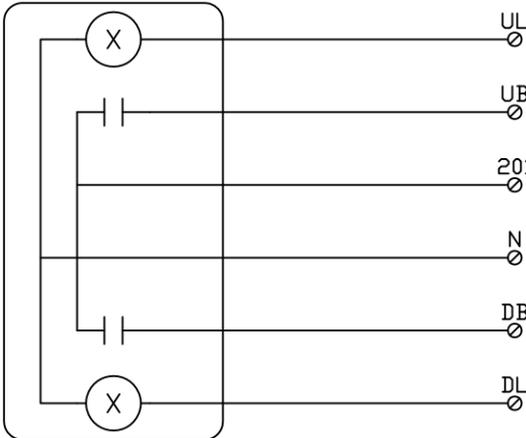
252

253

254

HALL BUTTON

255



256

257

258

259

260

261

TERMINAL#	WIRE #	CABLE#
		LOOP TO FLOOR ABOVE

		LOOP TO FLOOR BELOW
--	--	---------------------

		LOOP TO FLOOR ABOVE & BELOW
--	--	-----------------------------

		LOOP TO FLOOR ABOVE & BELOW
--	--	-----------------------------

		LOOP TO FLOOR ABOVE & BELOW
--	--	-----------------------------

--	--	--

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		LOOP TO FLOOR ABOVE & BELOW
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		LOOP TO FLOOR ABOVE & BELOW
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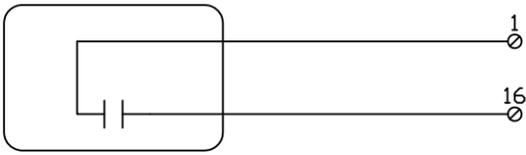
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24th FLOOR

263

DOOR LOCK

264

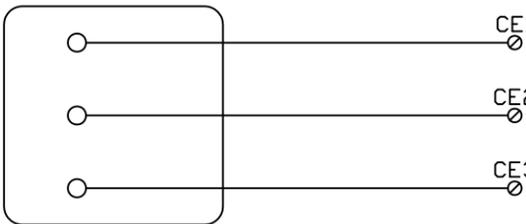


265

266

HALL LANTERN

267



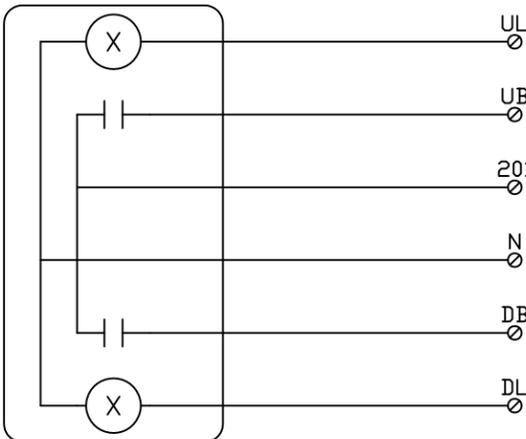
268

269

270

HALL BUTTON

271



272

273

274

275

276

277

278

279

280

TERMINAL#	WIRE #	CABLE#
		LOOP TO FLOOR ABOVE

		LOOP TO FLOOR BELOW
--	--	---------------------

		LOOP TO FLOOR ABOVE & BELOW
--	--	-----------------------------

		LOOP TO FLOOR ABOVE & BELOW
--	--	-----------------------------

		LOOP TO FLOOR ABOVE & BELOW
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		LOOP TO FLOOR ABOVE & BELOW
--	--	-----------------------------

		LOOP TO FLOOR ABOVE & BELOW
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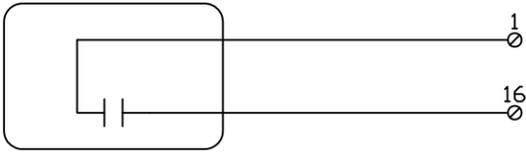
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23rd FLOOR

247

DOOR LOCK

248

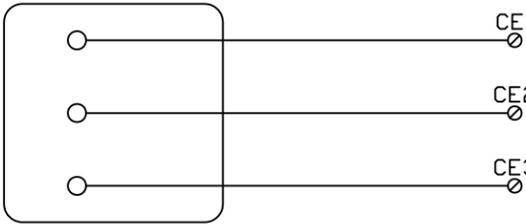


249

250

HALL LANTERN

251



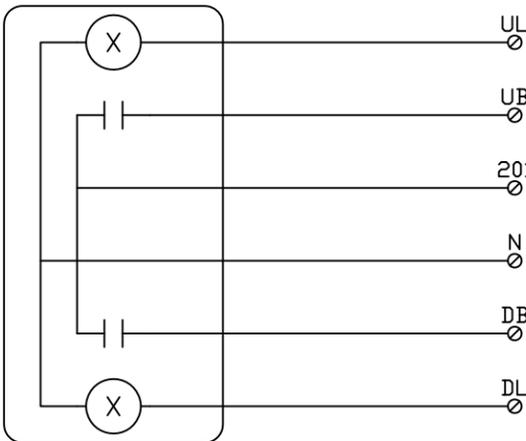
252

253

254

HALL BUTTON

255



256

257

258

259

260

261

TERMINAL#	WIRE #	CABLE#
		LOOP TO FLOOR ABOVE

		LOOP TO FLOOR BELOW
--	--	---------------------

		LOOP TO FLOOR ABOVE & BELOW
--	--	-----------------------------

		LOOP TO FLOOR ABOVE & BELOW
--	--	-----------------------------

		LOOP TO FLOOR ABOVE & BELOW
--	--	-----------------------------

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		LOOP TO FLOOR ABOVE & BELOW
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		LOOP TO FLOOR ABOVE & BELOW
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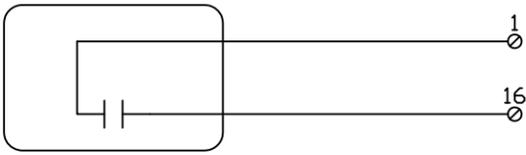
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22nd FLOOR

263

DOOR LOCK

264

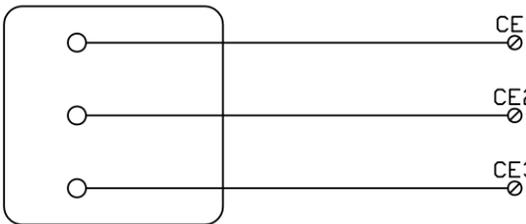


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266

HALL LANTERN

267



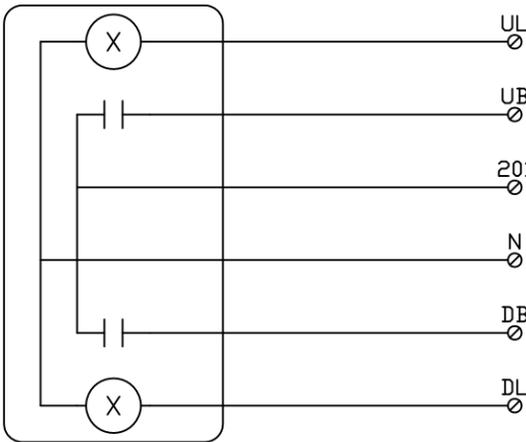
268

269

270

HALL BUTTON

271



272

273

274

275

276

277

278

279

280

TERMINAL#	WIRE #	CABLE#
		LOOP TO FLOOR ABOVE

		LOOP TO FLOOR BELOW
--	--	---------------------

		LOOP TO FLOOR ABOVE & BELOW
--	--	-----------------------------

		LOOP TO FLOOR ABOVE & BELOW
--	--	-----------------------------

		LOOP TO FLOOR ABOVE & BELOW
--	--	-----------------------------

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		LOOP TO FLOOR ABOVE & BELOW
--	--	-----------------------------

		LOOP TO FLOOR ABOVE & BELOW
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DRAWING NUMBER:	E829226B
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DRAFTER/ENGINEER	Robby
CONTRACT NUMBER(S):	8292

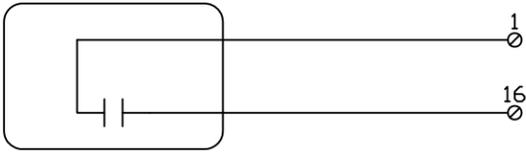
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21st FLOOR

247

DOOR LOCK

248

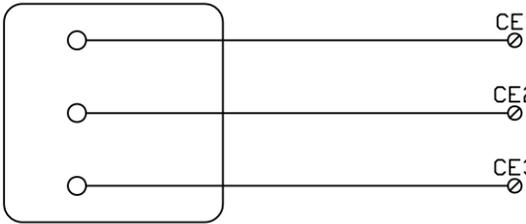


249

250

HALL LANTERN

251



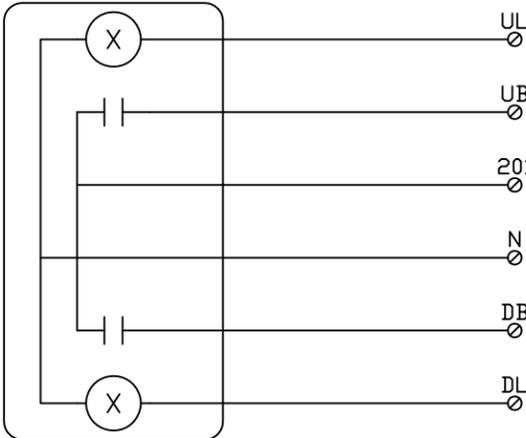
252

253

254

HALL BUTTON

255



256

257

258

259

260

261

TERMINAL#	WIRE #	CABLE#
		LOOP TO FLOOR ABOVE

		LOOP TO FLOOR BELOW
--	--	---------------------

		LOOP TO FLOOR ABOVE & BELOW
--	--	-----------------------------

		LOOP TO FLOOR ABOVE & BELOW
--	--	-----------------------------

		LOOP TO FLOOR ABOVE & BELOW
--	--	-----------------------------

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		LOOP TO FLOOR ABOVE & BELOW
--	--	-----------------------------

		LOOP TO FLOOR ABOVE & BELOW
--	--	-----------------------------

--	--	--

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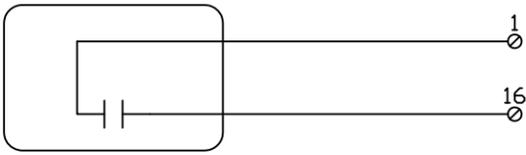
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20th FLOOR

263

DOOR LOCK

264

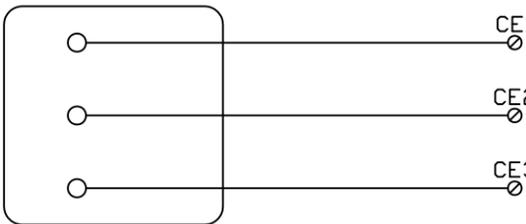


265

266

HALL LANTERN

267



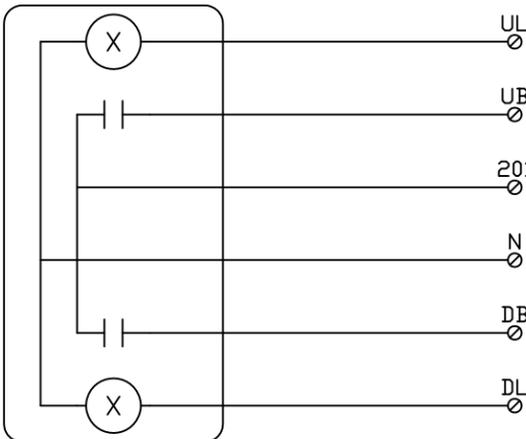
268

269

270

HALL BUTTON

271



272

273

274

275

276

277

278

279

280

TERMINAL#	WIRE #	CABLE#
		LOOP TO FLOOR ABOVE

		LOOP TO FLOOR BELOW
--	--	---------------------

		LOOP TO FLOOR ABOVE & BELOW
--	--	-----------------------------

		LOOP TO FLOOR ABOVE & BELOW
--	--	-----------------------------

		LOOP TO FLOOR ABOVE & BELOW
--	--	-----------------------------

--	--	--

--	--	--

		LOOP TO FLOOR ABOVE & BELOW
--	--	-----------------------------

		LOOP TO FLOOR ABOVE & BELOW
--	--	-----------------------------

--	--	--

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DRAWING NUMBER:	E829227B
DRAWING DATE:	April 29, 1997
DRAFTER/ENGINEER	Robby
CONTRACT NUMBER(S):	8292

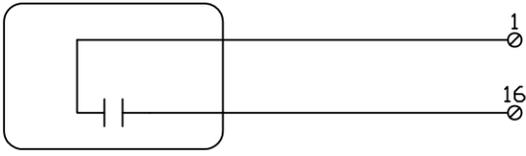
246

19th FLOOR

247

DOOR LOCK

248



249

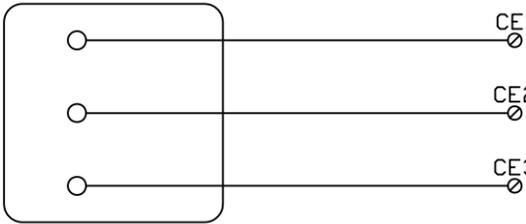
TERMINAL#	WIRE #	CABLE#
		LOOP TO FLOOR ABOVE

		LOOP TO FLOOR BELOW
--	--	---------------------

250

HALL LANTERN

251



252

		LOOP TO FLOOR ABOVE & BELOW
--	--	-----------------------------

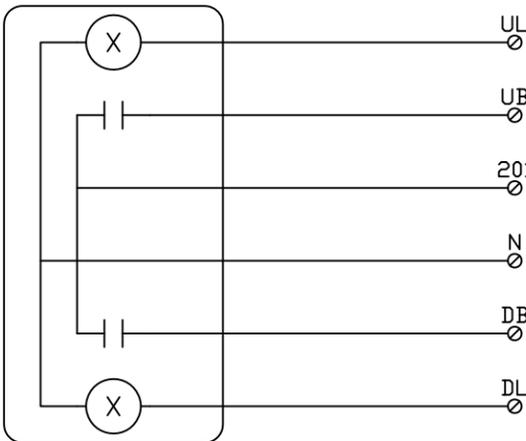
253

		LOOP TO FLOOR ABOVE & BELOW
--	--	-----------------------------

254

HALL BUTTON

255



256

--	--	--

257

--	--	--

258

		LOOP TO FLOOR ABOVE & BELOW
--	--	-----------------------------

259

		LOOP TO FLOOR ABOVE & BELOW
--	--	-----------------------------

260

--	--	--

261

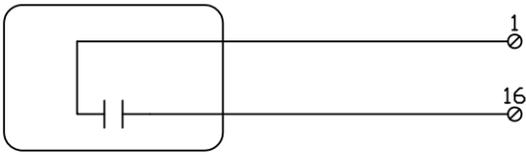
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18th FLOOR

263

DOOR LOCK

264



265

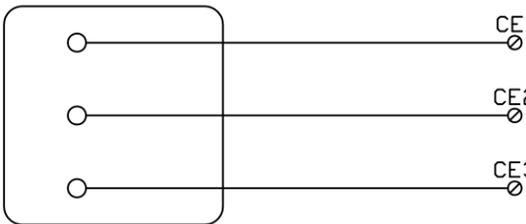
TERMINAL#	WIRE #	CABLE#
		LOOP TO FLOOR ABOVE

		LOOP TO FLOOR BELOW
--	--	---------------------

266

HALL LANTERN

267



268

		LOOP TO FLOOR ABOVE & BELOW
--	--	-----------------------------

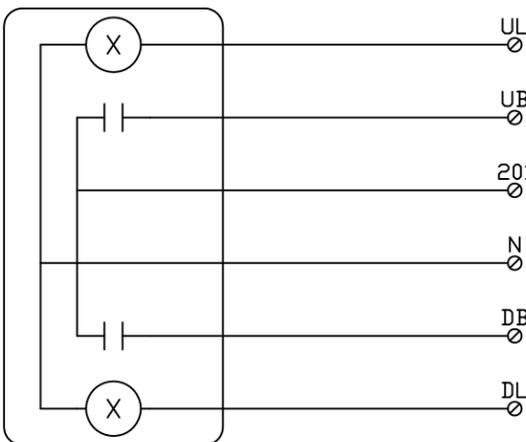
269

		LOOP TO FLOOR ABOVE & BELOW
--	--	-----------------------------

270

HALL BUTTON

271



272

--	--	--

273

--	--	--

274

		LOOP TO FLOOR ABOVE & BELOW
--	--	-----------------------------

275

		LOOP TO FLOOR ABOVE & BELOW
--	--	-----------------------------

276

--	--	--

277

278

279

280

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DRAWING DATE:	April 29, 1997
DRAFTER/ENGINEER:	Robby
CONTRACT NUMBER(S):	8292

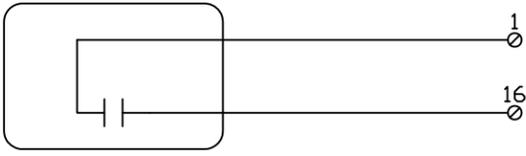
246

17th FLOOR

247

DOOR LOCK

248

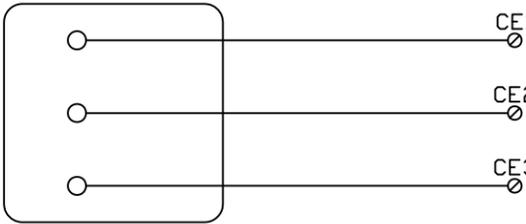


249

250

HALL LANTERN

251



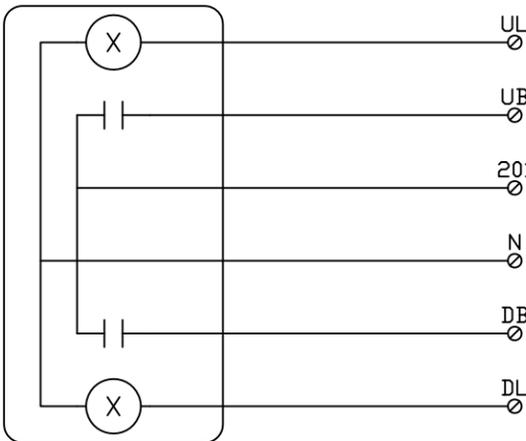
252

253

254

HALL BUTTON

255



256

257

258

259

260

261

TERMINAL#	WIRE #	CABLE#
		LOOP TO FLOOR ABOVE

		LOOP TO FLOOR BELOW
--	--	---------------------

		LOOP TO FLOOR ABOVE & BELOW
--	--	-----------------------------

		LOOP TO FLOOR ABOVE & BELOW
--	--	-----------------------------

		LOOP TO FLOOR ABOVE & BELOW
--	--	-----------------------------

--	--	--

--	--	--

		LOOP TO FLOOR ABOVE & BELOW
--	--	-----------------------------

		LOOP TO FLOOR ABOVE & BELOW
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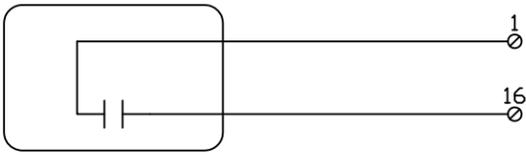
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16th FLOOR

263

DOOR LOCK

264

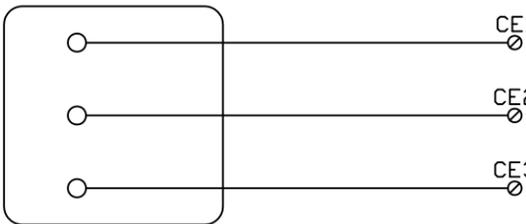


265

266

HALL LANTERN

267



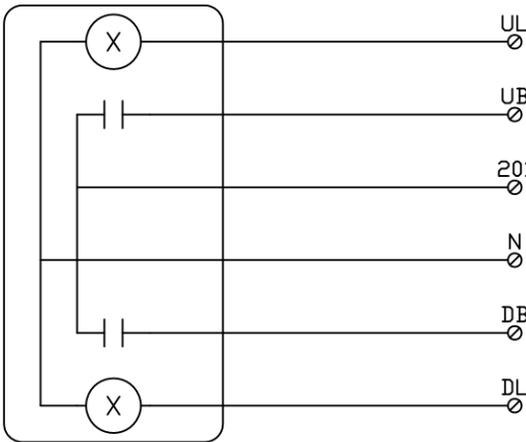
268

269

270

HALL BUTTON

271



272

273

274

275

276

277

278

279

280

TERMINAL#	WIRE #	CABLE#
		LOOP TO FLOOR ABOVE

		LOOP TO FLOOR BELOW
--	--	---------------------

		LOOP TO FLOOR ABOVE & BELOW
--	--	-----------------------------

		LOOP TO FLOOR ABOVE & BELOW
--	--	-----------------------------

		LOOP TO FLOOR ABOVE & BELOW
--	--	-----------------------------

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		LOOP TO FLOOR ABOVE & BELOW
--	--	-----------------------------

		LOOP TO FLOOR ABOVE & BELOW
--	--	-----------------------------

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Kennedy Space Center  
 Vehicle Assembly Building - Car #15  
 Hoistway Pony Diagram  
 Intermediate Floors

DRAWING NUMBER:	E829229B
DRAWING DATE:	April 29, 1997
DRAFTER/ENGINEER	Robby
CONTRACT NUMBER(S):	8292

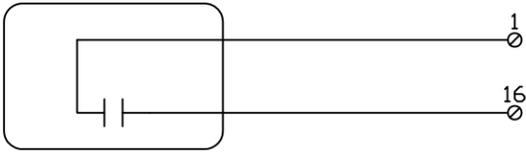
246

15th FLOOR

247

DOOR LOCK

248



249

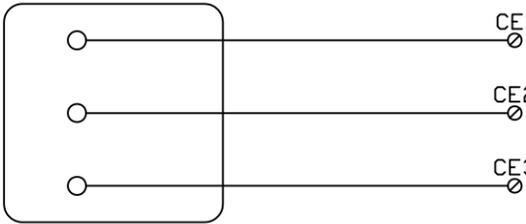
TERMINAL#	WIRE #	CABLE#
		LOOP TO FLOOR ABOVE

		LOOP TO FLOOR BELOW
--	--	---------------------

250

HALL LANTERN

251



252

		LOOP TO FLOOR ABOVE & BELOW
--	--	-----------------------------

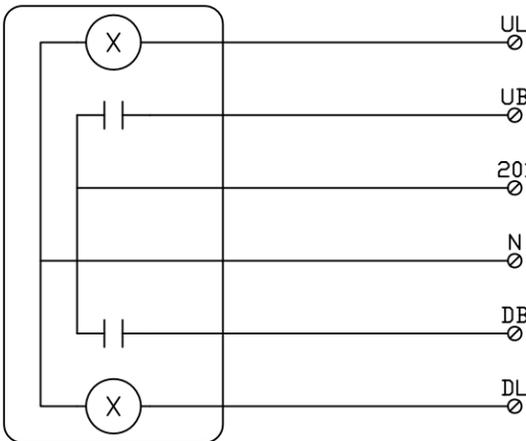
253

		LOOP TO FLOOR ABOVE & BELOW
--	--	-----------------------------

254

HALL BUTTON

255



256

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257

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258

		LOOP TO FLOOR ABOVE & BELOW
--	--	-----------------------------

259

		LOOP TO FLOOR ABOVE & BELOW
--	--	-----------------------------

260

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261

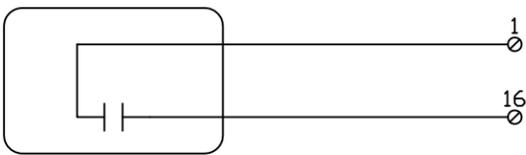
262

14th FLOOR

263

DOOR LOCK

264



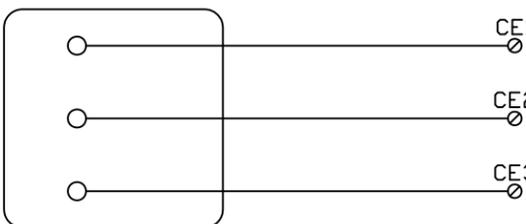
265

TERMINAL#	WIRE #	CABLE#
		LOOP TO FLOOR ABOVE

266

HALL LANTERN

267



268

		LOOP TO FLOOR BELOW
--	--	---------------------

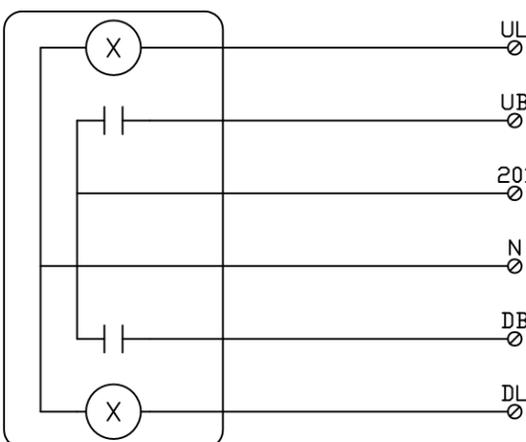
269

		LOOP TO FLOOR ABOVE & BELOW
--	--	-----------------------------

270

HALL BUTTON

271



272

		LOOP TO FLOOR ABOVE & BELOW
--	--	-----------------------------

273

		LOOP TO FLOOR ABOVE & BELOW
--	--	-----------------------------

274

		LOOP TO FLOOR ABOVE & BELOW
--	--	-----------------------------

275

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 Intermediate Floors

DRAWING NUMBER:	E829230B
DRAWING DATE:	April 29, 1997
DRAFTER/ENGINEER	Robby
CONTRACT NUMBER(S):	8292

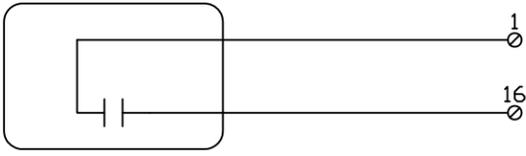
246

13th FLOOR

247

DOOR LOCK

248



249

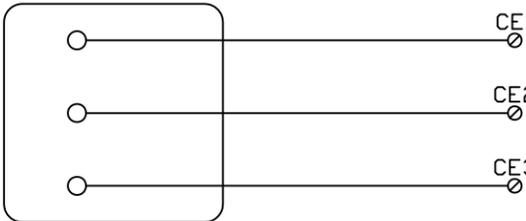
TERMINAL#	WIRE #	CABLE#
		LOOP TO FLOOR ABOVE

		LOOP TO FLOOR BELOW
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250

HALL LANTERN

251



252

		LOOP TO FLOOR ABOVE & BELOW
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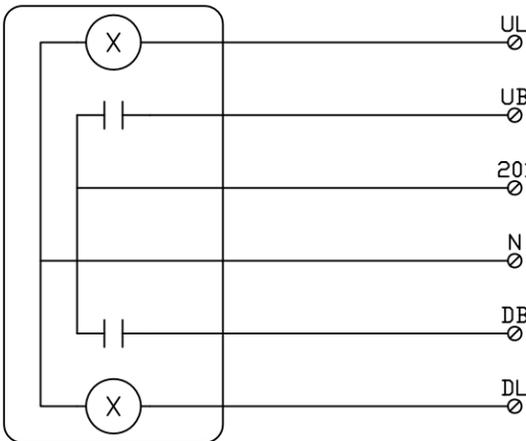
253

		LOOP TO FLOOR ABOVE & BELOW
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254

HALL BUTTON

255



256

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257

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258

		LOOP TO FLOOR ABOVE & BELOW
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259

		LOOP TO FLOOR ABOVE & BELOW
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260

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261

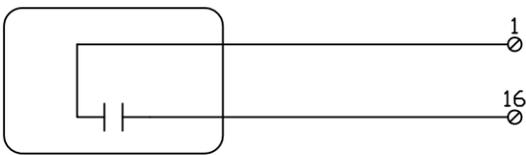
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12th FLOOR

263

DOOR LOCK

264



265

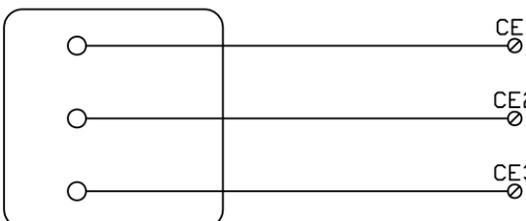
TERMINAL#	WIRE #	CABLE#
		LOOP TO FLOOR ABOVE

		LOOP TO FLOOR BELOW
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266

HALL LANTERN

267



268

		LOOP TO FLOOR ABOVE & BELOW
--	--	-----------------------------

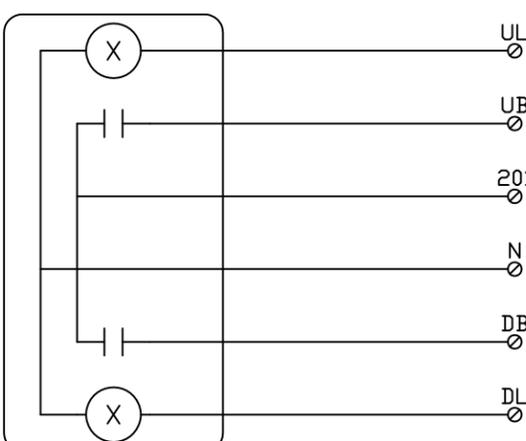
269

		LOOP TO FLOOR ABOVE & BELOW
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270

HALL BUTTON

271



272

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273

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274

		LOOP TO FLOOR ABOVE & BELOW
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275

		LOOP TO FLOOR ABOVE & BELOW
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 Intermediate Floors

DRAWING NUMBER:	E829231B
DRAWING DATE:	April 29, 1997
DRAFTER/ENGINEER	Robby
CONTRACT NUMBER(S):	8292

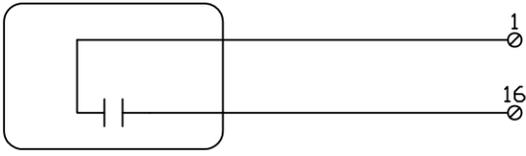
246

11th FLOOR

247

DOOR LOCK

248



249

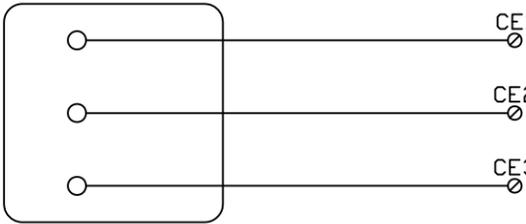
TERMINAL#	WIRE #	CABLE#
		LOOP TO FLOOR ABOVE

		LOOP TO FLOOR BELOW
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250

HALL LANTERN

251



252

		LOOP TO FLOOR ABOVE & BELOW
--	--	-----------------------------

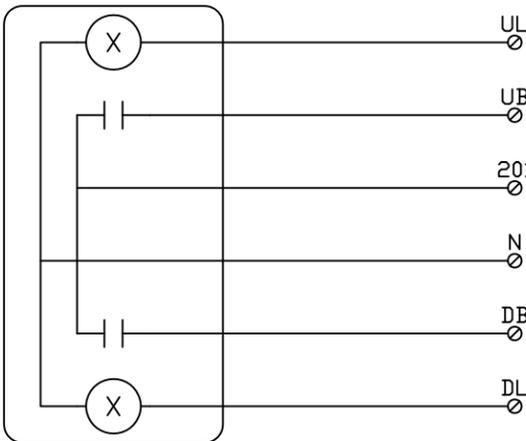
253

		LOOP TO FLOOR ABOVE & BELOW
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254

HALL BUTTON

255



256

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257

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258

		LOOP TO FLOOR ABOVE & BELOW
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259

		LOOP TO FLOOR ABOVE & BELOW
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260

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261

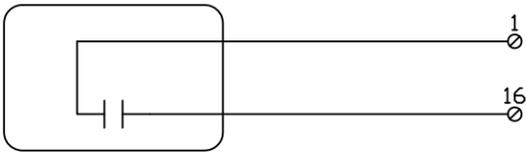
262

10th FLOOR

263

DOOR LOCK

264



265

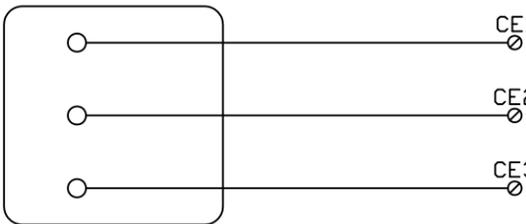
TERMINAL#	WIRE #	CABLE#
		LOOP TO FLOOR ABOVE

		LOOP TO FLOOR BELOW
--	--	---------------------

266

HALL LANTERN

267



268

		LOOP TO FLOOR ABOVE & BELOW
--	--	-----------------------------

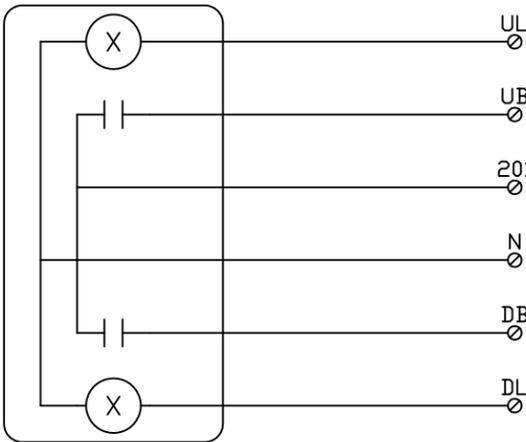
269

		LOOP TO FLOOR ABOVE & BELOW
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270

HALL BUTTON

271



272

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273

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274

		LOOP TO FLOOR ABOVE & BELOW
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275

		LOOP TO FLOOR ABOVE & BELOW
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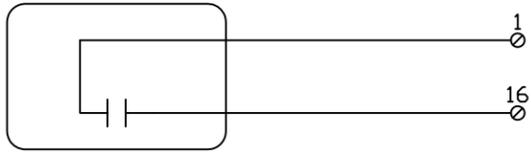
Kennedy Space Center  
 Vehicle Assembly Building - Car #15  
 Hoistway Pony Diagram  
 Intermediate Floors  
 Page 308

DRAWING NUMBER:	E829232B
DRAWING DATE:	April 29, 1997
DRAFTER/ENGINEER	Robby
CONTRACT NUMBER(S):	8292

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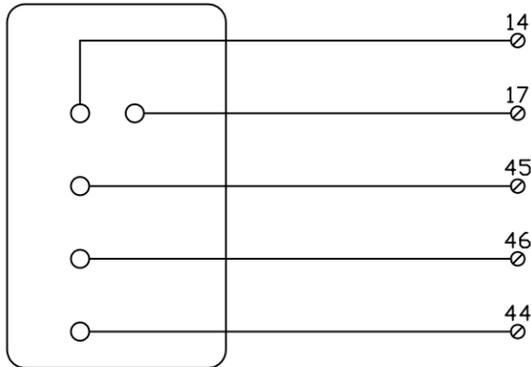
9th FLOOR

9TH FLOOR DOOR LOCK

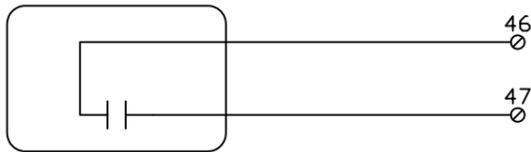


TERMINAL#	WIRE #	CABLE#

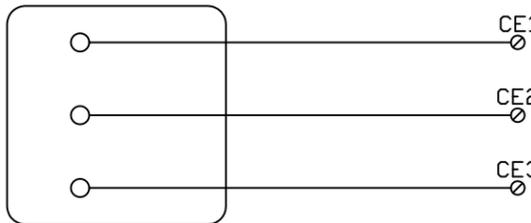
9TH ACCESS KESWITCH



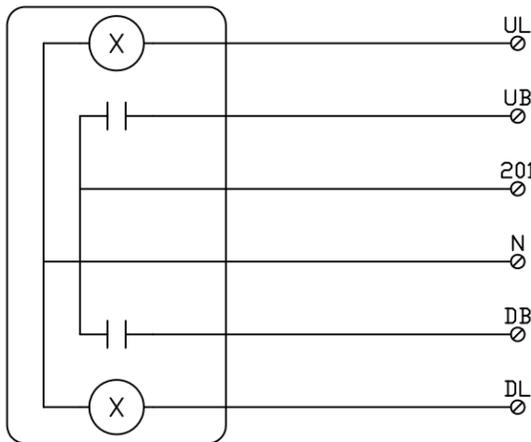

9TH ACCESS LIMIT




9TH FLOOR HALL LANTERN




HALL BUTTON



		LOOP TO FLOOR ABOVE & BELOW
		LOOP TO FLOOR ABOVE & BELOW

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 Vehicle Assembly Building - Car #15  
 Hoistway Pony Diagram  
 9th Floor  
 Page 309

DRAWING NUMBER:	E829233B
DRAWING DATE:	April 29, 1997
DRAFTER/ENGINEER	Robby
CONTRACT NUMBER(S):	8292

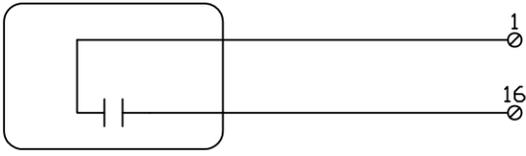
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8th FLOOR

247

DOOR LOCK

248



249

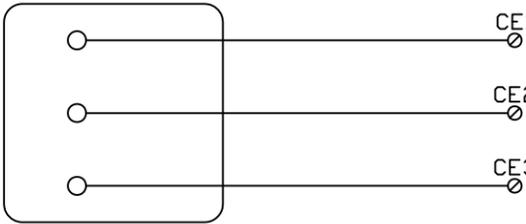
TERMINAL#	WIRE #	CABLE#
		LOOP TO FLOOR ABOVE

		LOOP TO FLOOR BELOW
--	--	---------------------

250

HALL LANTERN

251



252

		LOOP TO FLOOR ABOVE & BELOW
--	--	-----------------------------

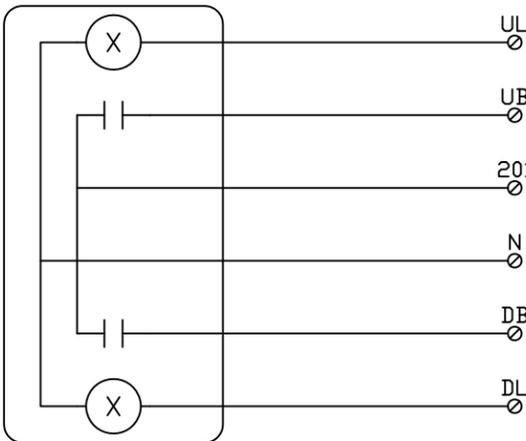
253

		LOOP TO FLOOR ABOVE & BELOW
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254

HALL BUTTON

255



256

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257

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258

		LOOP TO FLOOR ABOVE & BELOW
--	--	-----------------------------

259

		LOOP TO FLOOR ABOVE & BELOW
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260

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261

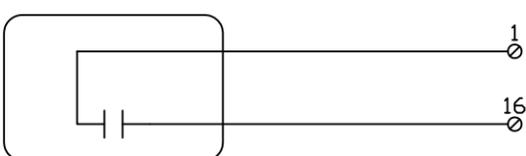
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7th FLOOR

263

DOOR LOCK

264



265

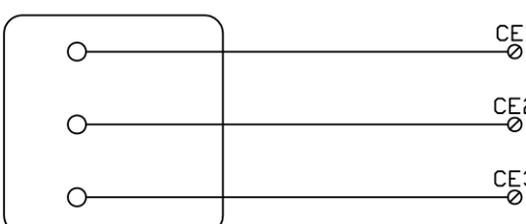
TERMINAL#	WIRE #	CABLE#
		LOOP TO FLOOR ABOVE

		LOOP TO FLOOR BELOW
--	--	---------------------

266

HALL LANTERN

267



268

		LOOP TO FLOOR ABOVE & BELOW
--	--	-----------------------------

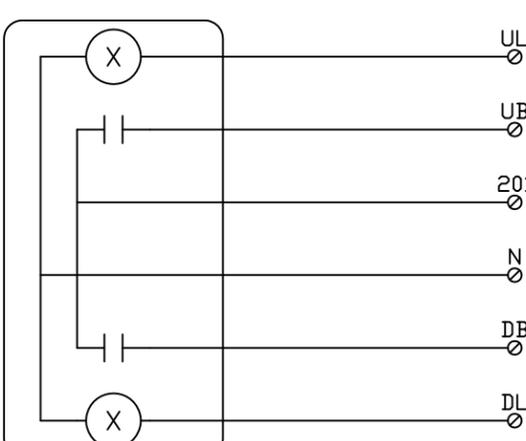
269

		LOOP TO FLOOR ABOVE & BELOW
--	--	-----------------------------

270

HALL BUTTON

271



272

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273

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274

		LOOP TO FLOOR ABOVE & BELOW
--	--	-----------------------------

275

		LOOP TO FLOOR ABOVE & BELOW
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276

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DRAWING NUMBER:	E829234B
DRAWING DATE:	April 29, 1997
DRAFTER/ENGINEER	Robby
CONTRACT NUMBER(S):	8292

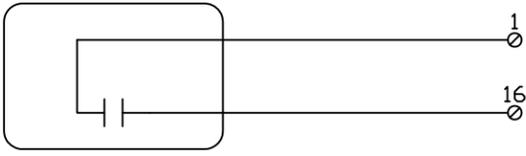
246

6th FLOOR

247

DOOR LOCK

248



249

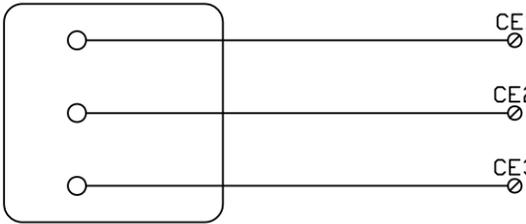
TERMINAL#	WIRE #	CABLE#
		LOOP TO FLOOR ABOVE

		LOOP TO FLOOR BELOW
--	--	---------------------

250

HALL LANTERN

251



252

		LOOP TO FLOOR ABOVE & BELOW
--	--	-----------------------------

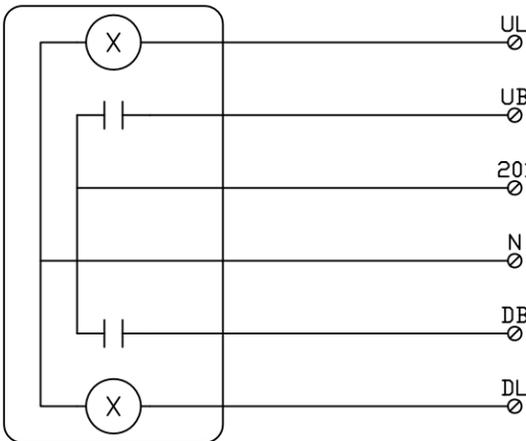
253

		LOOP TO FLOOR ABOVE & BELOW
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254

HALL BUTTON

255



256

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257

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258

		LOOP TO FLOOR ABOVE & BELOW
--	--	-----------------------------

259

		LOOP TO FLOOR ABOVE & BELOW
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260

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261

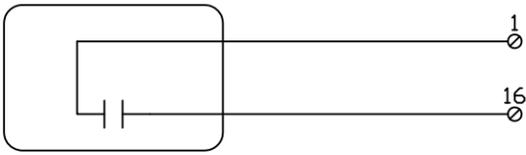
262

5th FLOOR

263

DOOR LOCK

264



265

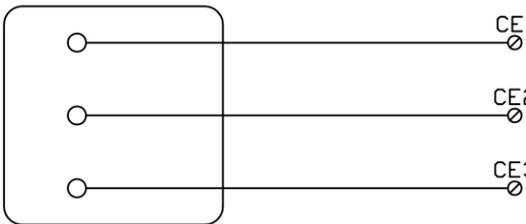
TERMINAL#	WIRE #	CABLE#
		LOOP TO FLOOR ABOVE

		LOOP TO FLOOR BELOW
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266

HALL LANTERN

267



268

		LOOP TO FLOOR ABOVE & BELOW
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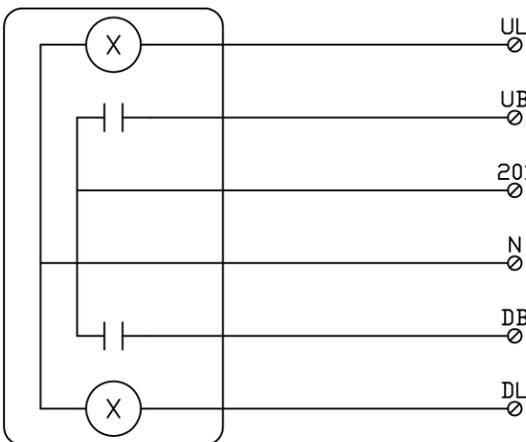
269

		LOOP TO FLOOR ABOVE & BELOW
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270

HALL BUTTON

271



272

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273

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274

		LOOP TO FLOOR ABOVE & BELOW
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275

		LOOP TO FLOOR ABOVE & BELOW
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 Intermediate Floors

DRAWING NUMBER:	E829235B
DRAWING DATE:	April 29, 1997
DRAFTER/ENGINEER:	Robby
CONTRACT NUMBER(S):	8292

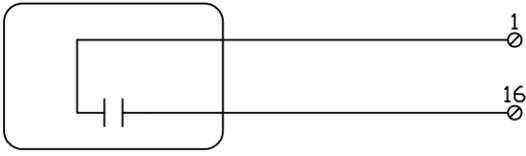
246

4th FLOOR

247

DOOR LOCK

248



249

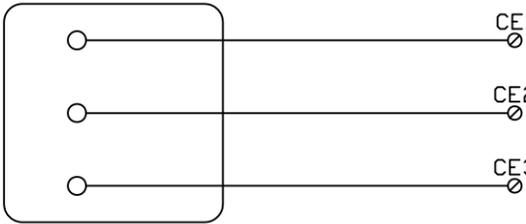
TERMINAL#	WIRE #	CABLE#
		LOOP TO FLOOR ABOVE

		LOOP TO FLOOR BELOW
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250

HALL LANTERN

251



252

		LOOP TO FLOOR ABOVE & BELOW
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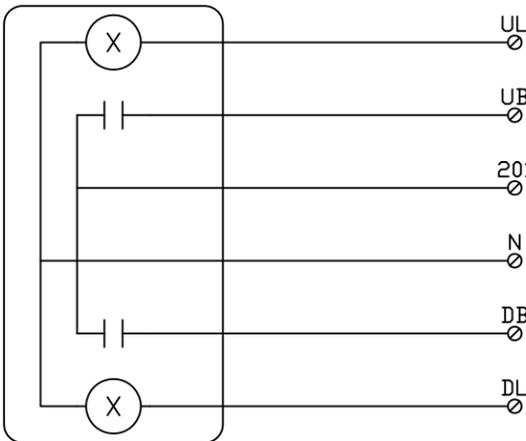
253

		LOOP TO FLOOR ABOVE & BELOW
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254

HALL BUTTON

255



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258

		LOOP TO FLOOR ABOVE & BELOW
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		LOOP TO FLOOR ABOVE & BELOW
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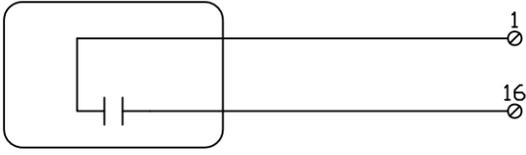
262

3rd FLOOR

263

DOOR LOCK

264



265

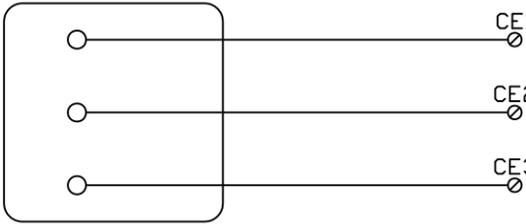
TERMINAL#	WIRE #	CABLE#
		LOOP TO FLOOR ABOVE

		LOOP TO FLOOR BELOW
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266

HALL LANTERN

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268

		LOOP TO FLOOR ABOVE & BELOW
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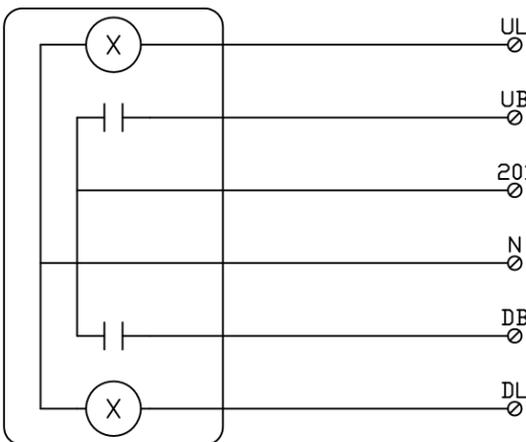
269

		LOOP TO FLOOR ABOVE & BELOW
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HALL BUTTON

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		LOOP TO FLOOR ABOVE & BELOW
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		LOOP TO FLOOR ABOVE & BELOW
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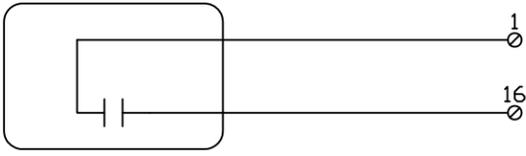
Kennedy Space Center  
 Vehicle Assembly Building - Car #15  
 Hoistway Pony Diagram  
 Intermediate Floors

DRAWING NUMBER:	E829236B
DRAWING DATE:	April 29, 1997
DRAFTER/ENGINEER	Robby
CONTRACT NUMBER(S):	8292

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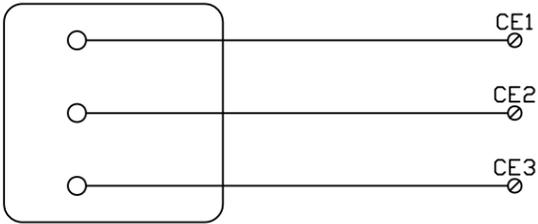
2nd FLOOR

DOOR LOCK



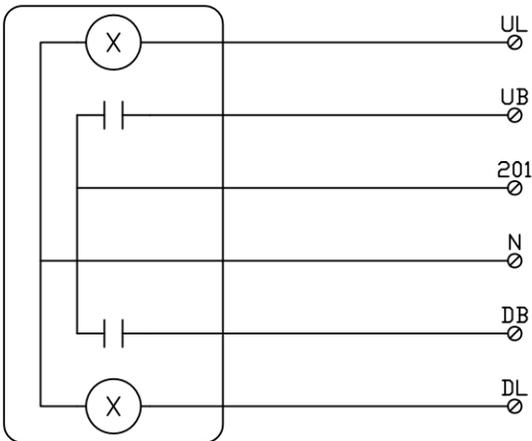
TERMINAL#	WIRE #	CABLE#
		LOOP TO FLOOR ABOVE
		LOOP TO FLOOR BELOW

HALL LANTERN



		LOOP TO FLOOR ABOVE & BELOW
		LOOP TO FLOOR ABOVE & BELOW
		LOOP TO FLOOR ABOVE & BELOW

HALL BUTTON



		LOOP TO FLOOR ABOVE & BELOW
		LOOP TO FLOOR ABOVE & BELOW

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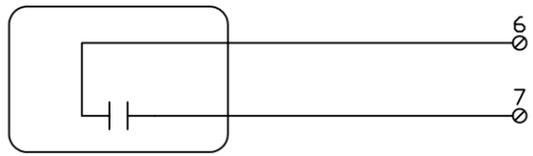
Kennedy Space Center  
 Vehicle Assembly Building - Car #15  
 Hoistway Pony Diagram  
 Intermediate Floors  
 Page 313

DRAWING NUMBER:	E829237B
DRAWING DATE:	April 29, 1997
DRAFTER/ENGINEER	Robby
CONTRACT NUMBER(S):	8292

246  
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TOP FLOOR

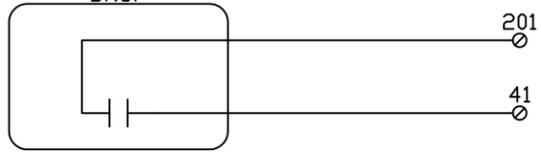
BOTTOM FINAL LIMIT



TERMINAL#	WIRE #	CABLE#

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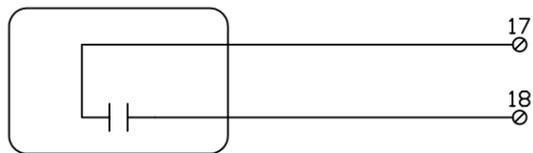
BOTTOM NORMAL STOP  
BNSP



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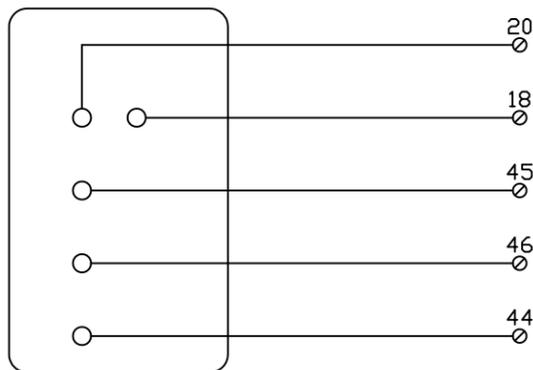
BOTTOM DOOR LOCK



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BOTTOM ACCESS KESWITCH



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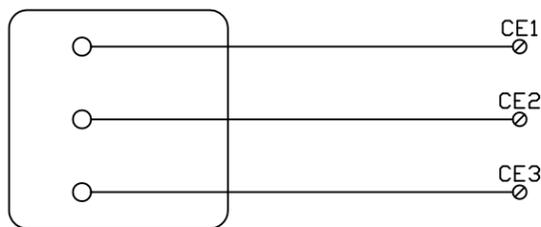
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BOTTOM FLOOR HALL LANTERN

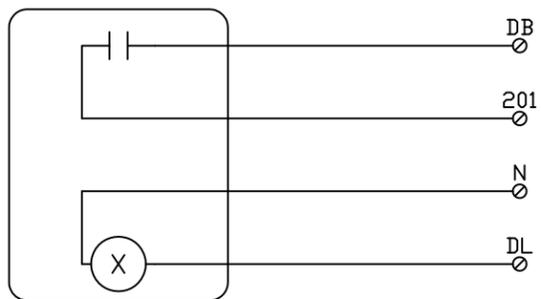


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BOTTOM HALL BUTTON



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Kennedy Space Center  
 Vehicle Assembly Building - Car #15  
 Hoistway Pony Diagram  
 Bottom Floor  
 Page 314

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DRAWING DATE:	April 29, 1997
DRAFTER/ENGINEER	Robby
CONTRACT NUMBER(S):	8292

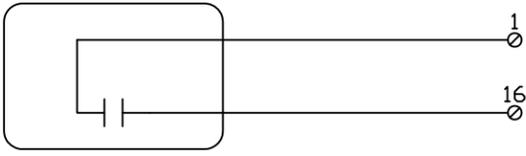
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'C' FLOOR

247

DOOR LOCK

248

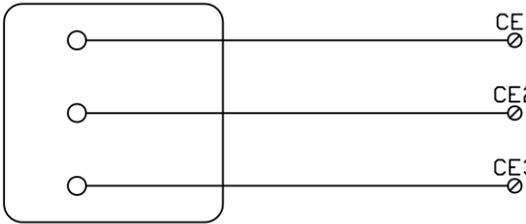


249

250

HALL LANTERN

251



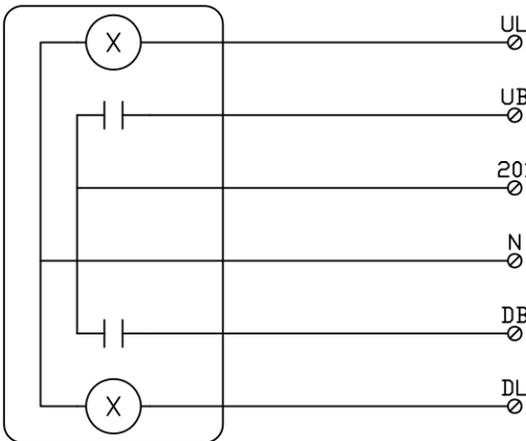
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253

254

HALL BUTTON

255



256

257

258

259

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TERMINAL#	WIRE #	CABLE#
		LOOP TO FLOOR ABOVE

		LOOP TO FLOOR BELOW
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		LOOP TO FLOOR ABOVE & BELOW
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		LOOP TO FLOOR ABOVE & BELOW
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		LOOP TO FLOOR ABOVE & BELOW
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		LOOP TO FLOOR ABOVE & BELOW
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		LOOP TO FLOOR ABOVE & BELOW
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261

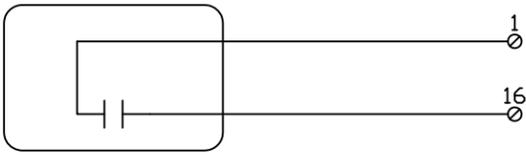
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'ER' FLOOR

263

DOOR LOCK

264

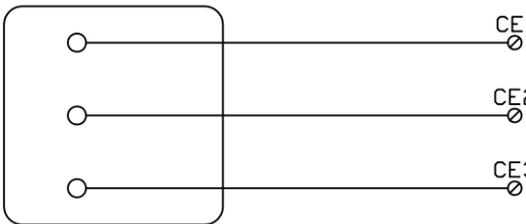


265

266

HALL LANTERN

267



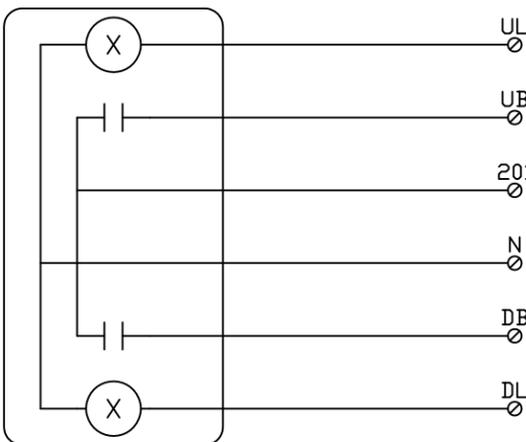
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269

270

HALL BUTTON

271



272

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276

TERMINAL#	WIRE #	CABLE#
		LOOP TO FLOOR ABOVE

		LOOP TO FLOOR BELOW
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		LOOP TO FLOOR ABOVE & BELOW
--	--	-----------------------------

		LOOP TO FLOOR ABOVE & BELOW
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		LOOP TO FLOOR ABOVE & BELOW
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		LOOP TO FLOOR ABOVE & BELOW
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		LOOP TO FLOOR ABOVE & BELOW
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Kennedy Space Center  
 Vehicle Assembly Building - Car #15  
 Hoistway Pony Diagram  
 Rear Floors  
 Page 315

DRAWING NUMBER:	E829239B
DRAWING DATE:	April 29, 1997
DRAFTER/ENGINEER	Robby
CONTRACT NUMBER(S):	8292

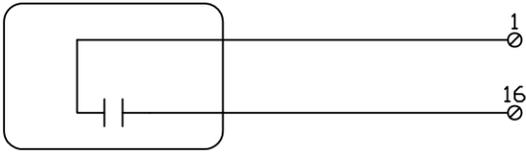
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'E' FLOOR

247

DOOR LOCK

248



249

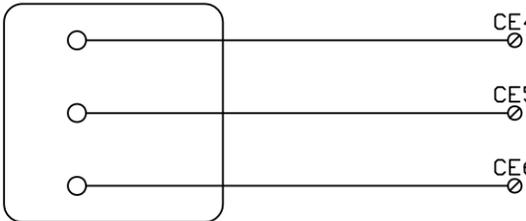
TERMINAL#	WIRE #	CABLE#
		LOOP TO FLOOR ABOVE

		LOOP TO FLOOR BELOW
--	--	---------------------

250

HALL LANTERN

251



252

		LOOP TO FLOOR ABOVE & BELOW
--	--	-----------------------------

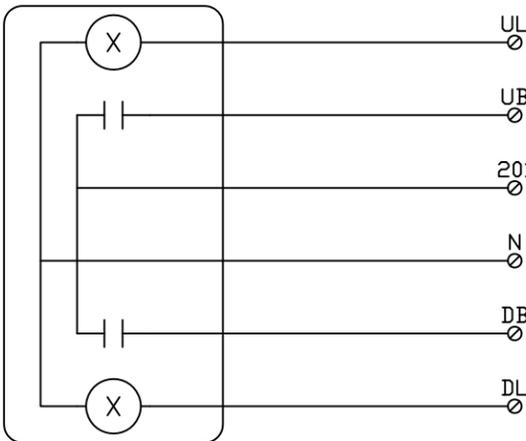
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		LOOP TO FLOOR ABOVE & BELOW
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254

HALL BUTTON

255



256

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257

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258

		LOOP TO FLOOR ABOVE & BELOW
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259

		LOOP TO FLOOR ABOVE & BELOW
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260

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261

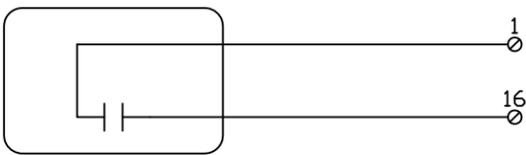
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'B' FLOOR

263

DOOR LOCK

264



265

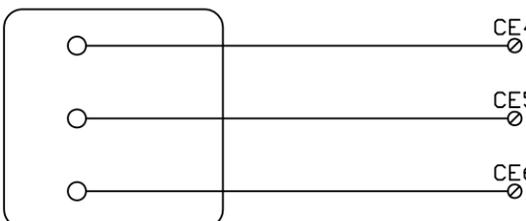
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		LOOP TO FLOOR ABOVE

		LOOP TO FLOOR BELOW
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266

HALL LANTERN

267



268

		LOOP TO FLOOR ABOVE & BELOW
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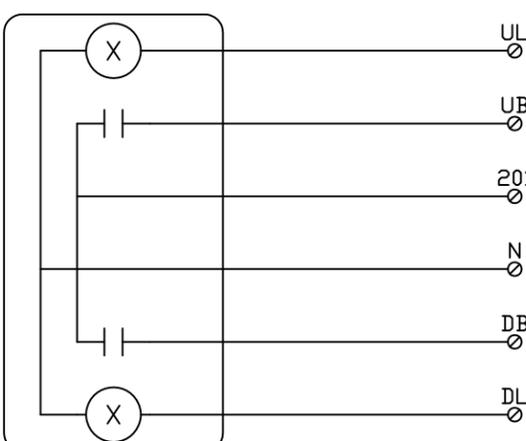
269

		LOOP TO FLOOR ABOVE & BELOW
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270

HALL BUTTON

271



272

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274

		LOOP TO FLOOR ABOVE & BELOW
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275

		LOOP TO FLOOR ABOVE & BELOW
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 Vehicle Assembly Building - Car #15  
 Hoistway Pony Diagram  
 Rear Floors

DRAWING NUMBER:	E829240B
DRAWING DATE:	April 29, 1997
DRAFTER/ENGINEER:	Robby
CONTRACT NUMBER(S):	8292

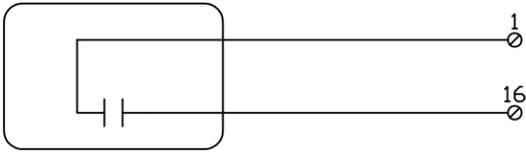
246

'F' FLOOR

247

DOOR LOCK

248



249

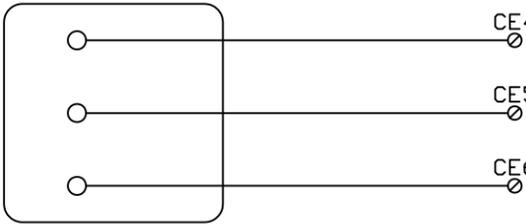
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		LOOP TO FLOOR ABOVE

		LOOP TO FLOOR BELOW
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250

HALL LANTERN

251



252

		LOOP TO FLOOR ABOVE & BELOW
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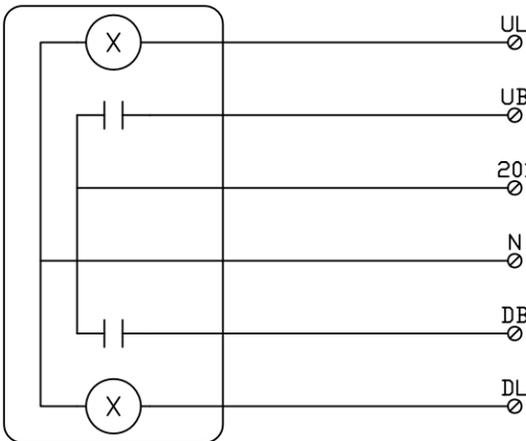
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		LOOP TO FLOOR ABOVE & BELOW
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254

HALL BUTTON

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258

		LOOP TO FLOOR ABOVE & BELOW
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259

		LOOP TO FLOOR ABOVE & BELOW
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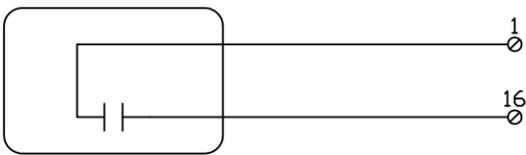
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'D' FLOOR

263

DOOR LOCK

264



265

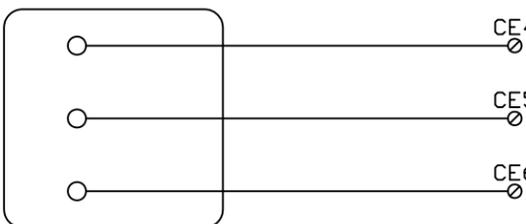
TERMINAL#	WIRE #	CABLE#
		LOOP TO FLOOR ABOVE

		LOOP TO FLOOR BELOW
--	--	---------------------

266

HALL LANTERN

267



268

		LOOP TO FLOOR ABOVE & BELOW
--	--	-----------------------------

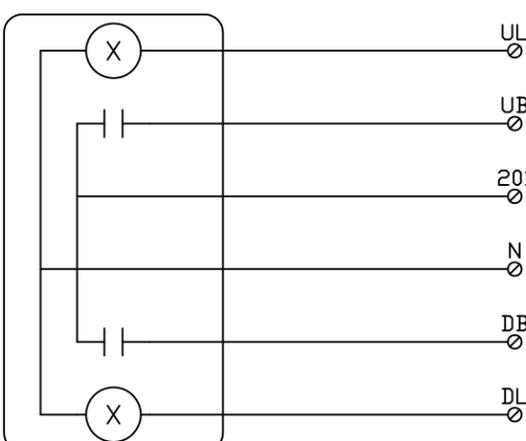
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		LOOP TO FLOOR ABOVE & BELOW
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270

HALL BUTTON

271



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		LOOP TO FLOOR ABOVE & BELOW
--	--	-----------------------------

275

		LOOP TO FLOOR ABOVE & BELOW
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 Rear Floors

DRAWING NUMBER:	E829241B
DRAWING DATE:	April 29, 1997
DRAFTER/ENGINEER	Robby
CONTRACT NUMBER(S):	8292

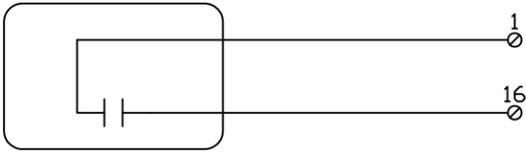
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'G' FLOOR

247

DOOR LOCK

248

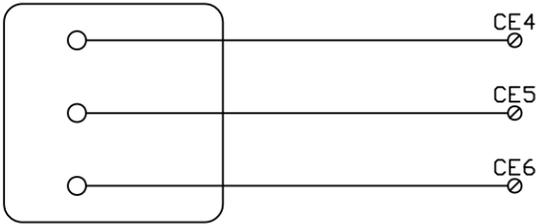


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250

HALL LANTERN

251



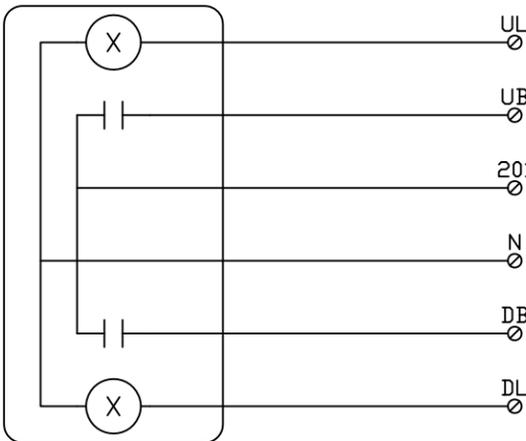
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253

254

HALL BUTTON

255



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261

TERMINAL#	WIRE #	CABLE#
		LOOP TO FLOOR ABOVE

		LOOP TO FLOOR BELOW
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		LOOP TO FLOOR ABOVE & BELOW
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		LOOP TO FLOOR ABOVE & BELOW
--	--	-----------------------------

		LOOP TO FLOOR ABOVE & BELOW
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		LOOP TO FLOOR ABOVE & BELOW
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		LOOP TO FLOOR ABOVE & BELOW
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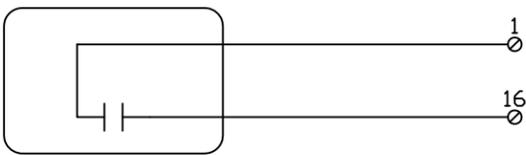
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'H' FLOOR

263

DOOR LOCK

264

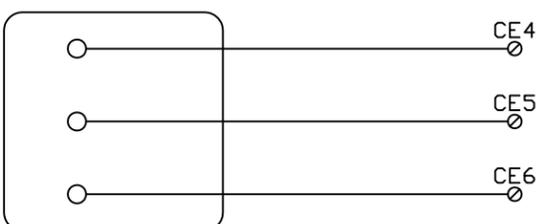


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266

HALL LANTERN

267



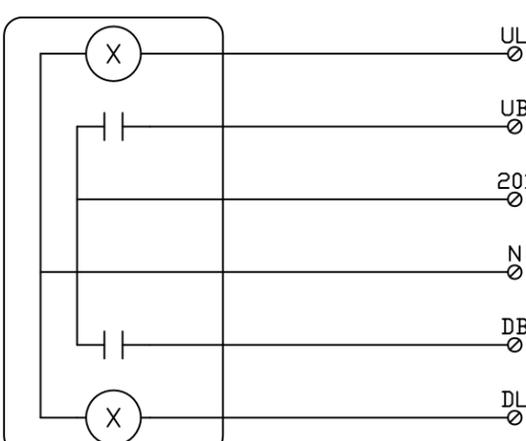
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269

270

HALL BUTTON

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TERMINAL#	WIRE #	CABLE#
		LOOP TO FLOOR ABOVE

		LOOP TO FLOOR BELOW
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		LOOP TO FLOOR ABOVE & BELOW
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		LOOP TO FLOOR ABOVE & BELOW
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		LOOP TO FLOOR ABOVE & BELOW
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		LOOP TO FLOOR ABOVE & BELOW
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		LOOP TO FLOOR ABOVE & BELOW
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 Vehicle Assembly Building - Car #15  
 Hoistway Pony Diagram  
 Rear Floors

DRAWING NUMBER:	E829242B
DRAWING DATE:	April 29, 1997
DRAFTER/ENGINEER	Robby
CONTRACT NUMBER(S):	8292

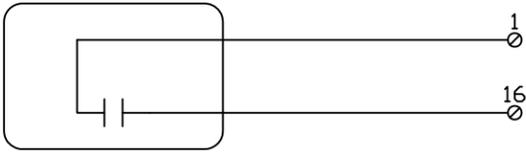
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"J" FLOOR

247

DOOR LOCK

248



249

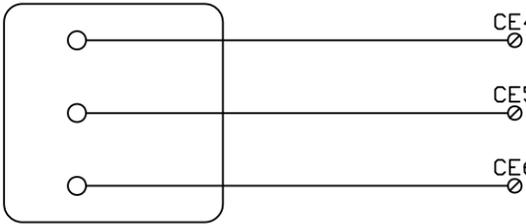
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		LOOP TO FLOOR BELOW
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250

HALL LANTERN

251



252

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--	--	-----------------------------

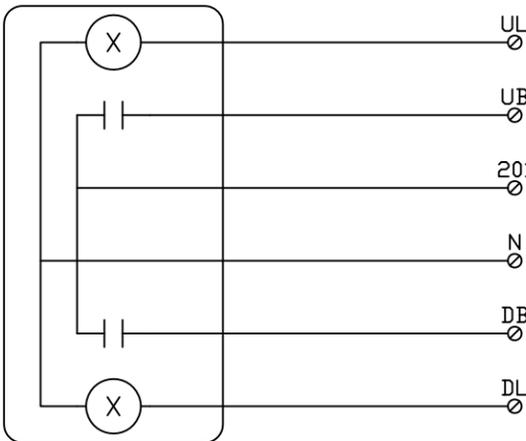
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		LOOP TO FLOOR ABOVE & BELOW
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254

HALL BUTTON

255



256

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258

		LOOP TO FLOOR ABOVE & BELOW
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259

		LOOP TO FLOOR ABOVE & BELOW
--	--	-----------------------------

260

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261

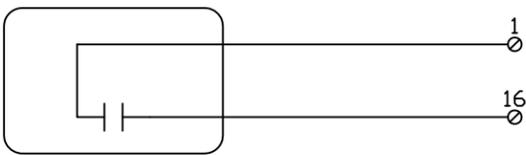
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"K" FLOOR

263

DOOR LOCK

264



265

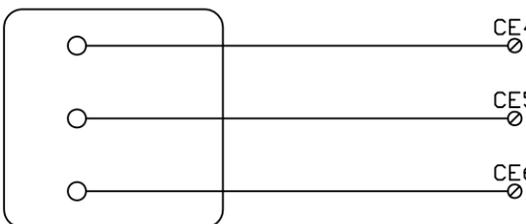
TERMINAL#	WIRE #	CABLE#
		LOOP TO FLOOR ABOVE

		LOOP TO FLOOR BELOW
--	--	---------------------

266

HALL LANTERN

267



268

		LOOP TO FLOOR ABOVE & BELOW
--	--	-----------------------------

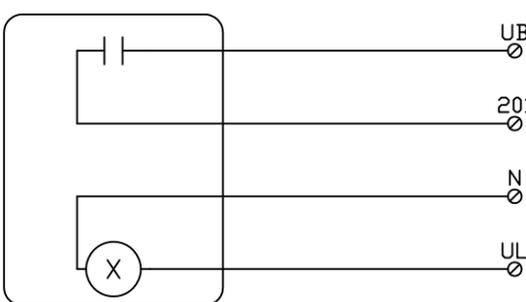
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		LOOP TO FLOOR ABOVE & BELOW
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270

HALL BUTTON

271



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274

		LOOP TO FLOOR ABOVE & BELOW
--	--	-----------------------------

275

		LOOP TO FLOOR ABOVE & BELOW
--	--	-----------------------------

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Kennedy Space Center  
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 Hoistway Pony Diagram  
 Rear Floors

DRAWING NUMBER:	E829243B
DRAWING DATE:	April 29, 1997
DRAFTER/ENGINEER	Robby
CONTRACT NUMBER(S):	8292

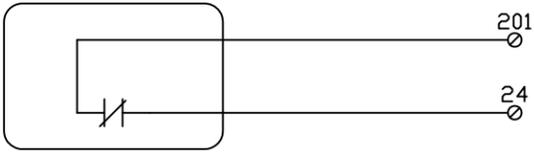
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Music Box Switches

247

TNSP

248



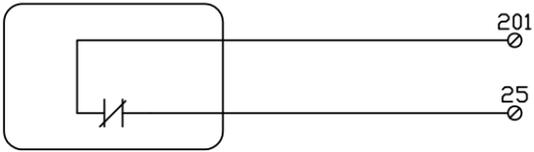
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TERMINAL#	WIRE #	CABLE#

250

TNSDL

251

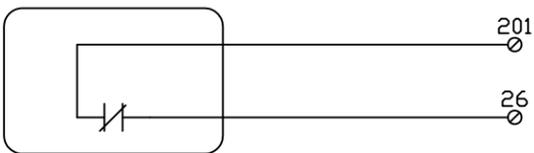


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TNSDM

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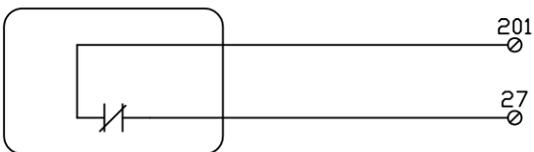


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TNSDH

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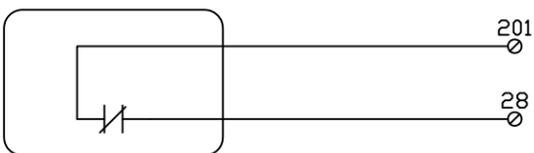


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BNSDH

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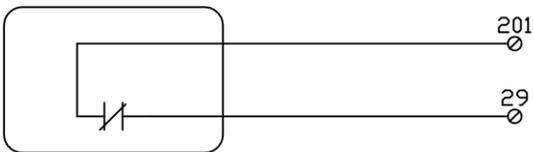


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BNSDM

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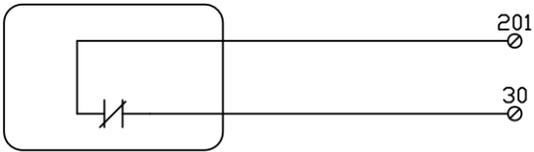


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BNSDL

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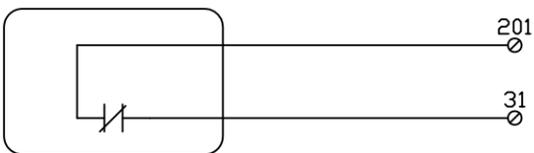


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BNSP

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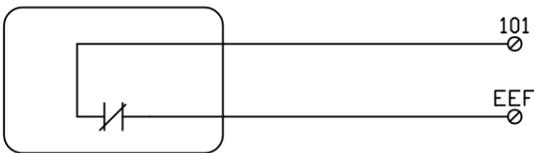
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ELECTRIC EYES

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EEF

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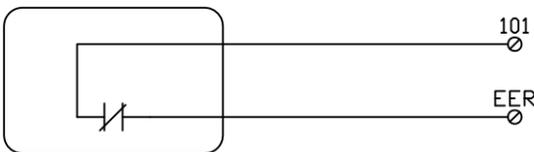


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EER

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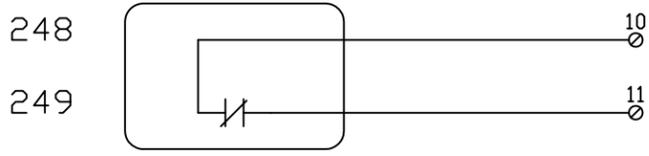
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 Chicago, IL 60622  
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Kennedy Space Center  
 Vehicle Assembly Building - Car #15  
 Car Top Pony Diagram

DRAWING NUMBER:	E829244B
DRAWING DATE:	May 6, 1997
DRAFTER/ENGINEER:	Robby
CONTRACT NUMBER(S):	8292

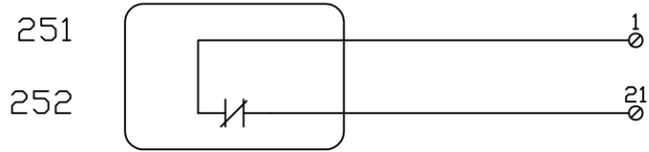
246 Car Top Station

247 CAR TOP STOP SWITCH

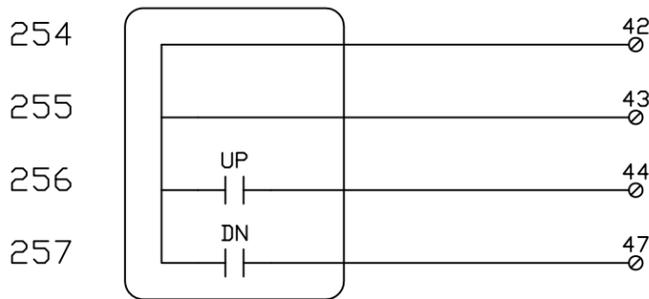


TERMINAL#	WIRE #	CABLE#

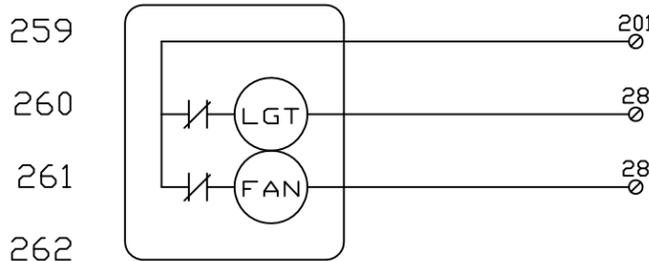
250 CAR TOP INSPECTION SWITCH



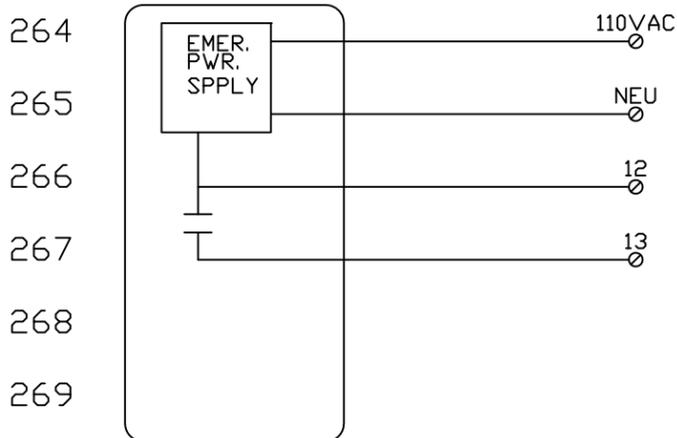

253 CAR TOP INSPECTION STATION




258 LFR




263 Emergency Power




270

271

272

273

274

275

276

277

278

279

280

Mid-American Elevator Inc.  
  
 820 N. Wolcott Ave.  
 Chicago, IL 60622  
 773.486.6900 fax 773.486.2438  
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Kennedy Space Center  
 Vehicle Assembly Building - Car #15  
 Car Top Pony Diagram

DRAWING NUMBER:	E829245B
DRAWING DATE:	May 6, 1997
DRAFTER/ENGINEER	Robby
CONTRACT NUMBER(S):	8292

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# APPENDIX E

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# USA Elevators



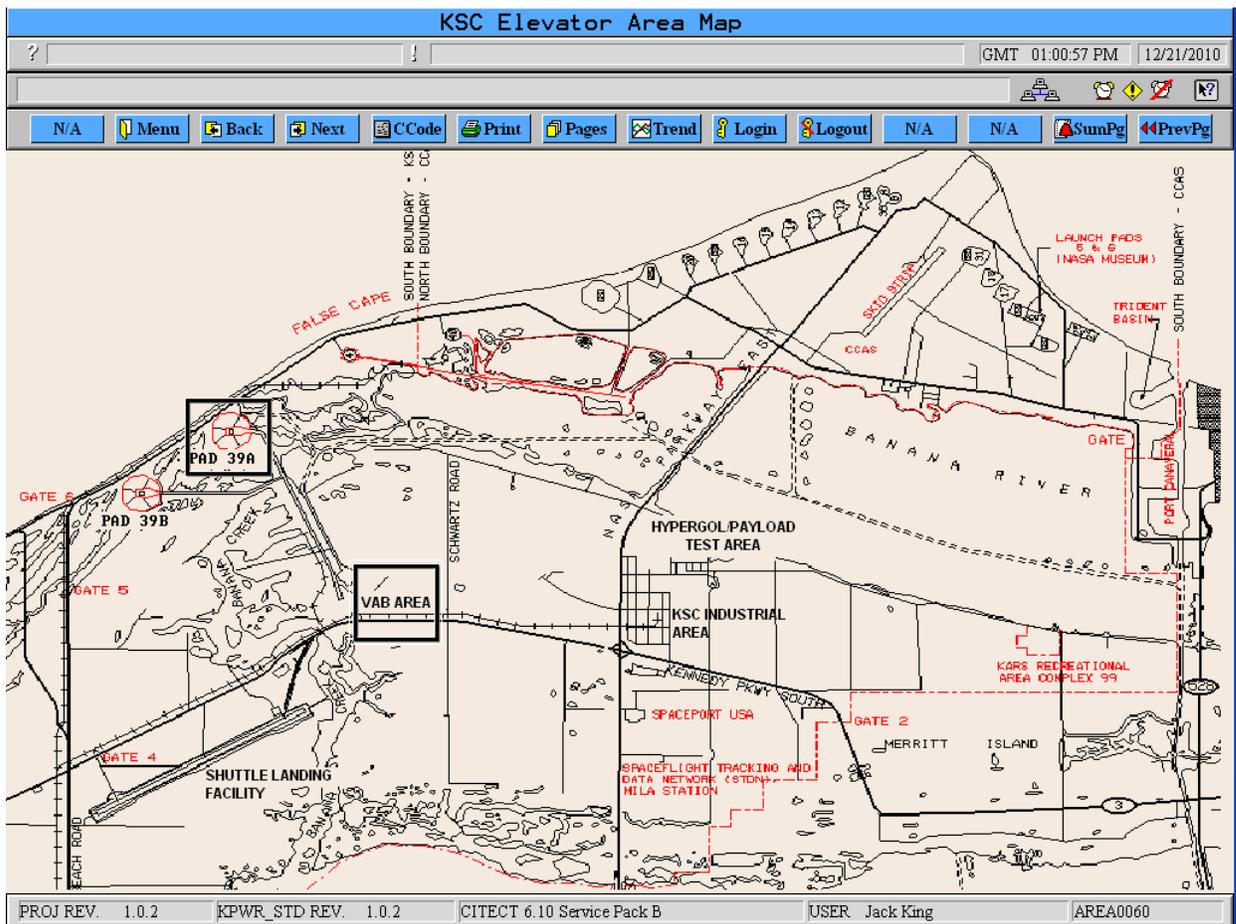
## KCCS CONSOLE ELEVATOR MONITORING GUIDE

# KCCS ELEVATOR REMOTE MONITOR

- Monitors the real time operational status of the VAB, OSB II, Logistics, OPF3 L/B and the Pad A FSS elevators.
- Remotely monitored from the CCC or from the elevator shop in the VAB room 2N2.
- Assists console operators with the status of the elevators.
- Assists elevator engineers and technicians with troubleshooting.

## I. Pad 39 A

The elevator remote monitor has an area Map that shows the VAB and the Pad 39 A area.



Selecting the Pad 39A area box will bring up the Pad A FSS elevators.

(E39A) Pad 39A FSS Elevator Cars 1 & 2

8/11/2008

GMT 09:00:39 AM

PAD 39A ELEVATOR CAR #1				GROUP CONTROLLER		PAD 39A ELEVATOR CAR #2			
LEVEL		STATUS		HALL CALLS		LEVEL		STATUS	
255		<input type="radio"/> Power	<input type="radio"/> InSrv	UP CALLS	DOWN CALLS	255		<input type="radio"/> Power	<input type="radio"/> InSrv
235		<input type="radio"/> Safety	<input type="radio"/> Insp			235		<input type="radio"/> Safety	<input type="radio"/> Insp
215		<input type="radio"/> Up	<input type="radio"/> Auto	235	235	215		<input type="radio"/> Up	<input type="radio"/> Auto
195		<input type="radio"/> Down	<input type="radio"/> Indpt	215	215	195		<input type="radio"/> Down	<input type="radio"/> Indpt
175		<input type="radio"/> DOL	<input type="radio"/> DDIS	195	195	175		<input type="radio"/> DOL	<input type="radio"/> DDIS
155		<input type="radio"/> DCL	<input type="radio"/> EnPwr	175	175	155		<input type="radio"/> DCL	<input type="radio"/> EnPwr
135		<input type="radio"/> DGL	<input type="radio"/> FS 1	155	155	135		<input type="radio"/> DGL	<input type="radio"/> FS 1
115		<input type="radio"/> DZ	<input type="radio"/> FS 2	135	135	115		<input type="radio"/> DZ	<input type="radio"/> FS 2
95		<input type="radio"/> OK	<input type="radio"/> FSZ 1	115	115	95		<input type="radio"/> OK	<input type="radio"/> FSZ 1
75		<input type="radio"/> RUNLOC	<input type="radio"/> FSZ 2	95	95	75		<input type="radio"/> RUNLOC	<input type="radio"/> FSZ 2
PAD		<input type="radio"/> FS Byp	<input type="radio"/> HeartB	PAD	PAD	PAD		<input type="radio"/> FS Byp	<input type="radio"/> HeartB
		<input type="radio"/> OSRU						<input type="radio"/> OSRU	
DOOR PERFORMANCE TIMES				GROUP		DOOR PERFORMANCE TIMES			
		Latest	Previous	PLC STATUS				Latest	Previous
Time To Open	0	Sec	3	CAR 1		Time To Open	0	Sec	3
Dwell Time	0	Sec	8	PLC STATUS		Dwell Time	0	Sec	9
Time To Close	0	Sec	2	CAR 2		Time To Close	0	Sec	2
				PLC STATUS					
<input type="button" value="FAULTS"/> <input type="button" value="STATUS"/>				<input type="button" value="FAULTS"/> <input type="button" value="STATUS"/>		<input type="button" value="FAULTS"/> <input type="button" value="STATUS"/>			

EDT:05:00:39 AM

PROJ REV. 0.12.6    KPWR\_STD REV. 0.12.6    CITECT 5.42 r0    USER Steve Csoni    ELEVADA

The elevator remote monitor has a Main display, Faults display, Status display and an active Alarms display.

***A. The Main display of the remote monitor is organized with Pad 39A Elevator Car #1(FSS1) on the left, Elevator Car #2(FSS2) on the right and the hall call buttons (controlled by the Group controller) in the middle.***

1. The FSS1 elevator on the left shows buttons that you can click on with your mouse under the heading “Level”. These are called “Car Call” buttons. These simulate the buttons inside the elevator car that you press to take you to a certain floor. The button will light up and stay lit until the call is answered as long as there are no problems.

2. Next to the car call buttons there is a little dynamic display showing a little picture of an elevator which is about the size of the car call buttons and its purpose is to show the position of the elevator. The position of the elevator will move between the PAD level and the 255 level as directed by the elevator controller.

a) The dynamic display of the elevator will also show if the elevator doors are open or closed and whether the elevator is commanded to go up or go down. A green “Up” or red “Down” arrow will show up next to the elevator to indicate its commanded direction.

3. Under the STATUS heading of the FSS1 elevator there are pilot lights to give a quick indicator of the status of the elevator. The lights turn “ON”(yellow) and “OFF”(black) to show the various states of signals from the elevator. These pilot lights are described as follows with their normal running states indicated:

a) **Power: Power: ON**

b) **Safety: Safety String:ON**

c) **Up: Up Demand:ON or OFF**

d) **Down: Down Demand:ON or OFF**

e) **DOL: Door Open Limit: ON or OFF**

f) **DCL: Door Close Limit: ON or OFF**

- g) **DGL**: Door Gate Lock: ON or OFF(ON=Doors Closed)
- h) **DZ**: Door Zone: ON or OFF
- i) **OK**: Ok to Run: ON or OFF
- j) **RUNLOC**: Run Local: ON or OFF
- k) **EE**: Electronic Eye: ON or OFF(ON=Doors blocked)
- l) **InSrv**: In Service: **ON**
- m) **Insp**: Elevator Inspection Maintenance Mode: OFF
- n) **Auto**: Elevator Auto Mode: **ON**
- o) **Indpt**: Elevator Independent Mode: **OFF**
- p) **DDIS**: Doors Disable Maintenance Mode: **OFF**
- q) **EmPwr**: Emergency Power: OFF: Not in use.
- r) **FS 1**: Fire Service Phase 1: **OFF**
- s) **FS 2** : Fire Service Phase 2: **OFF**
- t) **FSZ 1**: Fire Service Zone 1: **OFF**
- u) **FSZ 2**: Fire Service Zone 2: **OFF**
- v) **FS BYP**: Fire Service Bypass: **OFF**
- w) **OSRV**: Elevator Out of Service: **OFF**
- x) **HeartB**: Elevator HeartBeat: **Toggles ON & OFF.**

The ones in **red** are to indicate the state of the pilot light that is required for the elevator to operate in normal automatic operation. The ones not in red will either

change state during normal running operations or are not in use.

4. Under the heading, “Door Performance Times”, there is a table that shows door performance data. This information will be used by the elevator shop system engineers and technicians.

5. The hall call buttons in the middle of the main screen are buttons that you can click on with the mouse to place a “Hall Call Request” just as if you physically walked up to the elevator and pushed the button to call the elevator.

a) The Hall “Up” or “Down” buttons should light up green (Up) or red (Down) and will go out when the elevator comes into the floor to answer the call.

b) In the lower middle of the main display are three PLC status indicators with an arrow. These will indicate communications status between KCCS and the elevator PLCs. A green arrow pointing up is the normal mode.

***B. There is a Faults display accessible from the Main display by clicking with the mouse on the FAULTS button located below the “Door Performance Times” data for FSS 1.***

***There are 27 possible different types of faults in this list.***

ipada_car_faults						
PAD 39A CAR 1 FAULT REPORT						
FAULT	DATE/TIME OCCURED	DATE/TIME CLEARED	LEVEL	DIRECTION	COUNT	RESET
NMPS			PAD	DOWN	7	NMPS
WWRUN				DOWN	0	WWRUN
BWDTOFF	4/7/2008 09:24:25 AM	4/7/2008 09:24:27 AM	95	DOWN	5	BWDTOFF
RDY	4/7/2008 09:24:45 AM	4/7/2008 09:24:47 AM	PAD	DOWN	9	RDY
DCOL	6/25/2008 02:38:17 PM		115	DOWN	32	DCOL
GOV	4/7/2008 09:25:21 AM	4/7/2008 09:25:23 AM	PAD	DOWN	11	GOV
TFL	4/7/2008 09:25:38 AM	4/7/2008 09:25:40 AM	235	DOWN	4	TFL
BFL			195	DOWN	0	BFL
PIT	4/7/2008 09:26:11 AM	4/7/2008 09:26:13 AM	PAD	DOWN	5	PIT
BFR	4/7/2008 09:26:24 AM	4/7/2008 09:26:26 AM	215	DOWN	7	BFR
SPS	4/7/2008 09:26:38 AM	4/7/2008 09:26:40 AM	PAD	DOWN	2	SPS
CTS	4/7/2008 09:26:55 AM	4/7/2008 09:26:57 AM	195	DOWN	6	CTS
EME	4/7/2008 09:27:15 AM	4/7/2008 09:27:17 AM	PAD	DOWN	7	EME
TNSP	4/7/2008 09:27:33 AM	4/7/2008 09:27:35 AM	135	DOWN	6	TNSP
BNSP	4/7/2008 09:27:55 AM	4/7/2008 09:27:57 AM	PAD	DOWN	10	BNSP
CSS	4/7/2008 09:28:16 AM	4/7/2008 09:28:18 AM	195	DOWN	8	CSS
SAFE	4/7/2008 09:28:37 AM	4/7/2008 09:28:39 AM	75	DOWN	5	SAFE
CGS	4/7/2008 09:28:49 AM	4/7/2008 09:28:51 AM	PAD	DOWN	5	CGS
TDL	4/7/2008 09:29:12 AM	4/7/2008 09:29:14 AM	PAD	DOWN	1	TDL
BDL	4/7/2008 09:29:28 AM	4/7/2008 09:29:30 AM	PAD	DOWN	1	BDL
DGL	4/7/2008 09:29:47 AM	4/7/2008 09:29:49 AM	195	DOWN	5	DGL
DPCNT	4/7/2008 09:30:05 AM	4/7/2008 09:30:07 AM	PAD	DOWN	3	DPCNT
BWDTON	4/7/2008 09:30:24 AM	4/7/2008 09:30:26 AM	PAD	DOWN	1	BWDTON
HSF	4/7/2008 09:30:37 AM	4/7/2008 09:30:39 AM	195	DOWN	1	HSF
DRSCNT	4/7/2008 09:30:51 AM	4/7/2008 09:30:52 AM	PAD	DOWN	2	DRSCNT
STLDMR	4/7/2008 09:31:06 AM	4/7/2008 09:31:09 AM	155	DOWN	5	STLDMR
TCOK	4/7/2008 09:31:24 AM	4/7/2008 09:31:25 AM	PAD	DOWN	1	TCOK

**Each one of these faults will prevent the elevator from running. If any one of these has a time stamp in the second column and there is not one in the third then there is a problem and the elevator shop needs to be notified.**

1. As a fault occurs, the date/time stamp is displayed and the date/time stamp of when it clears is displayed.
2. The report displays the position of the elevator when the fault occurred and which direction it was going.
3. There is a fault count to keep track of how many faults have occurred since the last time the faults have been reset. The faults are reset by clicking on the buttons under the “RESET” column. The “RESET” button is only to be used by the engineers and technicians in the elevator shop.
4. Exit the display to go back to the main display by clicking the “Close Window” icon button at the bottom of the window.

**C. There is a Status display accessible from the Main display by clicking with the mouse on the STATUS button located below the “Door Performance Times” data for FSS 1.**

!pada_car_status						
PAD 39A CAR 1 STATUS REPORT						
FAULT	DATE/TIME OCCURED	DATE/TIME CLEARED	LEVEL	DIRECTION	COUNT	RESET
SAFE					0	SAFE
OK					0	OK
INDLOC					0	INDLOC
FS2LOC					0	FS2LOC
OSRU					0	OSRV
INSP					0	INSP




1. This screen is to be mainly used by the elevator shop engineers and technicians.
2. There are 6 status signals. All of these are shown as pilot lights on the main display except for FS2LOC.
3. Exit the display to go back to the main display by clicking the “Open door” icon button at the bottom of the display.

***D. There is an active Alarms display accessible from the Main display by clicking with the mouse on the “Alarm Clock” Icon at the top right of the display.***

1. This screen is mainly used by the elevator shop engineers and technicians.
2. Exit the display to go back to the main display by clicking the “PrevPg” icon button at the Top Right of the display.

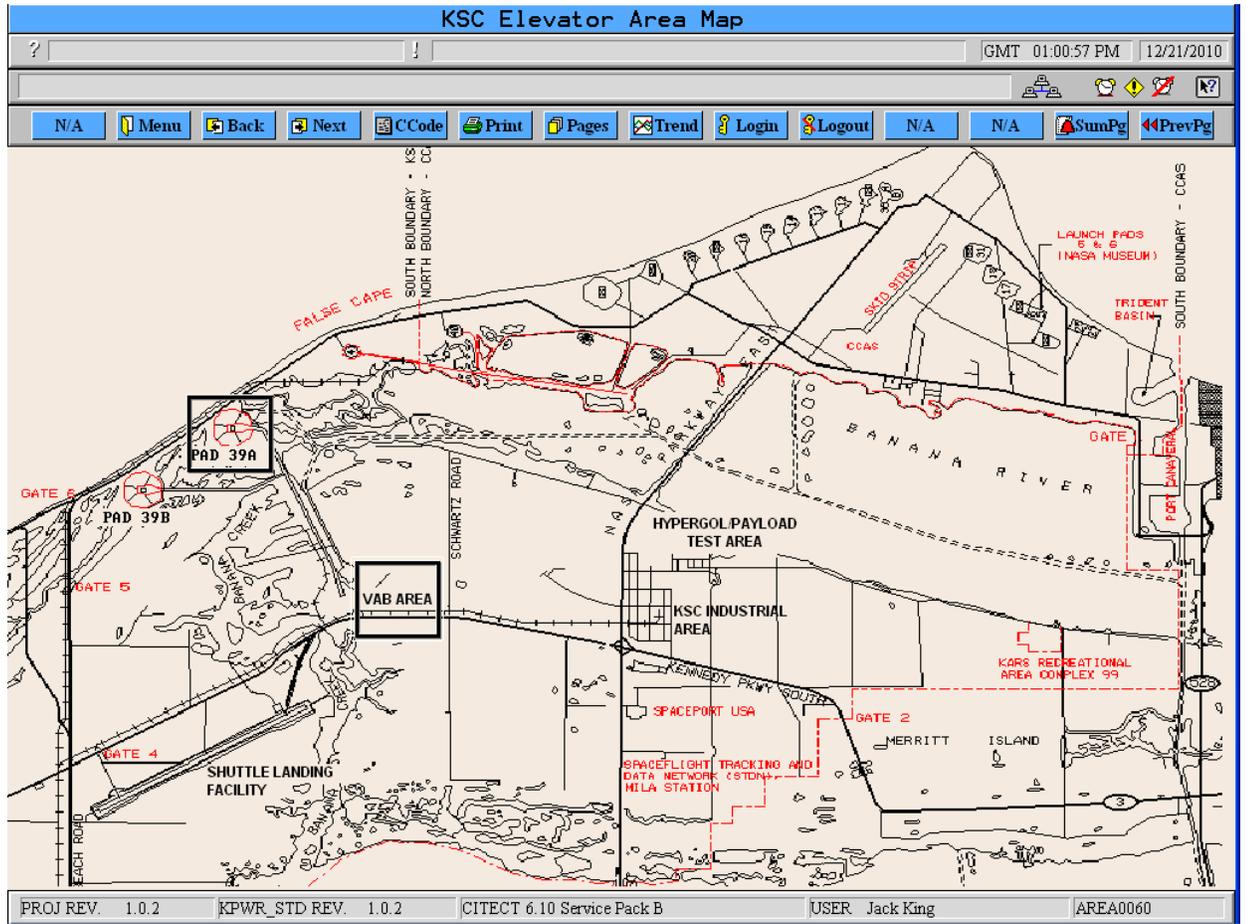
***E. All the faults and status information discussed above are identical for the FSS 2 elevator.***

***F. Pad Elevators Summary: The main display pilot lights are the first things to look at when checking the status of the elevators. They should all be in their normal states as indicated in paragraph 3 on pages 4 and 5.***

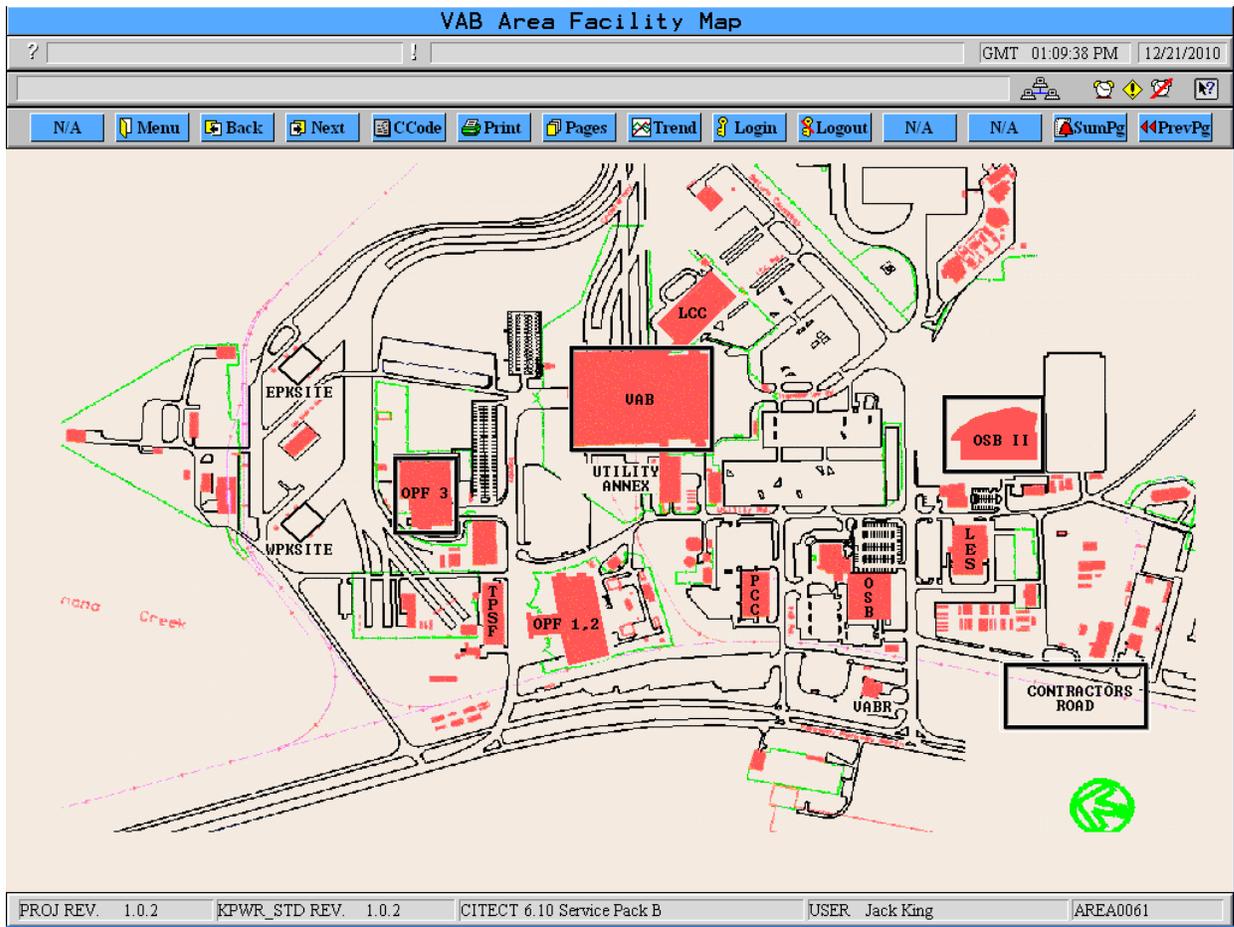
- 1. The most common ones to look at are InSrv, OSRV, Auto and Safety.**
- 2. One way to see if an elevator is responding is by clicking on one of the car call buttons with the mouse. If the elevator does not respond then there is a problem and the elevator shop needs to be notified.**
- 3. To check to see if the Group controller is dispatching the elevators ok, just click on a hall call button to see if an elevator responds. If the elevators do not respond then there is a problem and the elevator shop needs to be notified.**
- 4. If there are any Faults in the FAULTS display that do not have a time stamp under the "CLEARED" column, then there is a problem and the elevator shop needs to be notified.**

## II. VAB Area

Selecting the MENU icon brings you back to the elevator area map.

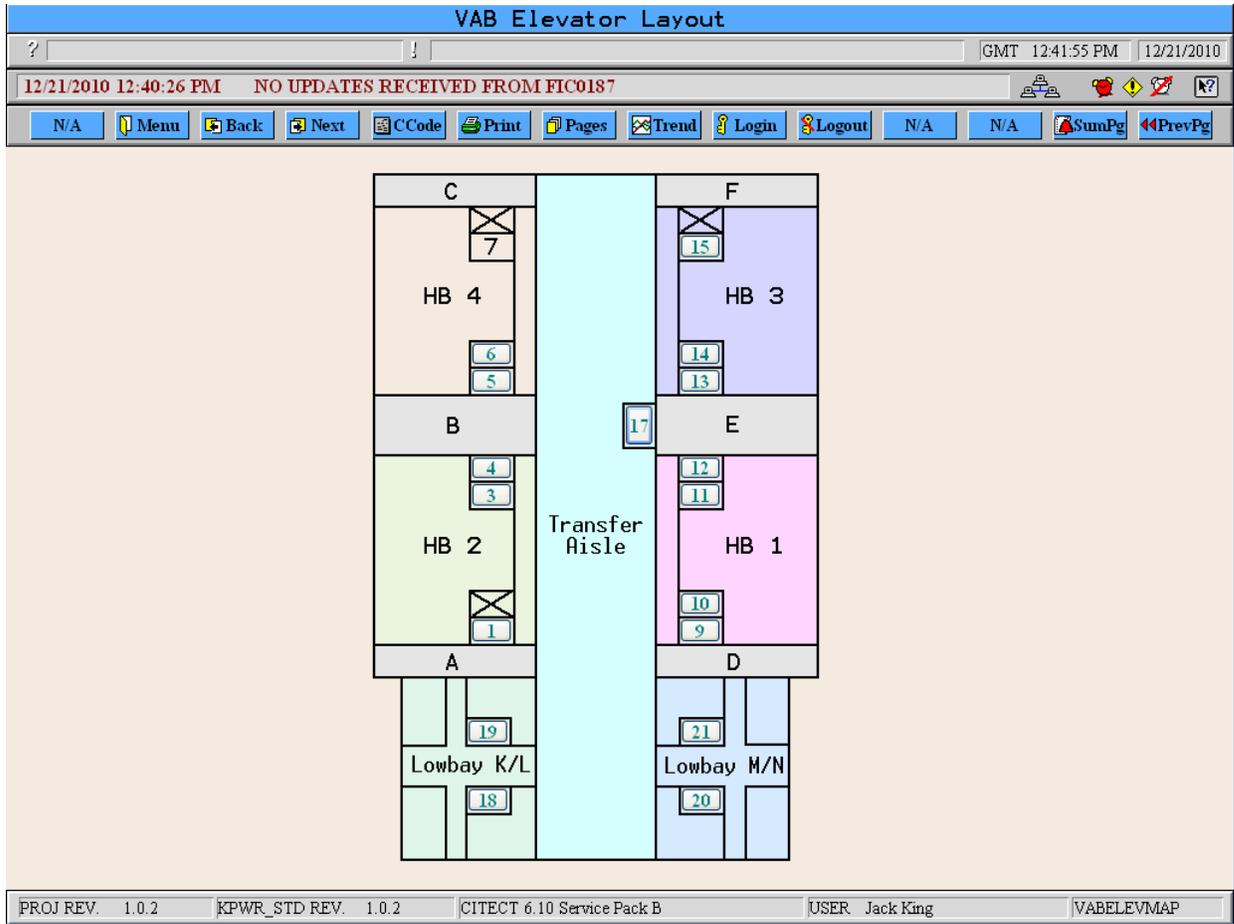


Selecting the VAB area box will bring up the VAB area elevators.



In this screen, there are three buildings(VAB, OPF 3, OSB II) and one area(Contractors road) that can be selected. Clicking on the VAB will bring up a plan view layout( shown below) showing the general locations of all the elevators inside the VAB.

**\*\*Note that the elevator in C tower is not actively monitored on KCCS. The elevator controls will need to be upgraded before KCCS can connect to it.**



## A. VAB Elevators

To pull up an elevator on the screen, just click on the elevator number. For example, click on VAB elevator 1 in HB 2 in A tower. The following screen will then display in front of you.

**(VAB1) VAB A Tower Elevator #1**

GMT 12:42:28 PM 12/21/2010

12/21/2010 12:40:26 PM NO UPDATES RECEIVED FROM FICO187

UAB ELEVATOR #1				UAB 1 HALL CALLS		
PI	FRONT	POSITION	REAR	LK	CALL	HALL BUTTON STATIONS
						UP CALLS LOCK HALL DN CALLS
36	34				34	34 34
35						
34						
33	31				31	31 31
32						
31						
30	28				28	28 28
29						
28						
27	25				25	25 25
26						
25						
24	22				22	22 22
23						
22	20				20	20 20
21	19				19	19 19
20						
19						
18	16				16	16 16
17						
16	14				14	14 14
15	13				13	13 13
14						
13						
12						
11	10				10	10 10
10						
9	9				9	9 9
8						
7	7		E		7	7 E 7 E
6						
5	5				5	5 5
4						
3	3				3	3 3
2	2				2	2 2
1	1				1	1 K 1 K

STATUS

- Power
- Safety
- Up
- Down
- DOL
- DCL
- DOLR
- DCLR
- RLK
- DGL
- DZ
- RDZ
- OK
- RUNLOC
- EE
- EER
- SEC
- InSrv
- Insp
- Auto
- Indpt
- DDIS
- EmPwr
- FS 1
- FS 2
- FSZ 1
- FSZ 2
- FS Byp
- OSRU
- HeartB

FAULTS STATUS

UAB 1 PLC STATUS

DOOR PERFORMANCE

FRONT DOOR

Latest Previous

Time To Open

0 S 6 S

Dwell Time

0 S 0 S

Time To Close

0 S 4 S

REAR DOOR

Latest Previous

Time To Open

0 S 0 S

Dwell Time

0 S 0 S

Time To Close

0 S 0 S

EST: 07:42:28 AM

PROJ REV. 1.0.2    KPWR\_STD REV. 1.0.2    CITECT 6.10 Service Pack B    USER Jack King    ELEVVAB1

1. This is the Main Display for the elevator VAB #1. This display is similar to the Pad elevator's display except that there is only one elevator and there are more car calls and hall calls. There are also some rear floors.

2. There are a few more Status pilot lights added to account for the rear floors. A Security Bypass Pilot light(SEC) has also been added to monitor the position of the Security Bypass switch.

3. The Faults and Status screens are very similar to the pad elevators.

!vab_car_faults						
VAB ELEVATOR 1 FAULT REPORT						
FAULT	DATE/TIME OCCURED	DATE/TIME CLEARED	LEVEL	DIRECTION	COUNT	RESET
NMPS			0		0	NMPS
WWRUN			0		0	WWRUN
BWDTOFF			0		0	BWDTOFF
RDY			0		0	RDY
GOU/SSSW			0		0	GOU/SSSW
TFL			0		0	TFL
BFL			0		0	BFL
PIT/CMPS			0		0	PIT/CMPS
SPS			0		0	SPS
CTS			0		0	CTS
TNSP			0		0	TNSP
BNSP			0		0	BNSP
CSS			0		0	CSS
BSS			0		0	BSS
SAFE			0		0	SAFE
CGS			0		0	CGS
TDL			0		0	TDL

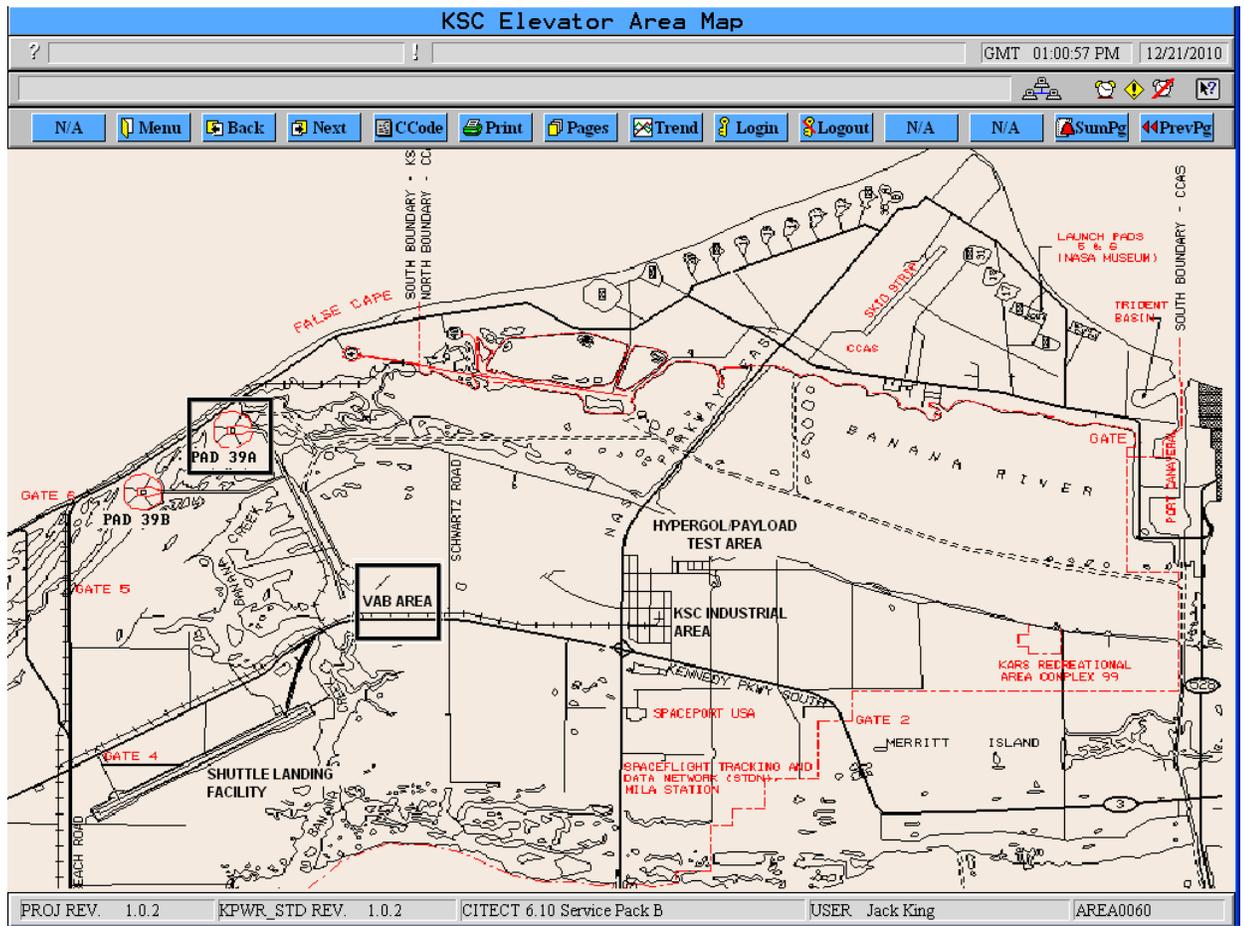
PAGE 1 OF 2

!vab_car_faults2						
VAB ELEVATOR 1 FAULT REPORT						
FAULT	DATE/TIME OCCURED	DATE/TIME CLEARED	LEVEL	DIRECTION	COUNT	RESET
BDL			0		0	BDL
IDGL			0		0	IDGL
DPCNTF			0		0	DPCNTF
DPCNTR			0		0	DPCNTR
BWDTON			0		0	BWDTON
HSF			0		0	HSF
DRSCNT			0		0	DRSCNT
STLDTMRF			0		0	STLDTMRF
STLDTMRR			0		0	STLDTMRR
SWF			0		0	SWF
LTL			0		0	LTL
DUPFLT			0		0	DUPFLT
HDR			0		0	HDR
DGLFHS			0		0	DGLFHS
NINS			0		0	NINS
MRFX			0		0	MRFX

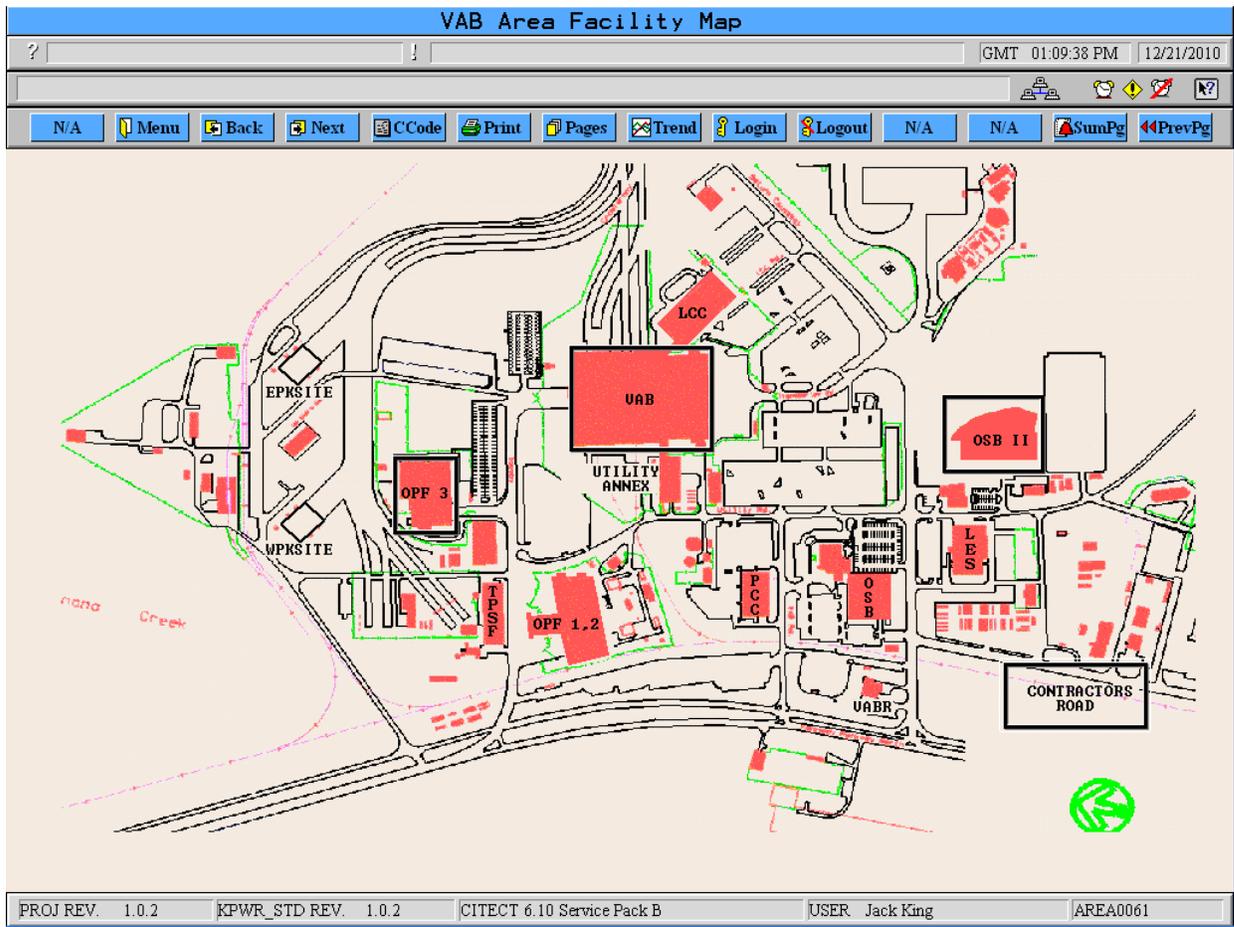
PAGE 2 OF 2

## B. OPF 3 Lowbay and OSB II Elevators

Selecting the MENU icon brings you back to the elevator area map.



Selecting the VAB area box will bring up the VAB area elevators.



Selecting either OPF 3 or OSB II will bring up the elevator(s) for those buildings. Currently, OPF 3 has just the Lowbay elevator on KCCS. The OSB II building has elevators OSB 6, 7, 8 and 9 on KCCS. The wheelchair lift OSB10 is not currently on KCCS.

**OPF-3 Low Bay Elevator**

GMT 12:56:59 PM 12/21/2010

---

OPF-3 LOW BAY ELEVATOR			OPF-3 HALL CALLS	
CAR CONTROL	POSITION	STATUS	HALL BUTTON STATIONS	
2 1		<ul style="list-style-type: none"> <li><input type="radio"/> Power</li> <li><input type="radio"/> Safety</li> <li><input type="radio"/> Up</li> <li><input type="radio"/> Down</li> <li><input type="radio"/> DOL</li> <li><input type="radio"/> DCL</li> <li><input type="radio"/> DGL</li> <li><input type="radio"/> DZ</li> <li><input type="radio"/> OK</li> <li><input type="radio"/> RUNLOC</li> <li><input type="radio"/> EE</li> <li><input type="radio"/> InSrv</li> <li><input type="radio"/> Insp</li> <li><input type="radio"/> Auto</li> <li><input type="radio"/> DDIS</li> <li><input type="radio"/> EmPwr</li> <li><input type="radio"/> FS 1</li> <li><input type="radio"/> FS 2</li> <li><input type="radio"/> FSZ 1</li> <li><input type="radio"/> FSZ 2</li> <li><input type="radio"/> FS Byp</li> <li><input type="radio"/> OSRU</li> <li><input type="radio"/> HeartB</li> </ul>	Up Calls 1	Down Calls 2
<b>DOOR PERFORMANCE TIMES</b>				
		Latest	Previous	
Time To Open	0	Sec	0	Sec
Due11 Time	0	Sec	0	Sec
Time To Close	0	Sec	0	Sec
<input type="button" value="FAULTS"/> <input type="button" value="STATUS"/>				

PROJ REV. 1.0.2    KPWR\_STD REV. 1.0.2    CITECT 6.10 Service Pack B    USER: Jack King    ELEVOPF3

**(E0SB2) OSB II Elevators 6, 7, 8 and 9**

GMT 12:58:13 PM 12/21/2010

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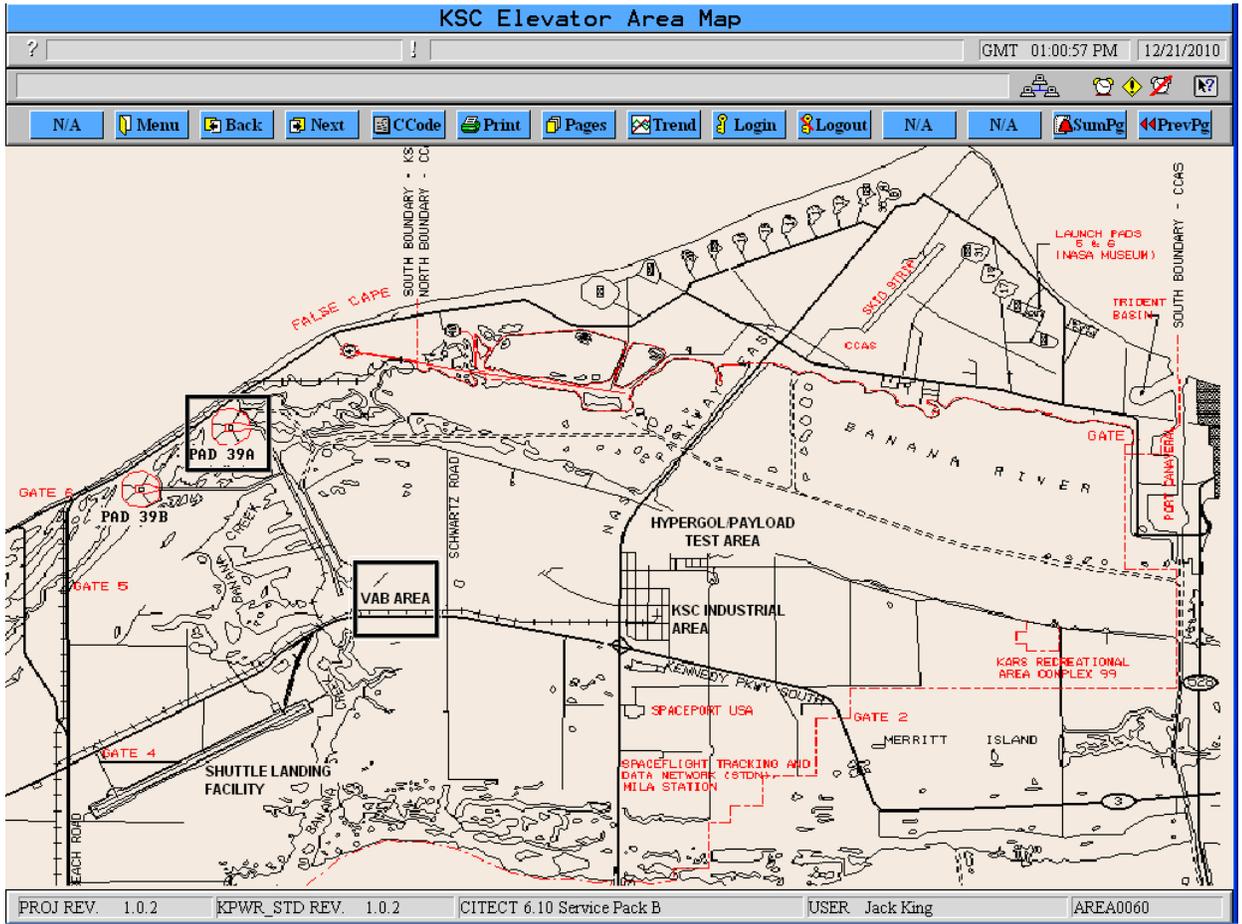
OSB II ELEVATORS 6,7,8												OSB II ELEVATOR 9								
OSB 6 STATUS			OSB 7 STATUS			OSB 8 STATUS			OSB 9 STATUS											
<ul style="list-style-type: none"> <li><input type="radio"/> Power</li> <li><input type="radio"/> Safety</li> <li><input type="radio"/> Up</li> <li><input type="radio"/> Down</li> <li><input type="radio"/> DOL</li> <li><input type="radio"/> DCL</li> <li><input type="radio"/> DGL</li> <li><input type="radio"/> DZ</li> <li><input type="radio"/> OK</li> <li><input type="radio"/> RUNLOC</li> <li><input type="radio"/> EE</li> <li><input type="radio"/> InSrv</li> <li><input type="radio"/> Insp</li> <li><input type="radio"/> Auto</li> <li><input type="radio"/> Indpt</li> <li><input type="radio"/> DDIS</li> <li><input type="radio"/> EmPwr</li> <li><input type="radio"/> FS 1</li> <li><input type="radio"/> FS 2</li> <li><input type="radio"/> FSZ 1</li> <li><input type="radio"/> FSZ 2</li> <li><input type="radio"/> OK</li> <li><input type="radio"/> FS Byp</li> <li><input type="radio"/> OSRU</li> <li><input type="radio"/> HeartB</li> </ul>			<ul style="list-style-type: none"> <li><input type="radio"/> Power</li> <li><input type="radio"/> Safety</li> <li><input type="radio"/> Up</li> <li><input type="radio"/> Down</li> <li><input type="radio"/> DOL</li> <li><input type="radio"/> DCL</li> <li><input type="radio"/> DGL</li> <li><input type="radio"/> DZ</li> <li><input type="radio"/> OK</li> <li><input type="radio"/> RUNLOC</li> <li><input type="radio"/> EE</li> <li><input type="radio"/> InSrv</li> <li><input type="radio"/> Insp</li> <li><input type="radio"/> Auto</li> <li><input type="radio"/> Indpt</li> <li><input type="radio"/> DDIS</li> <li><input type="radio"/> EmPwr</li> <li><input type="radio"/> FS 1</li> <li><input type="radio"/> FS 2</li> <li><input type="radio"/> FSZ 1</li> <li><input type="radio"/> FSZ 2</li> <li><input type="radio"/> OK</li> <li><input type="radio"/> FS Byp</li> <li><input type="radio"/> OSRU</li> <li><input type="radio"/> HeartB</li> </ul>			<ul style="list-style-type: none"> <li><input type="radio"/> Power</li> <li><input type="radio"/> Safety</li> <li><input type="radio"/> Up</li> <li><input type="radio"/> Down</li> <li><input type="radio"/> DOL</li> <li><input type="radio"/> DCL</li> <li><input type="radio"/> DGL</li> <li><input type="radio"/> DZ</li> <li><input type="radio"/> OK</li> <li><input type="radio"/> FS Byp</li> <li><input type="radio"/> OSRU</li> <li><input type="radio"/> InSrv</li> <li><input type="radio"/> Insp</li> <li><input type="radio"/> Auto</li> <li><input type="radio"/> Indpt</li> <li><input type="radio"/> DDIS</li> <li><input type="radio"/> EmPwr</li> <li><input type="radio"/> FS 1</li> <li><input type="radio"/> FS 2</li> <li><input type="radio"/> FSZ 1</li> <li><input type="radio"/> FSZ 2</li> <li><input type="radio"/> OK</li> <li><input type="radio"/> FS Byp</li> <li><input type="radio"/> OSRU</li> <li><input type="radio"/> HeartB</li> </ul>			<ul style="list-style-type: none"> <li><input type="radio"/> Power</li> <li><input type="radio"/> Safety</li> <li><input type="radio"/> Up</li> <li><input type="radio"/> Down</li> <li><input type="radio"/> DOL</li> <li><input type="radio"/> DCL</li> <li><input type="radio"/> DGL</li> <li><input type="radio"/> DZ</li> <li><input type="radio"/> OK</li> <li><input type="radio"/> FS Byp</li> <li><input type="radio"/> OSRU</li> <li><input type="radio"/> InSrv</li> <li><input type="radio"/> Insp</li> <li><input type="radio"/> Auto</li> <li><input type="radio"/> Indpt</li> <li><input type="radio"/> DDIS</li> <li><input type="radio"/> EmPwr</li> <li><input type="radio"/> FS 1</li> <li><input type="radio"/> FS 2</li> <li><input type="radio"/> FSZ 1</li> <li><input type="radio"/> FSZ 2</li> <li><input type="radio"/> OK</li> <li><input type="radio"/> FS Byp</li> <li><input type="radio"/> OSRU</li> <li><input type="radio"/> HeartB</li> </ul>			<input type="button" value="OSB II 6 PLC STATUS"/> <input type="button" value="OSB II 7 PLC STATUS"/> <input type="button" value="OSB II 8 PLC STATUS"/> <input type="button" value="EST:07:58:13 AM"/>				<input type="button" value="OSB II 9 PLC STATUS"/>				
DOOR PERFORMANCE			DOOR PERFORMANCE			DOOR PERFORMANCE			DOOR PERFORMANCE											
		Latest	Previous				Latest	Previous				Latest	Previous							
Time To Open	0	S	0	S	2	S	0	S	2	S	0	S	0	S	3	S				
Due11 Time	0	S	17	S	0	S	0	S	0	S	0	S	0	S	0	S				
Time To Close	0	S	0	S	2	S	0	S	2	S	0	S	0	S	458	S				
OSB 6,7,8 HALL CALLS			OSB 7 HALL CALLS			OSB 8 HALL CALLS			OSB 9 HALL CALLS											
<input type="button" value="FAULTS"/> <input type="button" value="STATUS"/>			<input type="button" value="FAULTS"/> <input type="button" value="STATUS"/>			<input type="button" value="FAULTS"/> <input type="button" value="STATUS"/>			<input type="button" value="FAULTS"/> <input type="button" value="STATUS"/>											
HALL MASTER OSB 6												HALL MASTER OSB 7			HALL MASTER OSB 8			HALL MASTER OSB 9		
Up Calls	Lock Hall	Down Calls	FRONT	POSITION	LOCK CALL	FRONT	POSITION	LOCK CALL	FRONT	POSITION	LOCK CALL	FRONT	POSITION	LOCK CALL	Up Calls	Lock Hall	Down Calls			
5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5			
4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4			
3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3			
2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2			
1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1			

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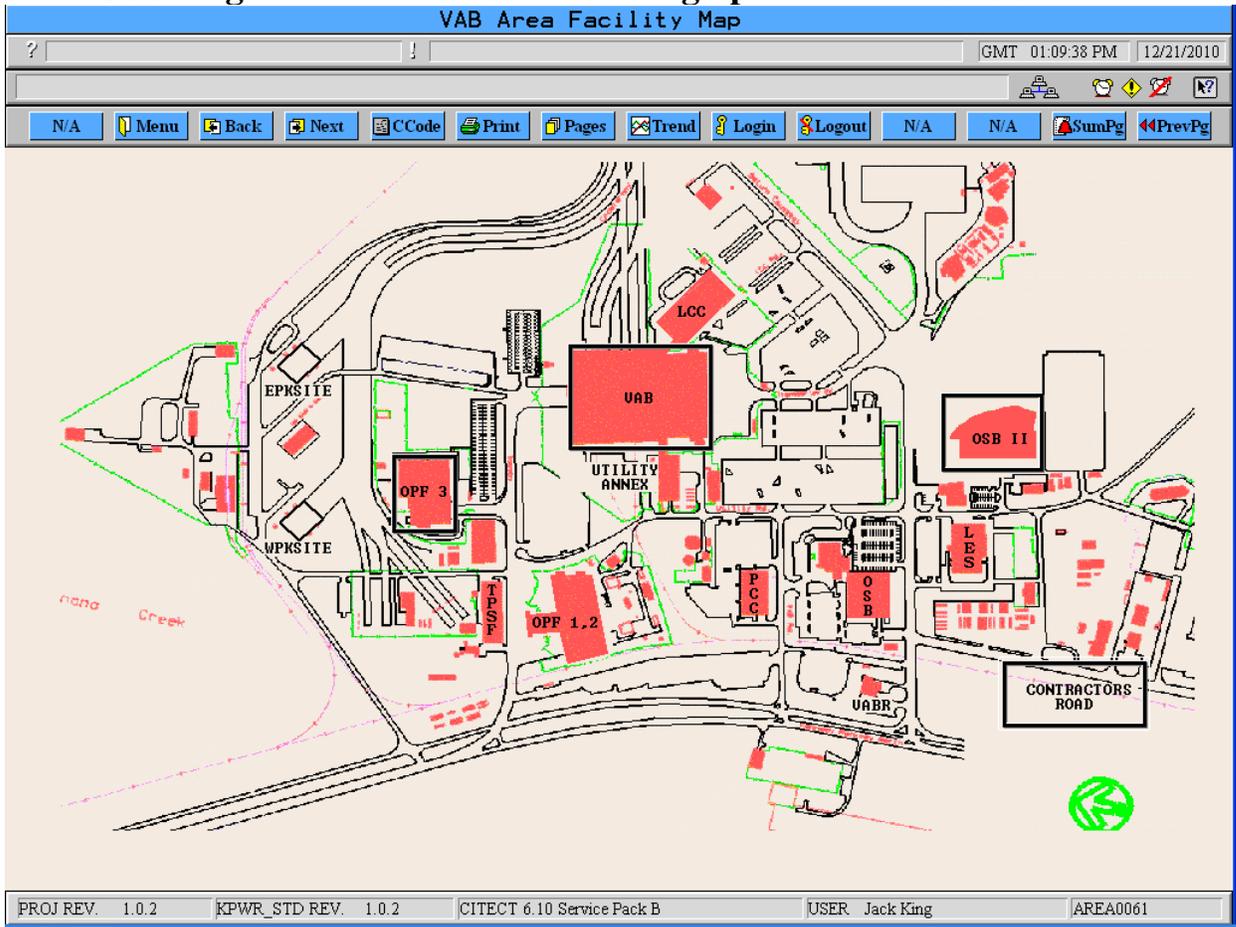
**Notice that the display for the OSB II building shows four elevators on one display. The first three from left to right(OSB 6, 7, 8) are the passenger elevators and the far one on the right(OSB 9) is the freight elevator.**

## C. Logistics Elevator

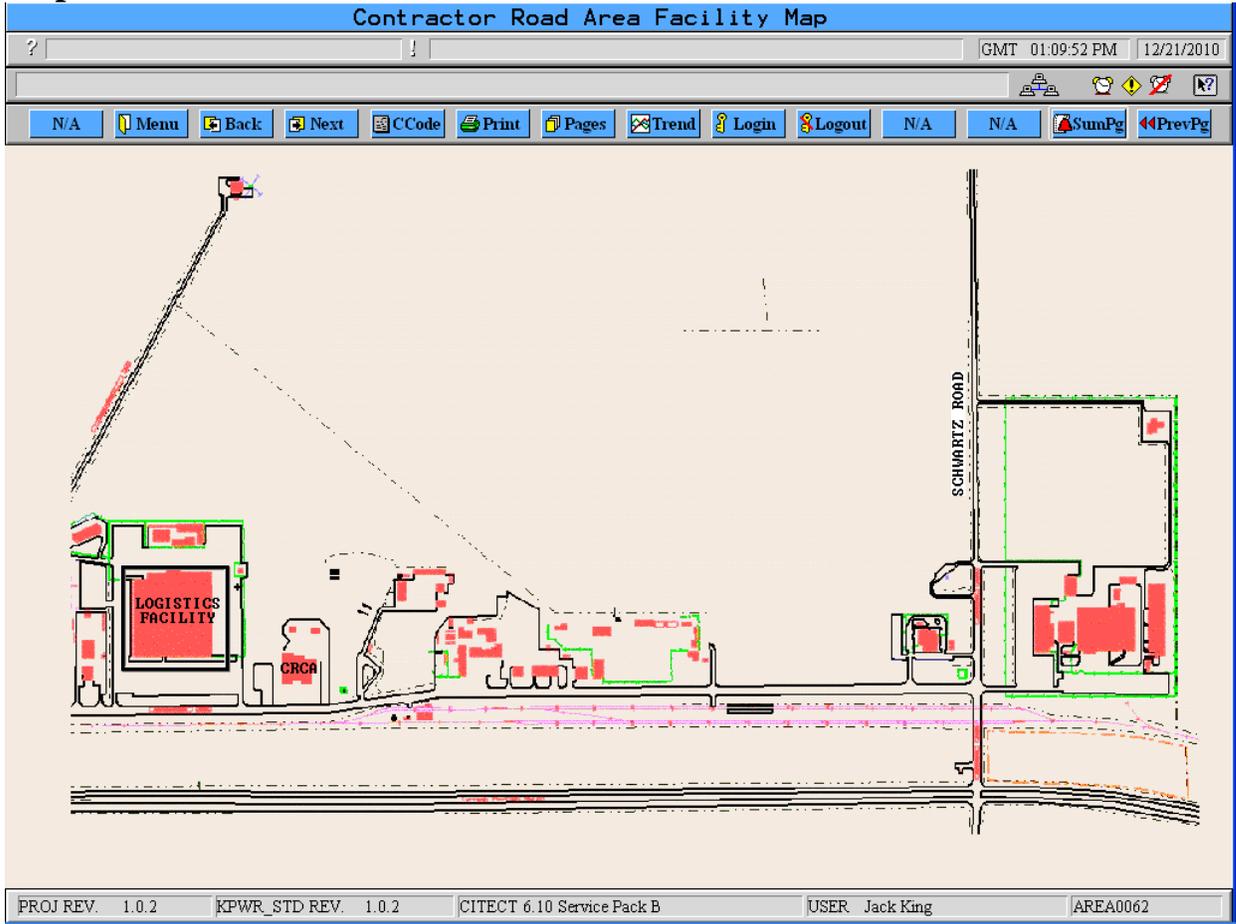
Selecting the MENU icon brings you back to the elevator area map.



# Selecting the VAB area box will bring up the VAB area elevators.



Selecting Contractors Road will bring up the Contractor Road area map.



Selecting the Logistics Facility will bring up the passenger elevator for Logistics Warehouse office building.

LOGISTICS PASSENGER ELEVATOR							LOGISTICS HALL CALLS					
FRONT	POSITION	LOCK CALL	STATUS				HALL BUTTON STATIONS					
			<ul style="list-style-type: none"> <li>● Power</li> <li>● Safety</li> <li>● Up</li> <li>● Down</li> <li>● DOL</li> <li>● DCL</li> <li>● DGL</li> <li>● DZ</li> <li>● OK</li> <li>● RUNLOC</li> <li>● EE</li> </ul>	<ul style="list-style-type: none"> <li>● InSrv</li> <li>● Insp</li> <li>● Auto</li> <li>● Indpt</li> <li>● DDIS</li> <li>● EmPwr</li> <li>● FS 1</li> <li>● FS 2</li> <li>● FSZ 1</li> <li>● FSZ 2</li> <li>● FS Byp</li> <li>● OSRU</li> <li>● HeartB</li> </ul>	Up Calls	Lock Hall	Down Calls					
3		3										
2		2					2	2	2			
1		1					1	1	1			
DOOR PERFORMANCE TIMES							LOGISTICS PLC STATUS EST: 07:54:57 AM					
			Latest		Previous							
Time To Open			0	Sec	3	Sec						
Dwell Time			0	Sec	0	Sec						
Time To Close			0	Sec	3	Sec						
			FAULTS		STATUS							

## D. Elevators PLC Status Screen

**There is another way to navigate to the many different elevators on KCCS. On every Main display of an elevator there is a “PLC STATUS” button with an arrow pointing up or down. Click on it and the following display will come up.**

Elevator PLC Status Page			Elevator PLC Status Page		
?			GMT 12:40:56 PM 12/21/2010		
N/A Menu Back Next CCode Print Pages Trend Login Logout N/A N/A SunPg PrevPg			N/A Menu Back Next CCode Print Pages Trend Login Logout N/A N/A SunPg PrevPg		
FIC	DESCRIPTION	STATUS	FIC	DESCRIPTION	STATUS
0357	39A ELEVATOR CONTROLLER	MEMORY2	0607	OPF-3 LOW BAY ELEVATOR	MEMORY3
0359	39A ELEVATOR CAR #1	MEMORY2	0609	LOGISTICS PASS ELEV	MEMORY3
0361	39A ELEVATOR CAR #2	MEMORY2			
0565	OSB-II ELEVATOR #6	MEMORY3			
0567	OSB-II ELEVATOR #7	MEMORY3			
0569	OSB-II ELEVATOR #8	MEMORY3			
0571	OSB-II FREIGHT ELEV #9	MEMORY3			
0573	VAB A TWR ELEVATOR #1	MEMORY3			
0575	VAB B TWR ELEVATOR #3	MEMORY3			
0577	VAB B TWR ELEVATOR #4	MEMORY3			
0579	VAB B TWR ELEVATOR #5	MEMORY3			
0581	VAB B TWR ELEVATOR #6	MEMORY3			
0583	VAB D TWR ELEVATOR #9	MEMORY3			
0585	VAB D TWR ELEVATOR #10	MEMORY3			
0587	VAB E TWR ELEVATOR #11	MEMORY3			
0589	VAB E TWR ELEVATOR #12	MEMORY3			
0591	VAB E TWR ELEVATOR #13	MEMORY3			
0593	VAB E TWR ELEVATOR #14	MEMORY3			
0595	VAB F TWR ELEVATOR #15	MEMORY3			
0597	VAB ROOF ELEVATOR #17	MEMORY3			
0599	VAB K,L LB 1 ELEV #18	MEMORY3			
0601	VAB K,L LB 1 ELEV #19	MEMORY3			
0603	VAB M,N LB 1 ELEV #20	MEMORY3			
0605	VAB M,N LB 1 ELEV #21	MEMORY3			

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**This screen is very helpful when a quick status is needed to determine if an elevator is currently out of service.**

1. Under normal conditions all the text under the column heading “Description” for each elevator should be highlighted GREEN(except for “39A elevator controller” at the top). If the text is not highlighted green and is

highlighted RED then the elevator is currently out of service.

2. Under the column heading “STATUS”, each elevator should show this field as highlighted green or yellow and show text as “PrimaryX” or “StandbyX”. If it states “OFFLINE” and is highlighted RED then there is no communication between KCCS and the elevator’s PLC.

***E. VAB Area Elevators Summary: The main display pilot lights are the first things to look at when checking the status of the elevators. They should all be in their normal states as indicated in paragraph 3 on pages 4 and 5***

1. The most common ones to look at are InSrv, OSRV, Auto and Safety.
2. One way to see if an elevator is responding is by clicking on one of the car call buttons with the mouse. If the elevator does not respond then there is a problem and the elevator shop needs to be notified.
3. To check to see if the elevators in a group are dispatching ok, just click on a hall call button to see if an elevator responds. If the elevators do not respond then there is a problem and the elevator shop needs to be notified.
4. If there are any Faults in the FAULTS display that do not have a time stamp under the “CLEARED” column, then there is a problem and the elevator shop needs to be notified.
5. A quick status check of all the elevators can be obtained on the PLC Status screen. A highlighted Red indicates a problem.

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