

Amendment No. 1
RFP FQ14021/STH
Elevators Rehabilitation – 100Units

WASHINGTON METROPOLITAN AREA TRANSIT AUTHORITY (WMATA)
600 FIFTH STREET, NW
WASHINGTON, DC 20001

OCTOBER 23, 2013



AMENDMENT NO. 1

REQUEST FOR PROPOSAL
(RFP) FQ14021/STH
ELEVATORS REHABILITATION – 100 UNITS

TO WHOM IT MAY CONCERN:

RFP – FQ14021/STH for the above referenced project is hereby changed in part as listed below:

1. The original solicitation package stated that proposals would be received on Tuesday, October 29, 2013 at 2:00PM, WMATA's Jackson Graham Building (JGB) Headquarters, Lobby Level at 600 5th Street N.W., Washington DC 20001. **This date and time has been changed to Monday, November 18, 2013 at 10:00AM.**
2. Technical, Contractual, or Administrative questions, please email them to shussey@wmata.com and lpepper@wmata.com no later than 2:00PM, **Thursday, October 31, 2013.**
3. The Authority received a total of fourteen (14) Requests for Information (RFI)/Questions as of October 18, 2013. WMATA provides responses to all fourteen (14) questions in Amendment Number 1, dated October 23, 2013.
4. Add Station Site Survey Schedule from October 28 thru 31, 2013.
5. SPECIAL PROVISIONS, PAGE 208 DELETE ONLY ARTICLE 2.58, QUALITY ASSURANCE COMPLIANCE IN ITS ENTIRETY.

ADD Article 2.58 QUALITY MANAGEMENT SYSTEM:

<u>Section</u>	<u>Add Pages</u>
2 (Special Provisions)	208, 208a thru 208h

6. TECHNICAL
Delete the following listed page and substitute the accompany page:

<u>Section</u>	<u>Delete Pages</u>	<u>Substitute Pages</u>
14210 (Technical)	3 thru 61	3 thru 56 Revised AM1 Dated 10-23-13
14211 (Technical)	62 thru 100	57 thru 113 Revised AM1 Dated 10-23-13
14221 (Technical)	101 thru 141	114 thru 156 Revised AM1 Dated 10-23-13

Washington
Metropolitan Area
Transit Authority

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www.metroopensdoors.com

A District of Columbia,
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All other terms and conditions remain the same.

Offeror is required to acknowledge receipt of this Amendment on the Solicitation, Offer and Award Form in the space provided. Failure to acknowledge all amendments may cause the proposal to be considered not responsive, which would require rejection of the Proposal.



Kunj Behari
Contracting Officer
Office of Procurement & Materials
Attachments

Elevator Rehabilitation - 100 Units

Questions and Responses

October 23, 2013

Hydraulic Elevators (Section 14210)

1. QUESTION: Specification section 1.02.A.24 (page 6): This work is not referenced in the matrix. Please confirm that new battery lowering devices are to be added to all new and existing hydraulic elevators controllers.

RESPONSE: Correct. All hydraulic elevators are to receive a battery lowering device.

2. QUESTION: Specification section 1.02.A.25/26 (page 6): This work is not referenced in the matrix. Please confirm that all machine rooms and pits are to be painted.

RESPONSE: Correct. All machine rooms and pits are to be painted.

3. QUESTION: Specification section 2.03.A.6 (page 16): Please confirm that raceway (duct) in the hoistway is not allowed, and all conduits are to be rigid galvanized with threaded joints, and all boxes NEMA 4x.

RESPONSE: Correct. Raceway is not permitted in the hoistway. All conduits in the hoistway are to be galvanized rigid pipe with threaded joints. All boxes in the hoistway are to be NEMA 4X.

4. QUESTION: Specification section 2.03.F.13/14 (page 41): Are the hall stations and car tops to include communications system?

RESPONSE: The existing communication devices in the hall stations and car top are to be retained. The Contractor shall provide provisions for, mount, wire and make the system operational in the new hall stations and car tops per code.

5. QUESTION: Specification section 2.04.F (page 50): The existing kiosk control system does not have the ability to perform a number of functions required throughout the specifications. Additionally, some of the kiosk control system main boards do not have the additional capacity necessary to connect the added signaling devices. Is the contractor responsible to make all necessary modifications (software and hardware) to make the overall system function for all elevators in the contract?

RESPONSE: It is the responsibility of the Contractor to make all required modifications to the kiosk control system in order to provide an operational system as described in the Specifications.

6. QUESTION: Specification section 2.05.K (page 56): This work is not referenced in the matrix. Please confirm if all machine room lighting is to be replaced, or only supplemented to meet code requirements.

RESPONSE: The Contractor is responsible for providing code compliant lighting in the machine rooms. This can be accomplished by supplementing the existing lighting. Where the existing lighting is retained, it is the responsibility of the Contractor to ensure that the installation is code compliant.

Geared Traction Elevators (Section 14211)

7. QUESTION: Specification section 1.02.A.3: This work is not referenced in the matrix. Please confirm that all geared machines are to be replaced.

RESPONSE: It is confirmed that all geared machines are to be replaced.

8. QUESTION: Specification section 1.02.A.28: This work is not referenced in the matrix. Please confirm that all deflectors, 2:1, and drive sheaves are to be replaced.

RESPONSE: It is confirmed that all sheaves are to be replaced on the geared traction elevators.

9. QUESTION: Specification section 1.02.A.27: This work is not referenced in the matrix. Please confirm that all brakes are to be replaced.

RESPONSE: It is confirmed that all brakes are to be replaced on the geared traction elevators.

Gearless Traction Elevators (Section 14221)

10. QUESTION: Specification section 2.03.D (page 114): This work is not referenced in the matrix. Please confirm that the existing controllers are to be retained and only the SCR drive is to be replaced

RESPONSE: New controllers are to be provided for the gearless traction elevators as noted in section 1.02.A.11.

General Questions

11: QUESTION: Will any post-modernization maintenance (1, 3 or 5 –year renewable terms after warranty) be considered to be awarded with the specified modernization work?

RESPONSE: Maintenance will not be part of the specified modernization work

12: QUESTION: Please confirm that the durations shown for each unit do not include time for inspections.

RESPONSE: Confirmed

13. QUESTION: I want to follow protocol and make a formal request for any information available on the units in the Solicitation FQ14021/LP Elevator rehabilitation. Does WMATA currently have data on the units such as: Rise, Speed, Capacity, Openings, Landings, Etc. This information would be extremely useful to all bidders when performing site surveys next week.

RESPONSE: The requested information which WMATA has was provided at the end of Appendices A, B and C.

14. QUESTION: We respectfully request expedited access (either escorted or unescorted) to all 100 elevators and related equipment spaces included as part the FQ14012-STH Elevator Rehab 100 units project. Our team wishes to perform a comprehensive survey of the machines, ancillary equipment, and surrounding areas. The information we obtain is necessary to assemble an accurate proposal for the work. In addition to ensuring accuracy of our proposal, RFP sections "General Conditions 1.13 & 1.28" necessitate our inspection of the respective elevators, supporting equipment, and surrounding areas.

RESPONSE: See survey schedule included in Amendment #1

	Station Name	Unit	Survey Date
1	Woodley Park	A04X02	Monday, October 28, 2013 Meeting location: Kiosk at Shady Grove at 8:00am
2	Friendship Heights	A08N02	
3	Friendship Heights	A08S01	
4	Friendship Heights	A08S02	
5	Friendship Heights	A08S03	
6	Friendship Heights	A08S04	
7	Friendship Heights	A08S05	
8	Medical Center	A10X01	
9	Medical Center	A10X02	
10	Rockville	A14X03	
11	Shady Grove	A15X01	
12	Shady Grove	A15X02	
13	Judiciary Square	B02N02	Monday, October 28, 2013 Meeting location: Kiosk at Judiciary Square at 4:00pm
14	Brookland	B05X01	
15	Fort Totten	B06X01	
16	Takoma	B07X01	
17	Silver Spring	B08S01	
18	Forest Glen	B09X01	
19	Forest Glen	B09X02	
20	Forest Glen	B09X03	
21	Forest Glen	B09X04	
22	Forest Glen	B09X05	
23	Forest Glen	B09X06	
24	Wheaton (Pedestrian Bridge)	B10X02	
25	Wheaton (Pedestrian Bridge)	B10X03	
26	Glenmont	B11X01	
27	Glenmont	B11X02	
28	Glenmont	B11X03	
29	New York Ave	B35S01	
30	New York Ave	B35S02	
31	Arlington Cemetery	C06X01	Tuesday, October 29, 2013 Meeting location: Kiosk at Huntington (south side) at 8:00am
32	Pentagon	C07E04	
33	Pentagon	C07E05	
34	Pentagon	C07N01	
35	Pentagon	C07N02	
36	Braddock Rd	C12X01	
37	King Street	C13N01	
38	King Street	C13N02	
39	Huntington	C15S02	
40	Potomac Avenue	D07X01	Tuesday, October 29, 2013 Meeting location: Kiosk at Greenbelt at 3:00pm
41	Minnesota Avenue	D09X01	
42	Deanwood	D10X01	
43	Cheverly	D11X01	
44	New Carrollton	D13X01	
45	Columbia Heights	E04X01	
46	Georgia Avenue	E05X01	
47	West Hyattsville	E07X01	
48	West Hyattsville	E07X02	
49	Prince George's Plaza	E08X01	
50	Prince George's Plaza	E08X02	
51	Prince George's Plaza	E08X03	
52	College Park	E09X01	
53	College Park	E09X02	
54	College Park	E09X03	
55	Greenbelt	E10X01	

	Station Name	Unit	Survey Date
56	Archives	F02X02	<p align="center">Wednesday October 30, 2013 Meeting location: Kiosk at Suitland at 8:00am</p>
57	Waterfront	F04X02	
58	Navy Yard	F05E01	
59	Southern Avenue	F08X01	
60	Southern Avenue	F08X02	
61	Naylor Road	F09X01	
62	Suitland	F10X01	
63	Suitland	F10X02	
64	Suitland	F10X03	
65	Addison Road	G03X01	
66	Addison Road	G03X02	
67	Addison Road	G03X03	
68	Morgan Boulevard	G04X01	
69	Morgan Boulevard	G04X02	
70	Largo Town Center	G05X01	
71	Largo Town Center	G05X02	
72	Largo Town Center	G05X03	
73	Largo Town Center	G05X04	
74	Largo Town Center	G05X05	
75	Largo Town Center	G05X06	
76	Franconia-Springfield	J03X01	<p align="center">Wednesday October 30, 2013 Meeting location: Kiosk at Franconia-Springfield at 3:00pm</p>
77	Franconia-Springfield	J03X02	
78	Franconia-Springfield	J03X04	
79	Franconia-Springfield	J03X05	
80	Franconia-Springfield	J03X06	
81	Clarendon	K02X01	
82	Virginia Square	K03X01	
83	Ballston	K04X01	
84	West Falls Church	K06X01	
85	West Falls Church	K06X02	
86	West Falls Church	K06X03	
87	Dunn Loring	K07X01	
88	Vienna	K08X01	
89	Vienna	K08X02	
90	Vienna	K08X03	
91	Vienna	K08X04	
92	West Falls Church-S & I	K90X01	<p align="center">Thursday October 31, 2013 Meeting location: Carmen Turner Facility 3500 Penny Drive, Landover, Maryland Lobby Entrance at 8am</p>
93	West Falls Church-FMNT	K91X01	
94	Northern Garage	T06X01	
95	Brentwood-S & I	B95X03	
96	Greenbelt Yard Annex	E94X01	
97	Greenbelt Yard Annex	E94X02	
98	Branch Ave Yard	F90X02	
99	Branch Ave Yard	F92X01	
100	Largo Yard	G92X01	

Revise Article 2.58 of the Construction Special Provisions to read:

#2.58 QUALITY MANAGEMENT SYSTEM

- A. The contractor shall prepare a quality plan consisting of plans, procedures, processes, work instructions, organization, and other associated resources necessary for implementing a quality management system to ensure that all materials, equipment, workmanship, fabrication, construction, operations, repairs, and documentation fully conform to the contract requirements.
- B. Quality management system standards applicable to the work include the following:
1. ISO 10005:2005 Quality management systems – Guidelines for quality plans
 2. ISO 9000:2005 Quality management systems – Fundamentals and vocabulary
- ANSI/ISO/ASQ Q10005-2005 and ANSI/ISO/ASQ Q9000-2005 quality management system standards may be used in place of the above ISO standards.
- C. For quality-related definitions used in this section, refer to ISO 9000:2005
- D. The Contractor shall maintain a documented, operational, and approved quality management system throughout the term of the Contract. This quality management system shall generally be as prescribed in ISO 10005:2005 and as supplemented in the Contract Documents.
- E. During the Term of the Contract, the Contractor shall exercise positive control over all of the Work, including that of subconsultants, subcontractors, fabricators, manufacturers, installers, and suppliers (suppliers and subcontractors) in accordance with the approved Quality Plan and the associated Quality Procedures and work instructions.
- F. The Quality Management System shall be revised, updated, and approved as necessary throughout the term of the Contract to reflect changes determined by management review, internal audit and/or WMATA audit to be necessary to improve the system.
- G. The Contractor shall develop a Quality Management System (QMS) for the project in accordance with ISO 10005:2005. The guidance given in ISO 10005:2005 shall be considered to be a requirement of this Contract and thus all occurrences of the word ‘should’ in ISO 10005:2005 shall be replaced by and interpreted as the word ‘shall.’
- H. The Quality Plan and procedures shall be approved by the Executive(s) responsible for the management of the contract.
- I. Work Instructions shall be approved at the appropriate level within the Contractor organization and are subject to audit by the Authority.
- J. Initial development, submission, and subsequent revisions of the Quality Plan and related procedures and work instructions shall require Authority approval. In addition, the execution of the Quality Management System shall be subject to Authority audit throughout the term of the Contract.

- K. The following additional requirements, as they relate to ISO 10005:2005 Quality Management Standards, shall be incorporated into the Quality Plan and the Quality Management System:
- a. Control of nonconforming product (Clause 5.17) – Contractor personnel responsible for implementing the quality system shall have the authority to stop all or portions of the contract work when the work fails to conform to either the contract or quality plan requirements and allowing the work to continue would create defective work requiring more than four hours total of engineering review, fabrication time, and rework at the site to correct.
 - b. Management responsibilities (Clause 5.5) - The Quality System Manager shall have management oversight of the responsibilities described in this clause.
 - c. Implementation of the quality plan (Clause 6.2) – Management reviews of the quality plan shall occur monthly during the first six months of the Contract and no less than quarterly thereafter. Written summaries of findings and major corrective actions shall be provided to the Authority Representative within five business days following completion of each review.
 - d. Design and development (Clause 5.11)
 1. Design control procedures shall be integrated and consistent with the Design Control Plan for the project.
 2. Control of design inputs and changes shall be managed in a manner that assures Contract requirements are correctly translated into the drawings and specifications used for procurement, manufacturing, construction, and testing.
 3. Completion of design, and the subsequent review, approval and distribution of submittals shall be completed prior to the start of any related construction or fabrication activity.
 4. Organizational and technical Interfaces shall be defined in a manner that assures inter-discipline coordination and communication among and between designers, builders, major subcontractors, manufacturers, systems and facilities personnel, and the Authority.
 5. Design verification activities shall include checking and back-checking calculations, drawings, and other design elements without reliance on review and comments from the Authority shall be conducted before providing each design submittal to the Authority and before the start of construction or fabrication. In addition, verification and validation of software products designed for the Project shall be planned and provided for within the design control procedures.
 6. Design review - The contractor shall include in design control procedures, methods for completing internal verification activity prior to the submission of documents to the Authority for review. The contractor shall submit a statement by the Design Professional who signed the drawings that the Final Design Drawings and Final Design Specifications conform to applicable architectural, engineering, systems and Authority requirements and to the appropriate jurisdictional regulations.
 7. The contractor's approach to meeting for configuration management (as described by ISO 10007) shall be defined in the design control procedures and shall include the means for contemporaneously:

- a. Relating the modification status of equipment and construction to the corresponding drawing or specification.
 - b. Ensuring that versions of software are controlled at all levels of design, development and production.
8. Design control plan
- a. Within 15 days after NTP, the Contractor shall submit the contract specific Design Control Plan.
 - b. In addition to that prescribed in the preceding paragraphs, the Design Control Plan shall include a Design Status Report that visibly tracks and reports the status of design products to be submitted by the Contractor for Authority review. The Contractor shall revise, update, and submit the Design Status Report for approval at least monthly.
 - c. The Design Status Report shall:
 1. Be consistent with and follow from the Finalized Design Control Plan and shall specifically track all design and design verification activities included in the approved Finalized Design Control Plan.
 2. Be in a format that allows the Contractor and the Authority to reasonably understand the means by which each design element of the project is being completed. It will provide planned versus actual schedule performance and shall be accurate and useful as a means for project personnel to understand how the Design is proceeding throughout the Term.
 3. Include subcontracted design work, if appropriate.
 4. Include a Configuration Control system for drawings that allows for all concerned Contractor and Authority personnel associated with the Contract to know the development and approval status of the various design documents.
 - e. Purchasing (Clause 5.12)
 1. Purchased material, equipment, and services shall be controlled to ensure that they are properly integrated into the Work.
 2. Procedural means shall be included to assure that contractor's subconsultants, suppliers and subcontractors satisfactorily demonstrate and document an adequate system for managing quality to the Contractor.
 3. The contractor shall have procedures for providing adequate surveillance of subconsultants, subcontractors and suppliers to assure conformance with the Quality Management System and Specification requirements. This surveillance shall include inspection and audit of both on- and off-site activities of the contractor's subconsultants, subcontractors and suppliers.

f. Identification and traceability (Clause 5.14)

The contractor's quality system shall include provisions to identify and trace products and materials where appropriate and as required in the WMATA Technical Specifications.

g. Production and service provision (Clause 5.13)

The contractor shall include procedures for control of, including but not limited to, the following processes:

1. Completion of quality procedures, work instructions, preactivity and coordination meetings, and training prior to the start of a related activity.
2. A formal system of continuous feedback of problems and their resolution shall be developed between the contractor's design professionals and production / construction staff.

h. Monitoring and measurement (Cause 5.18)

1. The contractor shall establish an integrated Inspection and Test Plan that conforms to the Quality Management System and the individual technical specifications and that allows for tracking of actual performance of inspections and tests.
2. Inspection procedures shall include instructions necessary to implement: 1) source inspections; 2) receiving inspections; 3) inspection of work in progress; 4) hold point inspections, and 5) completion inspections.
3. Test procedures shall utilize forms for recording test results and authorized approval signatures. Each test procedure shall identify the applicable specification section, article, and paragraph.
4. Daily Quality Reports shall be provided to the Authority that summarized the fabrication or construction activities, record the inspections and tests completed and the results, and record deficiencies identified during the previous 24 hours.
5. Processes will be included to assure that test equipment used by the contractor and subcontractors meets the requirements of the standards, and that the equipment and instruments are controlled, maintained and calibrated by a nationally recognized certification entity/agency. Devices used to calibrate measuring and test equipment or other measurement standards shall be traceable to one or more of the following:
 - a. U.S. national standards maintained by the U.S. National Institute of Standards and Technology (NIST) and the U.S. Naval Observatory.
 - b. Fundamental or natural physical constants with values assigned or accepted by NIST.

c. National standards of other countries, which are correlated with U.S. national standards.

d. Comparison to consensus standards.

6. Inspection and Test Plans

a. The Contractor shall submit Inspection and Test Plans that delineate the specific inspections and tests required to assure that characteristic design and contract requirements of structures, equipment, parts, components and systems are fully complied with. These Plans shall be an extension of the Quality Management System required and established in accordance with this Section.

b. The Inspection and Test Plans shall include the following:

1. A matrix of all tests required by the Contract Documents and the Design Specifications and Design Drawings to be performed by the contractor, suppliers, or subcontractors.
2. Samples of test reports - the test reports are to meet the minimum requirements called for in the applicable test standards, specifications.
3. Provisions for coordinating onsite and offsite testing.
4. Provisions for meeting the Authority notification criteria for planned tests and inspections specified to be witnessed by the Authority. Provide the Authority a minimum of 14 calendar days advance notice.

c. Where required by the Contract Documents, the contractor shall separate inspection and testing requirements into sub-plans.

d. As a minimum, the Test Plans shall include the following information:

1. Specification section, article, paragraph
2. Description of test
3. Type of test (e.g. total System, sub-system, factory)
4. Applicable standard
5. Test frequency
6. Responsibility for test performance
7. Completion status

8. Means of tracking and recording corrective actions being taken to assure compliance with the Contract Documents.
 9. Means for recording test results.
- e. As a minimum, the Inspection Plans shall include the following information:
1. A matrix of all inspections required by the Contract Documents and the Design Specifications and Design Drawings to be performed by Contractor, suppliers, or subcontractors and their frequency.
 2. Established hold points and witness points as approved by the Authority.
 3. Checklists to be utilized.

The Inspection and Test programs shall be designed by the contractor to assure that testing is performed to demonstrate that systems or components perform satisfactorily in service. Testing shall be performed by qualified and experienced personnel in accordance with approved test procedures. These procedures shall incorporate acceptance limits defined by industry codes and standards or by the Specifications; the more restrictive standard shall take precedence. All test results shall be documented, and submitted to the Authority for review

Inspection and test equipment shall be controlled and maintained in serviceable condition and within correct calibration with primary standards traceable to the NIST, or an approved alternative, shall be maintained. The system shall assure the accuracy of equipment and tools used to support this procurement.

Subcontractors and suppliers testing their own work shall be supervised and managed by the Contractor. Overall, responsibility for testing and subcontractor performance remains with the contractor.

i. Control of nonconforming product (Clause 5.17)

The authority within the contractor's organization to review and provide disposition of nonconforming products shall be identified. The disposition of product that does not conform to Contract Requirements shall be subject to approval by the Authority Representative.

j. Control of records (Clause 5.7)

1. The contractor shall establish and implement measures to identify, collect, index, file, and store. These procedures shall include a database to track and maintain control over all records generated by the Contract Work.
2. Records shall be stored and maintained in such a way that they are readily retrievable and provided with a suitable environment that minimize deterioration or damage, and prevent unauthorized alteration or loss.

3. Records shall be legible, reproducible, and identifiable with the item involved, and contain the date of origination and identity of the originator, verifier, and/or responsible supervisor.
4. Applies as well to records, as appropriate, from subcontractors, suppliers, fabricators, and test laboratories. Records generated by a supplier or fabricator shall be traceable to the product being supplied or fabricated and shall be provided in advance of shipment or shall be shipped with the product.

k. Audits (Clause 5.19)

1. Perform internal audits at least quarterly.
2. Record in the audit results any deficiencies in the quality system, the causes of deficiencies in the Quality System, and the status of corrective action or preventive action, when appropriate.
3. Provide the audit results to the Authority Representative and complete required corrective actions within 30 days of the audit.

L. Quality System Manager and Other Resources

1. The contractor shall appoint a Quality System Manager who is both an employee of the contractor and who is acceptable to the Authority. The Quality System Manager shall have at least 5 years experience in managing or overseeing quality management systems and shall not be in a supervisory or line management role of production personnel on this contract. The Quality System Manager shall be "Lead Auditor" trained to RABQSA requirements. A resume for the Quality System Manager is to be submitted with the Technical Proposal.
2. The Quality System Manager shall:
 - a. Report directly to and be supervised by an Officer of the contractor at a level above that of the Project Manager responsible for the project
 - b. Serve as a liaison officer with WMATA and the jurisdictional agencies on matters relating to the contractor's quality system
 - c. Be responsible for ensuring that the Quality System is effective in ensuring that the Quality Plan requirements are satisfied.
 - d. Be responsible for the oversight of onsite and offsite inspection and testing by the contractor, subcontractors, and suppliers.
3. In the event that the Quality System Manager is not found to be competent or to have sufficient relevant experience, the Authority will request that the Quality System Manager be removed from the project. In that event, the contractor shall submit a new candidate for consideration within 10 calendar days by submitting a resume.

4. In addition to the Quality System Manager, the contractor shall assign additional trained and experienced staff to fulfill Contract and Quality Plan requirements for meeting quality. The contractor shall provide sufficient resources to effectively manage quality related functions including the following:
 - a. Quality Management System Administration
 - b. Design Quality
 - c. Construction/Fabrication/Manufacturing Quality
 - d. Subcontractor Quality
 - e. Oversight of Quality Control
 - f. Configuration Management
 - g. Testing and Commissioning
- M. Authority Quality Oversight
1. The principal role of the Authority in the implementation of the Contractor's Quality Program will be oversight of the effectiveness of the Contractor's Quality Management System including quality control and quality assurance activities. However, the Authority reserves the right to conduct inspection of all phases of design and of both onsite and offsite fabrication and construction work activities by Authority field staff.
 2. Until the contractor's Quality Plan is approved by the Authority, no manufacturing, fabrication, or construction work shall be performed on any contract deliverable. Design activities shall not exceed 30 percent of the completed design. This restriction does not preclude any preparatory or temporary work performed by the contractor. Advance procurements can be made on with the approval of the Authority
 3. At its sole discretion, the Authority may conduct audits, tests, and inspections in addition to those performed by the Contractor.
 4. When the Authority determines that the approved Quality Management System or Plans, or any portion or feature thereof, is not controlling work sufficiently for the work to conform to Contract standards, the contractor shall take appropriate action to correct such deficiencies. The Authority Representative may stop the work activities if the Quality Management System is not working due to lack of contractor's quality control/assurance staff or for any other Contract non-compliance.
 5. Notwithstanding the above, Authority inspection, testing, or other actions shall not constitute acceptance of work, nor shall it relieve the contractor of its contractual responsibilities.
 6. When Authority inspection is required, the contractor shall add to the purchasing document the following statement:

“Authority inspection is required prior to shipment from your plant. Upon receipt of this order, promptly notify the Authority’s Representative at the Authority, in writing, so that appropriate planning for Authority inspection can be accomplished.”

N. Audits of the Contractor’s Quality Management System

1. There will be an ongoing review and evaluation of implementation of the Contractor’s Quality Management System to verify that the Contractor is effectively controlling the quality of design and construction. If the implementation of the Contractor’s Quality Management System is determined to be ineffective by the Authority, the Authority, at its sole discretion, may withhold payment at the appropriate percentage for any and all work it deems to be deficient or non-conforming to the Contract Documents, approved Final Design Specifications, approved Final Design Drawings, and/or appropriate standards. The Contractor will be expected to make whatever changes are necessary in the organization or in the Contractor Quality Management System to provide effective control of the quality of the work.
2. The Authority will perform audits to verify that the Contractor is effectively controlling the quality of the work. The basis for the audits will be the Contractor Quality Management System and the Contract Documents and Final Design Drawings and Final Design Specifications Issued for Construction.

O. Statement of Compliance, Quality Certification for Payment Verification

1. The Contractor shall provide the original and 3 paper copies and an electronic copy of an approved Quality System Manager’s Statement of Compliance Quality Certification with each pay request stating that the Quality Management System has effectively ensured that the items requested for payment have been designed, fabricated, and constructed to meet the design requirements, and have been inspected and tested as required to comply with Contract requirements including those of the Quality Management System. Work for which satisfactory records for design, testing, inspection or other quality elements are not available shall not qualify for payment. #

SECTION 14210, REHABILITATION OF HYDRAULIC ELEVATORS

PART 1 - GENERAL

1.01 SUMMARY

- A. This section specifies the requirements for rehabilitation of hydraulic elevators located throughout the WMATA system as identified in Appendix A – Hydraulic Unit Listing.
- B. This specification describes work for each aspect of the rehabilitation and not all elevators will have the same requirements. Refer to Appendix A - Hydraulic Unit Listing to determine which parts of the specification apply to this individual elevator.
- C. The following definitions apply to work of this Section:
 - 1. “Provide”: to furnish and install, complete for safe operation, unless specifically indicated otherwise.
 - 2. “Install”: to erect, mount and connect complete with related accessories.
 - 3. “Supply”: to purchase, procure, acquire and deliver complete with related accessories.
 - 4. “Work”: labor and materials required for proper and complete installation.
 - 5. “Wiring”: raceway, fittings, wire, boxes, and related items.
 - 6. “Concealed”: embedded in masonry or other construction; installed in furred spaces; within double partitions or hung ceilings, in trenches, in crawl spaces or in enclosures.
 - 7. “Exposed”: not installed underground or “concealed” as defined above.
 - 8. “Indicated”, shown or noted: as indicated, shown or noted on drawings or as specified.
 - 9. “Similar or equal”: of base bid manufacturer, equal in materials, weight, size, design and efficiency of specified product, conforming to acceptable manufacturers’ specifications.
 - 10. “Reviewed”, “satisfactory”, “accepted”, or “directed”: as reviewed, satisfactory, accepted or directed, by or to The Authority.

1.02 GENERAL DESCRIPTION OF ELEVATORS TO BE REHABILITATED

- A. Specific replacement requirements are listed in Appendix A - Hydraulic Unit Listing. The general extent of the work for the elevators to be rehabilitated includes the following
 - 1. Loading Classification - Passenger
 - 2. Sequence of Operation - Automatic Simplex

3. Hydraulic Power Unit - Furnish and install new hydraulic power unit designed and manufactured for oil hydraulic elevator service. Replace all valves and piping associated with the respective elevator.
4. Cylinder Type- Remove and replace conventional piston and cylinder assemblies.
5. Front Entrance & Frames- Refurbish or replace as indicated.
6. Rear Entrances & Frames - Refurbish or replace as indicated.
7. Cab Doors - Remove and replace with new doors and sills
8. Cab Enclosure - Remove and replace with new stainless steel cab enclosure
9. Cab Door Operation - Furnish and install new power-operated VVVF closed loop car door system.
10. Hoistway Door - Remove and replace as indicated, provide door with vision panels, 5" x 16" fire rated, U. L. Listed. Provide new hoistway sills and sill support.
11. Fixtures and Signals - Furnish and install new hall and car operating panels with register lights as indicated. Provide new car floor position indicator in car operating panel. The new car and hall button riser fixtures shall comply with the ADA.
12. Control Equipment - Provide new microprocessor based signal control system as required to suit new pump motor and oil hydraulic valves. Provide a controller air conditioning unit with each new controller. Where indicated, the existing microprocessor controller is to be retained and all fixtures and equipment shall integrate with existing controller. An air conditioning unit shall be provided for retained controllers that are not air conditioned.
13. Wiring and Conduit - Furnish and install new wiring and conduits in machine room and hoistway and between, including new coded traveling cables with 10% spare conductors with six pairs shielded communication cables and two coaxial cables for CCTV. Furnish and install new junction boxes throughout.
14. Car Platform - Remove and replace with stainless steel

		platform. Platform shall be balanced. Floor covering shall be resistant to urine absorption and deterioration.		
	15.	Car Frame -	Remove and replace. Frame shall be hot-dipped galvanized.	
	16.	Buffers -	Remove and replace with new spring buffers and buffer support steel. Steel shall be hot-dipped galvanized.	
	17.	Door Reopening Device -	Remove and replace with new.	
	18.	Car Guides -	Provide new spring tensioned roller guides.	
	19.	Guide Rails -	Reuse existing rails, clean & paint, except as noted. Provide rail extensions to support new car guides and replace bottom rail sections. Provide sheet metal shrouding at top on all open elevator hoistways to protect switches from public access. Finish of shroud shall match existing hoistway frame.	
	20.	Firemen's Emergency Svc.-	Furnish and install new elevator recall (Phase I) and (Phase II) Fire Service operation in accordance ASME A17.1.	
#	21.	Intercommunication Sys. -	Furnish and install a new hands free communications system from the car and corridor to station kiosk or command offices for garages and rail yards. All wiring required to provide a fully functional system is the responsibility of the Contractor.	#
	22.	Disability Compliance -	Comply with the requirements of the ADA and ANSI A117.1.	
	23.	Electrical Supply -	Reuse existing power supply 480V, 3-phase, 60-cycle, AC. Provide new mainline disconnect as indicated. Provide new light & signal 120V, 1 phase, 60-cycle disconnect. Comply with requirements of ASME A17.1 and the National Electric Code.	
#	24.	Battery Lowering -	Contractor shall supply battery lowering device to automatically lower elevator to lowest level upon loss of power. Devices to be provided even in locations where emergency generator exists. . A "Battery Operation Test" switch shall be added in the controller for periodic testing and repair procedures; this shall be a momentary pushbutton switch that, when pressed,	#

interrupts the signal from the mainline disconnect position detector switch so that battery operated lowering occurs when the mainline is turned off and the "Battery Operation Test" switch is held depressed to complete the operation.

- | | | |
|-----|-----------------|---|
| 25. | Miscellaneous - | Furnish and install new normal and final limit switches, top cab emergency exit contact, emergency car lighting (shall maintain lighting for a minimum of 4 hours), inspection and maintenance car top operating station, emergency keyways at both floors, pit stop switch, pit ladder, pit lighting fixtures and GFCI receptacles, removal of all abandoned equipment plus all old conduit and junction boxes not used and testing for compliance to Code and contract requirements as indicated. Provide lighting per Code requirements for elevator machine rooms and pits. |
| 26. | Painting- | The pit floor and pit walls shall be painted. All machine room equipment shall be given two (2) coats of approved machinery paint. All new iron work shall be given one coat of rust-inhibiting paint. All final finishes shall match existing finishes. |
| 27. | Hoistway Glass- | Upon completion of the rehabilitation, clean all interior and exterior sides of existing hoistway glass. Remove and replace damaged hoistway glass and damaged or missing frame work as indicated. |

1.03 DESIGN AND PERFORMANCE REQUIREMENTS

- A. Compliance: Design, fabrication and performance shall comply with all the latest applicable provisions of the Codes, Standards and recommendations of the entities listed below.
1. Codes: Work in this Section shall comply with all governing local codes including, but not necessarily be limited to ASME A17.1, National Electrical Code, and Board of Standards including all "Local Laws," and cited reference standards, appeals rulings and standards.
 2. Standards: Except as modified by governing Codes and by this Section, Work shall comply with the latest provisions of the following:

- a. ASME A17.1 2012 Safety Code for Elevators and Escalators
- b. ASME A17.2 2012 Guide for Inspections of Elevators, Escalators and Moving Walks
- c. ASME A17.3 2012 Safety Code for Existing Elevators and Escalators
- d. ANSI A117.1 Specifications for Making Buildings and Facilities Accessible to and Usable by Physically Handicapped People
- e. ADA Americans with Disabilities Act
- f. ASTM-A446 Steel Sheet, Zinc Coated (Galvanized) by the Hot-Dip Process, Structural (Physical) Quality
- g. ASTM-B221 Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes and Tubes
- h. ANSI/AWS- Structural Welding Code, Steel. D1.1
- i. ANSI/NFPA 70 2011 National Electrical Code
- j. ANSI/NFPA 80 Fire Door and Windows
- k. UL 10B- Fire Tests of Door Assemblies
- l. APA American Plywood Association
- m. ASTM A36 Structural Steel
- n. ASTM A167- Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip.
- o. NEMA LD-3- High Pressure Decorative Laminates.
- p. UL 486 Crimp Tools.
- q. ASTM E152 Fire Tests of Door Assemblies.
- r. FS-L-P-508H Plastic, Sheet Laminated, Decorative, and Nondecorative.
- s. FS-QQ-S-698- Steel Sheet and Strip, Low Carbon.
- t. NEII National Elevator Industry, Inc.
- u. All other specific provisions cited herein.

- B. All of the elevator equipment shall be designed, constructed, installed and adjusted to secure performance in accordance with the manufacturer's design standards with respect to smooth, quiet, convenient and efficient operation, durability, economy of maintenance and operations, and standards of safety.
- C. The control system shall provide smooth acceleration and deceleration with 3/16 inch leveling accuracy at all landings, from no load to full rated load in the elevator, under normal or unloading conditions. The self-leveling shall, within its zone, be entirely automatic and independent of the operating device and shall correct for overtravel and undertravel. The car shall remain at the landing irrespective of load. Clearance between the car sill and the hoistway landing shall not exceed 1-¼ inch.
- D. The door open time for elevators is to be 2.5 fps. The door close time shall be based on the Code requirements with a door delay feature. The door delay is the minimum acceptable time from notification that a car is answering a call (lantern and audible signal) until the doors of the car start to close. Time shall be calculated by the following equation:
- $$T = D / (1.5 \text{ ft/s}) (457 \text{ mm/s})$$
- T = Total time in seconds.
D = Distance from a point in the lobby 60 inches (1524mm) directly in front of the hall station to the centerline of the door opening.
- E. Car Call: The minimum acceptable time for doors to remain fully open shall not be less than 5 seconds.
- F. The speed of the elevator shall not vary +/- 5% under loading conditions.

1.04 DELIVERY, STORAGE AND HANDLING

- A. Delivery: Materials shall be delivered ready for use, in the approved manufacturer's original and unopened containers and packaging, bearing labels as to type of material, brand name and manufacturer's name. Delivered materials shall be identical to approved products and samples.
- B. Storage: Materials shall be stored under a cover in a dry and clean location, off the ground. Delivered materials which are damaged or otherwise not suitable for installation, shall be removed and replaced with acceptable materials at no additional cost to the Authority. On site staging/storage of materials is not guaranteed.
- C. Floor Loading: Do not load or permit any part of the structure to be loaded with a weight that will exceed the load factor and endanger the safety of the structure.

1.05 SUBMITTALS

- A. General: Submit in electronic format the following in accordance with this section, the

GENERAL PROVISIONS and the SPECIAL CONDITIONS:

1. Product Data: Submit the names and addresses of the manufacturers, together with catalog information or other identifying description for all items of elevator equipment.
2. Submittals: Submit shop drawings showing material type and gauge, general dimensions, methods of attachment, location and size of reinforcements and openings, and a general arrangement of components with complete information concerning the material, articles and/or design proposed for use in sufficient detail to show compliance with the specification including:
 - a. Machine room equipment details, layout and elevations, including bill of materials showing both new and existing equipment, remote piping diagrams, power requirements, details, operational description and method of wire connections for point to point wire connecting for control and signals, and all other Work which is required to achieve successful completion of the Work described herein.
 - b. Wiring Diagrams
 - c. Written description of the mode and sequence of operation.
 - d. Complete information on machines, motors, motor drives, pump unit, jack assembly including cylinder and casing, control system, including power requirements and equipment heat release information. Include calculation verifying that the fluid pressure loss for the hydraulic piping between the cylinder and the pump is not greater than ten (10) psi (pounds per square inch).
 - e. Elevator car and hall fixture drawings.
 - f. Complete car enclosure drawings and details of all equipment.
 - g. Entrance details including doors, hoistway door hangers, door operators, door protective devices, tracks, guides, etc., for passenger elevator entrances.
 - h. Machine room and hoistway ventilation requirements.
 - i. Platform with isolation details.
 - j. Suspended Load Data Sheets for elevators.
 - k. Submit certification that the entire hydraulic system withstands pressure test equal to twice the calculated working pressure.
 - l. The elevator manufacturer will provide certification, in writing and signed by an officer of the organization, that the owner of the elevators shall be provided with copies of any and all information, correspondence, bulletins, newsletters, manuals, techniques, procedures, drawings,

sketches and any other documents related to maintenance, safety, operations, design changes, modifications, retrofits, etc., which relate to any part, component, equipment, system, subsystem or material and services applicable to the elevators provided.

- m. Complete detailed installation, adjusting and controller setup procedures.

All of the above referenced shall be provided as it pertains to the original installation and for a period of ten (10) years after final acceptance of the last elevator provided.

The reference material shall be provided within thirty (30) days of publication or internal distribution by the elevator manufacturer. The material, even if labeled PROPRIETARY, shall be delivered to the Authority without prejudice or delay and at no additional cost.

- B. Operations Manual: Prior to the execution of work on the second elevator submit an electronic copy of the following manuals to the Contracting Officer's Representative for review. After approval and issue of the Certificate of Final Completion, submit five (5) bound manuals and two (2) CD-ROM electronic versions of the manual.
 - 1. Manuals shall be bound and indexed providing operating, adjusting, setup, trouble-shooting and maintenance instructions, parts listing, recommended parts inventory listing, purchase source listing for major and critical components, emergency instructions, and similar information. Maintenance instructions shall include lubrication and periodic maintenance requirements and schedules. Parts list and purchase source listing shall include electrical and control equipment. Manuals shall also include approved drawings and catalog cuts, folded if necessary.
 - 2. Adjusters Manual: Provide the contractors adjusters manual, the manual shall provide step by step procedures for calibrating and adjusting all equipment operations and including any printed circuit boards. Manuals shall comply with the requirements of this section, the GENERAL PROVISIONS and the SPECIAL CONDITIONS.
 - 3. Operating Instructions shall be printed or typewritten literature describing the function and operation of all controls including pictorial illustrations. The pictorial instructions shall be taken from an elevator that has been completed. Controller and shaft component shall also be included with a clear picture showing where the controller components are located, where applicable.
 - 4. Maintenance Instructions shall be printed or typewritten schedules describing all required maintenance procedures for each elevator.
 - 5. Wiring Diagrams shall be full size, ladder type, complete "as-built" wiring and single line diagrams showing the electrical connections, functions and sequence of operation of apparatus connected with each elevator using standard symbols or proprietary symbols defined on the diagram, both in the machine room and in the hoist way, shall be furnished in duplicate for each elevator. Wiring diagrams shall incorporate the wiring identification labeling to identify the controller and field wiring used for each circuit. Wiring diagrams shall have sheets numbered with an

indication of the total number of sheets in the diagram set. Each page should include the unit number of the elevator referenced in the diagram. After approval, a copy of each shall be laminated, framed, and mounted in each elevator machine room. An electronic version of wiring diagrams for each elevator shall be delivered to the Contracting Officer's Representative. Coded diagrams are not acceptable.

6. Lubrication Chart: After approval, one laminated and framed lubrication chart for each elevator shall be furnished and mounted as directed in each elevator machine room. Chart shall identify lubricants as well as lubrication points and required frequency of application.
 7. Record Drawings: The Contractor shall maintain at the construction site, one (1) set of full size drawings marked to show all deviations which have been made from the drawings, including buried or concealed construction and utility features which are revealed during the course of construction. These drawings shall be available for review by the Contracting Officer's Representative at all times and shall become the property of the Authority and be turned over to the Contracting Officer's Representative at completion of the Work of this Section. Provide in both hard copy and electronic (CD).
 8. Keys: Provide eight (8) sets of keys, per elevator, to operate all keyed switches and locks prior to completion of the first unit.
 9. Accessories: Provide all special tools and equipment necessary for making all system adjustments to the signal and pump motor controller and door equipment. A programming unit, preferably a laptop with 4GB memory, 15.6-inch display and DVD drive, with all software packages required to setup and program all equipment in the elevator system shall be provided, one per station or structure. Software shall include that for the display unit, DeviceNet, soft start, if applicable, and any other programmable devices, as well as for the controller PLC. Any hardware or software required for configuring, programming or communicating to the controller or any part of the elevator shall be submitted to the contracting officer. **NO SPECIAL TOOLS WITH DECAYING CIRCUITS OR CLOCKS ARE PERMITTED.**
 10. Spare Parts: Provide the Authority with spare parts per the special provisions section of the specification. The list of recommended spare parts will be provided to the Contracting Officer's Representative after submittals are approved and must have OEM's part number listed.
- C. Test Reports, and Certificates: Submit to the Contracting Officer's Representative test reports and inspection/acceptance certificates for each elevator.
- D. Work Area Barricade Protection Plans and Site Specific Work Plan
1. The work area protection plans shall be provided as part of the Site Specific Work Plan (SSWP) for each station by the Contractor for review no later than 60 days prior to the start of work.

2. Protection plans shall clearly indicate partition systems planned for demolition and installation phases of the project, including planning for escalator entry and egress during handling. Plans shall include finish details for elements exposed to the public.
3. Partitioning system shall include lockable access doors to prevent access to the work area by the public. Applicable work area notification/warning signage shall be provided by the Contractor. Signage shall be approved in size and design by Authority prior to use.
4. Partitioning plans shall be designed to withstand applicable wind loads applied to the station entrance areas as required by local building Code.
5. Barricade partitions shall be painted (color to be provided by WMATA) and a yellow safety caution stripe painted along the center of the panels.

1.06 GUARANTEES

- A. Notwithstanding the Specifications forming a part of this Contract, any inspection or approval of the Work by the Authority, or the existence of any patent or trade name, the Contractor nevertheless unconditionally guarantees that the equipment furnished and installed hereunder shall be of the best quality and shall be fully fit for the purpose for which it is intended. The Contractor shall unconditionally guarantee all equipment against defects or failures of any kind, including design, workmanship and materials for a period of one (1) year after the elevator has been commissioned into service. In the event of defects or failures in any component of the Work of this Section, then upon receipt of notice thereof from the Contracting Officer's Representative, the Contractor shall correct such defects or failures by immediately reconstructing, repairing or making such alterations or replacement of said component in the Work of this Section as may be necessary or desirable, in the sole opinion of the Contracting Officer's Representative, to comply with the above guaranty at no additional cost to the Authority.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. The requirements for elevator equipment manufacturers are as follows:
 1. Hydraulic Power Unit: Subject to compliance with the requirements of this Section, the hydraulic power unit shall be manufactured by one of the following or approved equal:
 - a. CEMCO Lift, Inc.
 - b. Thyssen
 - c. KONE
 - d. Schindler Elevator
 - e. Otis
 - f. Elevator Equipment Corporation (EECO)

- g. Approved Equal (Request for approval to be submitted prior to any delivery or installation of the equipment)
- 5. Door Reopening Device: Provide Janus Pana40 Plus full screen curtain and infra-red protective zone or approved equal.
- 6. Vision Panels: Panels are required to be installed on all hoistway and elevator car doors. Panels shall all applicable codes including ANSI Z97.1 and 16CFR Part 1201. Each individual piece shall be stamped with the markings as required by ANSI Z97.1 and shall remain visible after installation. Panels shall be fire resistant and shall be manufactured by one of the following manufacturers.
 - a. Pyroswiss
 - b. Pyroguard
 - c. Approved Equal

2.02 MATERIALS

- A. Stainless steel shall be corrosion resisting steel complying with Federal Specification Q.-S-698, Class 316, S. S. Condition A finished as specified. During erection, all stainless steel surfaces shall be protected by suitable peel off material.
- B. Cold rolled steel shall be low-carbon steel rolled to stretcher leveled standard flatness, complying with Federal Specification Q.-S-698.
- C. Rigid Steel Conduit, conduit fittings, and flexible steel conduit shall comply with the current Federal Specifications for the respective components.
- D. Guide rail clips shall be of open - hearth steel or its equivalent in accordance with ASME A17.1 requirements.
- E. Material of wheels for roller guide assembly shall be of the neoprene type.
- F. Material (insulating) used on hoist way slide door interlocks shall be of thermoplastic polyester.
- G. Material of hall pushbutton station bases and slide activators shall be molded LEXAN 141-701 thermoplastic, or equal.
- H. Material of hoist way and car door threshold sill shall be heavy duty nickel silver having an extruded, grooved, non-slip surface.
- I. Material for all tamper proof screws shall be of stainless steel, spanner head.
- J. Material of connectors or lugs for controller motor leads shall be of copper.
- K. All screws, bolts, fasteners shall be stainless steel.

2.03 CONSTRUCTION FEATURES

- A. General
 - 1. All welding shall be in accordance with Section 213 of ASME A17.1.

2. All electrical equipment, conduit, fittings and wiring shall conform to the requirements of the National Electrical Code (NEC) and ANSI/NFPA No. 70 for outdoor locations.
3. Clearance around equipment located in each elevator machine room shall comply with the applicable provisions of the National Electrical Code.
4. The elevator shall, comply with NEII "Suggested Minimum Passenger Elevator Requirements for the Handicapped", ANSI A117.1 and ADA requirements, including clearances, handrails, locations for signal & control fixtures and communication.
5. Design and construction of the equipment and parts subject to wear shall be such that similar devices provided will be completely interchangeable. Working parts shall be accessible for inspection, servicing and repair. Adequate means shall be provided for lubrication of all wearing parts that require lubrication.
6. All wiring shall be Underwriters Laboratory approved, stranded Type THHW, in accordance with the requirements of the National Electrical Code; the minimum size permitted shall be No. 18. PVC insulated wiring is not permitted. The wires shall be installed in wire raceway with approved outlet boxes, except that a small amount of flexible conduit may be used where conduit is not subject to moisture or embedded in concrete, as approved by the COTR. Terminal and pull boxes and other similar items shall be of approved substantial construction, thoroughly reinforced, and in no case less than No. 12 USSG for larger boxes. All electrical boxes exceeding 150 cubic inches shall be supported independently of the conduits. All boxes shall be NEMA 4X, Vynkier, Inc. or approved equal. All conduits shall be rigid galvanized, all joints shall be threaded. All flexible conduits shall be liquid tight with approved fittings.
7. Any junction boxes installed in the machine room or hoistway shall be accessible for maintenance. Drilling or opening top end of enclosure is not acceptable.
8. Car and hall signal circuits shall not exceed 120 volts.
9. Nameplates: Each major component of equipment shall have the manufacturers' name, type, class or catalog number on a metal plate securely attached to the equipment in a conspicuous location. The nameplates shall not be visible to the public.

B. Hoistway Equipment

1. Car Guide Rails
 - a. Existing guide rails shall be reused in place, except as indicated in 1.02 A.19 and 2.03 B.1.b, but shall be realigned to a 1/8 inch plumb for the full travel distance and all fasteners and splice plates securely tightened. Where indicated in Appendix A - Hydraulic Unit Listing, fasteners shall be replaced.

- b. Guide rails shall be clean and free of all signs of rust or abrasion and shall be filed to remove all rough edges or high spots prior to final inspection. All guide rail joints shall be filed to assure perfectly matching surfaces. Paint all guide rails with flat black rust inhibiting paint, if necessary. Bottom section of guide rails shall be replaced and rail extensions shall be provided to support new car guides.
 - c. Car roller guides shall be spring loaded and allow rail to rail and front to back adjustment of the rollers. Rollers shall have four (4) inch minimum wheels.
2. Buffers
- a. Replace spring buffers. Buffers shall be securely fastened to the pit channels. Paint pit channels which shall be aligned with striker plates on the car. Permanently fasten to each buffer a metal plate showing stroke and load rating.
 - b. Paint pipe stanchions and struts as required to properly protect all exposed metal surfaces.
3. Limit Switches
- a. Provide terminal stopping devices arranged to automatically stop the car within the top clearance and bottom overtravel independently of the operation of the normal terminal stopping devices, but with the buffers operative. The final terminal devices, when operated, shall prevent further normal operation. Final limit switches shall be so located that they open at or about the time the buffer is engaged by the car. Final limit switches shall be through-bolted after the conclusion of the final acceptance tests.
 - b. Provide normal stopping devices for the elevator at upper and lower terminals to automatically stop the car from any speed attained in normal operation within the top and bottom over travels, independent of the operating device, final terminal stopping devices and buffers.
4. Inspection and Maintenance Switches - Top of Car: Provide toggle switches to operate the elevator from the top of the car during adjustment, inspection, maintenance and repair. The operating means shall be of the continuous pressure type, and the speed of the car shall not exceed 50 ft./min. It shall operate the car only when the car doors and all hoist way doors are closed.
5. Pit Ladder: Retain, repair, clean and paint except where new code compliant pit ladder is to be provided as indicated in Appendix A - Hydraulic Unit Listing.
6. Pit Stop Switch, Pit Lighting Fixture & Switch
- a. Provide a new NEMA 4X emergency stop switch for the elevator in the pit at the point of access to the pit. The switch shall be of an approved type

and design, with a metal guard to prevent accidental operation. Plastic or fiberglass material of box and faceplate shall not be permitted. When opened, the switch shall cause the electric power to be removed from the pump motor and valve. Location shall be in accordance to Code requirements. Safety switches shall interrupt the power supply and hold the car to permit safe access to the pit for servicing.

- b. Provide new GFCI receptacle, new pit lighting fixture(s) and switch for the elevator in the pit.

C. Drive System

1. All replacement drive system components for the elevator shall be suitable for lifting the gross load of the rehabilitated elevators at rated speed to the height indicated in Appendix A - Hydraulic Unit Listing Breakout and verified in contractor's field survey.
 - a. Hydraulic Power Unit: Provide new hydraulic unit of a compact, self-contained integral design consisting of an electric motor, hydraulic oil pump, hydraulic oil control unit, hydraulic oil tank, hydraulic jack unit/assembly, piping and a controller. Motor and pump shall be mounted on a rubber isolated inner base with removable drip pan, and enclosed with sound insulated sheet steel panels. A structural steel outer base shall support hydraulic oil tank and controller. The pump unit shall be of the dry type, submersible pump units are not acceptable.
 - 1) Motor
 - a) Motor shall be of the drip-proof, squirrel cage, induction type suitable for 480-volt, three-phase, 60 hertz power and complying with NEMA Design D torque classification, Class F insulation.
 - b) Motor shall be suitable for electronic soft start controlled starting and of energy efficient and low noise operation.
 - c) Motor shall be of heavy duty construction, and designed for hydraulic elevator service with intermittent duty cycle rating.
 - d) Motor shall be provided with an electronic soft start feature and thermal overload protection for each phase.
 - e) Motors shall be labeled by manufacturer with NEMA minimum efficiency marking standard in accordance with NEMA standard MG-1-12.53b.
 - f) Motor shall be designed specifically for elevator service, shall not exceed nameplate full load current by more than 5% and be continuously rated 120 starts/hour, and start motor without exceeding 40 degrees Celsius rise.

- Include closed transition wye-delta starting. Should the Contractor select equipment which exceeds the limitations of the power feeders, then the Contractor shall be responsible to replace the conduit, feeders, breakers, disconnects and any other components in the electrical feeder system as required to the main distribution panel in the electrical vault from the elevator machine room. The contractor is to assume a 400 foot conduit and wiring run when pricing this item.
- g) Connect motor and pump with multiple V-belt. Belts and sheaves shall be sized for duty involved and designed to prevent any metallic contact between motor and pump shaft. Furnish and install isolation units of rubber in shear to prevent transmission of pump and motor vibration to building. Furnish and install expanded metal sheave guard that can be easily removed for servicing and inspection.
- h) Belt tightening device shall be provided without the requirement for a prying bar to maintain the tension while adjustment is being performed.
- 2) Hydraulic Oil Pump: Hydraulic oil pump shall be of the heavy duty positive displacement screw type, designed for steady discharge with minimum pulsations. Pump shall be belt driven by the electric motor. Pump output shall be capable of lifting elevator car with rated capacity, with a speed variation of no more than ten percent (10%) between no load and full load. Pump shall operate under flooded suction in an accurately machined case with the clearance required to assure maximum efficiency. Provide self-cleaning strainer in suction line to pump. Hydraulic fluid by-pass shall discharge directly into storage tank.
- 3) Hydraulic Oil Control Unit: Hydraulic oil control unit design shall be suitable for operation under the required pressures and shall perform all necessary functions for safe and proper hydraulic elevator operation. Unit shall be fully adjustable to optimize elevator performance and smooth operation. Adjustments shall be accessible and made without removing unit from oil lines. Unit shall be a single compact assembly consisting of the following:
- a) Main Valve Section which shall consist of bypass, lowering, and check valves to control down speed and up and down leveling. Check valve shall comply with ASME A17.1 code.
- b) Control Section which shall consist of solenoid valves that direct the main valve section and control up and down starting, transition from full speed to leveling speed, up and down stops, pressure relief valve, manual

lowering valve.

- c) Relief Valve which shall comply with the ASME A17.1 code.
 - d) Manual Lowering Valve which shall comply with the ASME A17.1 code.
- 4) Hydraulic Oil Tank
- a) Hydraulic oil tank shall be of the atmosphere storage and discharge type sized to store the volume of oil required to lift the elevator car to the top landing, plus additional reserve capacity of at least ten (10) gallons to prevent the entrance of air or other gas into the hydraulic system.
 - b) Tank shall be designed and constructed to meet or exceed the factor of safety requirements of the ASME A17.1 code.
 - c) The storage tank shall be sheet steel, of welded construction, and shall have a steel cover, suitable means for filling, a minimum one inch flame proof protected vent opening, an overflow connection, and a valved drain connection. Tank shall act as a storage tank only. Provide marked gauge to meter hydraulic fluid level. Provide a baffle in the bottom of the tank to prevent entry of any sediment or foreign particles into hydraulic system. Baffle shall also minimize aeration of hydraulic fluid.
 - d) Permissible minimum hydraulic fluid level shall be clearly indicated. Hydraulic fluid shall be of good grade to assure free flow when cool and shall have minimum flash point of 400 degrees F. Provide initial supply of hydraulic fluid for operation of elevator. Install flexible connections in suction and return lines to tank to conform to the requirements of the ASME A17.1 code.
 - (1) The viscosity of the hydraulic fluid shall be thermostatically controlled to maintain the fluid temperature in the reservoir, pump and valves at a minimum temperature by thermostatically controlled tank heaters.
 - (2) Furnish and install a data plate on the tank framing indicating the characteristics of the hydraulic fluid used.
- 5) Piston and Cylinder Assembly
- a. Cylinder: Provide equipment as applicable for the

- Contractor to assure for the proper and safe positioning of the elevator car at the top of the hoistway. Contractor shall take necessary precaution to assure for the safe and efficient removal and replacement of all equipment.
- b. Existing piston and cylinder: Remove the existing piston and cylinder. If welding, burning or cutting devices are to be employed, Contractor shall check for proper ventilation of the hoistway and the pit and ensure that an accumulation of flammable or explosive gasses are not present. Prior to the commencement of welding, burning or cutting, Contractor shall advise the Contracting Officer's Representative and proceed only after securing the permission and having a hot-weld permit on site. Contractor shall remove all oil from the cylinder, piston and piping and dispose of in accordance with regulatory requirements.
 - c. Well Hole and Casings: The existing casing shall be retained. Contractor shall utilize a high volume vacuum truck to remove debris and clear the well hole. In instances where a pump truck cannot be utilized, other means of cleaning the well hole shall be used. With the well hole clear of ground water and backfill, the Contractor shall plumb the hole and verify the depth prior to installation of new piston and cylinder assembly. Provide Inspection Report detailing results to Contracting Officer's Representative.
 - d. Pit channel: New Pit channels shall be provided. The Pit channels will accommodate the buffer springs and cylinder evacuation fittings. The pit mounting assembly shall be provided with a load plate capable of transferring the cylinder load to the pit floor.
 - e. PVC Casing: Provide casings 2" larger than plunger cylinders made from Schedule 80 PVC pipe complying with ASTM D 1785. The thickness of the PVC shall not be less than $\frac{3}{4}$ " thick. Exterior surface of the casing shall be cleaned prior to application of solvent welding material to ensure water tight connections. After PVC casing is set plumb, it shall be free of any liquid ensuring a dry condition prior to the installation of the cylinder. Provide top of PVC with a PVC pipe coupling connecting with cylinder victaulic coupling. The PVC casing shall be capped at the bottom. If space is excessive between the PVC liner and the outer casing, backfill may be provided at the base of the PVC to secure positioning. The cylinder shall accommodate a piston for a direct plunger, single stage type elevator lift mechanism. Cylinder shall include a double closed bottom - consisting of a bottom

hemisphere plus a safety bulkhead equipped with an orifice - seamless steel pipe with sufficient thickness to sustain 400 PSI test. The Cylinder shall be formed from either ASTM-A53 or ASTM-A106 pipe. The cylinder exterior shall be provided with an applied extruded coating consisting of painted zinc-oxide, covered with an extruded polyethylene coating which shall be applied to the cylinder prior to shipment. With multiple cylinder sections, the upper cylinder section shall be furnished with a thick steel sleeve with integral locking pins which shall be circumferentially welded to the bottom of the upper cylinder section. The mating top of the lower cylinder section shall be machined with ramped slots along the base. The two sections shall be inserted and twisted to lock and then welded. Provide cylinder head with a primary caged seal and a secondary seal with a closed weep capable of attaching to an oil recovery system. The cylinder head shall be provided with means to release air from cylinder and be easily repackable. The cylinder head shall be furnished with a thick shoulder which will limit the upward travel of the piston and offer protection to the packing. The top of the cylinder shall be sealed to the PVC liner forming a sealed unit. An evacuation tube with an evacuation port shall be provided between the PVC liner and the cylinder. An electronic monitoring device shall be installed to detect the presence of oil or water in the PVC casing. A "Liquid in Casing" alarm shall be provided to the elevator controller for display on the fault display and transmitting to the remote monitoring system.

- f. Pistons: All pistons shall be machined from seamless, drawn-over-mandrel, steel tubing. The plungers shall be ground and polished to a minimum 12 micro-inch finish, turned true and smooth with the OD held +/- 0.005 in. over the full length. All pistons under 18 feet in length shall be one-piece construction where site conditions allow access. Join multiple section plungers by means of threaded male and female couplings which will automatically bulkhead the upper and lower halves of the plunger. The top of the piston shall incorporate a heavy steel plate fillet welded into the plunger wall. The plate shall be drilled and tapped to accept machined bolts that attach the platform platen. Secure to car frame with new suitable isolated platen plates and new fasteners. The piston shall be provided with a stop ring electrically welded to it to prevent the piston from leaving the cylinder. The piston and cylinder shall be installed plumb and shall operate freely with minimum friction.
- g. Contractor shall provide all oil and necessary

appurtenances to return the elevator to service. Contractor shall attach all components and assure for proper operation.

- h. A copper tubing scavenger line, electrically operated pump, and self cleaning strainer shall be provided between the piston drip ring and oil storage tank. Scavenger line, pump and strainers shall operate independently of hydraulic fluid pressure. Scavenger pump shall be equipped with a water float designed to prevent operation of the pump, should the pit flood. It shall also be designed to be manually reset.
- i. Provide labor, material, equipment and necessary incidentals to provide cathodic protection for the hydraulic elevators. The cathodic protection will consist of isolation coupling, neoprene at platen plate, neoprene bolt sleeves at platen plate, neoprene between jack unit and pit channels and neoprene bolt sleeves at pit channel.
- j. Holeless Hydraulic Elevators (in addition to other criteria for the piston and cylinder assembly): Provide dual, single piece, direct-acting non-staged plungers in a non-cantilevered arrangement. The bottom of each plunger shall be fitted with a positive stop designed to prevent the plungers from leaving their cylinders. The top of each plunger shall be fastened to the car frame. Provide two hydraulic cylinders designed to stand upright on the pit floor, on either side of the car. Each cylinder shall be constructed from steel pipe with a machined steel flange at the upper end and a heavy steel bulkhead at the lower end. Each cylinder shall be connected to the oil line. A packing gland with guide bearing, wiper ring and packing especially designed for hydraulic elevator service shall be mounted at the top of each cylinder along with an oil collector ring and drain hole. Each cylinder shall be finished with a coat of rust inhibiting air dry enamel and have an air bleeder valve and oil drain plug positioned above the pit floor. The plunger surface shall be ground and polished as specified in paragraph f. above. The plunger seals shall be urethane cup design with integral wipers or approved equal. The cylinders shall be isolated from rails, pit channel, building structure and other sources of possible corrosive or galvanic damage by dielectric insulation of the cylinders in the same manner as described in paragraph i. above.

6) Piping

- a) Connections shall be provided between the storage tank,

pump, muffler, operating valves, and cylinder complete with necessary valves, pipe supports, and fittings. All connections between the discharge side of the pump, check valve, muffler, cylinder, lowering valves shall be of schedule 80 steel with screw, flanged, or where approved flexible or mechanical couplings. Mechanical couplings will be allowed only in the pit area or the machine room with prior approval from the Contracting Officer's Representative. Size of pipe and couplings between cylinder and pumping unit shall be such that fluid pressure loss is limited to ten (10) pounds.

- b) Valves, piping, and fittings shall not be subjected to working pressure greater than those recommended by the manufacturer.
 - (1) Flexible hose and fitting assemblies and flexible couplings installed between the check valve and the cylinder shall conform to the following:
 - (a) Installation shall be accomplished without introducing twist in the hose, and shall conform to the minimum bending radius specified in SAE 100 R2 hose, High Pressure, Steel Wire Reinforced, Rubber Covered Hydraulic Hose. Such units shall be located and supported to protect hose fittings from abrasion or undue stress from external sources; and shall not be installed within the hoist way, nor project into or through any wall.
 - (b) Such units shall have a bursting strength sufficient to withstand not less than ten (10) times the working pressures. They shall be tested in the factory or in the field prior to installation at a pressure of at least five times working pressures. They shall be permanently marked with pressure and date of test.
 - (c) Flexible hose shall otherwise conform to requirements of SAE 100 R2, and shall be compatible with the required hydraulic fluid.
 - (d) Hose fittings shall be of an approved type.
 - (e) The hose and fittings assemblies shall be permanently marked with the SAE

- hose type and field installation date.
- (f) If wear, corrosion or other factors indicate that safety factor of the hose has been materially reduced below the manufacturer's rating it shall be replaced.
 - (g) Flexible couplings shall be so designed and constructed that failure of the sealing element shall not permit separation of the parts connected.
- c) Support all horizontal piping. Place hangers or supports within 12 inches of every change of direction of pipe line and space supports not over ten (10) feet apart. Secure vertical runs properly with iron clamps at sufficiently close intervals to carry weight of pipe and contents and provide supports under pipe to floor. Furnish and install all piping from remote machine room to hoist way, including necessary supports and/or hangers.
 - d) Provide pipe sleeves where pipes pass through walls, floors, etc. sleeves shall be set during construction. After installation of piping, the sleeves shall be equipped with snug fitting inner liner of either glass or mineral wool insulation. 90 degree angles shall be kept to a minimum.
 - e) Provide blowout-proof, non-hammering, oil-hydraulic muffler in the hydraulic fluid supply pressure line near power unit in machine room. Muffler shall be designed to reduce to a minimum any pulsation or noises that may be transmitted through the hydraulic fluid into the hoist way.
 - f) Control valves shall be solenoid operated and arranged so hydraulic fluid flow will be controlled in positive and gradual manner to ensure smooth starting and stopping of elevator.
 - g) Provide safety check valve between cylinder and flexible pump connection which will hold elevator with specified load at any point when pump stops or pressure drops below minimum operating levels.
 - h) Provide an automatic shut-off valve in the supply line at the cylinder inlet. Pipe protruding from cylinder shall be welded at inlet and threaded to receive shut-off valve. When there is a ten percent (10%) drop in operating pressure, the automatic shut-off valve shall be activated. When activated, this device shall immediately stop the

descent of the elevator, and hold the elevator with rated load until it is lowered by the use of the manual lowering feature on the valve. The manual lowering feature of the automatic shut-off valve shall be arranged to limit the maximum descending speed of the elevator to 15 FPM. The exposed adjustments of the automatic shut-off valve shall have their means of adjustment sealed after being set to their correct position.

- i) Provide external tank shut-off gate valve to isolate hydraulic fluid during maintenance operations.
- j) Provide all pump relief and other auxiliary valves to comply with ASME A17.1 code and to ensure smooth, safe, and satisfactory operation of elevator.
- k) By-pass and relief valve shall be furnished and installed.
- l) Check valve shall be furnished and installed to hold the elevator car with rated load at any point when the pump stops.
- m) Provide gate valve in the pit near the jack capable of withstanding 150 percent of design operating pressure.
- n) Provide a line strainer between oil-hydraulic muffler and gate valve.
- o) Provide oil-tight drip pan for assembled pumping unit, including storage tank. Pan shall be not less than 16 gauge sheet steel, with one inch sides.
- p) The entire hydraulic system, including muffler, shall be tested to withstand a pressure equal to twice the calculated working pressure and submit certification.

D. Control System

1. Hydraulic Control Valves:

- a. Provide new electrically actuated and hydraulically operated control valves to govern direction, acceleration, running, deceleration, leveling and stopping.
- b. Provide safety switches for the elevator to cut off electric power to motor and valves, and stop elevator upon operation of any electrical safety device.
- c. The control system shall provide a smooth acceleration and retardation as specified herein.

- d. Provide an electronic soft start unit which limits the starting current of the pump motor to conform to the current rating of the motor.
2. Controllers
 - a. Elevator Control System
 - 1) The elevator control equipment shall contain diagnostic capabilities as required for the ease of complete maintenance.
 - 2) The diagnostic system shall be an integral part of the controller and provide user-friendly interaction between the service person and the controls. Controller shall be mounted in a NEMA 4X stainless steel cabinet. The door of the cabinet shall have a sealed window placed over the fault indicator board within.
 - 3) The supervisory logic shall be performed by a main controller or coordinated between the elevator controllers which will interface exclusively and directly into an Allen Bradley DH485 protocol remote monitoring network, transmitting data from the elevator controller through a data concentrator to the Authority's AEMS RTU computer control and data system. The supervisory logic will coordinate dispatching assignments, interfacing operational demand data accumulated from car and corridor operating fixtures, selector and door control functions.
 - a. Allocate service to demand, and respond in real time to prevailing traffic conditions as well as historical traffic patterns.
 - b. Constantly compare passenger demand, car load, anticipated demand, car motion status, machine status and other prevailing conditions and evaluate this information in the context of the following dispatching approaches:
 - (1) If applicable, give priority to contiguous calls, assigning calls on adjacent floor to the same car if other criteria are satisfied.
 - (2) Give priority to coincident calls, having the same car let a riding passenger off and a waiting passenger on at the same floor.
 - (3) Anticipate demand based on hall calls and car calls already registered and floors with a high possibility of demand.

- (4) Evaluate relative system response time for each car in the group if applicable, weighing all the above factors.
 - (5) Allocate calls and position cars to minimize waiting times, response time and travel time.
 - (6) Controller shall be capable of operating with an operating temperature range of 32F to 105F with non-drip environment and no more than 90 percent relative humidity.
- c. An Allen Bradley CompactLogix 1769-L32E based PLC control system shall be provided.
- (1) The exclusive Allen Bradley DH485 protocol data port will transmit data from the elevator controller to the station or facility data concentrator. The contractor shall provide a controller data interface to a DH 485 network located in the elevator machine room. Data cables in an existing controller or in the elevator machine room shall be retained and connected into the new controller and available for connection to the controller DH485 interface. If DH485 cabling is not available, the contractor shall run Belden 9842 cable or approved equal, to connect the controller into the monitoring DH485 network as directed by WMATA. The DH 485 controller interface shall be programmable for data rates up to 115 Kbps. The interface shall allow other nodes such as other elevator and escalator to be readily incorporated into the DH 485 network.
 - (2) If not already installed in the station or facility, a data concentrator PLC shall be installed using an Allen Bradley MicroLogix 1400 or SLC5/05 PLC per station to function as data concentrator to consolidate data from all controllers in the station. The software for the data concentrator shall receive controller data over the local monitoring DH 485 network and provide formatted data to the AEMS RTU through an RS232 link. The data concentrator shall provide an Ethernet port for interfacing with the WMATA wide area network. A data concentrator connection to the WMATA wide area network shall be provided.
- 4) Where a non DH485 network compatible controller is approved for installation, the discrete output signals in the Signal List shall be provided through relay contacts or analog current loop, as applicable, to a separate terminal strip. The signals shall be

active when the listed status is present as it is in the elevator control computer. The signals shall be 24 vdc from an independent power supply provided in the elevator controller cabinet or external enclosure by the manufacturer or the installer. Analog signals shall be connected in a 20ma current loop configuration to analog inputs on the added PLC. An area of 18 inches by 10 inches shall be available inside the controller or in an external enclosure - on the side is acceptable - that allows a unit 10 inches deep to be mounted. An Allen Bradley type MicroLogix 1100 PLC with 24-volt input modules for 32 inputs shall be supplied by the manufacturer or the installer. The CPU module must provide DH-485 and Ethernet communications ports. In addition, the contractor shall install an Allen Bradley network interface module, (model 1761-NET-AIC, or equal) for interfacing into the local remote monitoring DH485 network beside the PLC in the controller and provide 24 vdc power to the module. The output signals from the MCE or equivalent shall be wired from the terminal strip to the PLC inputs indicated in the Signal List table. PLC power and signal returns shall be wired into the PLC. The PLC power shall come from 120VAC provided by the car lighting supply in the elevator controller.

- a. The added Allen Bradley PLC will be used for remote monitoring capabilities into the Authority's established engineering monitoring network. ELES Engineering will be responsible for programming the added PLC and wiring the DH-485 network per the block diagram shown in Appendix E.
- b. The PLC shall accommodate the following Signal List, as applicable, and provide data to the data concentrator as specified in specification WMATA-DATA-1.08 (see Appendix F).

Table 1 – Monitored Faults and Statuses

Signal	Comment
Signal Power Supply Down	Common Power Source for inputs is not present
Safety Circuit Tripped	
Top Final Limit Tripped	
Bottom Final Limit Tripped	
Soft Start Faulted	
Overload Tripped	
STOP Button Activated	In-car, top-of-car, pit, controller, etc. STOP pressed
Door Protection Activated	
Out of Service by Delay	Failure to run when demand timed out
Motor Limit Timer Tripped	Motor runs longer than for full Inspection run plus 50%
Valve Limit Timer Tripped	Valve operates longer than for full Inspection run plus 60%
Inspection Operation On	
Independent Service On	
Viscosity Control On	Running pump in bypass mode to heat oil.
Controller TEST Switch On	Test mode on where there is no door operation but runs normally on Independent service
Fire Service Phase I On	
Fire Service Phase II On	
Smoke Sensor @ Main On	
Smoke Sensor at Others On	
Override On	Kiosk Override or Parking Operation on
Car is running up	
Car is Running down	
Car is in door zone	
Interlocks are made	
Front door gate switch made	
Front door fully closed	
Front door fully open	
Front door reversal device activated	
Front door protection activated	
Rear door gate switch made	
Rear door fully closed	
Rear door fully open	
Rear door reversal device activated	
Rear door protection activated	
In-car alarm pressed or phone activated	Either the ALARM button or the phone being activated should generate this alarm signal.
Water intrusion alarm active	Unsatisfactory water and/or oil level in the pit or other areas
Liquid in Casing	Monitor has detected liquid between the cylinder and PVC casing
Car position 1	
Car position 2	
Car position 3	

Car position 4	
Pump Motor Current	Provide 3-phase motor current data
Kilowatt Hours Used	Reset value at 12:01AM each day. (This is calculated by the data concentrator.)
Number of runs up	The up runs should include relevel operations. Reset value at 12:01AM each day.
Number of runs down	Reset value at 12:01AM each day.
Number of Door Cycles - open/close	Reset value at 12:01AM each day.
Low Oil	Indicate if tank oil level goes too low to run the car onto top final limit

- 5) The PLC CPU module shall store the last 99 faults, accessible independent of a laptop connection. All event and fault history data shall be downloadable to a flash or USB drive in a PDF or Excel format from controller fault/status display, or remote communications. The contractor shall provide WMATA with a programming and monitoring unit, such as a laptop computer with the newest version of Allen Bradley RS-Logix and any other software required to setup and program all electronic items in the control system, for each station that this system is installed, for the purpose of troubleshooting and remote monitoring modifications. The laptop should allow for uploading, editing and downloading any software that is being used on the elevators for any operation.
- 6) Elevator manufacturers may not supply their standard, proprietary elevator controller for this project.
- 7) An Allen Bradley PanelView Plus 6 fault/status display/interface (model number 2711P-K6M20A8 or EZ-Automation HMI display with model number EZC-T6C-E), shall be provided in the controller cabinet. Control system timers and other setup criteria shall be programmable through this unit. All fault, status and setup data shall be stored in the controller CPU module.
- 8) Where the programming is done by the supplier, the supplier shall provide a copy of all working programs, including labels for all inputs and outputs, data tables and internal logic points, on CD-R disks as well as a printed program listing. The programs and setup data shall not require a password for access and modification.
- 9) The main control of an elevator shall contain at least the following devices or electronic sensing: phase failure, line voltage monitor, and ground fault monitor.
- 10) Elevator fault reset shall be accomplished by a separate switch installed in the controller.

- 11) All terminals shall have identification markings and all wires, including field wires, shall be provided with permanent heat shrink sleeve wire markers. These unique wiring identifications shall be provided in the wiring diagram at each end of the circuit connections. The marking on the wire shall be identical to the marking on the wiring diagram and the terminal block.
- 12) The controller shall be equipped with an AC induction motor electronic soft-start device installed in-line before the motor contactor and the pump motor.
- 13) The starter shall be solid state, capable of starting motors smoothly and gradually, reducing inrush current and mechanical shock upon start up. The starter shall provide optimization of power factor while the motor is running.
- 14) Adjustable settings for accelerating time and starting torque shall be provided. The starter shall also contain auxiliary contacts, one set of which shall provide a "Soft Start" failure indication to the controller CPU, and a thermal overload relay for motor protection.
- 15) The controller shall have, at least one dedicated serial port for interface to the DH485 monitoring network and programming access, and at least one free Ethernet/IP port.
- 16) If needed, the programmable controller shall have at least one dedicated port to support the controller fault/status display.
- 17) The controller PLC shall provide the following Remote Monitoring and diagnostic network support:
 - a) All applicable faults, statuses and data listed in Table 1 shall be provided.
 - b) Fault indications shall remain until reset in the controller.
 - c) Status and analog data shall be provided for the duration of the condition.
 - d) Software in the controller PLC shall format monitoring data responses to data concentrator polling as specified in the WMATA-DATA-1.09 specification.
 - e) The monitoring data port in the controller shall be setup for DH485 protocol with the port network

- identification number programmed for the particular elevator identification. For instance, identification number 11 applies to elevator 1, 12 to elevator 2, etc.
- f) All faults, statuses and data shall be held by the controller CPU and sent from the CPU to the data concentrator when polled by the data concentrator.
- 18) Provide sufficient non-volatile CPU memory, for non-volatile retention of program memory, system status and operating parameters.
- 19) Diagnostics
- a) The processor shall have built-in diagnostics and self-test, such that each time power is cycled, the processor does a complete CPU and RAM memory test. Additionally the power-up test will momentarily light up all diagnostic LEDs to be sure they are working. A power up test will not be performed if the internal flag (bit) for Firemans Service Phase I is latched. The processor shall be capable of reporting major and minor fault codes and processor status information back to the data concentrator, provided the fault is not a catastrophic hardware failure where the processor is unable to power up.
- b) The processor shall have a built-in watchdog timer to ensure that all processor program scans occur within the time limit set by the watchdog timer or it goes into a "Fault" state.
- c) The processor shall have individual LED indicators that are clearly visible and labeled for easy identification. At a minimum the following indicators must be provided:
- (1) CPU is in RUN mode
 - (2) CPU is FAULTED
 - (3) CPU battery is LOW
 - (4) I/O points are FORCED and are not under program control COMMUNICATION channels are active.
- 20) Input/Output Modules
- a) The Input/Output modules shall be compatible with

the PLC processor I/O structure. Each module shall be provided with a detachable terminal strip to connect wiring to the module.

- b) Discrete Input Modules: Suitable for the input voltage and compatible with the Allen Bradley system.
- c) Discrete Output Modules: Suitable for the voltage and load and compatible with the Allen Bradley system.
- d) Analog Input Modules: Converts analog signals to proportional twelve-bit binary values. The module shall accept four 20 Ma signals. Provide modules compatible with the Allen-Bradley system.

21) I/O Chassis and Power Supply

- a) The I/O and other function modules shall be mounted to allow the addition of at least three additional modules.
- b) Power supplies shall provide power to the PLC processors, I/O and other function modules. The power supply shall be suitable for operation of 120 VAC, single phase power. Power supply capacity shall be a minimum of 150% of the connected load.

22) Air Conditioning

Provide an independent air conditioning unit for each new controller to maintain manufacturers' recommended operating temperatures. Condensate from the air conditioning unit must be piped to a suitable drain.

- 23) Provide a duplex receptacle inside the controller for the purpose of connecting diagnostic devices such as a laptop.

E. Hoistway Doors and Entrances

1. Replace or refurbish entrances and doors as indicated. Refurbishment is to include thorough cleaning followed by re-oxidation (bronze) or polishing (stainless). Remove frame and perform re-alignment and straightening of the entrance frame metal if required. If replacement is indicated, doors and entrances shall be of the same construction. Door panels shall be at least 1-¼ inches thick and shall be bronze clad or stainless steel on the outside landing side to meet the existing condition. Metal for doors and entrances shall not be less than 18 gauge metal. Doors shall have fire resistance rating to conform to fire

code requirements. Meeting edges of center opening doors shall be equipped with rubber bumper strips extending the full height of the panels. Other requirements, as stated below.

2. Hanger Cover Plates: Removable, full-length galvanized steel. Covers shall be made in sections for convenient access to hangers.
3. Fascia: Finish shall be galvanized steel, extending from top of header to sill of door above.
4. Toe Guard: Provide new toe guard. Finish shall be stainless steel.
5. Dust Cover: Provide new dust cover. Finish shall be galvanized steel.
6. Door Bumpers: Provide on vertical struts at top and bottom.
7. Doors: Fill with fireproof, sound deadening material. Provide reinforcement by formed vertical sections running full height of door. Doors shall be provided with four removable gibs.
8. Vision Panels: Provide for each landing & car door panel. The door panel with vision panel installed shall meet the UL rating for elevator hoistway doors. The glass vision panel shall be of uniform size of five (5) inches wide and sixteen (16) inches tall. The center of each glass vision panel shall be installed at 54 inches above the finished floor. All hardware in the door system shall be located as to provide a clear, unobstructed view into the elevator car or hoistway.
9. Sight guards: Provide for each landing door panel. Landing designations shall be permanently applied to each sight guard.
10. Hanger: Provide two-point suspension sheave type with provisions for vertical and lateral adjustments. Sheaves shall be a minimum 3-¼ inch in diameter with sealed ball or roller bearings.
11. Tracks: Shaped and finished to permit free movement of sheaves.
12. Closer: Spirator type
13. Door Restrictor Device per ASME A17.1
14. Door Protection:
 - a. Provide Janus Pana40 Plus full screen curtain and infra-red protective zone or approved equal.
 - b. Nudging: When doors are prevented from closing for 20

seconds due to failure of the proximity device or obstruction, the doors shall close at reduced speed and a buzzer shall sound.

F. Elevator Car Equipment

1. Car Frame: Replace. New frame shall be hot-dipped galvanized.
 - a. Platform: ¼" stainless steel plate.
 - b. Guides: Provide new spring tensioned roller guides with 4-inch minimum diameter rollers.
 - c. Sill and Sill Angle/Support: Provide new heavy duty nickel silver sills and new sill angles and support.
 - d. Toe Guard: Provide new stainless steel.
 - e. Hangers and tracks: Replace hangers, tracks and hardware. Hardware shall be of heavy duty design.
 - f. Floor covering: Provide an approved non slip, #1 finish. All corners and joints shall be welded to form a water tight container, with the sides turned upward a minimum height, and shall run in the direction of a mounted slope, which shall be 1/8" per foot, away from the door with each side sloped to the center. Floor shall be a decorative epoxy-mortar broadcast floor system, color shall be red. Floor cover shall be resistant to urine absorption and deterioration
2. Car Enclosure: Car enclosure shall be manufactured by an approved company. Provide the following features:
 - a. General: The enclosure shall be adequately reinforced and ventilated to meet all the Code requirements. Provide sound-deadening mastic to exterior.
 - b. Shell:
 - 1) Sides and back shall match existing finishes.
 - 2) Canopy: Provide 8 foot 0-inch clear height under canopy; Reinforced 14-gauge; Underside painted baked enamel reflective white. Arrange for hinged top emergency exit including lock as required by Code.
 - 3) Ceiling and lighting:
 - a) Provide clear access to the emergency exit per Code requirements.

- b) Cove type, 16 gauge metal troughs
 - c) LED tube light meeting the lighting requirements of A17.1 shall replace any ceiling light fixture
 - d) Ceiling finish, factory baked enamel finish, matte white
3. Front return panels and entrance columns: 14 gauge; finish shall be stainless steel, cabinets for special operating features and telephone required by these specifications.
4. Transom: Provide new, finish shall be stainless steel.
5. Car door panels: Same construction as hoistway door panel and shall be stainless steel.
6. Interior panels: Front and rear panels shall be stainless steel 14 gauge, rigidized type. Glass panels, if present, shall be laminated glass framed in stainless steel. Provide mounting method which prevents rattling or vibration.
7. Handrail: 6" x 3/8" flat handrail, bevel sharp edges. Provide on both sidewalls and rear. Finish shall be stainless steel.
8. Base: Provide a 4-inch high base.
9. Ventilation: Two-speed exhaust fan, manufacturer's pre-engineered standard, with battery back-up as per ASME A17.1. Fan shall provide minimum 350 cfm and be connected to operate continuously.
10. Car Door Contacts: Electrical contacts shall prevent the operation of the elevator by normal operating devices unless car doors are closed or within tolerances allowed by Code.
11. Door Operator
- a. Provide a GAL MOVFR-W or approved equal door operator with encoderless VVVF drive and the following features:
 - 1) ½ hp motor and heavy duty sprocket, chain, belt, and sheaves.
 - 2) Closed loop regulated speed performance.
 - 3) Hand-held keypad programming.
 - 4) Adjustments can be stored in the keypad and downloaded to another operator.
 - 5) Adjustable door obstruction reversal.
 - 6) Optical cams with LED indicators.
 - 7) Test switches for open, close, nudging and speed zone set up.

- 8) Universal inputs for open, close, and nudging.
- 9) Reversing switch to back up the door reversal device.
- 10) Weather proof enclosure

12. Elevator Car Emergency Communication Device

- # a. A vandal-resistant speaker type communications device shall be furnished in the elevator car and installed in the car station behind a perforated grille and connect to a location provided by WMATA. The push button, located in the car station shall be identified as "Emergency Push to Call". Communication in the car shall also rollover to a 24-hour manned site (Rail Operations Control Center) or alternative location provided by WMATA in the event that the kiosk does not respond to the call. The communications system must be compatible with the WMATA communications system established by the WMATA Communications Department. Retain and re-use the Ramex system boards in the car operating panels. All wiring required in order to provide a fully operational system is the responsibility of the Contractor. #
- b. Provide a red 3/8" diameter light jewel and "FLASHING LIGHT INDICATES ALARM RECEIVED, HELP IS ON THE WAY" engraved in 1/8 inch high lettering into the car operating panel faceplate and black finish with serrated edges. Activation of the emergency button shall illuminate the jewel. Amendment No. 1, October 23, 2013
Provide a long life incandescent lamp behind the jewel which shall illuminate red.
- c. Exposed hardware shall be stainless steel. The finish on unexposed parts, unless otherwise specified, shall be baked enamel.
- d. Contractor shall ensure that system is compatible with, and made operational with existing communication system.
- e. The two-way communication means within the car shall include a means to verify operability of the telephone line. Verification of the telephone line operation shall be automatically performed on at least a daily basis.

13. CCTV Camera: Conduit and wiring (as required) shall be provided to permit installation of surveillance CCTV equipment.

14. Signal Fixtures

a. General

- 1) Faceplate for all elevator operating and signal devices shall be fabricated from stainless steel with 1/8 inch thick faceplate (except hall button fixtures). Faceplate shall be

sufficiently oversized to completely cover cutouts. All faceplates shall be installed flush with surface upon which they are mounted. Abandoned fixtures shall be removed in their entirety and blank faceplate provided (where indicated) in a material to match the hall button fixture faceplate.

- 2) Fixtures shall be designed to fit within existing cutout and provided with new watertight back boxes unless otherwise noted. Where required, enlarge existing cutouts or provide additional cutouts to accommodate the fixtures. Perform all cutting, patching and refinishing of walls.
- 3) Fasten all car and corridor operating device and signal device faceplate with non-corrosive metal spanner head or bristol head tamper proof screws matching the finish of the faceplate to which they are applied.
- 4) Car and corridor pushbutton faceplate shall be designed so that pressure on pushbuttons shall be independent of pressure on pushbutton contacts.
- 5) Engraved legends or numerals in faceplate shall have, lettering ¼-inch high filled with white (or other highly visible color) epoxy unless otherwise specified. Firefighter's engraving shall be red filled. Engravings for devices not used for normal operation of the elevator shall be white (or other highly visible color) filled and a minimum of 1/8-inch high.
- 6) All hall and car call buttons shall be of the call register type, having a power supply not to exceed 120 volts. Pressure on a button shall illuminate the button to indicate that a call in the desired direction has been registered. Replacement bulbs shall be an LED type that is readily available from three (3) separate manufacturers. All car and corridor operating buttons shall be vandal resistant. Fixture faceplate shall be counterbored to accept the pushbutton. The pushbutton and faceplate shall be so designed to minimize the vandalizing of the button by prying action between the pushbutton and the faceplate. The button shall project a maximum of 3/16 inch beyond the faceplate and the bottom travel shall be limited by seating in the counterbore and not on the contact base. The buttons shall be held in the faceplate by a retaining washer. Pushbuttons of the call register type shall be counterbored and filled with 5/16 inch white plexiglass. The pushbutton module shall be self-contained and capable of being removed from the faceplate without

disturbing any other component.

- 7) All car and hall fixtures of the elevator shall be designed to accommodate the handicapped, in accordance with NEII and ADA. All button operators shall be metal encased. Provide markings adjacent to car control buttons as required by ADA. The markings shall be integral with the faceplate and shall be both numerical and Braille. Applied plates are not permitted.
- 8) The centerline of the elevator corridor call pushbuttons shall be provided in accordance with ADA requirements. Car operating call pushbuttons shall be a maximum of 4 feet 0 inches above the finished car flooring.

b. Car Operating Station

- 1) Main car operating panels shall be designed so that the devices used for normal operation shall be located in the lower portion of the panel and the devices used by service and maintenance personnel shall be located in the upper portion of the panel behind a locked door provided with a continuous concealed stainless steel hinge. The faceplate shall be one piece mounted to the back box with a continuous concealed stainless steel hinge and secured with a two position cylinder lock.

(a) The lower portion shall contain:

- (1) A complete set of 3/4 inch diameter illuminated pushbuttons with 5/8-inch indelible designations to the left of buttons corresponding to the floors served. Lights shall extinguish when the car stops at a given floor. Designations shall be white or other highly visible color.
- (2) Emergency signal alarm bell button with illuminating jewel and emergency stop keyswitch (red in color).
- (3) Door "OPEN" and door "CLOSE" buttons located below the car buttons. The door "OPEN" button shall be located adjacent to the car door entrance column.
- (4) Emergency light with lens.
- (5) Firemen's Emergency Service Phase II keyswitch, call cancel button and fire emblem light jewel (visual signal).

- (6) Emergency stop keyswitch and the emergency alarm bell button shall be located below the car operating buttons at a nominal distance from the finished floor of 35 inches. Emergency signal alarm bell button shall illuminate a jewel when activated and shall be connected to a 6-inch vibrating alarm bell located in the hoistway at the main landing and on top of each car. Provide alarm bell including the necessary wiring and auxiliary devices.
 - (7) Audible signal activation button.
 - (8) A flashing acknowledgment light which shall be engraved "FLASHING LIGHT INDICATES ALARM RECEIVED - HELP IS ON THE WAY" which shall flash whenever communication is established with the cars.
 - (9) Provide voice annunciation for the elevator, to be heard both inside and outside the car. The annunciator shall be digital and shall be programmable for any special messaging.
 - (10) Engraved lettering, one-inch high indicating Elevator Station & Number and "NO SMOKING"; one-quarter inch high indicating "CAPACITY XXXX LBS"
- (b) The upper section (service cabinet portion) shall contain the following devices, all of which shall be keyed:
- (1) Switch for controlling car work lights.
 - (2) Switch for controlling interior car lighting.
 - (3) Switch for controlling 2 speed car ventilating blower.
 - (4) Two-position, key-operated inspection switch that will disconnect normal operation, and will allow the top-of-car operating device to function.
 - (5) Independent Service keyed switch.
 - (6) Keyed switch (with pilot light) to remove power from the motor drive.
 - (7) Any other signal lights, switches, or devices required for adjustments and maintenance of the

elevator.

(8) Combination service cabinet door and certificate frame with LEXAN Lens.

- 2) Auxiliary car operating panels and car position indicators, shall be of the same style and finish as the main car operating panel, and provided on all elevators with front and rear opening doors.

c. Hall Stations

- 1) The existing hall button fixtures and wiring at each floor shall be removed and replaced as indicated. Provide new hall stations as indicated with new liquid tight branch wiring to the shaft riser. Provide faceplate for both elevator and hall stations, finishes to match existing and size as required to conceal existing cutouts. Mount faceplate to the backplate with tamper proof screws. Call buttons shall be a visible contrasting color to the fixture faceplate. Nomenclature shall be white.
- 2) Fixtures for terminal landings shall contain a single "UP" or "DOWN" button. Each button shall contain an integral registration light which shall illuminate upon registration of a call and shall extinguish when the call is answered. If a landing button is operated while the car and hoistway doors are closing at that floor, the doors shall stop and re-open and shall remain open for a normal passenger transfer time.

d. Car Position Indicator: The digital car position indicator shall be provided integral to the car operating panel.

e. Top-of-Car Operating Device

- 1) Provide a top of car operating device which shall be activated by a key switch mounted in the upper portion of the car operating panel. The keyswitch shall be keyed the same as the access key switches in the corridor and have the "ON" and "OFF" positions permanently marked on the faceplate with 1/4-inch letters.
- 2) Movement of the elevator shall be accomplished by continuous pressure on a direction button and a safety button simultaneously.
- 3) Provide a two position toggle switch marked "INSP" and "RUN".
- 4) Provide an emergency stop toggle type switch as per

Code.

- 5) Provide permanent identifications for the operation of all components in the device.
 - 6) Each device shall be permanently attached to the elevator crosshead on the side of the elevator which is nearest to the hoistway doors.
 - 7) Provide a fire emblem jewel which shall illuminate when Firemen's Emergency Service, Phase I is initiated.
 - 8) Provide a GFCI receptacle in the top of car operating device.
- f. Alarm Bell System: Provide an alarm bell system located on top of the car and in the hoistway at the main landing which shall be audible outside the hoistway when activated by the ALARM call button on the car control station.
- g. Car Directional Indicator: Provide new car directional indicator in the cab door jamb which shall be visible from the floor area adjacent to the hall call buttons.
- h. Accessibility Provisions:
- 1) Comply with the requirements of the Americans with Disabilities Act (ADA) and ANSI A117.1.
 - 2) Car operating panel shall be mounted so that the dimension from the finished floor to the centerline of the highest button used for automatic operation does not exceed 48 inches and the dimension from the finished floor to the centerline of the emergency controls is not less than 35 inches.
 - 3) Provide floor designations with both alpha/numerical and Grade 2 Braille markings on both side jambs of the hoistway entrances visible from within the car and the elevator lobby at a height of 60 inches above the finished floor. Designations shall be 2 inches high and shall be as approved by the Contracting Officer's Representative. Plates shall be secured to the entrance jambs by use of vandal resistant fasteners. Adhesive mountings are not permitted.
 - 4) Provide minimum 5/8 inch high markings with alpha/numeric and Grade 2 Braille designation adjacent to car control buttons. The marking shall be integral with the faceplate. Applied marking plates are not permitted.

- 5) The elevator shall have the capability to level and relevel to 3/16 inch leveling accuracy.
- 6) Corridor hall buttons centerline shall be centered at 42" above the finished floor.
- 7) Emergency communication shall be properly identified by a red jewel around the button and located so that the highest operational part shall not be more than 48 inches above the finished floor. In addition, a light jewel with the appropriate engraving shall be located on the car operating panel, which will illuminate to indicate that help is on the way once the emergency call has been acknowledged.

2.04 OPERATION

- A. Automatic Self Leveling: Provide a self-leveling feature that shall automatically bring the car to the floor landings within a tolerance of 3/16 inch fully loaded without "hunting". This self-leveling shall, within its zone, be entirely automatic and shall correct for over travel/ under travel. The car shall also be maintained approximately level with the landing, irrespective of load, while loading and unloading.
- B. Automatic Elevator Operation:
 1. Furnish and install operating devices consisting of a series of push buttons in the car numbered to correspond to the landings, and a single hall call button at each landing, all connected electrically to the control system governing floor selection, direction of travel, acceleration and retardation, to supply the operation described herein. In addition to the floor buttons, the car operating panel shall contain a red emergency stop switch arranged to interrupt the power supply to the motor independently of the operating device, a car light switch, an alarm bell button, a cab fan switch, "Door Open" and "Door Close" buttons, fire service switch, independent and inspection switches, hands free autodial telephone unit and such auxiliary switches and/or keyswitches as may be required. Switches and buttons not required for automatic operation shall be mounted behind a hinged locked cover which shall also house a frame for the car certificate.
 2. Car calls shall be registered by passengers within the car by pressing the button corresponding to the floor to which they wish to go. Corridor calls shall be registered by pressing the buttons in the corridor push-button fixture.
 3. Power operated doors shall open automatically as the car reaches the landing and, after an adjustable, predetermined time, shall close, and the car shall then proceed to answer any remaining car or assigned corridor calls. The protective device on the car door,

when activated, shall reopen and prevent closing the doors.

4. A low oil protective control circuit shall be provided to automatically stop the car should oil level become insufficient to permit the car to respond to an upper floor call. System shall automatically bring car down to lowest landing, open doors, and then shut down elevator. All control buttons except the door open button shall be made ineffective. A light shall be provided on the controller fault/status light panel which shall illuminate to indicate a low oil shutoff, as well as providing a fault status indication on the controller fault display.
5. Door open dwell times shall be adjustable so that open time for a car call is shorter than for landing calls. If a longer time is needed for passenger entry, doors shall be prevented from closing by the protective static curtain on car door, or by pressing the "Door Open" button in the car.
6. Should the car be delayed at a floor beyond a predetermined (field changeable) adjustable time (set initially at 30 seconds), a buzzer shall sound and the doors shall close at reduced speed. The nudging operation and buzzer activation shall be designed to be independent of the door closing sequence.

C. Two-Stop Collective Simplex Automatic Operation:

1. The existing two-stop collective simplex automatic operation shall be reused and checked for the following:
 - a. System shall be designed so that when the car is standing at either terminal landing, pressure on car button for the other terminal shall automatically dispatch car to that landing. Pressure of landing button at either terminal landing shall call car automatically to that landing. If a landing call is registered while the car is making its trip that call shall remain registered until the car responds to that call. If no car calls are registered car shall start automatically and respond to hall calls. Provide time limit relay arranged to hold car at landing at which it has stopped for predetermined time after car stops. After all car landing calls have been answered, car shall remain parked at landing where last used with car and hoistway doors closed until another call is registered. Pressing the landing button at floor at which car is parked shall automatically open car and hoistway doors. In all normal operations, the starting of the car shall be contingent upon establishment of hoistway door interlock and car door circuits.
 - b. Automatic dispatching operation: all two stop elevators shall include "Step-in-and-Go" feature. Calls for the opposite landing will be automatically set when the elevator opens its doors for a hall call. This feature shall be provided for all

elevators that have public access for two stops (i.e., any elevators with key operated service landings will be included).

2. For multi car installations:

- a. Allocate calls and position cars to minimize waiting times and travel time.
- b. Allocate service to demand and respond in real time to traffic conditions.
- c. Provide for scheduled, time and day initiated, operating modes such as up and down peak traffic conditions.

D. Operation of Elevators In Fire or Other Emergency Conditions

1. The Designated Level shall be the level designated by the local fire marshal or authority having jurisdiction.
2. Elevator controls for Emergency Fire Service Operation shall be connected to the existing system fire alarm system.
3. Emergency Fire Service Recall (Phase I) and In-Car (Phase II) Fire Service Operation shall be provided for the elevators in accordance with the ASME A17.1 code.
4. Provide a separate battery powered unit that senses loss of power. Device shall be G.A.L. Manufacturing Corp. Rescuvator or approved equal and, when activated by a power loss, shall operate as follows:
 - a) Elevator automatically descends to bottom landing.
 - b) Doors open automatically when car arrives at bottom landing and remain open until power is restored.
 - c) Elevator shall remain inoperative until normal power is restored.
 - d) The system shall differentiate between actual power failure and manual operation of disconnect switch. A "Battery Operation Test" switch shall be added in the controller for periodic testing and repair procedures; this shall be a momentary pushbutton switch that, when pressed, interrupts the signal from the mainline disconnect position detector switch so that battery operated lowering occurs when the mainline is turned off and the "Battery Operation Test" switch is held depressed to complete the operation.
 - e) Failure protection (operational/power) battery shall be a 12 volt minimum, sealed, lead acid or equal. Unit shall be connected to a power source in order to automatically maintain the battery

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at its proper charge. The battery shall not be installed in the elevator controller cabinet.

- f) Provide a manual lowering valve to allow the car to return to the lowest landing.
 - g) Provide all wiring and associated connections to the main line power.
- E. Independent Service: Provide an Independent Service key switch in the main car operating panel which, when placed in the ON position, will remove the elevator from its respective operation and transfer to Independent Service, it shall respond to all car signals but not hall signals. Doors shall open automatically but shall close by constant pressure on the DOOR CLOSE button. If the DOOR CLOSE button is released before the doors are fully closed, they shall reopen. Hall lanterns shall be inoperative during Independent Service Operation.
- F. Kiosk Control Panel: Contractor shall make all necessary repairs to ensure operation of the kiosk control panel and to ensure that new system is made compatible with the kiosk control system. All wires between the kiosk and the elevator machine room shall be replaced and the function of the buttons and lights shall be verified for proper operation.

2.05 ELECTRICAL REQUIREMENTS

- A. Provide wiring and conduit from the mainline disconnect switch throughout the elevator control system with complete wiring and conduit systems in the hoistway, machine room and pits, including traveling cables adequate for the proper operation of the equipment.
- 1. Conduit and Wiring
 - a. Unless otherwise specified, all electrical conductors in the pits and hoistways, except traveling cable connections to the car shall be provided in rigid zinc-coated steel conduit with steel outlet boxes, except that a small amount of flexible conduit may be used where conduit is not subject to moisture or embedded in concrete, as approved by the COTR. Terminal and pull boxes and other similar items shall be of approved construction, thoroughly reinforced, and in no case less than number 12 USSG. All electrical boxes exceeding 150 cubic inches shall be supported independently of the conduit. The rigid conduit shall conform to the Federal specifications hereinbefore specified. All raceway shall be threaded rigid steel conduit. Flexible heavy-duty service cord, type SO, may be used between fixed car wiring and switches on car doors for safety edges and light ray devices.

- b. All conduits terminating in steel cabinets, junction boxes, wireways, switch boxes, outlet boxes and similar locations shall have approved insulation bushings. If the bushings are constructed completely of insulation material, a steel locknut shall be installed under the bushing. At ends of conduit not terminating in steel cabinets or boxes, the conductors shall be protected by terminal fittings having an insulated opening for the conductors.
- c. Conduit and EMT fittings and connections using set screws or indentations as a means of attachment are not permitted.
- d. Connect motors and other components subject to movement or vibration, to the conduit or EMT systems with flexible conduit.
- e. All existing machine room conduit and wiring shall be replaced with new materials to suit the new equipment. Conductors in the machine rooms shall be installed in rigid zinc coated steel conduit, electrical metallic tubing or metal wireways.
- f. All existing hoistway wiring and conduit, including all junction boxes, shall be replaced with new.
- g. The Contractor shall furnish all materials and completely wire all parts of the electrical equipment of the elevators including electrical devices on hatch doors. All car wiring and conduit shall be replaced with new including car junction boxes.
- h. All solid state and electrical components located on top of the car enclosure or in the hoistway shall be installed within NEMA 4X enclosures.
- i. Conduit shall be brought and connected to suitable approved connection boxes at all outlets, apparatus and panels.
- j. The conduit shall be of such size that the wires or cables can be readily installed and replaced, if necessary. No conduit or raceway shall be less than 3/4 inch trade size, except that for small devices such as door switches, interlocks, etc., 1/2 inch conduit may be used. The total overall cross sectional area of the wires contained in any conduit shall not exceed 40 percent of the internal area of the conduit. Approved strain boxes shall be installed for all vertical runs in accordance with Code.
- k. Conduit shall be neatly and systematically run. All exposed conduit and boxes shall be supported by approved and substantial straps, hangers or clamps to the structural steel, reinforced concrete, or other approved supports. Riser conduits in hoistway shall be supported at each floor level.

- l. In all machine rooms, hoistway, etc., the equipment shall be laid out and installed so as to allow as adequate and convenient access for maintenance as space conditions will permit.
- m. All interlock, hall button and limit switch branch wiring shall be enclosed in flexible steel conduit with covering of liquid tight Type "EF" with connectors having nylon insulated throat.
- n. All screws used for terminal connections of all wiring (machine room, hoistway and pit) shall be provided with "star washers" of proper size and type.
- o. All existing conduit and wiring shall be removed and wall/floor slabs patched with fire rated material.
- p. There shall be no drilling or accessing top side of any controller or junction box for any purpose. Wires shall be run through the side or bottom of the enclosure.
- q. Any junction box with a terminal point shall have proper markings on all the wires and the terminal blocks. These markings shall be identified in the wiring diagram. No field splice of wires shall be allowed.

2. Conductors

- a. Unless otherwise specified, conductors, exclusive of traveling cables, shall be stranded or solid coated annealed copper in accordance with Code for Type THHW. Where 16 and 18 AWG are permitted by Code, either single conductor cable in accordance with Code for Type TF, or multiple conductor cable may be used provided the insulation of single conductor cable and outer jacket of multiple conductor cable is flame retardant and moisture resistant. PVC insulation will not be permitted. Multiple conductor cable shall have color coding or other suitable identification for each conductor. Conductors for control boards shall be in accordance with Code. No joints or splices shall be permitted in wiring except at outlets. Tap connectors may not be used.
- b. All wiring shall test free from short circuits or grounds. Insulation resistance between individual external conductors and between conductors and ground shall be not less than one megohm.
- c. Where size of conductors is not given, capacity shall be such that maximum current shall not exceed limits prescribed by Code.

- d. Equipment grounding shall be furnished and installed. Ground conduits, supports, controller enclosures, motors, platform and car frames, and all other non-current conducting metal enclosures for electrical equipment in accordance with Code. The ground wires shall be copper, green, insulated and sized as required by the Code.
- e. Terminal connections for all conductors used for external wiring between various items of elevator equipment shall be solderless pressure wire connectors in accordance with Code. The Contractor may at his option make these terminal connections on No. 10 or smaller conductors with approved terminal eyelets set on the conductor with a special setting tool, or with an approved pressure type terminal block. Terminal blocks using pierce-through serrated washers are not acceptable.
- f. Provide all necessary conduit and wiring between all remote machine room and hoistway.

3. Traveling Cables

- a. Traveling cables from junction box on car to junction box in hoistway shall consist of flexible traveling cables conforming to requirements of Code. Junction boxes in hoistway and on car shall be equipped with terminal blocks. All connections to terminal blocks shall be made with either terminal eyelet connections or pressure wire connectors of the clamp type that meet UL 486 requirements for stranded wire. Terminal blocks shall have permanent indelible identifying numbers for each connection. Handwritten labels are not permitted. The outer covering must remain intact between junction boxes. Abrupt bending or twisting producing distortion of cable is not permitted. Cables shall be free from any possible contact with hoistway structure, car or other equipment. Furnish and install shields or pads to protect the cables. Travel cables shall include coaxial cable shielded for the communications system.
- b. Cables shall include ten percent spare wires but not less than 2 spare conductors in each traveling cable between each controller, selector, and hoistway junction box, all spares to be properly tagged or otherwise identified with clear and indelible markings. Provide 6 shielded pairs and 2 shielded coaxial cables for CCTV.
- c. Provide sufficient wiring in the travel cables for car lighting and fan control circuits and car work lights.
- d. Provide traveling cable for telephone in the elevator car. Cable shall extend from junction box in hoistway to telephone box in car.

- e. Car and hoistway junction boxes shall be provided for the elevator. Hoistway junction boxes shall be provided if necessary.
- f. All insulated wiring, control wiring and wiring in traveling cables shall be tag coded at their terminals in the machine room, hoistway junction box, elevator cab junction box, and push-button stations within the cab, and shall agree with the approved wiring diagrams.

4. Tagging

- a. All insulated wiring, control wiring and wiring in traveling cables shall be tag coded at their terminals in the Elevator Machine Room, hoistway junction boxes, all elevator cab junction boxes and push-button (COP) stations within the cab. Each device, each terminal and each wire in the controller panels shall be properly identified by name, letter, or standard symbol in an approved indelible manner on the device, panel or wire. The identification markings shall be identical to markings used on the wiring diagrams. The markings shall be provided with permanent heat shrink sleeve wire markers. Handwritten labels are not allowed.
- B. Provide circuit protection for signal system incorporated in circuit breaker, disconnect switch or power controller.
 - C. Contacts in elevator motor circuits which are to be opened by governors or other safety devices shall be copper to carbon or other approved non-fusing type. Contacts on control and signal relays and switches shall be commercially pure silver. Contacts on switches breaking heavy motor circuits shall be copper to carbon or, if metal, shall have supplementary breaking contacts and shall operate with suitable wiping action, or shall be of approved equivalent design and construction. They shall be equipped with suitable blowout coils, vanes, barriers, etc., where necessary to prevent undue arcing and heating.
 - D. Car and hall operating signal circuits shall not exceed 120 volts.
 - E. In the machine room, hoistway, etc., the equipment shall be laid out and installed to allow as adequate and convenient access for maintenance as space conditions will permit.
 - F. Each major component of equipment shall have the manufacturer's name, type, class or catalog number on a metal plate securely attached to the item of equipment in a conspicuous location.
 - G. All cabinets containing motor drives, filter boxes, transformers and power reactors shall be supported on rails and isolated from the base

- building structure with elastomer pads having a minimum static deflection of 3/8" (Mason Type N, or equivalent). All connections to and from the cabinetry shall be flexible in order not to compromise the isolation system. Use non-rigid conduit for the final electrical connection, with all other conduit supports and clamps provided on a neoprene sponge insert.
- H. Supply, installation and connections of fused main line disconnect switch of the lockable type for the elevators in the machine rooms.
 - I. Signal to the controller in the machine room to indicate special emergency condition due to lobby smoke detector activation; and smoke detectors in the elevator lobby and machine room in accordance with the ASME A17.1 code. Furnish and install means to automatically disconnect the main line power supply to the elevator prior to the application of water.
 - J. Car lighting and fan circuit for the elevators shall be located in circuit breaker panel in the machine rooms.
 - K. Permanent light fixtures with switches and duplex grounded receptacles in the elevator machine room and elevator pit. Receptacles in the pit shall be ground fault circuit interrupter type.

2.06 MECHANICAL REQUIREMENTS

- A. All bearings, pivots, guides, gearing and similar elements subject to friction or rolling wear in the entire elevator installation, shall be accurately and smoothly finished and shall be arranged and equipped for adequate and convenient lubrication. Means shall be provided for flushing and draining the larger bearings and gear cases. All oiling holes shall have dustproof self-closing caps.
- B. All plain bearings shall be liberally sized in accordance with the best commercial elevator usages which have proved entirely satisfactory on heavy duty installation.
- C. Ball and roller bearings shall be of liberal size and of a type and make which have been extensively and successfully used for similar heavy duty on other elevator installations. They shall be fully enclosed. Loading, lubrication, support and all other conditions of use shall be in accordance with the recommendations of the bearing manufacturer, based on previous extensive and satisfactory elevator usage.
- D. All bolts used to connect moving parts, bolts carrying hoisting stresses, and all other bolts except guide rail bolts, subject to vibration or shock, shall be fitted with adequate means to prevent loosening of the nuts and bolts. Bolts transmitting shearing stresses between machine parts shall have tight body fit in drilled holes. All bolts subject to vibration shall be provided with split ring lock washers.

- E. All bearing and sliding surfaces of shafts, pins, bearings, bushings, guides, etc., shall be smoothly and accurately finished. They shall be assembled and installed in accurate alignment and with working clearance most suitable for the load, speed, lubrication and other conditions of use. All bearings shall be regularly checked for any tendency to run hot, and all defects corrected.
- F. Belts, pulleys, chains, gears, couplings, projecting setscrews, keys, cables and other rotating parts located so that any person can come in close proximity thereto, shall be fully enclosed or properly guarded.

2.07 PERFORMANCE

- A. Performance Times, Leveling, Contract Speed and Door Operating Times: The Contractor shall adjust the control system to provide and maintain smooth acceleration and deceleration under varied conditions. Door operating times shall be field adjustable.
- B. Speed: Plus or minus 10 percent under all loading conditions.
- C. Capacity: Safely lower, stop and hold 125 percent of rated load.
- D. Door open time shall be adjustable and pre-set for 5 seconds.

2.08 SHOP FABRICATION

- A. The various parts of the elevator systems shall be fabricated and assembled as practical, in the shop to minimize field assembly. Parts which cannot be shop-assembled but require close field fit shall be trial-assembled in the shop and given field erection marks where necessary to eliminate fitting work at the construction site.
- B. A CAD drawing shall be submitted to the contracting officer for the various parts of the elevator system that are fabricated.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Procedures for taking a unit out of service shall be performed in accordance with Appendix D "EOC Key Functions".
- B. Install all replacement equipment, systems, and components in strict accordance with manufacturer's instructions and approved shop drawings.
- C. It is the contractor's responsibility to ensure that existing equipment

can be safely removed and new equipment installed in existing spaces through existing access. Any exceptions to this shall be identified and exceptions taken prior to submission of the proposal.

3.02 ACCEPTANCE INSPECTION AND TESTS

- A. Upon completion of rehabilitation Work for the elevator, perform acceptance inspection and tests required in Section 1006 of the ASME A17.1 code, prior to beginning rehabilitation work on the next elevator. Provide all instruments, materials and labor required for the tests. Final acceptance tests shall be made by the Authority. Notify the Contracting Officer's Representative one (1) week prior to each scheduled test. Submit copies of all test results to the Contracting Officer's Representative. The O&M Manuals, schematics, and sequence of operation shall be submitted to the Contracting Officer's Representative for approval prior to the execution of the work on the next elevator. The approval process will not delay the start of work on the next elevator.
- B. All malfunctions and deficiencies revealed by the tests shall be forthwith corrected by the Contractor at no additional cost to the Authority.
- C. Full-Load Run Test: Elevators shall be tested for a period of one (1) hour continuous run with full contract load in the car. During the test run, the car shall be stopped at all floors in both directions of travel for a standing period of not less than five (5) nor more than ten (10) seconds per floor.
- D. Speed Test: The actual speed of the elevator shall be determined in both directions of travel with full contract load and no load in the elevator. Speed tests shall be made before the full load run test and after the full load run test. Speed shall be determined by applying a tachometer to the car rails while riding the top of the car. The actual measured speed of the elevator with all loads in either direction shall be within 5% of specified rated speed. Full speed runs shall be quiet and free from vibration and sway.
- E. Static Car Balancing: The car shall be statically balanced in its sling so that the total lateral force on top car guide assemblies shall be a maximum of forty pounds (40 lbs.) for all positions of the car in the hoistway.
- F. Car Leveling Test: Elevator car leveling device shall be tested for accuracy of leveling at all floors with no load in car, and with contract load in car, in both directions of travel. Accuracy of floor leveling shall be within plus or minus 3/16" of level with any landing floor for which the stop has been initiated (with a definite range of distance in advance of the landing) regardless of load in car or direction of travel. The car leveling device shall automatically correct over travel as well as under travel and shall maintain the car floor within plus or minus

- 3/16" of level with the landing floor regardless of change in load.
- G. Insulation Resistance Test: The elevator's complete wiring system shall be free from short circuits and grounds and the insulation resistance of the system shall be determined by the use of a Megohmmeter, at the discretion of the inspector conducting the test.
 - H. Overload Devices: All overload current protection devices shall be tested within their designated circuitry. Overloads shall not be bench tested.
 - I. Limit Stops: The position of the car when stopped by each of the normal limit stops with no load and with contract load in the car shall be accurately measured. The car shall reach the terminal landings under the above condition. Final position of the elevator relative to the terminal landings shall be determined when the elevator has been stopped by the final limits. The lower limit stop shall be made with contract load in the elevator. The upper limit stop shall be made with no load in the elevator. Elevator shall be operated at contract speed for both tests. Normal limit stopping devices shall be inoperative for the tests.
 - J. Setting of Car Door Contacts: The position of the car door at which the elevator may be started shall be measured. The distance from full closure shall not exceed that required by the Code. The test shall be made with the hoistway doors closed or with the hoistway door contact inoperative.
 - K. Setting of Interlocks: The position of the hoistway door at which the elevator may be started shall be measured and shall not exceed the Code requirements.
 - L. Operating and Signal System: The elevator shall be operated by the operating devices provided, and the operation signals and automatic floor leveling shall function in accordance with requirements specified. Starting, stopping and leveling shall be smooth and comfortable without appreciable steps of acceleration or deceleration.
 - M. Provide a full fire service test of both Phase I and Phase II Fireman's Service.
 - N. All elevators, if connected to the emergency power system (generator), will also be tested with the emergency power system. Tests are to be performed after revenue hours.
 - O. Performance Guarantee: Should any of these tests develop any defects or evidence of poor workmanship, any variance or noncompliance with the requirements of the specified codes and or ordinances or any variance or noncompliance with the requirements of these specifications, the following work and or repairs shall be complete at no expense to the Authority.

1. Replace equipment that does not meet code or specified requirements.
 2. Perform work and furnish labor, materials and equipment necessary to meet specified operation and performance.
 3. Perform and assume cost for retesting required by Governing Code Authority and Authority to verify specified operation and performance.
- P. Warranties: Contractor shall be responsible for all warranty work for a period of one (1) year, including both labor and materials.

3.03 CLEANING AND ADJUSTMENTS

- A. After completion of Work of this Section, and before the issuance of Certificate of Final Completion, Work shall be thoroughly cleaned, and properly adjusted, so that it is in proper operating condition. The entire Work shall be left in a clean condition, satisfactory to the Contracting Officer's Representative.

3.04 INSTRUCTION OF AUTHORITY'S PERSONNEL

- A. The Contractor shall make arrangements for the instruction of personnel as designated by the Authority (a minimum of 24 hours as scheduled by the Contracting Officer's Representative) in the details of maintaining, adjusting and trouble-shooting the equipment per training session, with a minimum total of twelve (12) days of training.
- B. Training: Provide separate training sessions, conducted by authorized instructors, each session shall be 8 hour continuous duration during normal working hours. The Authority's personnel designated to receive training will be identified to the contractor prior to the scheduled training. The major topics/area of instruction shall be addressed in the training sessions are as follows:
1. Troubleshooting of all mechanical systems such as door operations, safety interlocks, safety systems, etc.
 2. Troubleshooting of all electrical/electronic control systems and subsystems in conjunction with the use of the straight line and schematic diagrams provided by the contractor.
 3. A separate training manual shall be submitted for approval prior to the scheduling of the training. The O&M manual shall not be used as a training manual.
 4. At the completion of the first training session, a narrated and properly edited training video shall be submitted for the Authority in DVD or flash drive form. The video shall be used for future

training sessions. The video shall cover operation of devices, maintenance and troubleshooting.

The following items shall be included as minimum requirements: Installation and adjustment of valves; adjusting safety switches; troubleshooting, and maintenance procedure of major components.

- C. Scheduling: Training shall be done on the first elevator after it has been completely finished, tested and ready for turnover to the Authority.

3.05 OWNERSHIP OF REMOVED EQUIPMENT

- A. Prior to commencement of work on EACH elevator, contractor will contact the Authority in writing to determine what equipment, if any, is to be retained by the Authority. Contracting Officer's Representative will respond within five (5) working days.
- B. The specified equipment shall be delivered to the Authority at the Pennsy Drive Facility in Landover, Maryland as directed by the Contracting Officer's Representative.

END OF SECTION

SECTION 14211, REHABILITATION OF GEARED TRACTION ELEVATORS**PART 1 - GENERAL****1.01 SUMMARY**

- A. This section specifies the requirements for rehabilitation of traction elevators located throughout the WMATA system as identified in Appendix B – Traction Unit Listing.
- B. The general extent of removals, furnishing/installation, and additions of equipment and components for the existing elevator rehabilitation as specified in 1.02 “General Description of Elevators To Be Rehabilitated” herein. This specification describes work for each aspect of the rehabilitation and not all elevators will have the same requirements. Refer to Appendix B - Traction Unit Listing to determine which parts of the specification apply this elevator.
- C. The following definitions apply to work of this Section:
1. “Provide”: to furnish and install, complete for safe operation, unless specifically indicated otherwise.
 2. “Install”: to erect, mount and connect complete with related accessories.
 3. “Supply”: to purchase, procure, acquire and deliver complete with related accessories.
 4. “Work”: labor and materials required for proper and complete installation.
 5. “Wiring”: raceway, fittings, wire, boxes, and related items.
 6. “Concealed”: embedded in masonry or other construction, installed in furred spaces, within double partitions or hung ceilings, in trenches, in crawl spaces or in enclosures.
 7. “Exposed”: not installed underground or “concealed” as defined above.
 8. “Indicated”, “shown” or “noted”: as indicated, shown or noted on drawings or as specified.
 9. “Similar” or “equal”: of base bid manufacturer, equal in materials, weight, size, design and efficiency of specified product, conforming with “Acceptable manufacturers.”
 10. “Reviewed”, “satisfactory”, “accepted”, or “directed”: as reviewed, satisfactory, accepted or directed, by or to The Authority.

1.02 GENERAL DESCRIPTION OF ELEVATORS TO BE REHABILITATED

A. Specific replacement requirements are listed in Appendix B - Traction Unit Listing. The general extent of the work for the elevators to be rehabilitated includes, but is not necessarily limited to the following:

- | | | |
|------|-------------------------------------|---|
| 1. | Loading Classification - | Passenger |
| 2. | Sequence of Operation - | Automatic Simplex |
| 3. | Geared Machine - | Provide new geared traction machines |
| 4. | Hoist Motors - | Remove and replace with AC motors |
| 5. | Entrances & Frames - | Refurbish or replace entrances and frames as indicated. |
| 6. | Governors - | Remove and replace |
| 7. | Cab and Hoistway Door Arrangement - | Remove and replace with new doors and sills. |
| 8. | Cab Enclosure - | Replace with new stainless steel cab enclosure. |
| # 9. | Hoist ropes - | Provide new hoist, governor and counterweight ropes. All hoist ropes to be pre-stretched. # |
| 10. | Cab Door Operation - | Furnish and install new power-operated VVVF closed loop car door system. |
| 11. | Fixtures and Signals - | Furnish and install new hall and car operating panels with register lights. Provide new car floor position indicator in car operating panel. The new car and hall button riser fixtures shall comply with ADA. |
| 12. | Control & Drive Equipment - | Provide new microprocessor based signal control system to suit new VVVF system. Provide a controller air conditioning unit with each new controller. Where indicated, the existing microprocessor controller is to be retained and all fixtures and equipment shall integrate with existing controller. An air conditioning unit shall be provided for retained controllers that are not air conditioned. |

13.	Wiring and Conduit -	Furnish and install new wiring and conduits in machine room and hoistway and in between, including new coded traveling cables with 10% spare conductors with six pairs shielded communication cables and two coaxial cables for CCTV. Furnish and install new junction boxes throughout.	
14..	Car Platform -	Remove and replace. Platform shall be balanced. Floor cover shall be resistant to urine absorption and deterioration.	
15.	Car Frame -	Remove and replace. Frame shall be hot-dipped galvanized.	
16.	Door Reopening Device -	Remove and replace with new.	
17.	Buffers -	Remove and replace with new.	
18.	Safeties -	Remove and replace with new.	
19.	Car Guides -	Provide new spring tensioned roller guides.	
20.	Guide Rails -	Reuse existing rails, clean & paint, except as noted. Provide rail extensions to support new car guides and replace bottom rail sections. Finish of shroud shall match existing hoistway frame..	
21.	Firemen's Emergency Svc. -	Furnish and install new elevator recall (Phase I) and (Phase II) Fire Service operation in accordance ASME A17.1.	
#	22. Intercommunication Sys. -	Furnish and install a new hands free communications system from the car and corridor to station kiosk or command offices for garages and rail yards. All wiring required to provide a fully functional system is the responsibility of the Contractor.	#
23.	Disability Compliance -	Comply with the requirements of the ADA and ANSI A117.1.	
24.	Electrical Supply -	Reuse existing power supply 480V, 3-phase, 60-cycle, AC. Provide new mainline disconnect as indicated. Provide new light & signal 120V, 1 phase, 60-cycle disconnect. Comply with	

- requirements of ASME A17.1 and the National Electric Code.
25. Miscellaneous - Furnish and install new normal and final limits, top cab emergency exit contact, emergency car lighting (shall maintain lighting for a minimum of 4 hours), inspection and maintenance car top operating station, and emergency keyways at both floors, pit stop switch, pit ladder, pit lighting fixtures and GFCI receptacles, removal of all abandoned equipment plus all old conduit and junction boxes not used and testing for compliance to Code and contract requirements. Provide lighting per Code requirements for elevator machine rooms.
26. Painting - The pit and pit walls shall be painted. All machine room equipment shall be given two (2) coats of approved machinery paint. All new iron work shall be given one coat of rust-inhibiting paint. All finishes shall match existing finishes.
27. Brakes - Provide new brakes.
28. Sheaves - Remove and replace all sheaves.
29. Hoistway Glass - Upon completion of the rehabilitation, clean all interior and exterior sides of existing hoistway glass. Remove and replace damaged hoistway glass and damaged or missing frame work as indicated.

1.03 DESIGN AND PERFORMANCE REQUIREMENTS

- A. Compliance: Design, fabrication and performance shall comply with all the latest applicable provisions of the Codes, Standards and recommendations of the entities listed below.
1. Codes: Work of this Section shall comply with all governing local Codes including, but shall not necessarily be limited to ASME A17.1, Electrical Code, and Board of Standards including all "Local Laws" and cited reference standards and Appeals Rulings and Standards.
 2. Standards: Except as modified by governing Codes and by this Section, Work shall comply with the latest provisions of the following:

- a. ASME A17.1 2012 Safety Code for Elevators and Escalators
- b. ASME A17.2 2012 Guide for Inspections of Elevators, Escalators and Moving Walks
- c. ASME A17.3 2012 Safety Code for Existing Elevators and Escalators
- d. ANSI A117.1 Specifications for Making Buildings and Facilities Accessible to and Usable by Physically Handicapped People
- e. ADA Americans with Disabilities Act
- f. ASTM-A446 Steel Sheet, Zinc Coated (Galvanized) by the Hot-Dip Process, Structural (Physical) Quality
- g. ASTM-B221 Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes and Tubes
- h. ANSI/AWS- Structural Welding Code, Steel. D1.1
- i. ANSI/NFPA 70 2012 National Electrical Code
- j. ANSI/NFPA 80 Fire Door and Windows
- k. UL 10B- Fire Tests of Door Assemblies
- l. APA American Plywood Association
- m. ASTM A36 Structural Steel
- n. ASTM A167- Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip.
- o. NEMA LD-3- High Pressure Decorative Laminates.
- p. UL 486 Crimp Tools.
- q. ASTM E152 Fire Tests of Door Assemblies.
- r. FS-L-P-508H Plastic, Sheet Laminated, Decorative, and Nondecorative.
- s. FS-QQ-S-698- Steel Sheet and Strip, Low Carbon.
- t. NEII National Elevator Industry, Inc.

- u. All other specific provisions cited herein.
- B. All of the elevator equipment shall be designed, constructed, installed and adjusted to secure performance in accordance with the manufacturer's design standards with respect to smooth, quiet, convenient and efficient operation, durability, economy of maintenance and operations, and standards of safety.
- C. The control system shall provide smooth acceleration and deceleration with 3/16" leveling accuracy at all landings, from no load to full rated load in the elevator, under normal or unloading conditions. The self-leveling shall, within its zone, be entirely automatic and independent of the operating device and shall correct for overtravel and undertravel. The car shall remain at the landing irrespective of load. Clearance between the car sill and the hoistway landing shall not exceed 1-1/4 inches.
- D. The door open time for elevators is to be 2.5 fps. The door close time shall be based on the Code requirements with a door delay feature. The door delay is the minimum acceptable time from notification that a car is answering a call (lantern and audible signal) until the doors of the car start to close. Time shall be calculated by the following equation:
- $$T = D / (1.5 \text{ ft/s}) (457 \text{ mm/s})$$
- T = Total time in seconds.
D = Distance from a point in the lobby 60 inches (1524mm) directly in front of the hall station to the centerline of the door opening.
- E. Car Call: The minimum acceptable time for doors to remain fully open shall not be less than 5 seconds.
- F. The speed of the elevator shall not vary +/- 5% under loading conditions

1.04 DELIVERY, STORAGE AND HANDLING

- A. Delivery: Materials shall be delivered ready for use, in the approved manufacturers original and unopened containers and packaging, bearing labels as to type of material, brand name and manufacturers name. Delivered materials shall be identical to approved products and samples.
- B. Storage: Materials shall be stored under a cover in a dry and clean location, off the ground. Delivered materials which are damaged or otherwise not suitable for installation, shall be removed and replaced with acceptable materials at no additional cost to the Authority. On site staging/storage of materials is not guaranteed.

- C. Floor Loading: Do not load or permit any part of the structure to be loaded with a weight that will exceed the load factor and endanger the safety of the structure.

1.05 SUBMITTALS

- A. General: Submit the following in accordance with this section, the GENERAL PROVISIONS and the SPECIAL CONDITIONS:
1. Product Data: Submit the names and addresses of the manufacturers, together with catalog information or other identifying description for all items of elevator equipment.
 2. Submittals: Submit shop drawings showing material type and gauge, general dimensions, methods of attachment, location and size of reinforcements and openings, and a general arrangement of components with complete information concerning the material, articles and/or design proposed for use in sufficient detail to show compliance with the specification including:
 - a. Machine room equipment details, layout and elevations, including bill of materials showing both new and existing equipment, power requirements, details, operational description and method of wire connections for point to point wire connecting for control and signals, and all other Work which is required to achieve successful completion of the Work described herein.
 - b. Wiring Diagrams
 - c. Written description of the mode and sequence of operation.
 - d. Complete information on machines, motors, motor drives, control system and all related equipment, including power requirements and equipment heat release information.
 - e. Elevator car and hall fixture drawings.
 - f. Complete car enclosure drawings and details of all equipment.
 - g. Entrance details including doors, hoist way door hangers, door operators, door protective devices, tracks, guides, etc., for passenger elevator entrances.
 - h.. Machine room and hoistway ventilation requirements.
 - i. Platform with isolation details.

- j. Suspended Load Data Sheets for elevators.
- k. Work plan for removing and replacing machines and equipment shall be submitted at least sixty (60) days prior to commencement of work.

- l. The elevator manufacturer will provide certification, in writing and signed by an officer of the organization, that the owner of the elevators shall be provided with copies of any and all information, correspondence, bulletins, newsletters, manuals, techniques, procedures, drawings, sketches and any other documents related to maintenance, safety, operations, design changes, modifications, retrofits, etc., which relate to any part, component, equipment, system, subsystem or material and services applicable to the elevators provided.

- m. Complete detailed installation, adjusting and controller setup procedures.

All of the above referenced shall be provided as it pertains to the original installation and for a period of ten (10) years after final acceptance of the last elevator provided.

The reference material shall be provided within thirty (30) days of publication or internal distribution by the elevator manufacturer. The material, even if labeled PROPRIETARY, shall be delivered to the Authority without prejudice or delay and at no additional cost.

- B. Operations Manual: Prior to the execution of work on the second elevator submit an electronic copy of the following manuals to the Contracting Officer's Representative for review. After approval and issue of the Certificate of Final Completion, submit five (5) bound manuals and two (2) CD-ROM electronic versions of the manual.
 - 1. Manuals shall be bound and indexed providing operating, trouble-shooting and maintenance instructions, parts listing, recommended parts inventory listing, purchase source listing for major and critical components, emergency instructions, and similar information. Maintenance instructions shall include lubrication and periodic maintenance requirements and schedules. Parts list and purchase source listing shall include electrical and control equipment. Manuals shall also include approved drawings and catalog cuts, folded if necessary.
 - 2. Adjusters Manual: Provide the contractors adjusters manual, the manual shall provide step by step procedures for calibrating and adjusting all equipment operations and including any printed circuit boards. Manuals shall comply with the requirements of this section, the GENERAL PROVISIONS and the SPECIAL CONDITIONS.
 - 3. Operating Instructions shall be printed or typewritten literature describing the

function and operation of all controls including pictorial illustrations where applicable.

4. Maintenance Instructions shall be printed or typewritten schedules describing all required maintenance procedures for each elevator.
5. Wiring Diagrams shall be full size, ladder type, complete "as-built" wiring and single line diagrams showing the electrical connections, functions and sequence of operation of apparatus connected with each elevator, using standard symbols or proprietary symbols defined on the diagram, both in the machine room and in the hoistway, shall be furnished in duplicate for each elevator. Wiring diagrams shall incorporate the wiring identification labeling to identify the controller and field wiring used for each circuit. Wiring diagrams shall have sheets numbered with an indication of the total number of sheets in the diagram set. After approval, a copy of each shall be plastic or laminated, framed, and mounted in each elevator machine room. An electronic version of wiring diagrams for each elevator shall be delivered to the Contracting Officer's Representative. Coded diagrams are not acceptable.
6. Lubrication Chart: After approval, one laminated and framed lubrication chart for each elevator shall be furnished and mounted as directed in each elevator machine room. Chart shall identify lubricants as well as lubrication points and required frequency of application.
7. Record Drawings: The Contractor shall maintain at the construction site one set of full size drawings marked to show all deviations which have been made from the drawings, including buried or concealed construction and utility features which are revealed during the course of construction. These drawings shall be available for review by the Contracting Officer's Representative at all times and shall become the property of the Authority and be turned over to the Contracting Officer's Representative at completion of the Work of this Section. Provide in both hard copy and electronic copy (CD).
8. Keys: Provide eight (8) sets of keys per elevator to operate all keyed switches and locks prior to completion of the first unit.
9. Accessories: Provide all special tools and equipment necessary for making all system adjustments to the signal and speed controller and door equipment A programming unit, preferably a laptop with 4GB memory, 15.6-inch display and DVD drive, with all software packages required to setup and program all equipment in the elevator system shall be provided, one per station or structure. Software shall include that for the display unit, DeviceNet, soft start, if applicable, and any other programmable devices, as well as for the controller PLC. Any hardware or software required for configuring, programming or communicating to

the controller or any part of the elevator shall be submitted to the contracting officer. NO SPECIAL TOOLS WITH DECAIVING CIRCUITS OR CLOCKS ARE PERMITTED.

10. Spare Parts: Provide the Authority with spare parts per the special provisions section of the specification. The list of recommended spare parts will be provided to the Contracting Officer's Representative after submittals are approved and must have OEM's part number listed.
 11. Power Confirmation: Provide power confirmation statement identifying both the "in rush and full load starting current" and the "full load up current" with the car balanced at precisely 42.5% capacity load.
- C. Test Reports, and Certificates: Submit to the Contracting Officer's Representative test report and inspection/acceptance certificates for each elevator.
- D. Work Area Barricade Protection Plans and Site Specific Work Plan
1. The work area protection plans shall be provided as part of the Site Specific Work Plan (SSWP) for each station by the Contractor for review no later than 60 days prior to the start of work.
 2. Protection plans shall clearly indicate partition systems planned for demolition and installation phases of the project, including planning for escalator entry and egress during handling. Plans shall include finish details for elements exposed to the public.
 3. Partitioning system shall include lockable access doors to prevent access to the work area by the public. Applicable work area notification/warning signage shall be provided by the Contractor. Signage shall be approved in size and design by Authority prior to use.
 4. Partitioning plans shall be designed to withstand applicable wind loads applied to the station entrance areas as required by local building Code.
 5. Barricade partitions shall be painted (color to be provided by WMATA) and a yellow safety caution stripe painted along the center of the panels.

1.06 GUARANTEES

- A. Notwithstanding the Specifications forming a part of this Contract, any inspection or approval of the Work by the Authority, or the existence of any patent or trade name, the Contractor nevertheless unconditionally guarantees that the equipment furnished and installed hereunder shall be of the best quality and shall be fully fit for the purpose for which it is intended. The Contractor shall unconditionally guarantee all equipment against defects or failures of any kind, including design, workmanship and materials for a period of one (1) year from the date the elevator is commissioned into service. In the event of defects or failures in any component of the Work of this Section, then upon receipt of

notice thereof from the Contracting Officer's Representative, the Contractor shall correct such defects or failures by immediately reconstructing, repairing or making such alterations or replacement of said component in the Work of this Section as may be necessary or desirable, in the sole opinion of the Contracting Officer's Representative, to comply with the above guaranty.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Machines - Provide new geared hoist machines of sufficient capacity to run the elevators at their rated speed carrying its rated load. This new machine shall incorporate an AC motor controlled by a closed-loop vector-type solid state AC motor drive. Detailed work plans and drawings for removing the old machines and placing the new machines shall be submitted to the Contracting Officer's Representative for approval. Work shall not commence until approval is obtained.
1. Meet Code requirements to run, stop and hold 125% of rated load.
 2. Meet Code requirements for load testing of safeties and buffers.
 3. Run fully loaded cars at 350 FPM (+/- 5%) for 30 consecutive round trips with normal door operation without experiencing running, stopping or holding problems.
 4. Improve upon current rope drop to cars and counterweights by locating the hoist machine and deflector sheaves at optimal positions.
- B. Drive: Provide new Variable Voltage Variable Frequency (VVVF) drive, meeting the following requirements and be manufactured by one of the listed approved manufacturers.
1. Motor: Totally enclosed non-ventilated AC motor Type F insulation.
 2. Motor armature shall be dynamically balanced and supported by ball bearings of ample capacity.
 3. Motor Control: Vector controlled pulse-width modulated AC drive. The VVVF Drive shall convert the AC Power supply using a two step process to a VVVF power supply for use by the hoist motor. Speed control shall be by means of vector control providing independent excitation and torque current. Provide a digital velocity encoder on the motor, giving feedback to the controller on motor speed and position.
 4. Brake: Spring applied electric brake, held open by an electro-magnet

actuated by the controller and designed to make smooth, positive stops. Brake shall be designed to automatically apply in event of interruption of power supply from any cause. Control of the operation of the brake shall be all digital. The setting and lifting of the brake shall be software based and all electronic. All adjustments and setup of the brake shall be made using a PC interface. No contactors or resistors shall be used in the actuation of the brake.

5. Approved Drive Manufacturers

- a) Allen Bradley
- b) Magnetek
- c) Mitsubishi
- d) Toshiba
- e) General Electric
- f) Baldor Sweo
- g) Approved Equal (Request for approval to be submitted prior to any delivery or installation of the equipment)

C. Operating and Signal Fixtures: Operating and signal fixtures shall be manufactured by one of the following or approved equal. All fixtures shall be of one manufacturer and shall be vandal resistant design:

- 1. Adams Elevator Equipment
- 2. G.A.L Manufacturing Corp.
- 3. P T L Equipment
- 4. Elevator Products Corp.
- 5. Elevator Specialties
- 6. Approved Equal (Request for approval to be submitted prior to any delivery or installation of the equipment)

D. Car and Hoistway Door Equipment: The car and hoistway door equipment shall be

manufactured by one or more of the following or approved equal. Door operating system and associated hardware shall be of one manufacturer.

1. G.A.L. Manufacturing Corp.
 2. Adams Elevator Equipment Co.
 3. KONE
 4. Thyssen
 5. Otis
 6. Approved Equal (Request for approval to be submitted prior to any delivery or installation of the equipment)
- E. Door Reopening Device: Provide Janus Pana40 Plus full screen curtain and infra-red protective zone or approved equal.
- F. Vision Panels: Panels are required to be installed on all hoistway and elevator car doors. Panels shall all applicable codes including ANSI Z97.1 and 16CFR Part 1201. Each individual piece shall be stamped with the markings as required by ANSI Z97.1 and shall remain visible after installation. Panels shall be fire resistant and shall be manufactured by one of the following manufacturers.
1. Pyroswiss
 2. Pyroguard
 3. Approved Equal

2.02 MATERIALS

- A. Stainless steel shall be corrosion resisting steel complying with Federal Specification QQ-S-698, Class 316, S. S. Condition A finished as specified. During erection, all stainless steel surfaces shall be protected by suitable peel off material.
- B. Cold rolled steel shall be low-carbon steel rolled to stretcher leveled standard flatness, complying with Federal Specification QQ-S-698.
- C. Rigid Steel Conduit, conduit fittings, and flexible steel conduit shall comply with the current Federal Specifications for the respective components.
- D. Guide rail clips shall be of open - hearth steel or its equivalent in accordance with ASME A17.1 requirements.

- E. Material of wheels for roller guide assembly shall be of the neoprene type.
- F. Material (insulating) used on hoistway slide door interlocks shall be of thermoplastic polyester.
- G. Material of hall pushbutton station bases and slide activators shall be molded LEXAN 141-701 thermoplastic, or equal.
- H. Material of hoistway and car door threshold sill shall be of nickel silver, having an extruded, grooved, non-slip surface.
- I. Material for all tamper proof spanner head screws shall be of stainless steel, spanner head.
- J. Material of connectors or lugs for controller motor leads shall be of copper.
- K. All screws, bolts, fasteners shall be stainless steel.

2.03 CONSTRUCTION FEATURES

A. General

1. All welding shall be in accordance with Section 213 of ASME A17.1.
2. All electrical equipment, conduit, fittings and wiring shall conform to the requirements of the National Electrical Code (NEC) and ANSI/NFPA No. 70 for outdoor locations.
3. Clearance around equipment located in each elevator machine room shall comply with the applicable provisions of the National Electrical Code.
4. The elevator shall, comply with NEII "Suggested Minimum Passenger Elevator Requirements for the Handicapped", ANSI A117.1 and ADA requirements, including clearances, handrails, locations for signal & control fixtures and communication.
5. Design and construction of the equipment and parts subject to wear shall be such that similar devices provided will completely interchangeable. Working parts shall be accessible for inspection, servicing and repair. Adequate means shall be provided for lubrication of all wearing parts that require lubrication.
6. All wiring shall be Underwriters approved, stranded Type THHW, in accordance with the requirements of the National Electrical Code; the minimum size permitted shall be No. 18. PVC insulated wiring is not permitted. The wires shall be installed in wire raceway with approved outlet boxes, except that a small

amount of flexible conduit may be used where conduit is not subject to moisture or embedded in concrete, as approved by the COTR. Terminal and pull boxes and other similar items shall be of approved substantial construction, thoroughly reinforced, and in no case less than No. 12 USSG for larger boxes. All electrical boxes exceeding 150 cubic inches shall be supported independently of the conduits. All boxes shall be NEMA 4X, Vynkier, Inc. or approved equal. All conduits shall be rigid galvanized, all joints shall be threaded. All flexible conduits shall be liquid tight with approved fittings.

7. Any junction boxes installed in the machine room or hoistway shall be accessible for maintenance. Drilling or opening top end of enclosure is not acceptable.
8. Car and hall signal circuits shall not exceed 120 volts.
9. Nameplates: Each major component of equipment shall have the manufacturer's name, type, class or catalog number on a metal plate securely attached to the item of equipment in a conspicuous location. Nameplates shall not be visible to the public.

B. Hoistway Equipment

1. Car and Counterweight Guide Rails
 - a. Existing guide rails shall be reused in place, except as indicated in 1.02 A.19 and 2.03 B.1.b, but shall be realigned to a 1/8 inch plumb for the full travel distance and all fasteners and splice plates securely tightened. Where indicated in Appendix B - Traction Unit Listing, fasteners shall be replaced.
 - b. Guide rails shall be clean and free of all signs of rust or abrasion and shall be filed to remove all rough edges or high spots prior to final inspection. All guide rail joints shall be filed to assure perfectly matching surfaces. Paint all guide rails with flat black rust inhibiting paint if necessary. Bottom section of guide rails shall be replaced and rail extensions shall be provided to support new car guides.
 - c. Car roller guides shall be spring loaded and allow rail to rail and front to back adjustment of the rollers. Rollers shall have four (4) inch minimum wheels.
2. Buffers
 - a. Provide new buffers. Buffers shall be securely fastened to the pit channels. Paint pit channels which shall be aligned with striker plates on

- the car. Permanently fasten to each buffer a metal plate showing stroke and loading rating.
- b. Paint buffer supports and other pit channel steel as required to properly protect all exposed metal surfaces.
3. Limit Switches
- a. Provide terminal stopping devices arranged to automatically stop the car within the top clearance and bottom overtravel independently of the operation of the normal terminal stopping devices, but with the buffers operative. The final terminal devices, when operated, shall prevent further normal operation. Final limit switches shall be so located that they open at or about the time the buffer is engaged by the car. Final limit switches shall be through-bolted after the conclusion of the final acceptance tests.
- b. Provide normal stopping devices for the elevator at upper and lower terminals to automatically stop the car from any speed attained in normal operation within the top and bottom over travels, independent of the operating device, final terminal stopping devices and buffers.
4. Inspection and Maintenance Switches - Top of Car: Provide toggle switches to operate the elevator from the top of the car during adjustment, inspection, maintenance and repair. The operating means shall be of the continuous pressure type, and the speed of the car shall not exceed 50 ft./min. It shall operate the car only when the car doors and all hoistway doors are closed.
5. Pit Ladder: Retain, repair, modify, clean and paint or provide new code compliant pit ladder as indicated in Appendix B - Traction Unit Listing.
6. Pit Stop Switch, Pit Lighting Fixture & Switch
- a. Provide a new NEMA 4X emergency stop switch for the elevator in the pit at the point of access to the pit. The switch shall be of an approved type and design, with a metal guard to prevent accidental operation. Plastic or fiberglass material of box and faceplate shall not be permitted. When opened, the switch shall cause the electric power to be removed from the driving machine and brake. Location shall be in accordance to Code requirements. Safety switches shall interrupt the power supply and hold the car to permit safe access to the pit for servicing.
- b. Provide new GCFI receptacle, new pit lighting fixture and switch for the elevator in the pit.

C. Drive System

1. All replacement drive system components for the elevator shall be suitable for lifting the gross load of the rehabilitated elevators at rated speed to the height indicated in Appendix B - Traction Unit Listing and verified in contractor's field survey.
2. VVVF Motor Drive: Disconnect and completely remove the existing motor generator sets and provide new VVVF motor drives as follows:
 - a. The drive shall be capable of varying the torque on the motor during acceleration and deceleration.
 - b. The drive shall be capable of on-site programming the volts per Hertz, acceleration and deceleration ride profiles to adjust the ride quality due to drive control characteristics.
 - c. The flux vector drive shall control AC induction motors through the use of a high resolution, dual channel optical encoder.
 - d. The flux vector drive shall be capable of delivering 100% rated motor torque from base speed down to zero speed.
 - e. The flux vector drive shall not use DC injection for slowdown braking.
 - f. The flux vector drive shall be adjustable to achieve the required current, motor voltage and frequency so as to match the characteristics of the hoist motor.
 - g. A drive using variable voltage variable frequency output to operate the hoist motor is not acceptable.
 - h. The drive shall not create excessive audible noise in the elevator motor.
 - i. The drive shall be capable of delivering sufficient current to accelerate the elevator to contract speed at the rated load. The drive shall provide speed regulation within 5% during all phases of acceleration, deceleration and leveling.
 - j. A contactor shall disconnect the hoist motor from the drive's output each time the elevator stops. If the contactor has not returned to the de-energized state when the elevator stops, the elevator shall not restart.
 - k. Drives for motors 50HP and over shall be regenerative to the power line

D. Hoist Motors:

1. The existing hoist motor shall be removed and replaced as directed. The new motors shall be of the alternating current reversible induction type of a design adapted to the severe requirements of elevator service. Motor shall be capable of developing the required high starting torque (minimum 225%) with a low starting current, and shall be designed to stand the severe loads encountered in elevator service.
2. All motors furnished shall be designed, manufactured, and tested in accordance with the latest applicable standards of ANSI, IEEE, ASTM, and OSHA (Safety and Health Standards, 29CFR1910). As a minimum requirement, all motors shall conform with the latest applicable sections of NEMA Standard No. MG-1. It shall have sufficient capacity to operate elevator with rated contract load at rated contract speed without overheating.
3. Insulation of all windings shall be impregnated and baked to prevent absorption of moisture and oil. The insulation resistance between motor frame and windings shall not be less than one megohm. The motor windings shall stand a dielectric test of twice the normal voltage plus 1000 RMS volts of 60-Hertz alternating current for one minute. Insulation shall be Class H.
4. Motor bearings shall be either of the anti-friction bearing metal sleeve type with oil reservoirs, automatic self lubrication, oil gauges, capped filler openings and drains or of the open (non-seal) type ball or roller type arranged for grease lubrication and fitted with grease gun connections and drain plugs. Bearings and lubricant reservoirs shall be virtually dust tight, and shall incorporate effective lubricant seals or other means to prevent lubricant leakage. Bearings shall be replaceable type and separate from the motor housing (not part of the housing). Bearings that are part of the motor housing will not be accepted.
5. Motor enclosure type shall be TEFC. All motors will have the wiring box mounted in NEMA F1 position. The enclosures shall be of cast iron construction.
 - a. Frame, end brackets and conduit box shall all be cast iron construction.
 - b. Motors shall have permanently attached a means for lifting, preferably built into the frame.
 - c. Motor frames shall have drain openings suitably located for the mounting assembly being provided.
 - d. Motor nameplates shall be Type 316 stainless steel mounted on enclosure

with stainless steel fastening pins. Nameplate shall have as a minimum, all information as described in NEMA Standard MG-1-20.60

6. Motors shall be fitted with an oversized, cast iron, main terminal box, one size larger than the manufacturer's standard. The box shall be arranged so that conduit can enter from the bottom. Gaskets shall be supplied between the box and motor frame as well as between the box and its cover. The box shall be mounted on the right hand side when facing the end of the motor opposite the shaft extension. The boxes shall come completely assembled to the motor and shall use all cadmium plated attachments.
7. Motor leads in the conduit box shall have the same insulation class as the windings. Motor lead wire shall be rated 125 C and shall be sized for 105 C at the motor nameplate amperes at 1.0 Sf per EASA recommendations. Leads are to be numbered for clockwise rotation when facing opposite the shaft end.
8. Motors shall be provided with a compression type grounding lug, the same size as motor leads, mounted in the conduit box by drilling and tapping into the motor frame or by a double ended silicon bronze cap.
9. Motors shall be grounded directly from the motor to the drive to approved earth ground.
10. Motors shall be designed specifically for elevator service, shall not exceed nameplate full load current by more than 5% and be continuously rated 120 starts/hour, and start motor without exceeding 40 degrees Celsius rise. Should the Contractor select equipment which exceeds the limitations of the power feeders, then the Contractor shall be responsible to replace the conduit, feeders, breakers, disconnects and any other components in the electrical feeder system as required to the main distribution panel in the electrical vault from the elevator machine room. The contractor is to assume a 400 foot conduit and wiring run when pricing this item.

E. Controllers

1. Controllers
 - a. Elevator Control System
 - 1) The elevator control equipment shall contain diagnostic capabilities as required for the ease of complete maintenance.
 - 2) The diagnostic system shall be an integral part of the controller and provide user-friendly interaction between the service person

and the controls. Controller shall be mounted in a NEMA 4X stainless steel cabinet. The door of the cabinet shall have a sealed window placed over the fault indicator board within

- 3) The supervisory logic shall be performed by a main controller or coordinated between the elevator controllers which will interface exclusively and directly into an Allen Bradley DH485 protocol remote monitoring network, transmitting data from the elevator controller through a data concentrator to the Authority's AEMS RTU computer control and data system. The supervisory logic will coordinate dispatching assignments, interfacing operational demand data accumulated from car and corridor operating fixtures, selector and door control functions.
 - a. Allocate service to demand, and respond in real time to prevailing traffic conditions as well as historical traffic patterns.
 - b. Constantly compare passenger demand, car load, anticipated demand, car motion status, machine status and other prevailing conditions and evaluate this information in the context of the following dispatching approaches:
 - (1) If applicable, give priority to contiguous calls, assigning calls on adjacent floor to the same car if other criteria is satisfied.
 - (2) Give priority to coincident calls, having the same car let a riding passenger off and a waiting passenger on at the same floor.
 - (3) Anticipate demand based on hall calls and car calls already registered and floors with a high possibility of demand.
 - (4) Evaluate relative system response time for each car in the group if applicable, weighing all the above factors.
 - (5) Allocate calls and position cars to minimize waiting times, response time and travel time.

- (6) Controller shall be capable of operating with an operating temperature range of 32F to 105F with non-drip environment and no more than 90 percent relative humidity.
- c. An Allen Bradley CompactLogix 1769-L32E based PLC control system shall be provided.
 - (1) The exclusive Allen Bradley DH485 protocol data port will transmit data from the elevator controller to the station or facility data concentrator. The contractor shall provide a controller data interface to a DH 485 network located in the elevator machine room. Data cables in an existing controller or in the elevator machine room shall be retained and connected into the new controller and available for connection to the controller DH485 interface. If DH485 cabling is not available, the contractor shall run Belden 9842 cable or approved equal, to connect the controller into the monitoring DH485 network as directed by WMATA. The DH 485 controller interface shall be programmable for data rates up to 115 Kbps. The interface shall allow other nodes such as other elevator and escalator to be readily incorporated into the DH 485 network.
 - (2) If not already installed in the station or facility, a data concentrator PLC shall be installed using an Allen Bradley MicroLogix 1400 or SLC5/05 PLC per station to function as data concentrator to consolidate data from all controllers in the station. The software for the data concentrator shall receive controller data over the local monitoring DH 485 network and provide formatted data to the AEMS RTU through an RS232 link. The data concentrator shall provide an Ethernet port for interfacing with the WMATA wide area network. A data concentrator connection to the WMATA wide area network shall be provided.
- 4) Where a non-DH485 network compatible controller is approved for installation, the discrete output signals in the Signal List shall be provided through relay contacts or analog current loop, as

applicable, to a separate terminal strip. The signals shall be active when the listed status is present as it is in the elevator control computer. The signals shall be 24 vdc from an independent power supply provided in the elevator controller cabinet or external enclosure by the manufacturer or the installer. Analog signals shall be connected in a 20ma current loop configuration to analog inputs on the added PLC. An area of 18 inches by 10 inches shall be available inside the controller or in an external enclosure - on the side is acceptable - that allows a unit 10 inches deep to be mounted. An Allen Bradley type MicroLogix 1100 PLC with 24-volt input modules for 32 inputs shall be supplied by the manufacturer or the installer. The CPU module must provide DH-485 and Ethernet communications ports. In addition, the contractor shall install an Allen Bradley network interface module, (model 1761-NET-AIC, or equal) for interfacing into the local remote monitoring DH485 network beside the PLC in the controller and provide 24 vdc power to the module. The output signals from the MCE or equivalent shall be wired from the terminal strip to the PLC inputs indicated in the Signal List table. PLC power and signal returns shall be wired into the PLC. The PLC power shall come from 120VAC provided by the car lighting supply in the elevator controller.

- a. The added Allen Bradley PLC will be used for remote monitoring capabilities into the Authority's established engineering monitoring network. ELES Engineering will be responsible for programming the added PLC and wiring the DH-485 network per the block diagram shown in Appendix E.
- b. The PLC shall accommodate the following Signal List, as applicable, and provide data to the data concentrator as specified in specification WMATA-DATA-1.09. (see Appendix F).

Table 1. Monitored Faults and Statuses

Signal	Comment
Signal Power Supply Down	Common Power Source for inputs is not present
Safety Circuit Tripped	
Top Final Limit Tripped	
Bottom Final Limit Tripped	
Drive Faulted	
Overload Tripped	
STOP Button Activated	In-car, top-of-car, pit, controller, etc. STOP pressed
Door Protection Activated	
Out of Service by Delay	Failure to run when demand timed out
Motor Limit Timer Tripped	Motor runs longer than for full Inspection run plus 50%
Hoist Machine Brake Picked	
Rope Brake Set	
Inspection Operation On	
Independent Service On	
Controller TEST Switch On	Test mode on where there is no door operation but runs normally on Independent service
Fire Service Phase I On	
Fire Service Phase II On	
Smoke Sensor @ Main On	
Smoke Sensor at Others On	
Override On	Kiosk Override or Parking Operation on
Car is running up	
Car is Running down	
Car is in door zone	
Interlocks are made	
Front door gate switch made	
Front door fully closed	
Front door fully open	
Front door reversal device activated	
Front door protection activated	
Rear door gate switch made	
Rear door fully closed	
Rear door fully open	
Rear door reversal device activated	
Rear door protection activated	
In-car alarm pressed or phone activated	Either the ALARM button or the phone being activated should generate this alarm signal.

Water intrusion alarm active	Unsatisfactory water and/or oil level in the pit or other areas
Car position 1	
Car position 2	
Car position 3	
Car position 4	
Car Position 5	
Car Position 6	
Car Position 7	
Car Position 8	
Hoist Motor Current	Provide 3-phase motor current data
Kilowatt Hours Used	Reset value at 12:01AM each day. (This is calculated by the data concentrator.)
Number of runs up	Reset value at 12:01AM each day.
Number of runs down	Reset value at 12:01AM each day.
Number of Door Cycles– open/close	Reset value at 12:01AM each day.

- 5) The PLC CPU module shall store the last 99 faults, accessible independent of a laptop connection. All event and fault history data shall be downloadable to a flash or USB drive in a PDF or Excel format from controller fault/status display, or remote communications. The contractor shall provide WMATA with a programming and monitoring unit, such as a laptop computer with the newest version of Allen Bradley RS-Logix and any other software required to setup and program all electronic items in the control system, for each station that this system is installed, for the purpose of troubleshooting and remote monitoring modifications. The laptop should allow for uploading, editing and downloading any software that is being used on the elevators for any operation.
- 6) Elevator manufacturers may not supply their standard proprietary elevator controller for this project.
- 7) An Allen Bradley PanelView Plus 6, fault/status display/interface (model number 2711P-K6M20A8 or EZ-Automation HMI display with model number EZC-T6C-E) shall be provided in the controller cabinet. Control system timers and other setup criteria shall be programmable through this unit. All fault, status and setup data shall be stored in the controller CPU module.

- 8) Where the programming is done by the supplier, the supplier shall provide a copy of all working programs, including labels for all inputs and outputs, data tables and internal logic points, on CD-R disks as well as a printed program listing. The programs and setup data shall require a password for access and modification.
- 9) The main control of an elevator shall contain at least the following devices or electronic sensing: phase failure, line voltage monitor, and ground fault monitor.
- 10) Elevator fault reset shall be done by a separate switch installed in the controller.
- 11) All terminals shall have identification markings and all wires, including field wires, shall be provided with permanent heat shrink sleeve wire markers. These unique wiring identifications shall be provided in the wiring diagram at each end of the circuit connections. The marking on the wire shall be identical to the marking on the wiring diagram and the terminal block.
- 12) The controller shall be equipped with the AC vector drive installed in-line before the hoist motor contactor and the hoist motor.
- 13) The AC vector drive shall be capable of accelerating and decelerating the hoist motor smoothly and gradually.
- 14) Adjustable settings for acceleration and deceleration ramps shall be provided.
- 15) The controller shall have at least one dedicated serial port for interface to the DH485 monitoring network and programming access, and at least one free Ethernet/IP port.
- 16) If needed, the Programmable Controller shall have at least one dedicated port to support the controller fault/status display.
- 17) The controller PLC shall provide the following Remote Monitoring and diagnostic network support:

- a) All applicable faults, statuses and data listed in Table 1 shall be provided.
 - b) Fault indications shall remain until reset in the controller.
 - c) Status and analog data shall be provided for the duration of the condition.
 - d) Software in the controller PLC shall format monitoring data responses to data concentrator polling as specified in the WMATA-DATA-1.09 specification.
 - e) The monitoring data port in the controller shall be setup for DH485 protocol with the port network identification number programmed for the particular elevator identification. For instance, identification number 11 applies to elevator 1, 12 to elevator 2, etc.
 - f) All faults, statuses and data shall be held by the controller CPU and sent from the CPU to the data concentrator when polled by the data concentrator
- 18) Provide sufficient non-volatile CPU memory, for non-volatile retention of program memory, system status and operating parameters.
- 19) Diagnostics
- a) The processor shall have built-in diagnostics and self-test, such that each time power is cycled, the processor does a complete CPU and RAM memory test. Additionally the power-up test will momentarily light up all diagnostic LEDs to be sure they are working. A power up test will not be performed if the internal flag (bit) for Firemans Service Phase I is latched. The processor shall be capable of reporting major and minor fault codes and processor status information back to the data concentrator, provided the fault is not a catastrophic hardware failure where the processor is unable to power up.

- b) The processor shall have a built-in watchdog timer to ensure that all processor program scans occur within the time limit set by the watchdog timer or it goes into a "Fault" state.
 - c) The processor shall have individual LED indicators that are clearly visible and labeled for easy identification. At a minimum the following indicators must be provided:
 - (1) CPU is in RUN mode
 - (2) CPU is FAULTED
 - (3) CPU battery is LOW
 - (4) I/O points are FORCED and are not under program control COMMUNICATION channels are active.
- 20) Input/Output Modules
- a) The Input/Output modules shall be compatible with the PLC processor I/O structure. Each module shall be provided with a detachable terminal strip to connect wiring to the module.
 - b) Discrete Input Modules: Suitable for the input voltage and compatible with the Allen Bradley system.
 - c) Discrete Output Modules: Suitable for the voltage and load and compatible with the Allen Bradley system.
 - d) Analog Input Modules: Converts analog signals to proportional twelve-bit binary values. The module shall accept four 20 Ma signals. Provide modules compatible with the Allen-Bradley system.
- 21) I/O Chassis and Power Supply
- a) The I/O and other function modules shall be mounted to allow the addition of, at least, three additional modules.
 - b) Power supplies shall provide power to the PLC processors, I/O and other function modules. The power supply shall be

suitable for operation of 120 VAC, single phase power.
Power supply capacity shall be a minimum of 150% of the
connected load.

22) Air Conditioning

Provide an independent air conditioning unit for each new controller to maintain manufacturers' recommended operating temperatures. Condensate from the air conditioning unit must be piped to a suitable drain.

23) Provide a duplex receptacle inside the controller for the purpose of connecting diagnostic devices such as a laptop.

F. Hoistway Doors and Entrances

1. Replace or refurbish entrances and doors as indicated. Refurbishment to include thorough cleaning followed by re-oxidation (bronze) or polishing (stainless). Remove frame and perform re-alignment and straightening of the entrance frame metal if required. If replacement is indicated, doors and entrances shall be of the same construction. Door panels shall be at least 1-1/4 inches thick and shall be bronze clad or stainless steel on the outside landing side to meet the existing condition. Metal for doors and entrances shall not be less than 18 gauge metal. Doors shall have fire resistance rating to conform to fire code requirements. Meeting edges of center opening doors shall be equipped with rubber bumper strips extending the full height of the panels. Other requirements, as stated below.
2. Hanger Cover Plates: Provide new removable, full-length galvanized steel. Covers shall be made in sections for convenient access to hangers.
3. Fascia: Finish shall be galvanized steel, extending from top of header to sill of door above.
4. Toe Guard: Provide new toe guard. Finish to be stainless steel.
5. Dust Cover: Provide new dust cover. Finish shall be galvanized steel.
6. Door Bumpers: Provide at top and bottom.
7. Doors: Fill with fireproof, sound deadening material. Provide reinforcement by formed vertical sections running full height of door. Doors shall be provided with four removable gibs.
8. Vision Panels: Provide for each landing & car door panel. The door panel with vision panel installed shall meet the UL rating for elevator hoistway doors. The glass vision panel shall be of uniform size of five (5) inches wide and sixteen (16) inches tall. The center of each glass vision panel shall be

installed at 54 inches above the finished floor. All hardware in the door system shall be located as to provide a clear, unobstructed view into the elevator car or hoistway.

9. Sight guards: Provide for each landing door panel. Landing designations shall be permanently applied to each sight guard.
10. Hanger: Provide two-point suspension sheave type with provisions for vertical and lateral adjustments. Sheaves shall be minimum 3-1/4 inch in diameter with sealed ball or roller bearings.
11. Tracks: Shaped and finished to permit free movement of sheaves. Bottom of track shall be in contact with upthrust roller.
12. Closer: Spirator Type
13. Door Restrictor Device per ASME A17.1
14. Door Protection:
 - a. Provide Janus Pana40 Plus full screen curtain and infra-red protective zone or approved equal
 - b. Nudging: When doors are prevented from closing for 20 seconds due to failure of the proximity device or obstruction, the doors shall close at reduced speed and a buzzer shall sound.

G. Elevator Car Equipment

1. Provide:
 - a. Car Frame: Replace with new hot-dipped galvanized frame.
 - b. Platform: provide new 1/4" stainless steel platform.
 - c. Provide new spring tensioned roller guides with 4-inch minimum diameter rollers.
 - d. Sill and Sill Angle/Support: Provide new heavy duty nickel silver sills and new sill angles and support.
 - e. Toe Guard: provide new stainless steel.
 - f. Hangers and tracks: Replace with new hardware. Hardware shall be

of heavy duty design.

- g. Floor covering: Provide an approved non slip, #1 finish. All corners and joints shall be welded to form a water tight container, with the sides turned upward a minimum height, and shall run in the direction of a mounted slope, which shall be 1/8" per foot, away from the door with each side sloped to the center. Floor shall be a decorative epoxy-mortar broadcast floor system, color shall be red. Floor cover shall be resistant to urine absorption and deterioration.
- h. Car Enclosure: Car enclosure shall be manufactured by an approved company. Provide the following features:
- 1) General: The enclosure shall be adequately reinforced and ventilated to meet all the Code requirements. Provide sound-deadening mastic to exterior.
 - 2) Shell: Sides and back shall match existing finishes.
 - 3) Canopy: Provide 8 foot – 0 inch clear height under canopy. Reinforced 14-gauge. Underside painted baked enamel reflective white. Arrange for hinged top emergency exit including lock as required by Code.
 - 4) Ceiling and lighting:
 - a) Provide clear access to the emergency exit per Code requirements.
 - b) Cove type, 16 gauge metal troughs
 - c) LED tube light meeting the lighting requirements of A17.1 shall replace any ceiling light fixture
 - d) Ceiling finish, factory baked enamel finish, matte white
 - 5) Front return panels and entrance columns: 14 gauge, Finish shall be stainless steel. Provide lockable cabinets for special operating features and telephone required by these specifications.
 - 6) Transom: Provide new, finish shall match new cab finish.
 - 7) Car door panels: Same construction as hoistway door panel.

Finish shall be stainless steel.

- 8) Interior panels: Front and rear panels shall be stainless steel 14 gauge, rigidized type. Glass panels if present, shall be laminated glass framed in stainless steel. Provide mounting method which prevents rattling or vibration.
- 9) Handrail: 6" x 3/8" flat stainless steel handrail, bevel sharp edges. Provide on both sidewalls and rear.
- 10) Base: Provide a 4-inch high base.
- 11) Ventilation: Two-speed exhaust fan, manufacturers, pre-engineered standard, with battery back-up as per ASME A17.1. Fan shall provide minimum 350 cfm and be connected to operate continuously.
- 12) Car Door Contacts: Electrical contacts shall prevent the operation of the elevator by normal operating devices unless car doors are closed or within tolerances allowed by Code.
- 13) Door Operator
 - a. Provide a GAL MOVFR-W or approved equal door operator with encoderless VVVF drive and the following features:
 - 1) ½ hp motor and heavy duty sprocket, chain, belt, and sheaves.
 - 2) Closed loop regulated speed performance.
 - 3) Hand-held keypad programming.
 - 4) Adjustments can be stored in the keypad and downloaded to another operator.
 - 5) Adjustable door obstruction reversal.
 - 6) Optical cams with LED indicators.
 - 7) Test switches for open, close, nudging and speed zone set up.
 - 8) Universal inputs for open, close, and nudging.
 - 9) Reversing switch to back up the door reversal device.
 - 10) Weather proof enclosure

14. Elevator Car Emergency Communication Device

- a. A vandal-resistant speaker type communications device shall be furnished in the elevator car and installed in the car station behind a perforated grille and connected to a location provided by WMATA. The push button, located in the car station shall be identified as "Emergency Push to Call".
 - b. Communication in the car shall also rollover to a 24-hour manned site (Rail Operations Control Center) or alternative location provided by WMATA in the event that the kiosk does not respond to the call.
 - c. Provide a red 3/8" diameter light jewel and "FLASHING LIGHT INDICATES ALARM RECEIVED, HELP IS ON THE WAY" engraved in 1/8 inch high lettering into the car operating panel faceplate and black filled with epoxy. Activation of the emergency button shall cause the jewel to blink on and off. Provide a long life incandescent lamp behind the jewel which shall illuminate red.
 - d. Exposed hardware shall be stainless steel. The finish on unexposed parts, unless otherwise specified, shall be baked enamel.
 - # e. Contractor shall ensure that system is compatible with, and made operational with existing communication system. All wiring required in order to provide a fully operational system is the responsibility of the Contractor. #
 - # f. Retain and re-use the Ramex system boards in the car operating panels. All wiring required in order to provide a fully operational system is the responsibility of the Contractor. #
 - g. The two-way communication means within the car shall include a means to verify operability of the telephone line. Verification of the telephone line operation shall be automatically performed on at least a daily basis.
15. CCTV Camera: Conduit and wiring (as required) shall be provided to permit installation of surveillance CCTV equipment

16. Signal Fixtures

a. General

- 1) Faceplate for all elevator operating and signal devices shall be fabricated from stainless steel with 1/8 inch thick faceplate (except hall button fixtures). Faceplate shall be sufficiently oversized to completely cover cutouts. All faceplates shall be installed flush with surface upon which they are mounted. Abandoned fixtures shall be removed in their entirety and blank faceplate provided (where indicated) in a material to match the hall button fixture faceplate.
- 2) Fixtures shall be designed to fit within existing cutout and provided with new watertight back boxes unless otherwise noted. Where required, enlarge existing cutouts or provide additional cutouts to accommodate the fixtures. Perform all cutting, patching and refinishing of walls.
- 3) Fasten all car and corridor operating device and signal device faceplate with non-corrosive metal spanner head or bristol head tamper proof screws matching the finish of the faceplate to which they are applied.
- 4) Car and corridor pushbutton faceplate shall be designed so that pressure on pushbuttons shall be independent of pressure on pushbutton contacts.
- 5) Engraved legends or numerals in faceplate shall have, lettering 1/4-inch high filled with white (or other highly visible color) epoxy unless otherwise specified. Firefighter's engraving shall be red filled. Engravings for devices not used for normal operation of the elevator shall be white (or other highly visible color) filled and a minimum of 1/8-inch high.
- 6) All hall and car call buttons shall be of the call register type, having a power supply not to exceed 120 volts. Pressure on a button shall illuminate the button to indicate that a call in the desired direction has been registered. Replacement bulbs shall be an LED type that is readily available from three (3) separate manufacturers. All car and corridor operating buttons shall be vandal resistant.

Fixture faceplate shall be counterbored to accept the pushbutton. The pushbutton and faceplate shall be so designed to minimize the vandalizing of the button by prying action between the pushbutton and the faceplate. The button shall project a maximum of 3/16 inch beyond the faceplate and the bottom travel shall be limited by seating in the counterbore and not on the contact base. The buttons shall be held in the faceplate by a retaining washer. Pushbuttons of the call register type shall be counterbored and filled with 5/16 inch white plexiglass. The pushbutton module shall be self-contained and capable of being removed from the faceplate without disturbing any other component.

- 7) All car and hall fixtures of the elevator shall be designed to accommodate the handicapped, in accordance with NEII and ADA. All button operators shall be metal encased. Provide markings adjacent to car control buttons as required by ADA. The markings shall be integral with the faceplate and shall be both numerical and braille. Applied plates are not permitted.
- 8) The centerline of the elevator corridor call pushbuttons shall be provided in accordance with ADA requirements. Car operating call pushbuttons shall be a maximum of 4 feet 0 inches above the finished car flooring

b. Car Operating Station

1. Main car operating panels shall be designed so that the devices used for normal operation shall be located in the lower portion of the panel and the devices used by service and maintenance personnel shall be located in the upper portion of the panel behind a locked door provided with a continuous concealed stainless steel hinge. The faceplate shall be one piece mounted to the back box with a continuous concealed stainless steel hinge and secured with a two position cylinder lock. The panel shall open toward the nearest side wall as to allow easy access to wiring.
 - a. The lower portion shall contain:
 - (1) A complete set of 3/4 inch diameter illuminated

pushbuttons with 5/8-inch indelible designations to the left of buttons corresponding to the floors served. Lights shall extinguish when the car stops at a given floor. Designations shall be white or other highly visible color.

- (2) Emergency signal alarm bell button with illuminating jewel and emergency stop keyswitch (red in color).
- (3) Door "OPEN" and door "CLOSE" buttons located below the car buttons. The door "OPEN" button shall be located adjacent to the car door entrance column.
- (4) Emergency light with lens.
- (5) Firemen's Emergency Service Phase II keyswitch, call cancel button and fire emblem light jewel (visual signal).
- (6) Emergency stop keyswitch and the emergency alarm bell button shall be located below the car operating buttons at a nominal distance from the finished floor of 35 inches. Emergency signal alarm bell button shall illuminate a jewel when activated and shall be connected to a 6-inch vibrating alarm bell located in the hoistway at the main landing and on top of each car. Provide alarm bell including the necessary wiring and auxiliary devices.
- (7) Audible signal activation button.
- (8) A flashing acknowledgment light which shall be engraved "FLASHING LIGHT INDICATES ALARM RECEIVED - HELP IS ON THE WAY" which shall flash whenever communication is established with the cars.
- (9) Provide voice annunciation for the elevator, to be heard both inside and outside the car. The annunciator shall be digital and shall be programmable for any special messaging.

- (10) Engraved lettering, one-inch high indicating Elevator Station & Number and "NO SMOKING"; one-quarter inch high indicating "CAPACITY XXXX LBS"

b. The upper section (service cabinet portion) shall contain the following devices, all of which shall be keyed:

- (1) Switch for controlling car work lights.
 - (2) Switch for controlling interior car lighting.
 - (3) Switch for controlling 2 speed car ventilating blower.
 - (4) Two-position, key-operated inspection switch that will disconnect normal operation, and will allow the top-of-car operating device to function.
 - (5) Independent Service keyed switch.
 - (6) Keyed switch (with pilot light) to remove power from the motor drive.
 - (7) Any other signal lights, switches, or devices required for adjustments and maintenance of the elevator.
 - (8) Combination service cabinet door and certificate frame with LEXAN Lens.
2. Auxiliary car operating panels and car position indicators, shall be of the same style and finish as the main car operating panel, and provided on all elevators with front and rear opening doors.

c. Hall Stations

- 1) The existing hall button fixtures and wiring at each floor shall be removed and replaced as indicated. Provide new hall stations as indicated with new liquid tight branch

wiring to the shaft riser. Provide faceplate for both elevator and hall station, finishes to match existing and size as required to conceal existing cutouts. Mount faceplate to the backplate with tamper proof screws.

- 2) Fixtures for terminal landings shall contain a single "UP" or "DOWN" button. Each button shall contain an integral registration light which shall illuminate upon registration of a call and shall extinguish when the call is answered. If a landing button is operated while the car and hoistway doors are closing at that floor, the doors shall stop and re-open and shall remain open for a normal passenger transfer time.
- d. Car Position Indicator: The digital car position indicator shall be provided integral to the car operating panel.
- e. Top-of-Car Operating Device
- 1) Provide a top of car operating device which shall be activated by a key switch mounted in the upper portion of the car operating panel. The keyswitch shall be keyed the same as the access key switches in the corridor and have the "ON" and "OFF" positions permanently marked on the faceplate with 1/4-inch letters.
 - 2) Movement of the elevator shall be accomplished by continuous pressure on a direction button and a safety button simultaneously.
 - 3) Provide a two position toggle switch marked "INSP" and "RUN".
 - 4) Provide an emergency stop toggle type switch as per Code.
 - 5) Provide permanent identifications for the operation of all components in the device.
 - 6) Each device shall be permanently attached to the elevator crosshead on the side of the elevator which is nearest to the hoistway doors.

- 7) Provide a fire emblem jewel which shall illuminate when Firemen's Emergency Service, Phase I is initiated
 - 8) Provide a GFCI receptacle in the top of car operating device.
- f. Alarm Bell System: Provide an alarm bell system located on top of the car and in the hoistway at the main landing which shall be audible outside the hoistway when activated by the ALARM call button on the car control station.
- g. Car Directional Indicator: Provide new car directional indicator in the cab door jamb which shall be visible from the floor area adjacent to the hall call buttons.
- h. Accessibility Provisions -
- 1) Comply with the requirements of the Americans with Disabilities Act (ADA) and ANSI A117.1.
 - 2) Car operating panel shall be mounted so that the dimension from the finished floor to the centerline of the highest button used for automatic operation does not exceed 48 inches and the dimension from the finished floor to the centerline of the emergency controls is not less than 35 inches.
 - 3) Provide floor designations with both alpha/numerical and Grade 2 Braille markings on both side jambs of the hoistway entrances visible from within the car and the elevator lobby at a height of 60 inches above the finished floor. Designations shall be 2 inches high and shall be as approved by the Contracting Officer's Representative. Plates shall be secured to the entrance jambs by use of vandal resistant fasteners. Adhesive mountings are not permitted.
 - 4) Provide minimum 5/8 inch high markings with alpha/numeric and Grade 2 Braille designation adjacent to car control buttons. The marking shall be integral with the faceplate. Applied marking plates are not permitted.
 - 5) The elevator shall have the capability to level and relevel to 1/4 inch leveling accuracy.

- 6) Corridor hall buttons centerline shall be centered at 42" above the finished floor.
- 7) Emergency communication shall be properly identified by a red jewel around the button and located so that the highest operational part shall not be more than 48 inches above the finished floor. In addition, a light jewel with the appropriate engraving shall be located on the car operating panel, which will illuminate to indicate that help is on the way once the emergency call has been acknowledged.

H. Governor:

1. Disconnect and completely remove the existing governor and tension weight frame in pit for each elevator and replace with new equipment and tension weight frame in pit installed and connected in place, as hereinafter specified. The new governors shall be located in the machine room.
2. Governor shall be complete with weighted pit tension sheave, governor release carrier and mounting base with protected cable sleeves.
3. Two way overspeed and speed-reducing switches shall be furnished as required by Code.
4. The governor rope clamping device shall be designed so that no appreciable damage to or deformation of the governor rope shall result from the stopping action of the device in operating the safety. The grip jaws shall be of such shape and length that pull through action of the governor rope will result in a minimum amount of rope abrasion.
5. Anti-friction metal bearings shall be provided for the governor and pit tension sheaves. Bearings shall be either self-oiling or grease gun type construction. Ball or roller bearings may be used in lieu of sleeve type.
6. Provide metal guard over top of the governor and pit tension sheave to prevent objects from lodging between governor rope and sheaves.
7. Governor, with the exception of finished surfaces, screw threads, etc., shall be factory painted and shall operate freely. No field painting of governor parts shall be permitted.
8. Governor rope shall be fastened to the governor releasing carrier by babbitted

rope shackles or other approved means.

9. A spin test to check the accuracy of the settings of the overspeed and speed-reducing switches and governor tripping speed shall be performed.

2.04 OPERATION

- A. Automatic Self Leveling: Provide a self-leveling feature that shall automatically bring the car to the floor landings within a tolerance of 3/16 inch fully loaded without "hunting". This self-leveling shall, within its zone, be entirely automatic, and shall correct for overtravel/undertravel and rope stretch. The car shall also be maintained approximately level with the landing, irrespective of load, while loading and unloading.
- B. Automatic Elevator Operation:
1. Furnish and install operating devices consisting of a series of push buttons in the car numbered to correspond to the landings, and a single hall call button at each landing, all connected electrically to the control system governing floor selection, direction of travel, acceleration and retardation, to supply the operation described herein. In addition to the floor buttons, the car operating panel shall contain a red emergency stop switch arranged to interrupt the power supply to the motor independently of the operating device, a car light switch, an alarm bell button, a switch, "Door Open" and "Door Close" buttons, fire service switch, independent and inspection switches, hands free autodial telephone unit and such auxiliary switches and/or keyswitches as may be required. Switches and buttons not required for automatic operation shall be mounted behind a hinged locked cover which shall also house a frame for the car certificate.
 2. Car calls shall be registered by passengers within the car by pressing the button corresponding to the floor to which they wish to go. Corridor calls shall be registered by pressing the buttons in the corridor push-button fixture.
 3. Power operated doors shall open automatically as the car reaches the landing and, after an adjustable, predetermined time, shall close and the car shall then proceed to answer any remaining car or assigned corridor calls. The protective device on the car door, when activated, shall prevent closing the doors.
 4. Door open dwell times shall be adjustable so that open time for a car call is shorter than for landing calls. If a longer time is needed for passenger entry, doors shall be prevented from closing by the protective static curtain on car door, or by pressing the "Door Open" button in the car.
 5. Should the car be delayed at a floor beyond a predetermined (field changeable) adjustable time (set initially at 30 seconds), a buzzer shall sound and the doors shall close at reduced speed. The nudging operation and buzzer activation shall be designed to be independent of the door closing sequence.

6. System shall be designed so that when the car is standing at either terminal landing, pressure on car button for the other terminal shall automatically dispatch car to that landing. Pressure of landing button at either terminal landing shall call car automatically to that landing. If a landing call is registered while the car is making its trip, that call shall remain registered until the car responds to that call. If no car calls are registered car shall start automatically and respond to hall calls. Provide time limit relay arranged to hold car at landing at which it has stopped for predetermined time after car stops. After all car landing calls have been answered, car shall remain parked at landing where last used with car and hoistway doors closed until another call is registered. Pressing the landing button at floor at which car is parked shall automatically open car and hoistway doors. In all normal operations, the starting of the car shall be contingent upon establishment of hoistway door interlock and car door circuits.
 7. Automatic dispatching operation: all two stop elevators shall include "Step-in-and-Go" feature. Calls for the opposite landing will be automatically set when the elevator opens its doors for a hall call. This feature shall be provided for all elevators that have public access for two stops (i.e., any elevators with key operated service landings will be included).
- C. Operation of Elevators In Fire or Other Emergency Conditions
1. The Designated Level shall be the level designated by the local fire marshal or authority having jurisdiction.
 2. Elevator controls for Emergency Fire Service Operation shall be connected to the existing system fire alarm system.
 3. Emergency Fire Service Recall (Phase I) and In-Car (Phase II) Fire Service Operation shall be provided for the elevators in accordance with the ASME A17.1 code.
- D. Independent Service: Provide an Independent Service key switch in the main car operating panel which, when placed in the ON position, will remove the elevator from its respective operation and transfer to Independent Service, it shall respond to all car signals but not hall signals. Doors shall open automatically but shall close by constant pressure on the DOOR CLOSE button. If the DOOR CLOSE button is released before the doors are fully closed, they shall reopen. Hall lanterns shall be inoperative during Independent Service Operation.
- E. Kiosk Control Panel: Contractor shall make all necessary repairs to ensure operation of the kiosk control panel and to ensure that new system is made

compatible with the kiosk control system. All wires between the kiosk and the elevator machine rooms shall be replaced and the function of the buttons and lights shall be verified for proper operation.

2.05 ELECTRICAL REQUIREMENTS

- A. Provide wiring and conduit from the mainline disconnect switch throughout the elevator control system with complete wiring and conduit systems in the hoistway, machine room and pits, including traveling cables adequate for the proper operation of the equipment.

1. Conduit and Wiring

- a. Unless otherwise specified, all electrical conductors in the pits and hoistways, except traveling cable connections to the car shall be provided in rigid zinc-coated steel conduit with steel outlet boxes, except that a small amount of flexible conduit may be used where conduit is not subject to moisture or embedded in concrete, as approved by the COTR. Terminal and pull boxes and other similar items, shall be of approved construction, thoroughly reinforced, and in no case less than number 12 USSG. All electrical boxes exceeding 150 cubic inches shall be supported independently of the conduits. The rigid conduit shall conform to the Federal specifications hereinbefore specified. All raceway shall be threaded rigid steel conduit. Flexible heavy-duty service cord, type SO, may be used between fixed car wiring and switches on car doors for safety edges and light ray devices.
- b. All conduit terminating in steel cabinets, junction boxes, wireways, switch boxes, outlet boxes and similar locations shall have approved insulation bushings. If the bushings are constructed completely of insulation material, a steel locknut shall be installed under the bushing. At ends of conduits not terminating in steel cabinets or boxes, the conductors shall be protected by terminal fittings having an insulated opening for the conductors.
- c. Conduit and EMT fittings and connections using set screws or indentations as a means of attachment are not permitted.
- d. Connect motors and other components subject to movement or vibration, to the conduit or EMT systems with flexible conduit.
- e. All existing machine room conduit and wiring shall be replaced with new materials to suit the new equipment. Conductors in the machine

rooms shall be installed in rigid zinc coated steel conduit, electrical metallic tubing or metal wireways.

- f. All existing hoistway wiring and conduit, including center hoistway junction boxes, shall be replaced with new.
- g. The Contractor shall furnish all materials and completely wire all parts of the electrical equipment of the elevators including electrical devices on hatch doors. All car wiring and conduit shall be replaced with new including car junction boxes.
- h. All solid state and electrical components located on top of the car enclosure or in the hoistway shall be installed within NEMA 4X enclosures.
- i. Conduits shall be brought and connected to suitable approved connection boxes at all outlets, apparatus and panels.
- j. The conduits shall be of such size that the wires or cables can be readily installed and replaced, if necessary. No conduit or raceway shall be less than 3/4 inch trade size, except that for small devices such as door switches, interlocks, etc., 1/2 inch conduit may be used. The total overall cross sectional area of the wires contained in any conduit shall not exceed 40 percent of the internal area of the conduit. Approved strain boxes shall be installed for all vertical runs in accordance with Code.
- k. Conduits shall be neatly and systematically run. All exposed conduit and boxes shall be supported by approved and substantial straps, hangers or clamps to the structural steel, reinforced concrete, or other approved supports. Riser conduits in hoistway shall be supported at each floor level.
- l. In all machine rooms, hoistway, etc., the equipment shall be laid out and installed so as to allow as adequate and convenient access for maintenance as space conditions will permit.
- m. All interlock, hall button and limit switch branch wiring shall be enclosed in flexible steel conduit with covering of liquid tight Type "EF" with connectors having nylon insulated throat.
- n. All screws used for terminal connections of all wiring (machine room, hoistway and pit) shall be provided with "star washers" of proper size and type.

- o. All existing conduit and wiring shall be removed and wall/floor slabs patched with fire rated material.

2. Conductors

- a. Unless otherwise specified, conductors, exclusive of traveling cables, shall be stranded or solid coated annealed copper in accordance with Code for Type THHW. Where 16 and 18 AWG are permitted by Code, either single conductor cable in accordance with Code for Type TF, or multiple conductor cable may be used provided the insulation of single conductor cable and outer jacket of multiple conductor cable is flame retardant and moisture resistant. PVC insulation will not be permitted. Multiple conductor cable shall have color coding or other suitable identification for each conductor. Conductors for control boards, shall be in accordance with Code. No joints or splices shall be permitted in wiring except at outlets. Tap connectors may not be used.
- b. All wiring shall test free from short circuits or grounds. Insulation resistance between individual external conductors and between conductors and ground shall be not less than one megohm.
- c. Where size of conductors is not given, capacity shall be such that maximum current shall not exceed limits prescribed by Code.
- d. Equipment grounding shall be furnished and installed. Ground conduits, supports, controller enclosures, motors, platform and car frames, and all other non-current conducting metal enclosures for electrical equipment in accordance with Code. The ground wires shall be copper, green, insulated and sized as required by the code; at a minimum #8 solid copper.
- e. Terminal connections for all conductors used for external wiring between various items of elevator equipment shall be solderless pressure wire connectors in accordance with Code. The Contractor may at his option make these terminal connections on No. 10 or smaller conductors with approved terminal eyelets set on the conductor with a special setting tool, or with an approved pressure type terminal block. Terminal blocks using pierce-through serrated washers are not acceptable.
- f. Provide all necessary conduit and wiring between all remote machine

room and hoistway.

3. Traveling Cables

- a. Traveling cables from junction box on car to junction box in hoistway shall consist of flexible traveling cables conforming with requirements of Code. Junction boxes in hoistway and on car shall be equipped with terminal blocks. All connections to terminal blocks shall be made with either terminal eyelet connections or pressure wire connectors of the clamp type that meet UL 486 requirements for stranded wire. Terminal blocks shall have permanent indelible identifying numbers for each connection. The outer covering must remain intact between junction boxes. Abrupt bending or twisting producing distortion of cable is not permitted. Cables shall be free from any possible contact with hoistway structure, car or other equipment. Furnish and install shields or pads to protect the cables. Travel cables shall include coaxial cable shielded for the communications system.
- b. Cables shall include ten percent spare wires but not less than 2 spare conductors in each traveling cable between each controller, selector, and hoistway junction box, all spares to be properly tagged or otherwise identified with clear and indelible markings. Provide 6 shielded pairs and 2 shielded coaxial cables for CCTV.
- c. Provide sufficient wiring in the travel cables for car lighting and fan control circuits and car work lights.
- d. Provide traveling cable for telephone in the elevator car. Cable shall extend from junction box in hoistway to telephone box in car.
- e. Car and hoistway junction boxes shall be provided for the elevator. Hoistway junction boxes shall be provided if necessary.
- f. All insulated wiring, control wiring and wiring in traveling cables shall be tag coded at their terminals in the machine room, hoistway junction box, elevator cab junction box, and push-button stations within the cab, and shall agree with the approved wiring diagrams.

4. Tagging

- a. All insulated wiring, control wiring and wiring in traveling cables shall be tag coded at their terminals in the Elevator Machine Room, hoistway junction boxes, all elevator cab junction boxes and push-

button (COP) stations within the cab. Each device, each terminal and each wire in the controller panels shall be properly identified by name, letter, or standard symbol in an approved indelible manner on the device, panel or wire. The identification markings shall be identical to markings used on the wiring diagrams. The markings shall be provided with permanent heat shrink sleeve wire markers. Handwritten labels are not allowed.

- B. Provide circuit protection for signal system incorporated in circuit breaker, disconnect switch or power controller.
- C. Contacts in elevator motor circuits which are to be opened by governors or other safety devices shall be copper to carbon or other approved non-fusing type. Contacts on control and signal relays and switches shall be commercially pure silver. Contacts on switches breaking heavy motor circuits shall be copper to carbon or, if of metal, shall have supplementary breaking contacts and shall operate with suitable wiping action, or shall be of approved equivalent design and construction. They shall be equipped with suitable blowout coils, vanes, suppressors, barriers, etc., where necessary to prevent undue arcing and heating.
- D. Car and hall operating signal circuits shall not exceed 120 volts.
- E. In the machine room, hoistway, etc., the equipment shall be laid out and installed so as to allow as adequate and convenient access for maintenance as space conditions will permit.
- F. Each major component of equipment shall have the manufacturers name, type, class or catalog number on a metal plate securely attached to the item of equipment in a conspicuous location.
- G. All cabinets containing motor drives, filter boxes, transformers and power reactors shall be supported on rails and isolated from the base building structure with elastomer pads having a minimum static deflection of 3/8" (Mason Type N or equivalent). All connections to and from the cabinetry shall be flexible in order not to compromise the isolation system. Use non-rigid conduit for the final electrical connection, with all other conduit supports and clamps provided on a neoprene sponge insert.
- H. Supply, installation and connections of fused main line disconnect switch of the lockable type for the elevators in the machine rooms.
- I. Signal to the controller in the machine room to indicate special emergency condition due to lobby smoke detector activation; and smoke detectors in the

elevator lobby and machine room in accordance with the ASME A17.1 code. Furnish and install means to automatically disconnect the main line power supply to the elevator prior to the application of water.

- J. Car lighting and fan circuit for the elevators shall be located in circuit breaker panel in the machine rooms.
- K. Permanent light fixtures with switches and duplex grounded receptacles in the elevator machine room and elevator pit. Receptacles in the pit shall be ground fault circuit interrupter type.

2.06 MECHANICAL REQUIREMENTS

- A. All bearings, pivots, guides, gearing and similar elements subject to friction or rolling wear in the entire elevator installation shall be accurately and smoothly finished and shall be arranged and equipped for adequate and convenient lubrication. Means shall be provided for flushing and draining the larger bearings and gear cases. All oiling holes shall have dustproof self-closing caps.
- B. All plain bearings shall be liberally sized in accordance with the best commercial elevator usages which have proved entirely satisfactory on heavy duty installation.
- C. Ball and roller bearings shall be of liberal size and of a type and make which have been extensively and successfully used for similar heavy duty on other elevator installations. They shall be fully enclosed. Loading, lubrication, support and all other conditions of use shall be in accordance with the recommendations of the bearing manufacturer, based on previous extensive and satisfactory elevator usage.
- D. All bolts used to connect moving parts, bolts carrying hoisting stresses, and all other bolts except guide rail bolts, subject to vibration or shock shall be fitted with adequate means to prevent loosening of the nuts and bolts. Bolts transmitting shearing stresses between machine parts shall have tight body fit in drilled holes. All bolts subject to vibration shall be provided with split ring lock washers.
- E. All bearing and sliding surfaces of shafts, pins, bearings, bushings, guides, etc., shall be smoothly and accurately finished. They shall be assembled and installed in accurate alignment and with working clearance most suitable for the load, speed, lubrication and other conditions of use. All bearings shall be regularly checked for any tendency to run hot, and all defects corrected.
- F. Belts, pulleys, chains, gears, couplings, projecting setscrews, keys, cables and other rotating parts located so that any person can come in close proximity thereto shall be fully enclosed or properly guarded.

2.07 PERFORMANCE

- A. Performance Times, Leveling, Contract Speed and Door Operating Times: The Contractor shall adjust the control system to provide and maintain smooth acceleration and deceleration under varied conditions. Door operating times shall be field adjustable.
- B. Speed: Plus or minus 10 percent under all loading conditions.
- C. Capacity: Safely lower, stop and hold 125 percent of rated load.
- D. Door open time shall be adjustable and pre-set for 5 seconds.

2.08 SHOP FABRICATION

- A. The various parts of the elevator systems shall be fabricated and assembled insofar as practical, in the shop to minimize field assembly. Parts which cannot be shop-assembled but require close field fit shall be trial-assembled in the shop and given field erection marks where necessary to eliminate fitting work at the construction site.
- B. A CAD drawing shall be submitted to the contracting officer for the various parts of the elevator system that are fabricated.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Procedures for taking a unit out of service shall be performed in accordance with Appendix D "EOC Key Functions".
- B. Install all replacement equipment, systems, and components in strict accordance with manufacturer's instructions and approved shop drawings.
- C. It is the contractor's responsibility to ensure that existing equipment can be safely removed and new equipment installed in existing spaces through existing access. Any exceptions to this shall be identified and exceptions taken prior to submission of the proposal.

3.02 ACCEPTANCE INSPECTION AND TESTS

- A. Upon completion of rehabilitation Work for the elevator, perform acceptance inspection and tests required in Section 1006 of the ASME A17.1 code, prior to

beginning rehabilitation work on the next elevator. Provide all instruments, materials and labor required for the tests. Final acceptance tests shall be made by the Authority. Notify the Contracting Officer's Representative one (1) week prior to each scheduled test. Submit copies of all test results to the Contracting Officer's Representative. The O & M Manuals, schematics, sequence of operation must be submitted to the Contracting Officer's Representative for approval prior to execution of the work on the next elevator. The approval process will not delay the beginning of work on the next elevator.

- B. All malfunctions and deficiencies revealed by the tests shall be forthwith corrected by the Contractor at no additional cost to the Authority.
- C. Full-Load Run Test: Elevators shall be tested for a period of one (1) hour continuous run with full contract load in the car. During the test run, the car shall be stopped at all floors in both directions of travel for a standing period of not less than five (5) nor more than ten (10) seconds per floor.
- D. Speed Test: The actual speed of the elevator shall be determined in both directions of travel with full contract load and no load in the elevator. Speed tests shall be made before the full load run test and after the full load run test. Speed shall be determined by applying a tachometer to the car rails. The actual measured speed of the elevator with all loads in either direction shall be within 5% of specified rated speed. Full speed runs shall be quiet and free from vibration and sway.
- E. Static Car Balancing: The car shall be statically balanced in its sling so that the total lateral force on top car guide assemblies shall be a maximum of forty pounds (40 lbs.) for all positions of the car in the shaftway.
- F. Car Leveling Test: Elevator car leveling device shall be tested for accuracy of leveling at all floors with no load in car, and with contract load in car, in both directions of travel. Accuracy of floor leveling, shall be within plus or minus 3/16-inch of level with any landing floor for which the stop has been initiated (with a definite range of distance in advance of the landing) regardless of load in car or direction of travel. The car leveling device shall automatically correct over travel as well as under travel and shall maintain the car floor within plus or minus 3/16-inch of level with the landing floor regardless of change in load. Rebalance car counterweight.
- G. Insulation Resistance Test: The elevator's complete wiring system shall be free from short circuits and grounds and the insulation resistance of the system shall be determined by the use of a Megohmmeter, at the discretion of the inspector conducting the test.

- H. Overload Devices: All overload current protection devices shall be tested within their designated circuitry. Overloads shall not be bench tested.
- I. Limit Stops: The position of the car when stopped by each of the normal limit stops with no load and with contract load in the car shall be accurately measured. The car shall reach the terminal landings under the above condition. Final position of the elevator relative to the terminal landings shall be determined when the elevator has been stopped by the final limits. The lower limit stop shall be made with contract load in the elevator. The upper limit stop shall be made with no load in the elevator. Elevator shall be operated at contract speed for both tests. Normal limit stopping devices shall be inoperative for the tests.
- J. Setting of Car Door Contacts: The position of the car door at which the elevator may be started shall be measured. The distance from full closure shall not exceed that required by the Code. The test shall be made with the hoistway doors closed or with the hoistway door contact inoperative.
- K. Setting of Interlocks: The position of the hoistway door at which the elevator may be started shall be measured and shall not exceed the Code requirements.
- L. Operating and Signal System: The elevator shall be operated by the operating devices provided, and the operation signals and automatic floor leveling shall function in accordance with requirements specified. Starting, stopping and leveling shall be smooth and comfortable without appreciable steps of acceleration or deceleration.
- M. Provide a full fire service test of both Phase I and Phase II Fireman's Service.
- N. All elevators, if connected to the emergency power system (generator), will also be tested with the emergency power system. Tests are to be performed after revenue hours.
- O. Performance Guarantee: Should any of these tests develop any defects or evidence of poor workmanship, any variance or noncompliance with the requirements of the specified codes and or ordinances or any variance or noncompliance with the requirements of these specifications, the following work and or repairs shall be complete at no expense to the Authority.
 - 1. Replace equipment that does not meet code or specified requirements.
 - 2. Perform work and furnish labor, materials and equipment necessary to meet specified operation and performance.
 - 3. Perform and assume cost for retesting required by Governing Code Authority

and Authority to verify specified operation and performance.

- P. Warranties: Contractor shall be responsible for all warranty work for a period of one year, including both labor and materials.

3.03 CLEANING AND ADJUSTMENTS

- A. After completion of work of this section, and before the issuance of Certificate of Final Completion, work shall be thoroughly cleaned, and properly adjusted, so that it is in proper operating condition. The entire work shall be left in a clean condition, satisfactory to the Contracting Officer's Representative.

3.04 INSTRUCTION OF AUTHORITY'S PERSONNEL

- A. The Contractor shall make arrangements for the instruction of personnel as designated by the Authority (a minimum of 24 hours as scheduled by the Contracting Officer's Representative) in the details of maintaining, adjusting and trouble-shooting the equipment per training session, with a minimum total of twelve (12) days of training.
- B. Training: Provide separate training sessions, conducted by authorized instructors, each session shall be 8 hour continuous duration during normal working hours. The Authority's personnel designated to receive training will be identified to the contractor prior to the scheduled training. The major topics/area of instruction shall be addressed in the training sessions are as follows:
1. Troubleshooting of all mechanical systems such as door operations, safety interlocks, safety systems, etc.
 2. Troubleshooting of all electrical/electronic control systems and subsystems in conjunction with the use of the straight line and schematic diagrams provided by the contractor.
 3. A separate training manual shall be submitted for approval prior to the scheduling of the training. The O&M manual shall not be used as a training manual.
 4. At the completion of the first training session, a narrated and properly edited training video shall be submitted for the Authority in DVD or flash drive form. The video shall be used for future training sessions. The video shall cover operation of devices, maintenance and troubleshooting.

The following items shall be included as minimum requirements: Installation

and adjustment of valves; adjusting safety switches; troubleshooting, and maintenance procedure of major components.

- C. Scheduling: Training shall be done on the first elevator after it has been completely finished, tested and ready for turnover to the Authority.

3.05 OWNERSHIP OF REMOVED EQUIPMENT

- A. Prior to commencement of work on EACH elevator, contractor will contact the Authority in writing to determine what equipment, if any, is to be retained by the Authority. The Contracting Officer's Representative will respond within five (5) working days.
- B. The specified equipment shall be delivered to the Authority at the Pennsy Drive Facility in Landover, Maryland as directed by the Contracting Officer's Representative.

END OF SECTION

SECTION 14221, REHABILITATION OF GEARLESS TRACTION ELEVATORSPART 1 - GENERAL

1.01 SUMMARY

- A. This Section specifies the requirements for rehabilitation of six (6) gearless traction elevators located at the Forest Glen station as identified in Appendix C.
- B. The contractor will be responsible for the complete maintenance of all six (6) elevators, commencing at the time the first elevator is removed from service until the last elevator is accepted by the Authority and returned to service.

1.02 GENERAL DESCRIPTION OF ELEVATORS TO BE REHABILITATED

- A. The general extent of the work for the elevators to be rehabilitated includes, but is not necessarily limited to the following:
- | | | | |
|-----|--------------------------|---|---|
| 1. | Loading Classification - | Passenger | |
| 2. | Operation - | 6 car group operation | |
| 3. | Machine - | Dover, repair as specified | |
| # | 4. Hoist ropes- | Provide new hoist, governor and counterweight ropes. All hoist ropes to be pre-stretched. | # |
| 5. | Entrances - | Retain & refurbish or replace as indicated | |
| 6. | Governors - | Remove and replace. | |
| 7. | Cab & Hoistway Doors - | Remove and replace with new doors and sills, or retain and refurbish as indicated | |
| 8. | Cab Enclosure - | Replace with new stainless steel cab enclosure. | |
| 9. | Cab Door Operation - | Furnish and install new power operated car door system. Replace non-contact infrared car door protective device as required | |
| 10. | Fixtures and Signals - | Furnish and install new hall and car operating panels with register lights. Provide new car floor position indicator incorporated into the car operating panel. The new car and hall button riser fixtures shall comply with the ADA. | |

- | | | |
|-------|-------------------------------|---|
| 11. | Control & Drive Equipment - | Provide new controller system to suit new SCR system. |
| 12. | Wiring and Conduit - | Furnish and install new wiring and conduits in machine room and hoistway and between, including new coded traveling cables with 10% spare conductors with six pairs shielded communication cables and two coaxial cables for CCTV. Furnish and install new junction boxes throughout. |
| 13. | Car Platform - | Remove and replace with new stainless steel platform. Platform shall be balanced. Floor cover shall be resistant to urine absorption and deterioration. |
| 14. | Car Frame - | Remove and replace. Frame shall be hot-dipped galvanized. |
| 15. | Buffers - | Remove and replace with new. |
| 16. | Car Guides - | Provide new spring tensioned roller guides. |
| 17. | Guide Rails - | Reuse existing, clean & paint, except as noted. Replace bottom rail sections. |
| 18. | Fireman's Emergency Service - | Furnish and install new elevator recall (Phase I) and (Phase II) Fire Service operation in accordance ASME A17.1. |
| # 19. | Intercommunication System - | Furnish and install a new hands free communications system from the car and corridor to station kiosk or command offices for garages and rail yards. All wiring required to provide a fully functional system is the responsibility of the Contractor. |
| 20. | Disability Compliance - | Comply with the requirements of the ADA and ANSI A117.1. |
| 21. | Electrical Supply - | Remove and replace main line disconnects boxes. Provide new grounding system. Provide new light and signal 120V, 1 phase, 60 cycle disconnect. Comply with requirements of ASME A17.1 and the National Electric Code. |

22. Miscellaneous - Furnish and install new normal and final limits, top cab emergency exit contact, emergency car lighting (shall maintain lighting for a minimum of 4 hours) inspection and maintenance car top operating station, and emergency keyways at both floors with escutcheon tubes, pit stop switch, pit ladder, pit lighting fixtures and GFI receptacle as required, removals of all abandoned equipment plus all old conduit and junction boxes not used and testing for compliance to Code and contract requirements. Provide lighting per Code requirements for elevator machine rooms and pits.
23. Painting- The pit and pit walls shall be painted. All machine room equipment and floors shall be given two (2) coats of approved machinery paint. All new iron work shall be given one coat of rust-inhibitive paint. All final finishes shall match existing finishes.

1.03 DESIGN AND PERFORMANCE REQUIREMENTS

- A. Compliance: Design, fabrication and performance shall comply with all the latest applicable provisions of the Codes, Standards and recommendations of the entities listed below.
1. Codes: Work of this Section shall comply with all governing local Codes including, but shall not necessarily be limited to ASME A17.1, Electrical Code, and Board of Standards including all "Local Laws" and cited reference standards and Appeals Rulings and Standards.
 2. Standards: Except as modified by governing Codes and by this Section, Work shall comply with the latest provisions of the following:
 - a. ASME A17.1 2012 Safety Code for Elevators and Escalators
 - b. ASME A17.2 2012 Guide for Inspections of Elevators, Escalators and Moving Walks
 - c. ASME A17.3 2012 Safety Code for Existing Elevators and Escalators
 - d. ANSI A117.1 Specifications for Making Buildings and Facilities Accessible to and Usable by Physically Handicapped People
 - e. ADA Americans with Disabilities Act
 - f. ASTM-A446 Steel Sheet, Zinc Coated (Galvanized) by the Hot-Dip Process, Structural (Physical) Quality

- g. ASTM-B221 Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes and Tubes
 - h. ANSI/AWS- Structural Welding Code, Steel. D1.1
 - i. ANSI/NFPA 70 2011 National Electrical Code
 - j. ANSI/NFPA 80 Fire Door and Windows
 - k. UL 10B- Fire Tests of Door Assemblies
 - l. APA American Plywood Association
 - m. ASTM A36 Structural Steel
 - n. ASTM A167- Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip.
 - o. NEMA LD-3- High Pressure Decorative Laminates.
 - p. UL 486 Crimp Tools.
 - q. ASTM E152 Fire Tests of Door Assemblies.
 - r. FS-L-P-508H Plastic, Sheet Laminated, Decorative, and Nondecorative.
 - s. FS-QQ-S-698- Steel Sheet and Strip, Low Carbon.
 - t. NEII National Elevator Industry, Inc.
 - u. All other specific provisions cited herein.
- B. All of the elevator equipment shall be designed, constructed, installed and adjusted to secure performance in accordance with the manufacturer's design standards with respect to smooth, quiet, convenient and efficient operation, durability, economy of maintenance and operations, and standards of safety.
- C. The control system shall provide smooth acceleration and deceleration with 3/16" leveling accuracy at all landings, from no load to full rated load in the elevator, under normal or unloading conditions. The self-leveling shall, within its zone, be entirely automatic and independent of the operating device and shall correct for overtravel and undertravel. The car shall remain at the landing irrespective of load. Clearance between the car sill and the hoistway landing shall not exceed 1-1/4 inches.
- D. The door open time for elevators is to be 2.5 fps. The door close time shall be based on the Code requirements with a door delay feature. The door delay is the minimum acceptable time from notification that a car is answering a call (lantern and audible signal) until the doors of the car start to close. Time shall be calculated by the following equation:

- T = $D/(1.5\text{ft/s})(457\text{mm/s})$
T = Total time in seconds.
D = Distance from a point in the lobby 60 inches (1524mm) directly in front of the hall station to the centerline of the door opening.

- E. Car Call: The minimum acceptable time for doors to remain fully open shall not be less than 5 seconds.
- F. The speed of the elevator shall not vary +/- 5% under loading conditions

1.04 DELIVERY, STORAGE AND HANDLING

- A. Delivery: Materials shall be delivered ready for use, in the approved manufacturers original and unopened containers and packaging, bearing labels as to type of material, brand name and manufacturer's name. Delivered materials shall be identical to approved products and samples.
- B. Storage: Materials shall be stored under a cover in a dry and clean location, off the ground. Delivered materials which are damaged or otherwise not suitable for installation, shall be removed and replaced with acceptable materials at no additional cost to the Authority. On site staging/storage of materials is not guaranteed.
- C. Floor Loading: Do not load or permit any part of the structure to be loaded with a weight that will exceed the load factor and endanger the safety of the structure.

1.05 SUBMITTALS

- A. General: Submit the following in accordance with this section, the GENERAL PROVISIONS and the SPECIAL CONDITIONS:
1. Product Data: Submit the names and addresses of the manufacturers, together with catalog information or other identifying description for all items of elevator equipment.
 2. Submittals: Submit shop drawings showing material type and gauge, general dimensions, methods of attachment, location and size of reinforcements and openings, and a general arrangement of components with complete information concerning the material, articles and/or design proposed for use in sufficient detail to show compliance with the specification including:
 - a. Machine room equipment details, layout and elevations, including bill of materials showing both new and existing equipment, power requirements, details, operational description and method of wire connections for point to point wire connecting for control and signals, and all other Work which is required to achieve successful completion of the Work described herein.
 - b. Wiring Diagrams
 - c. Written description of the mode and sequence of operation.

- d. Complete information on machines, motors, motor drives, control system and all related equipment, including power requirements and equipment heat release information.
- e. Elevator car and hall fixture drawings.
- f. Complete car enclosure drawings and details of all equipment.
- g. Entrance details including doors, hoistway door hangers, door operators, door protective devices, tracks, guides, etc., for passenger elevator entrances.
- h. Machine room and hoistway ventilation requirements.
- i. Platform with isolation details.
- j. Suspended Load Data Sheets for elevators.
- k. Work plan for removing and replacing machines and equipment shall be submitted at least sixty (60) days prior to commencement of work.
- l. The elevator manufacturer will provide certification, in writing and signed by an officer of the organization, that the owner of the elevators shall be provided with copies of any and all information, correspondence, bulletins, newsletters, manuals, techniques, procedures, drawings, sketches and any other documents related to maintenance, safety, operations, design changes, modifications, retrofits, etc., which relate to any part, component, equipment, system, subsystem or material and services applicable to the elevators provided.
- m. Complete detailed installation, adjusting and controller setup procedures.

All of the above referenced shall be provided as it pertains to the original installation and for a period of ten (10) years after final acceptance of the last elevator provided.

The reference material shall be provided within thirty (30) days of publication or internal distribution by the elevator manufacturer. The material, even if labeled PROPRIETARY, shall be delivered to the Authority without prejudice or delay and at no additional cost.

- B. Operations Manual: Prior to the execution of work on the second elevator submit an electronic copy of the following manuals to the Contracting Officer's Representative for review. After approval and issue of the Certificate of Final Completion, submit five (5) bound manuals and two (2) CD-ROM electronic versions of the manual.

1. Manuals shall be bound and indexed providing operating, trouble-shooting and maintenance instructions, parts listing, recommended parts inventory listing, purchase source listing for major and critical components, emergency instructions, and similar information. Maintenance instructions shall include lubrication and periodic maintenance requirements and schedules. Parts list and purchase source listing shall include electrical and control equipment. Manuals shall also include

approved drawings and catalog cuts, folded if necessary.

2. Adjusters Manual: Provide the contractors adjusters manual, the manual shall provide step by step procedures for calibrating and adjusting all equipment operations and including any printed circuit boards. Manuals shall comply with the requirements of this section, the GENERAL PROVISIONS and the SPECIAL CONDITIONS.
2. Operating Instructions shall be printed or typewritten literature describing the function and operation of all controls including pictorial illustrations. The pictorial instructions shall be taken from an elevator that has been completed. Controller and shaft component shall also be included with a clear picture showing where the controller components are located, where applicable.
3. Maintenance Instructions shall be printed or typewritten schedules describing all required maintenance procedures for each elevator.
4. Wiring Diagrams shall be full size, ladder type, complete "as-built" wiring and single line diagrams showing the electrical connections, functions and sequence of operation of apparatus connected with each elevator, using standard symbols or proprietary symbols defined on the diagram, both in the machine room and in the hoistway, shall be furnished in duplicate for each elevator. Wiring diagrams shall incorporate the wiring identification labeling to identify the controller and field wiring used for each circuit. Wiring diagrams shall have sheets numbered with an indication of the total number of sheets in the diagram set. After approval, a copy of each shall be plastic or laminated, framed, and mounted in each elevator machine room. An electronic version of wiring diagrams for each elevator shall be delivered to the Contracting Officer's Representative. Coded diagrams are not acceptable.
5. Lubrication Chart: After approval, one laminated and framed lubrication chart for each elevator shall be furnished and mounted as directed in each elevator machine room. Chart shall identify lubricants as well as lubrication points and required frequency of application.
6. Record Drawings: The Contractor shall maintain at the construction site, one set of full size Drawings marked to show all deviations which have been made from the Drawings, including buried or concealed construction and utility features which are revealed during the course of construction. These drawings shall be available for review by the Contracting Officer's Representative at all times and shall become the property of the Authority and be turned over to the Contracting Officer's Representative at completion of the Work of this Section. Provide in both hard copy and electronic. (CD)
7. Keys: Provide eight (8) sets of keys, per elevator, to operate all keyed switches and locks prior to completion of the first unit.
8. Accessories: Provide all special tools and equipment necessary for making all system adjustments to the signal and speed controller and door equipment A programming unit, preferably a laptop with 4GB memory, 15.6-inch display and DVD drive, with all software packages required to setup and program all equipment in the elevator system shall be provided, one per station or structure. Software shall include that for the display unit, DeviceNet, soft start, if applicable, and any other programmable

devices, as well as for the controller PLC. Any hardware or software required for configuring, programming or communicating to the controller or any part of the elevator shall be submitted to the contracting officer. **NO SPECIAL TOOLS WITH DECAYING CIRCUITS OR CLOCKS ARE PERMITTED.**

9. Spare Parts: Provide the Authority with spare parts per the special provisions section of the specification. The list of recommended spare parts will be provided to the Contracting Officer's Representative after submittals are approved and must have OEM's part number listed.
 10. Power Confirmation: Provide power confirmation statement identifying both the "in rush and full load starting current" and the "full load up current" with the car balanced at precisely 42.5% capacity load.
- C. Test Reports, and Certificates: Submit to the Contracting Officer's Representative test report and inspection/acceptance certificates for each elevator.
- D. Work Area Barricade Protection Plans and Site Specific Work Plan
1. The work area protection plans shall be provided as part of the Site Specific Work Plan (SSWP) for each station by the Contractor for review no later than 60 days prior to the start of work.
 2. Protection plans shall clearly indicate partition systems planned for demolition and installation phases of the project, including planning for escalator entry and egress during handling. Plans shall include finish details for elements exposed to the public.
 3. Partitioning system shall include lockable access doors to prevent access to the work area by the public. Applicable work area notification/warning signage shall be provided by the Contractor. Signage shall be approved in size and design by Authority prior to use.
 4. Partitioning plans shall be designed to withstand applicable wind loads applied to the station entrance areas as required by local building Code.
 5. Barricade partitions shall be painted (color to be provided by WMATA) and a yellow safety caution stripe painted along the center of the panels.

1.06 GUARANTEES

- A. Notwithstanding the Specifications forming a part of this Contract, any inspection or approval of the Work by the Authority, or the existence of any patent or trade name, the Contractor nevertheless unconditionally guarantees that the equipment furnished and installed hereunder shall be of the best quality and shall be fully fit for the purpose for which it is intended. The Contractor shall unconditionally guarantee all equipment against defects or failures of any kind, including design, workmanship and materials for a period of one (1) year from the date the elevator is commissioned into service. In the event of defects or failures in any component of the Work of this Section, then upon receipt of notice thereof from the Engineer, the Contractor shall correct such defects or failures by immediately reconstructing, repairing

or making such alterations or replacement of said component in the Work of this Section as may be necessary or desirable, in the sole opinion of the Engineer, to comply with the above guaranty.

1.07 DESIGN CRITERIA

- A. General: Elevators shall be designed with provisions for thermal expansion and contraction of complete elevator assemblies.
- B. Operational Requirements: Hours of operation shall be considered as twenty-four (24) hours per day, seven (7) days per week.
- C. Environmental Requirements: Elevators shall be capable of operating with full-specified performance capability while exposed to the following climatic and environmental conditions: Elevators shall be designed to operate while exposed to the natural elements of weather, including sunlight, rain, slush, snow and ice; all conditions of relative humidity while exposed to salt, de-icing chemicals, airborne dust, and debris, and corrosive elements; and in a dry bulb temperature range of minus twenty five (25) plus one hundred and twenty (+120) degrees Fahrenheit
- D. Bearings: Bearings: All machine and motor bearing housings shall be provided with a drilled, tapped and spot faced area in the vertical and axial axis to accommodate a transducer that a Fast Fourier Transform (FFT) analyzer requires. Permanently mount transducers on the drive bearings and run the wires into the controller to a panel with BNC connectors on the ends to accommodate the FFT analyzer.
 - 1. Motor limit: rigid mount: .15 ips flex mount: .2 ips.
 - 2. Bearings shall be rated for an AFBMA L10 life as specified, under a fluctuating bearing load. All bearings shall have basic dynamic load ratings.
- E. Fasteners: Fasteners shall be compatible with materials being fastened. Fasteners shall be furnished with self -locking nuts or retaining rings (spring washers, toothed disks). Fasteners shall be equal to or of greater corrosion resistance than the most corrosion resistant metals being fastened.
- F. Ride Quality
 - 1. All elevators shall have a maximum decibel reading of 70 with the doors closed during a run in the up direction.
 - 2. All elevators shall have a ride quality of:
 - a. A95 raw 35 mill-g, peak to peak in the x, y and z axis during a full load run in the up direction.
 - b. The vibration readings shall be verified in the field with an EVA-625 (as manufactured by PMT, Inc. or approved equal) placed in the center of the cab

floor.

G. Car Frame: No cantilevered car frames are permitted.

PART 2 – PRODUCTS

2.01 MANUFACTURES

- A. The requirements for elevator equipment manufacturers are as follows:
1. Controller Manufacturers:
 - a. C.E.C. Futura
 - b. M.C.E. IMC Performa
- B. Gearless traction machine: Reuse existing machine. Clean entire machine of accumulated carbon dust, dirt and grease. Electrically test each machine armature and field piece and correct all deficiencies discovered. Submit detailed report of findings for each machine. Paint entire assembly. Drain, flush and provide new oil. All worn bearings are to be replaced. Replace all brushes and damaged brush holders
- C. Completely disassemble brake unit as required in order to insure the proper operating condition of the brake pins, coils, contacts, sleeves and brake lining. Replace any item that is defective.
- D. All sheaves are to be thoroughly cleaned and inspected. Bearings and seals are to be replaced. Traction sheave grooves are to be inspected for uneven wear. Should it be discovered that uneven groove conditions exist then the sheave is to be regrooved. Sheaves are to be replaced if regrooving would result in the metal surface being reduced to a thickness that would present unsafe application.
- E. New hoist, compensation and governor ropes are to be provided on all elevators.
- F. Operating and Signal Fixtures: Operating and signal fixtures shall be manufactured by one of the following or approved equal. All fixtures shall be of one manufacturer and shall be vandal resistant design:
1. Adams Elevator Equipment
 2. G.A.L Manufacturing Corp.
 3. P T L Equipment
 4. Elevator Products Corp.
 5. Elevator Specialties
 6. Approved Equal (Request for approval to be submitted prior to any delivery or installation of the equipment)

- G. Car and Hoistway Door Equipment: The car and hoistway door equipment shall be manufactured by one or more of the following or approved equal. Door operating system and associated hardware shall be of one manufacturer.
1. G.A.L. Manufacturing Corp.
 2. Adams Elevator Equipment Co.
 3. KONE
 4. Thyssen
 5. Otis
 6. Approved Equal (Request for approval to be submitted prior to any delivery or installation of the equipment)
- H. Door Reopening Device: Provide Janus Pana40 Plus full screen curtain and infra-red protective zone or approved equal.
- I. Vision Panels: Panels are required to be installed on all hoistway and elevator car doors. Panels shall meet all applicable codes including ANSI Z97.1 and 16CFR Part 1201. Each individual piece shall be stamped with the markings as required by ANSI Z97.1 and shall remain visible after installation. Panels shall be fire resistant and shall be manufactured by one of the following manufacturers:
1. Pyroswiss
 2. Pyroguard
 3. Approved Equal

2.02 MATERIALS

- A. Stainless steel shall be corrosion resisting steel complying with Federal Specification QQ-S-698, Class 316, S. S. Condition A finished as specified. During erection, all stainless steel surfaces shall be protected by suitable peel off material.
- B. Cold rolled steel shall be low-carbon steel rolled to stretcher leveled standard flatness, complying with Federal Specification QQ-S-698.
- C. Rigid Steel Conduit, conduit fittings, and flexible steel conduit shall comply with the current Federal Specifications for the respective components.
- D. Guide rail clips shall be of open - hearth steel or its equivalent in accordance with ASME A17.1 requirements.
- E. Material of wheels for roller guide assembly shall be of the neoprene type.

- F. Material (insulating) used on hoistway slide door interlocks shall be of thermoplastic polyester.
- G. Material of hall pushbutton station bases and slide activators shall be molded LEXAN 141-701 thermoplastic, or equal.
- H. Material of hoistway and car door threshold sill shall be of nickel silver, having an extruded, grooved, non-slip surface.
- I. Material for all tamper proof spanner head screws shall be of stainless steel, spanner head.
- J. Material of connectors or lugs for controller motor leads shall be of copper.
- K. All screws, bolts, fasteners shall be stainless steel

2.03 CONSTRUCTION FEATURES

A. General

1. All welding shall be in accordance with Section 213 of ASME 17.1
2. All electrical equipment, conduit, fittings and wiring shall conform to the requirements of the National Electric Code (NEC) and ANSI/NFPA No. 70 for outdoor locations.
3. Clearance around equipment located in each elevator machine room shall comply with the applicable provisions of the National Electrical Code.
4. The elevator shall, comply with NEII "Suggested Minimum Passenger Elevator Requirements for the Handicapped", ANSI A117.1 and ADA requirements, including clearances, handrails, locations for signal & control fixtures and communication.
5. Design and construction of the equipment and parts subject to wear shall be such that similar devices provided will completely interchangeable. Working parts shall be accessible for inspection, servicing and repair. Adequate means shall be provided for lubrication of all wearing parts that require lubrication.
6. All wiring shall be Underwriters approved, stranded Type THHW, in accordance with the requirements of the National Electrical Code; the minimum size permitted shall be No. 18. PVC insulated wiring is not permitted. The wires shall be installed in wire raceway with approved outlet boxes, except that a small amount of flexible conduit may be used where conduit is not subject to moisture or embedded in concrete, as approved by the COTR. Terminal and pull boxes and other similar items shall be of approved substantial construction, thoroughly reinforced, and in no case less than No. 12 USSG for larger boxes. All electrical boxes exceeding 150 cubic inches shall be supported independently of the conduits. All boxes shall be NEMA 4X, Vynkier, Inc. or approved equal. All conduits shall be rigid galvanized, all joints shall be threaded. All flexible conduits shall be liquid tight with approved fittings.

7. Any junction boxes installed in the machine room or hoistway shall be accessible for maintenance. Drilling or opening top end of enclosure is not acceptable.
8. Car and hall signal circuits shall not exceed 120 volts.
9. Nameplates: Each major component of equipment shall have the manufacturers' name, type, class or catalog number on a metal plate securely attached to the equipment in a conspicuous location. The nameplates shall not be visible to the public.

B. Hoistway Equipment

1. Car and Counterweight Guide Rails

- a. All existing guide rails shall be reused in place, except as indicated in 1.02 A.19 and 2.03 B.1.b, but shall be realigned to a 1/8 inch plumb for the full travel distance and all fasteners and splice plates securely tightened. Where indicated in Appendix C – Gearless Unit Listing, fasteners shall be replaced.
- b. Guide rails shall be clean and free of all signs of rust or abrasion and shall be filed to remove all rough edges or high spots prior to final inspection. All guide rail joints shall be filed to assure perfectly matching surfaces. Paint all guide rails with flat black rust inhibiting paint if necessary. Bottom section of guide rails shall be replaced.

2. Buffers

- a. Provide new buffers. Buffers shall be securely fastened to the pit channels. Paint pit channels which shall be aligned with striker plates on the car. Permanently fasten to each buffer a metal plate showing stroke and loading rating.
- b. Paint buffer supports and other pit channel steel as required to properly protect all exposed metal surfaces.

3. Pit Stop Switch, Pit Lighting Fixture & Switch

- a. Provide a new NEMA 4X emergency stop switch for the elevator in the pit at the point of access to the pit. The switch shall be of an approved type and design, with a metal guard to prevent accidental operation. Plastic or fiberglass material of box and faceplate shall not be permitted. When opened, the switch shall cause the electric power to be removed from the driving machine and brake. Location shall be in accordance to Code requirements. Safety switches shall interrupt the power supply and hold the car to permit safe access to the pit for servicing.
- b. Provide new GCFI receptacle, new pit lighting fixture(s) and switch for the elevator in the pit.

4. Limit Switches

- a. Provide terminal stopping devices arranged to automatically stop the car within the top clearance and bottom overtravel independently of the operation of the normal terminal stopping devices, but with the buffers operative. The final terminal devices, when operated, shall prevent further normal operation. Final limit switches shall be so located that they open at or about the time the buffer is engaged by the car. Final limit switches shall be through-bolted after the conclusion of the final acceptance tests.
- b. Provide normal stopping devices for the elevator at upper and lower terminals to automatically stop the car from any speed attained in normal operation within the top and bottom over travels, independent of the operating device, final terminal stopping devices and buffers.

5. Inspection and Maintenance Switches - Top of Car:

- a. Provide toggle switches to operate the elevator from the top of the car during adjustment, inspection, maintenance and repair. The operating means shall be of the continuous pressure type, and the speed of the car shall not exceed 50 ft./min. It shall operate the car only when the car doors and all hoistway doors are closed.

6. Roller guides

- a. New roller guides shall be provided for both the car and the counterweight.

C. Drive System

1. SCR Drive

- a. Provide a solid state SCR drive for each machine. The drive controls system shall use an optimized speed profile in a dual nested closed loop feedback system based on car position and speed. The speed feedback device shall permit continuous comparison of motor speed with the calculated speed profile to provide accurate control of acceleration and deceleration to final stop regardless of direction of travel or load in the car. The drive subsystems controls shall be stored in non-volatile memory.
- b. The total harmonic distortion permitted at the elevator disconnect is 3%.

D. Controllers

1. Controllers

a.. Non-Proprietary Microprocessor Group Control

1. Due to the physical layout of the two machine rooms, no stand-alone group controller cabinet is permitted. Provide a serial link distributed group supervisory system between the two machine rooms.
2. Momentary pressure of hall button shall bring a car to corresponding landing. After car stops in response to hall call, a time relay shall render car inoperative from hall button, for a predetermined interval. Pressure on hall button at the landing where the car is standing shall cause the door to open.
3. The system is to be capable of balancing service and provide continuing operation when any elevator(s) is removed from group operation. Microprocessor control shall have the capability to operate and meet the ever-changing traffic patterns based on building demand.
4. The following features are to be incorporated into the control system:
 - a. Multiple Floor Dispatching.
 - b. Heavy Up Incoming Traffic
 - c. Heavy Down Traffic
 - d. Two Way Traffic Conditions
 - e. Delayed Car Feature
 - f. Adjustable Door Dwell Time
 - g. Fire Service Phase I & II
 - h. Anti-Nuisance Operation
 - i. Load Weighing Bypass
 - j. Inter-Group Emergency Power Operation
 - k. Nudging
 - l. Voice Annunciation
 - m. Card Reader Provisions
5. Car and hoistway doors shall open automatically when car stops in response to a car or hall call.
6. Doors shall close after a predetermined interval after opening unless closing is interrupted by car door reversal device or door open button in car.
7. Fire Service Control shall override any Special Service Operation.
8. The elevator control equipment shall contain diagnostic capabilities as required for the ease of complete maintenance.

9. The diagnostic system shall be an integral part of the controller and provide user-friendly interaction between the service person and the controls. Controller shall be mounted NEMA 4X stainless steel cabinet. The door of the cabinet shall have a sealed window placed over the fault indicator board within
10. The supervisory logic shall be performed by a main controller or coordinated between the elevator controllers which will interface exclusively and directly into an Allen Bradley DH485 protocol remote monitoring network, transmitting data from the elevator controller through a data concentrator to the Authority's AEMS RTU computer control and data system. The supervisory logic will coordinate dispatching assignments, interfacing operational demand data accumulated from car and corridor operating fixtures, selector and door control functions.
 - a. Allocate service to demand, and respond in real time to prevailing traffic conditions as well as historical traffic patterns.
 - b. Constantly compare passenger demand, car load, anticipated demand, car motion status, machine status and other prevailing conditions and evaluate this information in the context of the following dispatching approaches:
 - (1) If applicable, give priority to contiguous calls, assigning calls on adjacent floor to the same car if other criteria is satisfied.
 - (2) Give priority to coincident calls, having the same car let a riding passenger off and a waiting passenger on at the same floor.
 - (3) Anticipate demand based on hall calls and car calls already registered and floors with a high possibility of demand.
 - (4) Evaluate relative system response time for each car in the group if applicable, weighing all the above factors.
 - (5) Allocate calls and position cars to minimize waiting times, response time and travel time.
 - (6) Controller shall be capable of operating with an operating temperature range of 32F to 105F with non-drip environment and no more than 90 percent relative humidity.
 - c. An Allen Bradley CompactLogix 1769-L32E based PLC control system shall be provided.
 - (1) The exclusive Allen Bradley DH485 protocol data port

will transmit data from the elevator controller to the station or facility data concentrator. The contractor shall provide a controller data interface to a DH 485 network located in the elevator machine room. Data cables in an existing controller or in the elevator machine room shall be retained and connected into the new controller and available for connection to the controller DH485 interface. If DH485 cabling is not available, the contractor shall run Belden 9842 cable or approved equal, to connect the controller into the monitoring DH485 network as directed by WMATA. The DH 485 controller interface shall be programmable for data rates up to 115 Kbps. The interface shall allow other nodes such as other elevator and escalator to be readily incorporated into the DH 485 network.

- (2) If not already installed in the station or facility, a data concentrator PLC shall be installed using an Allen Bradley MicroLogix 1400 or SLC5/05 PLC per station to function as data concentrator to consolidate data from all controllers in the station. The software for the data concentrator shall receive controller data over the local monitoring DH 485 network and provide formatted data to the AEMS RTU through an RS232 link. The data concentrator shall provide an Ethernet port for interfacing with the WMATA wide area network. A data concentrator connection to the WMATA wide area network shall be provided.

11. Where a non-DH485 network compatible controller is approved for installation, the discrete output signals in the Signal List shall be provided through relay contacts or analog current loop, as applicable, to a separate terminal strip. The signals shall be active when the listed status is present as it is in the elevator control computer. The signals shall be 24 vdc from an independent power supply provided in the elevator controller cabinet or external enclosure by the manufacturer or the installer. Analog signals shall be connected in a 20ma current loop configuration to analog inputs on the added PLC. An area of 18 inches by 10 inches shall be available inside the controller or in an external enclosure - on the side is acceptable - that allows a unit 10 inches deep to be mounted. An Allen Bradley type MicroLogix 1100 PLC with 24-volt input modules for 32 inputs shall be supplied by the manufacturer or the installer. The CPU module must provide DH-485 and Ethernet communications ports. In addition, the contractor shall install an Allen Bradley network interface module, (model 1761-NET-AIC, or equal) for interfacing into the local remote monitoring DH485 network beside the PLC in the controller and provide 24 vdc power to the module. The output signals from the MCE or equivalent shall be wired from the terminal strip to the PLC inputs indicated in the Signal List table. PLC power and signal returns shall be wired into the PLC. The PLC power shall come from 120VAC provided by the car lighting supply in the elevator controller.

- a. The added Allen Bradley PLC will be used for remote monitoring capabilities into the Authority's established engineering monitoring network. ELES Engineering will be responsible for programming the added PLC and wiring the DH-485 network per the block diagram shown in Appendix E.
- b. The PLC shall accommodate the following Signal List, as applicable, and provide data to the data concentrator as specified in specification WMATA-DATA-1.09. (see Appendix F).

Table 1. Monitored Faults and Statuses

Signal	Comment
Signal Power Supply Down	Common Power Source for inputs is not present
Safety Circuit Tripped	
Top Final Limit Tripped	
Bottom Final Limit Tripped	
Drive Faulted	
Overload Tripped	
STOP Button Activated	In-car, top-of-car, pit, controller, etc. STOP pressed
Door Protection Activated	
Out of Service by Delay	Failure to run when demand timed out
Motor Limit Timer Tripped	Motor runs longer than for full Inspection run plus 50%
Hoist Machine Brake Picked	
Rope Brake Set	
Inspection Operation On	
Independent Service On	
Controller TEST Switch On	Test mode on where there is no door operation but runs normally on Independent service
Fire Service Phase I On	
Fire Service Phase II On	
Smoke Sensor @ Main On	
Smoke Sensor at Others On	
Override On	Kiosk Override or Parking Operation on
Car is running up	
Car is Running down	
Car is in door zone	
Interlocks are made	
Front door gate switch made	
Front door fully closed	
Front door fully open	
Front door reversal device activated	
Front door protection activated	
Rear door gate switch made	
Rear door fully closed	
Rear door fully open	
Rear door reversal device activated	
Rear door protection activated	
In-car alarm pressed or phone activated	Either the ALARM button or the phone being activated should generate this alarm signal.
Water intrusion alarm active	Unsatisfactory water and/or oil level in the pit or other areas
Car position 1	
Car position 2	
Car position 3	
Car position 4	
Car Position 5	

Car Position 6	
Car Position 7	
Car Position 8	
Hoist Motor Current	Provide 3-phase motor current data
Kilowatt Hours Used	Reset value at 12:01AM each day. (This is calculated by the data concentrator.)
Number of runs up	Reset value at 12:01AM each day.
Number of runs down	Reset value at 12:01AM each day.
Number of Door Cycles– open/close	Reset value at 12:01AM each day.

12. The PLC CPU module shall store the last 99 faults, accessible independent of a laptop connection. All event and fault history data shall be downloadable to a flash or USB drive in a PDF or Excel format from controller fault/status display, or remote communications. The contractor shall provide WMATA with a programming and monitoring unit, such as a laptop computer with the newest version of Allen Bradley RS-Logix and any other software required to setup and program all electronic items in the control system, for each station that this system is installed, for the purpose of troubleshooting and remote monitoring modifications. The laptop should allow for uploading, editing and downloading any software that is being used on the elevators for any operation.
13. Elevator manufacturers may not supply their standard proprietary elevator controller for this project.
14. An Allen Bradley PanelView Plus 6, fault/status display/interface (model number 2711P-K6M20A8 or EZ-Automation HMI display with model number EZC-T6C-E) shall be provided in the controller cabinet. Control system timers and other setup criteria shall be programmable through this unit. All fault, status and setup data shall be stored in the controller CPU module.
15. Where the programming is done by the supplier, the supplier shall provide a copy of all working programs, including labels for all inputs and outputs, data tables and internal logic points, on CD-R disks as well as a printed program listing. The programs and setup data shall require a password for access and modification.
16. The main control of an elevator shall contain at least the following devices or electronic sensing: phase failure, line voltage monitor, and ground fault monitor.
17. Elevator fault reset shall be done by a separate switch installed in the controller.
18. All terminals shall have identification markings and all wires, including field wires, shall be provided with permanent heat shrink sleeve wire markers. These unique wiring identifications shall be provided in the wiring diagram at each end of the circuit connections. The marking on the wire shall be identical to the marking on the wiring diagram and the

terminal block.

19. The controller shall be equipped with the AC vector drive installed in-line before the hoist motor contactor and the hoist motor.
20. The AC vector drive shall be capable of accelerating and decelerating the hoist motor smoothly and gradually.
21. Adjustable settings for acceleration and deceleration ramps shall be provided.
22. The controller shall have at least one dedicated serial port for interface to the DH485 monitoring network and programming access, and at least one free Ethernet/IP port.
23. If needed, the Programmable Controller shall have at least one dedicated port to support the controller fault/status display.
24. The controller PLC shall provide the following Remote Monitoring and diagnostic network support:
 - a) All applicable faults, statuses and data listed in Table 1 shall be provided.
 - b) Fault indications shall remain until reset in the controller.
 - c) Status and analog data shall be provided for the duration of the condition.
 - d) Software in the controller PLC shall format monitoring data responses to data concentrator polling as specified in the WMATA-DATA-1.09 specification.
 - e) The monitoring data port in the controller shall be setup for DH485 protocol with the port network identification number programmed for the particular elevator identification. For instance, identification number 11 applies to elevator 1, 12 to elevator 2, etc.
 - f) All faults, statuses and data shall be held by the controller CPU and sent from the CPU to the data concentrator when polled by the data concentrator
25. Provide sufficient non-volatile CPU memory, for non-volatile retention of program memory, system status and operating parameters.

26. Diagnostics

- a) The processor shall have built-in diagnostics and self-test, such that each time power is cycled, the processor does a complete CPU and RAM memory test. Additionally the power-up test will momentarily light up all diagnostic LEDs to be sure they are working. A power up test will not be performed if the internal flag (bit) for Firemans Service Phase I is latched. The processor shall be capable of reporting major and minor fault codes and processor status information back to the data concentrator, provided the fault is not a catastrophic hardware failure where the processor is unable to power up.
- b) The processor shall have a built-in watchdog timer to ensure that all processor program scans occur within the time limit set by the watchdog timer or it goes into a "Fault" state.
- c) The processor shall have individual LED indicators that are clearly visible and labeled for easy identification. At a minimum the following indicators must be provided:
 - (1) CPU is in RUN mode
 - (2) CPU is FAULTED
 - (3) CPU battery is LOW
 - (4) I/O points are FORCED and are not under program control COMMUNICATION channels are active.

27. Input/Output Modules

- a) The Input/Output modules shall be compatible with the PLC processor I/O structure. Each module shall be provided with a detachable terminal strip to connect wiring to the module.
- b) Discrete Input Modules: Suitable for the input voltage and compatible with the Allen Bradley system.
- c) Discrete Output Modules: Suitable for the voltage and load and compatible with the Allen Bradley system.
- d) Analog Input Modules: Converts analog signals to proportional twelve-bit binary values. The module shall

accept four 20 Ma signals. Provide modules compatible with the Allen-Bradley system.

28. I/O Chassis and Power Supply

- a) The I/O and other function modules shall be mounted to allow the addition of, at least, three additional modules.
- b) Power supplies shall provide power to the PLC processors, I/O and other function modules. The power supply shall be suitable for operation of 120 VAC, single phase power. Power supply capacity shall be a minimum of 150% of the connected load.

29. Air Conditioning - Provide an independent air conditioning unit for each new controller to maintain manufacturers' recommended operating temperatures. Condensate from the air conditioning unit must be piped to a suitable drain.

30. Provide a duplex receptacle inside the controller for the purpose of connecting diagnostic devices such as a laptop.

E. Independent Service: Provide controls to remove elevator from normal operation and provide control of the elevator from car buttons only. Car shall travel at contract speed and shall not respond to corridor calls.

F. Attendant Operation: Service Elevator is to be designed to operate with attendant operation feature.

G. Car Top Operation: Provide new inspection and maintenance control station mounted on each car top. The station is to include up and down buttons, inspection operation button, stop switch, GFI duplex outlet, work light and guard along with audible and visual signal to comply with fire service control.

H. Emergency Recall Operation (Fire Service): Provide operation and equipment per Code requirements. Provide a three-position key switch, marked "BYPASS-OFF-ON", at the main fire egress lobby. Any additional switches for control panels of alternate recall floors are to be two-position, marked "OFF-ON". All elevators are to be provided with Phase II operation. Elevator Contractor shall provide relays, wiring, and terminal strips to receive signals from ionization detectors.

I. Emergency Car Lighting and Alarm System: Unit shall provide emergency light in car upon failure or interruption of normal car lighting. Emergency lighting unit shall provide a minimum illumination of 0.2 foot-candle at 4 feet above car floor approximately one (1) foot in front of car operating panel for not less than 4 hours. Battery shall be 6-volt minimum, sealed rechargeable lead acid or equal. Battery

charger shall be capable of restoring battery to full charge within sixteen (16) hours after resumption of normal power. Provide an external means for testing battery, lamps, and alarm bell.

J. Standby Power Panel and Operation:

1. Include all relays, auxiliary contacts and selector switches for emergency operation control in machine room.
2. Power wiring from emergency source is to be provided by Electrical Contractor.
3. All relays shall automatically reset as emergency supply becomes available for each car.
4. Submit wiring diagrams for coordination.
5. Emergency operation shall be arranged such that the elevator system shall sense a loss of normal power at each automatic transfer switch on an individual basis. Upon power loss at one transfer switch (partial power failure), no more than two (2) elevators served by that transfer switch shall be capable of operating at one time. Upon loss of power at more than one elevator transfer switch, the elevators shall be interlocked such that no more than one elevator may operate simultaneously from the emergency power system. Sensing contacts at each transfer switch and related wiring to each elevator machine room shall be by the Contractor.
6. Provide and install standby power panel.
7. Contractor will provide all wiring for automatic transfer of main power circuit to emergency service.
9. Provide to test elevators under full load and no-load conditions while on emergency power. Tests are to be performed after revenue hours.
10. Provide manual override switch that will override the automatic selection of the elevators and permit the operator to select any elevator to operate.

K. Door Hold Operation: Provide controls and a button within operating panel, which shall hold the doors open for an adjustable period of 30 to 90 seconds.

1. The following shall resume normal door operation:
 - a. Activation of door close button.
 - b. Activation of any floor button within the elevator.
 - c. Expiration of time period

2.04 OPERATION PERFORMANCE

- A. The control system shall provide smooth acceleration and deceleration with 3/16 inch leveling accuracy at all landings, from no load to full rated load in the elevator, under normal or unloading conditions. The self-leveling shall, within its zone, be entirely automatic and independent of the operating device and shall correct for over travel and under travel. The car shall remain at the landing irrespective of load. Clearance between the car sill and the hoistway landing shall not exceed 1-1/4 inches.
- B. The door open time for elevators is to be 2.5 fps. The door close time shall be based on the Code requirements with a door delay feature. The door delay is the minimum acceptable time from notification that a car is answering a call (lantern and audible signal) until the doors of the car start to close. Time shall be calculated by the following equation:
- $$T = D / (1.5 \text{ ft/s}) (457 \text{ mm/s})$$
- T = Total time in seconds.
D = Distance from a point in the lobby 60 inches (1524mm) directly in front of the hall station to the centerline of the door opening.
- C. Car Call: The minimum acceptable time for doors to remain fully open shall not be less than 5 seconds.
- D. The speed of the elevator shall not vary +/- 5% under loading conditions
- E. Elevators are to be statically and dynamically balanced. With empty car, maximum pressure on any roller guide shall not exceed ten (10) pounds, with the elevator located at any point in the hoistway.
- F. Prior to final acceptance and prior to the termination of the maintenance period, the elevators shall be adjusted as required to meet these performance requirements.
- G. Hoistway Doors and Entrances
1. Replace or refurbish entrances and doors as indicated. Refurbishment to include thorough cleaning followed by re-oxidation (bronze) or polishing (stainless). Remove frame and perform re-alignment and straightening of the entrance frame metal if required. If replacement is indicated, doors and entrances shall be of the same construction. Door panels shall be at least 1-1/4 inches thick and shall be bronze clad or stainless steel on the outside landing side to meet the existing condition. Metal for doors and entrances shall not be less than 18 gauge metal. Doors shall have fire resistance rating to conform to fire code requirements. Meeting edges of center opening doors shall be equipped with rubber bumper strips extending the full height of the panels. Other requirements, as stated below.
 2. Hanger Cover Plates: Provide new removable, full-length galvanized steel. Covers shall be made in sections for convenient access to hangers.

3. Fascia: Finish shall be galvanized steel, extending from top of header to sill of door above.
4. Toe Guard: Provide new toe guard. Finish shall be stainless steel.
5. Dust Cover: Provide new dust cover. Finish shall be galvanized steel.
6. Door Bumpers: Provide at top and bottom.
7. Doors: Fill with fireproof, sound deadening material. Provide reinforcement by formed vertical sections running full height of door. Doors shall be provided with four removable gibs.
8. Vision Panels: Provide for each landing & car door panel. The door panel with vision panel installed shall meet the UL rating for elevator hoistway doors. The glass vision panel shall be of uniform size of five (5) inches wide and sixteen (16) inches tall. The center of each glass vision panel shall be installed at 54 inches above the finished floor. All hardware in the door system shall be located as to provide a clear, unobstructed view into the elevator car or hoistway.
9. Sight guards: Provide for each landing door panel. Landing designations shall be permanently applied to each sight guard.
10. Hanger: Provide two-point suspension sheave type with provisions for vertical and lateral adjustments. Sheaves shall be minimum 3-1/4 inch in diameter with sealed ball or roller bearings.
11. Tracks: Shaped and finished to permit free movement of sheaves. Bottom of track shall be in contact with upthrust roller.
12. Closer: Spirator Type
13. Door Restrictor Device per ASME A17.1
14. Door Protection:
 - a. Provide Janus Pana40 Plus full screen curtain and infra-red protective zone or approved equal
 - b. Nudging: When doors are prevented from closing for 20 seconds due to failure of the proximity device or obstruction, the doors shall close at reduced speed and a buzzer shall sound.

H. Elevator Car Equipment

1. Provide:
 - a. Car Frame: Replace with new hot-dipped galvanized frame.

- b. Platform: provide new 1/4" stainless steel platform.
- c. Provide new spring tensioned roller guides with 4-inch minimum diameter rollers.
- d. Sill and Sill Angle/Support: Provide new heavy duty nickel silver sills and new sill angles and support.
- e. Toe Guard: provide new stainless steel.
- f. Hangers and tracks: Replace with new hardware. Hardware shall be of heavy duty design.
- g. Floor covering: Provide an approved non slip, #1 finish. All corners and joints shall be welded to form a water tight container, with the sides turned upward a minimum height, and shall run in the direction of a mounted slope, which shall be 1/8" per foot, away from the door with each side sloped to the center. Floor shall be a decorative epoxy-mortar broadcast floor system, color shall be red. Floor cover shall be resistant to urine absorption and deterioration.
- h. Car Enclosure: Car enclosure shall be manufactured by an approved company. Provide the following features:
 - 1) General: The enclosure shall be adequately reinforced and ventilated to meet all the Code requirements. Provide sound-deadening mastic to exterior.
 - 2) Shell: Sides and back shall be stainless steel.
 - 3) Canopy: Provide 8 foot – 0 inch clear height under canopy. Reinforced 14-gauge. Underside painted baked enamel reflective white. Arrange for hinged top emergency exit including lock as required by Code.
 - 4) Ceiling and lighting:
 - a) Provide clear access to the emergency exit per Code requirements.
 - b) Cove type, 16 gauge metal troughs
 - c) LED tube light meeting the lighting requirements of A17.1 shall replace any ceiling light fixture
 - d) Ceiling finish, factory baked enamel finish, matte white
 - 5) Front return panels and entrance columns: 14 gauge, Finish shall be stainless steel. Provide lockable cabinets for special operating features and telephone required by these specifications.

- 6) Transom: Provide new, finish shall match new cab finish.
- 7) Car door panels: Same construction as hoistway door panel. Finish shall be stainless steel.
- 8) Interior panels: Front and rear panels shall be stainless steel 14 gauge, rigidized type. Glass panels if present, shall be laminated glass framed in stainless steel. Provide mounting method which prevents rattling or vibration.
- 9) Handrail: 6" x 3/8" flat stainless steel handrail, bevel sharp edges. Provide on both sidewalls and rear.
- 10) Base: Provide a 4-inch high base.
- 11) Ventilation: Two-speed exhaust fan, manufacturers, pre-engineered standard, with battery back-up as per ASME A17.1. Fan shall provide minimum 350 cfm and be connected to operate continuously.
- 12) Car Door Contacts: Electrical contacts shall prevent the operation of the elevator by normal operating devices unless car doors are closed or within tolerances allowed by Code.
- 13) All shrouding shall match existing hoistway frame.
- 14) Door Operator
 - a. Provide a GAL MOVFR-W or approved equal door operator with encoderless VVVF drive and the following features:
 - 1) ½ hp motor and heavy duty sprocket, chain, belt, and sheaves.
 - 2) Closed loop regulated speed performance.
 - 3) Hand-held keypad programming.
 - 4) Adjustments can be stored in the keypad and downloaded to another operator.
 - 5) Adjustable door obstruction reversal.
 - 6) Optical cams with LED indicators.
 - 7) Test switches for open, close, nudging and speed zone set up.
 - 8) Universal inputs for open, close, and nudging.
 - 9) Reversing switch to back up the door reversal device.
 - 10) Weather proof enclosure
- 15) Elevator Car Emergency Communication Device
 - a. A vandal-resistant speaker type communications device shall be furnished in the elevator car and installed in the car station behind a perforated grille. and connect to a location provided

by WMATA. The push button, located in the car station shall be identified as "Emergency Push to Call".

b. Communication in the car shall also rollover to a 24-hour manned site (Rail Operations Control Center) or alternative location provided by WMATA in the event that the kiosk does not respond to the call. All wiring required in order to provide a fully operational system is the responsibility of the Contractor.

1. Retain and re-use the Ramex system boards in the car operating panels.

c. Provide a red 3/8" diameter light jewel and "FLASHING LIGHT INDICATES ALARM RECEIVED, HELP IS ON THE WAY" engraved in 1/8 inch high lettering into the car operating panel faceplate and black filled with epoxy. Activation of the emergency button shall cause the jewel to blink on and off. Provide a long life incandescent lamp behind the jewel which shall illuminate red.

d. Exposed hardware shall be stainless steel. The finish on unexposed parts, unless otherwise specified, shall be baked enamel.

e. Contractor shall ensure that system is compatible with, and made operational with existing communication system. All wiring required in order to provide a fully operational system is the responsibility of the Contractor.

f. The two-way communication means within the car shall include a means to verify operability of the telephone line. Verification of the telephone line operation shall be automatically performed on at least a daily basis.

16) CCTV Camera: Conduit and wiring (as required) shall be provided to permit installation of surveillance CCTV equipment

I. Signal Fixtures

a. General

1) Faceplate for all elevator operating and signal devices shall be fabricated from stainless steel with 1/8 inch thick faceplate (except hall station fixtures). Faceplate shall be sufficiently oversized to completely cover cutouts. All faceplates shall be installed flush with surface upon which they are mounted. Abandoned fixtures

shall be removed in their entirety and blank faceplate provided (where indicated) in a material to match the hall button fixture faceplate.

- 2) Fixtures shall be designed to fit within existing cutout and provided with new watertight back boxes unless otherwise noted. Where required, enlarge existing cutouts or provide additional cutouts to accommodate the fixtures. Perform all cutting, patching and refinishing of walls.
- 3) Fasten all car and corridor operating device and signal device faceplate with non-corrosive metal spanner head or bristol head tamper proof screws matching the finish of the faceplate to which they are applied.
- 4) Car and corridor pushbutton faceplate shall be designed so that pressure on pushbuttons shall be independent of pressure on pushbutton contacts.
- 5) Engraved legends or numerals in faceplate shall have, lettering ¼-inch high filled with white (or other highly visible color) epoxy unless otherwise specified. Firefighter's engraving shall be red filled. Engravings for devices not used for normal operation of the elevator shall be white (or other highly visible color) filled and a minimum of 1/8-inch high.
- 6) All hall and car call buttons shall be of the call register type, having a power supply not to exceed 120 volts. Pressure on a button shall illuminate the button to indicate that a call in the desired direction has been registered. Replacement bulbs shall be an LED type that is readily available from three (3) separate manufacturers. All car and corridor operating buttons shall be vandal resistant. Fixture faceplate shall be counterbored to accept the pushbutton. The pushbutton and faceplate shall be so designed to minimize the vandalizing of the button by prying action between the pushbutton and the faceplate. The button shall project a maximum of 3/16 inch beyond the faceplate and the bottom travel shall be limited by seating in the counterbore and not on the contact base. The buttons shall be held in the faceplate by a retaining washer. Pushbuttons of the call register type shall be counterbored and filled with 5/16 inch white plexiglass. The pushbutton module shall be self-contained and capable of being removed from the faceplate without disturbing any other component.
- 7) All car and hall fixtures of the elevator shall be designed to accommodate the handicapped, in accordance with NEII and ADA. All button operators shall be metal encased. Provide markings adjacent to car control buttons as required by ADA. The markings shall be integral with the faceplate and shall be both numerical and braille. Applied plates are not permitted.

- 8) The centerline of the elevator corridor call pushbuttons shall be provided in accordance with ADA requirements. Car operating call pushbuttons shall be a maximum of 4 feet 0 inches above the finished car flooring

b. Car Operating Station

1. Main car operating panels shall be designed so that the devices used for normal operation shall be located in the lower portion of the panel and the devices used by service and maintenance personnel shall be located in the upper portion of the panel behind a locked door provided with a continuous concealed stainless steel hinge. The faceplate shall be one piece mounted to the back box with a continuous concealed stainless steel hinge and secured with a two position cylinder lock.

a. The lower portion shall contain:

- (1) A complete set of 3/4 inch diameter illuminated pushbuttons with 5/8-inch indelible designations to the left of buttons corresponding to the floors served. Lights shall extinguish when the car stops at a given floor. Designations shall be white or other highly visible color.
- (2) Emergency signal alarm bell button with illuminating jewel and emergency stop keyswitch (red in color).
- (3) Door "OPEN" and door "CLOSE" buttons located below the car buttons. The door "OPEN" button shall be located adjacent to the car door entrance column.
- (4) Emergency light with lens.
- (5) Firemen's Emergency Service Phase II keyswitch, call cancel button and fire emblem light jewel (visual signal).
- (6) Emergency stop keyswitch and the emergency alarm bell button shall be located below the car operating buttons at a nominal distance from the finished floor of 35 inches. Emergency signal alarm bell button shall illuminate a jewel when activated and shall be connected to a 6-inch vibrating alarm bell located in the hoistway at the main landing and on top of each car. Provide alarm bell including the necessary wiring and auxiliary devices.
- (7) Audible signal activation button.

- (8) A flashing acknowledgment light which shall be engraved "FLASHING LIGHT INDICATES ALARM RECEIVED - HELP IS ON THE WAY" which shall flash whenever communication is established with the cars.
 - (9) Provide voice annunciation for the elevator, to be heard both inside and outside the car. The annunciator shall be digital and shall be programmable for any special messaging.
 - (10) Engraved lettering, one-inch high indicating Elevator Station & Number and "NO SMOKING"; one-quarter inch high indicating "CAPACITY XXXX LBS"
- b. The upper section (service cabinet portion) shall contain the following devices, all of which shall be keyed:
- (1) Switch for controlling car work lights.
 - (2) Switch for controlling interior car lighting.
 - (3) Switch for controlling 2 speed car ventilating blower.
 - (4) Two-position, key-operated inspection switch that will disconnect normal operation, and will allow the top-of-car operating device to function.
 - (5) Independent Service keyed switch.
 - (6) Keyed switch (with pilot light) to remove power from the motor drive.
 - (7) Any other signal lights, switches, or devices required for adjustments and maintenance of the elevator.
 - (8) Combination service cabinet door and certificate frame with LEXAN Lens.
2. Auxiliary car operating panels and car position indicators, shall be of the same style and finish as the main car operating panel, and provided on all elevators with front and rear opening doors.

c. Hall Stations

- 1) The existing hall button fixtures and wiring at each floor shall be removed and replaced as indicated. Provide new hall stations as indicated with new liquid tight branch wiring to the shaft riser. Provide faceplate for both elevator and hall

stations, finishes to match existing and size as required to conceal existing cutouts. Mount faceplate to the backplate with tamper proof screws. Call buttons shall be a visible contrasting color to the fixture faceplate. Nomenclature shall be white.

- 2) Fixtures for terminal landings shall contain a single "UP" or "DOWN" button. Each button shall contain an integral registration light which shall illuminate upon registration of a call and shall extinguish when the call is answered. If a landing button is operated while the car and hoistway doors are closing at that floor, the doors shall stop and re-open and shall remain open for a normal passenger transfer time.
- d. Car Position Indicator: The digital car position indicator shall be provided integral to the car operating panel.
- e. Top-of-Car Operating Device
- 1) Provide a top of car operating device which shall be activated by a key switch mounted in the upper portion of the car operating panel. The keyswitch shall be keyed the same as the access key switches in the corridor and have the "ON" and "OFF" positions permanently marked on the faceplate with 1/4-inch letters.
 - 2) Movement of the elevator shall be accomplished by continuous pressure on a direction button and a safety button simultaneously.
 - 3) Provide a two position toggle switch marked "INSP" and "RUN".
 - 4) Provide an emergency stop toggle type switch as per Code.
 - 5) Provide permanent identifications for the operation of all components in the device.
 - 6) Each device shall be permanently attached to the elevator crosshead on the side of the elevator which is nearest to the hoistway doors.
 - 7) Provide a fire emblem jewel which shall illuminate when Firemen's Emergency Service, Phase I is initiated.
 - 8) Provide a GFCI receptacle in the top of car operating device.
- f. Alarm Bell System: Provide an alarm bell system located on top of the car and in the hoistway at the main landing which shall be audible outside the hoistway when activated by the ALARM call button on the car control station.

g. Car Directional Indicator: Provide new car directional indicator in the cab door jamb which shall be visible from the floor area adjacent to the hall call buttons.

h. Accessibility Provisions

- 1) Comply with the requirements of the Americans with Disabilities Act (ADA) and ANSI A117.1.
- 2) Car operating panel shall be mounted so that the dimension from the finished floor to the centerline of the highest button used for automatic operation does not exceed 48 inches and the dimension from the finished floor to the centerline of the emergency controls is not less than 35 inches.
- 3) Provide floor designations with both alpha/numerical and Grade 2 Braille markings on both side jambs of the hoistway entrances visible from within the car and the elevator lobby at a height of 60 inches above the finished floor. Designations shall be 2 inches high and shall be as approved by the Contracting Officer's Representative. Plates shall be secured to the entrance jambs by use of vandal resistant fasteners. Adhesive mountings are not permitted.
- 4) Provide minimum 5/8 inch high markings with alpha/numeric and Grade 2 Braille designation adjacent to car control buttons. The marking shall be integral with the faceplate. Applied marking plates are not permitted.
- 5) The elevator shall have the capability to level and relevel to 3/16 inch leveling accuracy.
- 6) Corridor hall buttons centerline shall be centered at 42" above the finished floor.
- 7) Emergency communication shall be properly identified by a red jewel around the button and located so that the highest operational part shall not be more than 48 inches above the finished floor. In addition, a light jewel with the appropriate engraving shall be located on the car operating panel, which will illuminate to indicate that help is on the way once the emergency call has been acknowledged.

2.05 ELECTRICAL REQUIREMENTS

- A. Provide wiring and conduit from the mainline disconnect switch throughout the elevator control system with complete wiring and conduit systems in the hoistway, machine room and pits, including traveling cables adequate for the proper operation of the equipment.

1. Conduit and Wiring

- a. Unless otherwise specified, all electrical conductors in the pits and hoistways, except traveling cable connections to the car shall be provided in rigid zinc-coated steel conduit with steel outlet boxes, except that a small amount of flexible conduit may be used where conduit is not subject to moisture or embedded in concrete. Terminal boxes, pull boxes and other similar items, shall be of approved construction, thoroughly reinforced, and in no case less than number 12 USSG. All electrical boxes exceeding 150 cubic inches shall be supported independently of the conduits. The rigid conduit shall conform to the Federal specifications hereinbefore specified. All raceway shall be threaded rigid steel conduit. Flexible heavy-duty service cord, type SO, may be used between fixed car wiring and switches on car doors for safety edges and light ray devices.
- b. All conduits terminating in steel cabinets, junction boxes, wireways, switch boxes, outlet boxes and similar locations shall have approved insulation bushings. If the bushings are constructed completely of insulation material, a steel locknut shall be installed under the bushing. At ends of conduits not terminating in steel cabinets or boxes, the conductors shall be protected by terminal fittings having an insulated opening for the conductors.
- c. Conduit and EMT fittings and connections using set screws or indentations as a means of attachment are not permitted.
- d. Connect motors and other components subject to movement or vibration, to the conduit or EMT systems with flexible conduit.
- e. All existing machine room conduit and wiring shall be replaced with new materials to suit the new equipment. Conductors in the machine rooms shall be installed in rigid zinc coated steel conduit, electrical metallic tubing or metal wireways.
- f. All existing hoistway wiring and conduit, including center hoistway junction boxes, shall be replaced with new.
- g. The Contractor shall furnish all materials and completely wire all parts of the electrical equipment of the elevators including electrical devices on hatch doors. All car wiring and conduit shall be replaced with new including car junction boxes.
- h. All solid state and electrical components located on top of the car enclosure or in the hoistway shall be installed within NEMA 4X enclosures.
- i. Conduits shall be brought and connected to suitable approved connection boxes at all outlets, apparatus and panels.

- j. The conduits shall be of such size that the wires or cables can be readily installed and replaced, if necessary. No conduit or raceway shall be less than 3/4 inch trade size, except that for small devices such as door switches, interlocks, etc., 1/2 inch conduit may be used. The total overall cross sectional area of the wires contained in any conduit shall not exceed 40 percent of the internal area of the conduit. Approved strain boxes shall be installed for all vertical runs in accordance with Code.
- k. Conduits shall be neatly and systematically run. All exposed conduit and boxes shall be supported by approved and substantial straps, hangers or clamps to the structural steel, reinforced concrete, or other approved supports. Riser conduits in hoistway shall be supported at each floor level.
- l. In all machine rooms, hoistway, etc., the equipment shall be laid out and installed so as to allow as adequate and convenient access for maintenance as space conditions will permit.
- m. All interlock, hall button and limit switch branch wiring shall be enclosed in flexible steel conduit with covering of liquid tight Type "EF" with connectors having nylon insulated throat.
- n. All screws used for terminal connections of all wiring (machine room, hoistway and pit) shall be provided with "star washers" of proper size and type.
- o. All existing conduit and wiring shall be removed and wall/floor slabs patched with fire rated material.
- p. There shall be no drilling or accessing top side of any controller or junction box for any purpose. Wires shall be run through the side or bottom of the enclosure.
- q. Any junction box with a terminal point shall have proper markings on all the wires and terminal blocks. These markings shall be identified in the wiring diagram. No field splice of wires shall be allowed.

2. Conductors

- a. Unless otherwise specified, conductors, exclusive of traveling cables, shall be stranded or solid coated annealed copper in accordance with Code for Type THHW. Where 16 and 18 AWG are permitted by Code, either single conductor cable in accordance with Code for Type TF, or multiple conductor cable may be used provided the insulation of single conductor cable and outer jacket of multiple conductor cable is flame retardant and moisture resistant. PVC insulation will not be permitted. Multiple conductor cable shall have color coding or other suitable identification for each conductor. Conductors for control boards, shall be in accordance with Code. No joints or splices shall be permitted in wiring except at outlets. Tap connectors may not be used.

- b. All wiring shall test free from short circuits or grounds. Insulation resistance between individual external conductors and between conductors and ground shall be not less than one megohm.
- c. Where size of conductors is not given, capacity shall be such that maximum current shall not exceed limits prescribed by Code.
- d. Equipment grounding shall be furnished and installed. Ground conduits, supports, controller enclosures, motors, platform and car frames, and all other non-current conducting metal enclosures for electrical equipment in accordance with Code. The ground wires shall be copper, green, insulated and sized as required by the code.
- e. Terminal connections for all conductors used for external wiring between various items of elevator equipment shall be solderless pressure wire connectors in accordance with Code. The Contractor may at his option make these terminal connections on No. 10 or smaller conductors with approved terminal eyelets set on the conductor with a special setting tool, or with an approved pressure type terminal block. Terminal blocks using pierce-through serrated washers are not acceptable.
- f. Provide all necessary conduit and wiring between all remote machine room and hoistway.

3. Traveling Cables

- a. Traveling cables from junction box on car to junction box in hoistway shall consist of flexible traveling cables conforming with requirements of Code. Junction boxes in hoistway and on car shall be equipped with terminal blocks. All connections to terminal blocks shall be made with either terminal eyelet connections or pressure wire connectors of the clamp type that meet UL 486 requirements for stranded wire. Terminal blocks shall have permanent indelible identifying numbers for each connection. The outer covering must remain intact between junction boxes. Abrupt bending or twisting producing distortion of cable is not permitted. Cables shall be free from any possible contact with hoistway structure, car or other equipment. Furnish and install shields or pads to protect the cables. Travel cables shall include coaxial cable shielded for the communications system.
- b. Cables shall include ten percent spare wires but not less than 2 spare conductors in each traveling cable between each controller, selector, and hoistway junction box, all spares to be properly tagged or otherwise identified with clear and indelible markings. Provide 6 shielded pairs and 2 shielded, coaxial cables for CCTV.
- c. Provide sufficient wiring in the travel cables for car lighting and fan control circuits and car work lights.

- d. Provide traveling cable for telephone in the elevator car. Cable shall extend from junction box in hoistway to telephone box in car.
- e. Car and hoistway junction boxes shall be provided for the elevator. Hoistway junction boxes shall be provided if necessary.
- f. All insulated wiring, control wiring and wiring in traveling cables shall be tag coded at their terminals in the machine room, hoistway junction box, elevator cab junction box, and push-button stations within the cab, and shall agree with the approved wiring diagrams.

4. Tagging

- a. All insulated wiring, control wiring and wiring in traveling cables shall be tag coded at their terminals in the Elevator Machine Room, hoistway junction boxes, all elevator cab junction boxes and push-button (COP) stations within the cab. Each device, each terminal and each wire in the controller panels shall be properly identified by name, letter, or standard symbol in an approved indelible manner on the device, panel or wire. The identification markings shall be identical to markings used on the wiring diagrams. Handwritten labels are not allowed.
- B. Provide circuit protection for signal system incorporated in circuit breaker, disconnect switch or power controller.
 - C. Contacts in elevator motor circuits which are to be opened by governors or other safety devices, shall be copper to carbon or other approved non-fusing type. Contacts on control and signal relays and switches shall be commercially pure silver. Contacts on switches breaking heavy motor circuits shall be copper to carbon or, if of metal, shall have supplementary breaking contacts and shall operate with suitable wiping action, or shall be of approved equivalent design and construction. They shall be equipped with suitable blowout coils, vanes, suppressors, barriers, etc., where necessary to prevent undue arcing and heating.
 - D. Car and hall operating signal circuits shall not exceed 120 volts.
 - E. In the machine room, hoistway, etc., the equipment shall be laid out and installed so as to allow as adequate and convenient access for maintenance as space conditions will permit.
 - F. Each major component of equipment shall have the manufacturer's name, type, class or catalog number on a metal plate securely attached to the item of equipment in a conspicuous location.
 - G. All cabinets containing motor drives, filter boxes, transformers and power reactors shall be supported on rails and isolated from the base building structure with elastomer pads having a minimum static deflection of 3/8" (Mason Type N, or equivalent). All connections to and from the cabinetry shall be flexible in order not to compromise the isolation system. Use non-rigid conduit for the final electrical

connection, with all other conduit supports and clamps provided on a neoprene sponge insert.

- H. Supply, installation and connections of fused main line disconnect switch of the lockable type for the elevators in the machine rooms.
- I. Signal to the controller in the machine room to indicate special emergency condition due to lobby smoke detector activation; and smoke detectors in the elevator lobby and machine room in accordance with the ASME A17.1 code. Furnish and install means to automatically disconnect the main line power supply to the elevator prior to the application of water.
- J. Car lighting and fan circuit for the elevators shall be located in circuit breaker panel in the machine rooms.
- K. Permanent light fixtures with switches and duplex grounded receptacles in the elevator machine room and elevator pit. Receptacles in the pit shall be ground fault circuit interrupter type.

2.05 MECHANICAL REQUIREMENTS

- A. All bearings, pivots, guides, gearing and similar elements subject to friction or rolling wear in the entire elevator installation, shall be accurately and smoothly finished and shall be arranged and equipped for adequate and convenient lubrication. Means shall be provided for flushing and draining the larger bearings and gear cases. All oiling holes shall have dustproof self-closing caps.
- B. All plain bearings shall be liberally sized in accordance with the best commercial elevator usages which have proved entirely satisfactory on heavy duty installation.
- C. Ball and roller bearings shall be of liberal size and of a type and make which have been extensively and successfully used for similar heavy duty on other elevator installations. They shall be fully enclosed. Loading, lubrication, support and all other conditions of use shall be in accordance with the recommendations of the bearing manufacturer, based on previous extensive and satisfactory elevator usage.
- D. All bolts used to connect moving parts, bolts carrying hoisting stresses, and all other bolts except guide rail bolts, subject to vibration or shock, shall be fitted with adequate means to prevent loosening of the nuts and bolts. Bolts transmitting shearing stresses between machine parts shall have tight body fit in drilled holes. All bolts subject to vibration shall be provided with split ring lock washers.
- E. All bearing and sliding surfaces of shafts, pins, bearings, bushings, guides, etc., shall be smoothly and accurately finished. They shall be assembled and installed in accurate alignment and with working clearance most suitable for the load, speed, lubrication and other conditions of use. All bearings shall be regularly checked for any tendency to run hot, and all defects corrected.

- F. Belts, pulleys, chains, gears, couplings, projecting setscrews, keys, cables and other rotating parts located so that any person can come in close proximity thereto, shall be fully enclosed or properly guarded.

2.06 PERFORMANCE

- A. Performance Times, Leveling, Contract Speed and Door Operating Times: The Contractor shall adjust the control system to provide and maintain smooth acceleration and deceleration under varied conditions. These parameters shall be field adjustable if necessary.
- B. Speed: Plus or minus 10 percent under all loading conditions.
- C. Capacity: Safely lower, stop and hold 125 percent of rated load.
- D. Door open time shall be adjustable and pre-set for 5 seconds.

2.07 SHOP FABRICATION

- A. The various parts of the elevator systems shall be fabricated and assembled insofar as practical, in the shop to minimize field assembly. Parts which cannot be shop-assembled but require close field fit shall be trial-assembled in the shop and given field erection marks where necessary to eliminate fitting work at the construction site.
- B. A CAD drawing shall be submitted to the contracting officer for the various parts of the elevator system that are fabricated.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Procedures for taking a unit out of service shall be performed in accordance with Appendix D "EOC Key Functions".
- B. Install all replacement equipment, systems, and components in strict accordance with manufacturer's instructions and approved shop drawings.
- C. It is the contractor's responsibility to ensure that existing equipment can be safely removed and new equipment installed in existing spaces through existing access. Any exceptions to this shall be identified and exceptions taken prior to submission of the proposal.

3.02 ACCEPTANCE INSPECTION AND TESTS

- A. Upon completion of rehabilitation work for the elevator, perform acceptance inspection and tests required by the ASME A17.1 code, prior to beginning rehabilitation work on

the next elevator. Provide all instruments, materials and labor required for the tests. Final acceptance tests shall be made by the Authority. Notify the Contracting Officer's Representative one (1) week prior to each scheduled test. Submit copies of all test results to the Contracting Officer's Representative. The O & M Manuals, schematics, sequence of operation must be submitted to the Contracting Officer's Representative for approval prior to execution of the work on the next elevator. The approval process will not delay the beginning of work on the next elevator.

- B. All malfunctions and deficiencies revealed by the tests shall be forthwith corrected by the Contractor at no additional cost to the Authority.
- C. Full-Load Run Test: Elevators shall be tested for a period of one (1) hour continuous run with full contract load in the car. During the test run, the car shall be stopped at all floors in both directions of travel for a standing period of not less than five (5) nor more than ten (10) seconds per floor.
- D. Speed Test: The actual speed of the elevator shall be determined in both directions of travel with full contract load and no load in the elevator. Speed tests shall be made before the full load run test and after the full load run test. Speed shall be determined by applying a tachometer to the car rails while riding the top of the car. The actual measured speed of the elevator with all loads in either direction shall be within 5% of specified rated speed. Full speed runs shall be quiet and free from vibration and sway.
- E. Static Car Balancing: The car shall be statically balanced in its sling so that the total lateral force on top car guide assemblies shall be a maximum of forty pounds (40 lbs.) for all positions of the car in the hoistway.
- F. Car Leveling Test: Elevator car leveling device shall be tested for accuracy of leveling at all floors with no load in car, and with contract load in car, in both directions of travel. Accuracy of floor leveling, shall be within plus or minus 3/16-inch of level with any landing floor for which the stop has been initiated (with a definite range of distance in advance of the landing) regardless of load in car or direction of travel. The car leveling device shall automatically correct over travel as well as under travel and shall maintain the car floor within plus or minus 3/16-inch of level with the landing floor regardless of change in load. Rebalance car counterweight.
- G. Insulation Resistance Test: The elevator's complete wiring system shall be free from short circuits and grounds and the insulation resistance of the system shall be determined by the use of a Megohmmeter, at the discretion of the inspector conducting the test.
- H. Overload Devices: All overload current protection devices shall be tested within their designated circuitry. Overloads shall not be bench tested.
- I. Limit Stops: The position of the car when stopped by each of the normal limit stops with no load and with contract load in the car shall be accurately measured. The car shall reach the terminal landings under the above condition. Final position of the elevator relative to the terminal landings shall be determined when the elevator has been stopped by the final limits. The lower limit stop shall be made with contract load in the elevator. The upper limit stop shall be made with no load in the elevator. Elevator shall be operated at contract speed for both tests. Normal limit stopping devices shall be inoperative for the tests.

- J. Setting of Car Door Contacts: The position of the car door at which the elevator may be started shall be measured. The distance from full closure shall not exceed that required by the Code. The test shall be made with the hoistway doors closed or with the hoistway door contact inoperative.
- K. Setting of Interlocks: The position of the hoistway door at which the elevator may be started shall be measured and shall not exceed the Code requirements.
- L. Operating and Signal System: The elevator shall be operated by the operating devices provided, and the operation signals and automatic floor leveling shall function in accordance with requirements specified. Starting, stopping and leveling shall be smooth and comfortable without appreciable steps of acceleration or deceleration. Stopping shall be without bumps or jars.
- M. Provide a full fire service test of both Phase I and Phase II Fireman's Service.
- N. All elevators, if connected to the emergency power system (generator), will also be tested with the emergency power system. Tests are to be performed after revenue hours.
- O. Performance Guarantee: Should any of these tests develop any defects or evidence of poor workmanship, any variance or noncompliance with the requirements of the specified codes and or ordinances or any variance or noncompliance with the requirements of these specifications, the following work and or repairs shall be complete at no expense to the Authority.
 - 1. Replace equipment that does not meet code or specified requirements.
 - 2. Perform work and furnish labor, materials and equipment necessary to meet specified operation and performance.
 - 3. Perform and assume cost for retesting required by Governing Code Authority and Authority to verify specified operation and performance.
- P. Warranties: Contractor shall be responsible for all warranty work for a period of one (1) year, including both labor and materials.

3.03 CLEANING AND ADJUSTMENTS

- A. After completion of Work of this Section, and before the issuance of Certificate of Final Completion, Work shall be thoroughly cleaned, and properly adjusted, so that it is in proper operating condition. The entire Work shall be left in a clean condition, satisfactory to the Contracting Officer's Representative.

3.04 INSTRUCTION OF AUTHORITY'S PERSONNEL

- A. The Contractor shall make arrangements for the instruction of personnel as designated by the Authority (a minimum of 24 hours as scheduled by the Contracting Officer's Representative) in the details of maintaining, adjusting and trouble-shooting the equipment per training session, with a minimum total of twelve (12) days of training.

- B. Training: Provide separate training sessions, conducted by authorized instructors, each session shall be 8 hour continuous duration during normal working hours. The Authority's personnel designated to receive training will be identified to the contractor prior to the scheduled training. The major topics/area of instruction shall be addressed in the training sessions are as follows:
1. Troubleshooting of all mechanical systems such as door operations, safety interlocks, safety systems, etc.
 2. Troubleshooting of all electrical/electronic control systems and subsystems in conjunction with the use of the straight line and schematic diagrams provided by the contractor.
 3. A separate training manual shall be submitted for approval prior to the scheduling of the training. The O&M manual shall not be used as a training manual.
 4. At the completion of the first training session, a narrated and properly edited training video shall be submitted for the Authority in DVD or flash drive form. The video shall be used for future training sessions. The video shall cover operation of devices, maintenance and troubleshooting.
- The following items shall be included as minimum requirements: Installation and adjustment of valves; adjusting safety switches; troubleshooting, and maintenance procedure of major components.
- C. Scheduling: Training shall be done on the first elevator after it has been completely finished, tested and ready for turnover to the Authority.

3.05 OWNERSHIP OF REMOVED EQUIPMENT

- A. Prior to commencement of work on EACH elevator, contractor will contact the Authority in writing to determine what equipment, if any, is to be retained by the Authority. The Contracting Officer's Representative will respond within five (5) working days.
- B. The specified equipment shall be delivered to the Authority at the Pennsy Drive Facility in Landover, Maryland as directed by the Contracting Officer's Representative.

END OF SECTION