THE PORT AUTHORITY OF NY & NJ

PROCUREMENT DEPARTMENT
4 WORLD TRADE CENTER
150 GREENWICH STREET, 21ST FLOOR
NEW YORK, NY 10007

INVITATION FOR BID/PUBLIC BID OPENING

BID INFORMATION

ISSUED DATE: 07/16/2015

TITLE: Manufacture and Deliver a Track Inspection Vehicle for PATH

BID NO.: 43154

SUBMIT SEALED BIDS BEFORE THE DUE DATE AND TIME TO THE ABOVE ADDRESS WHERE THEY WILL BE PUBLICLY OPENED AND READ

QUESTIONS DUE: July 29, 2015 **TIME: 11:00 AM**

BID DUE DATE: August 13, 2015 **TIME: 11:00 AM**

BUYER NAME: Richard Grehl **PHONE NO.: (212) 435-4633**
EMAIL: rgrehl@panynj.gov

BIDDER INFORMATION
(TO BE COMPLETED BY THE BIDDER)
(PLEASE PRINT)

_____
(NAME OF BIDDING ENTITY)

_____
(ADDRESS)

_____
(CITY, STATE AND ZIP CODE)

_____
(REPRESENTATIVE TO CONTACT-NAME & TITLE **(TELEPHONE)**

_____
(FEDERAL TAX I.D. NO.) **(FAX NO.)**

_____ BUSINESS CORPORATION _____PARTNERSHIP _____INDIVIDUAL

_____ OTHER (SPECIFY): _____

INVITATION FOR BID

PART I – STANDARD INFORMATION FOR BIDDERS, TABLE OF CONTENTS

PART I - STANDARD INFORMATION FOR BIDDERS

1. General Information: The Port Authority of New York and New Jersey

The Port Authority of New York and New Jersey (the "Port Authority" or the "Authority") is an agency of the States of New York and New Jersey, created and existing by virtue of the Compact of April 30, 1921, made by and between the two States, and thereafter consented to by the Congress of the United States. It is charged with providing transportation, terminals and other facilities of trade and commerce within the Port District. The Port District comprises and area of about 1,500 square miles in both States, centering about New York Harbor. The Port District includes the Cities of New York and Yonkers in New York State, and the cities of Newark, Jersey City, Bayonne, Hoboken and Elizabeth in the State of New Jersey, and over 200 other municipalities, including all or part of seventeen counties, in the two States. The Port Authority manages and/or operates all of the region's major commercial airports (Newark Liberty International, John F. Kennedy International, Teterboro, LaGuardia, Atlantic City International and Stewart International Airports), marine terminals in both New Jersey and New York (Port Newark and Elizabeth, Howland Hook and Brooklyn Piers); and its interstate tunnels and bridges (the Lincoln and Holland Tunnels; the George Washington, Bayonne, and Goethals Bridges; and the Outerbridge Crossing), which are vital "Gateways to the Nation."

In addition, the Port Authority operates the Port Authority Bus Terminal in Manhattan, the largest facility of its kind in the world, and the George Washington Bridge and Journal Square Transportation Center bus stations. A key link in interstate commuter travel, the Port Authority also operates the Port Authority Trans-Hudson Corporation (PATH), a rapid rail transit system linking Newark, and the Jersey City and Hoboken waterfronts, with midtown and downtown Manhattan. A number of other key properties are managed by the agency including but not limited to a large satellite communications facility (the Teleport) in Staten Island, and a resource recovery co-generation plant in Newark. Prior to September 11, 2001, the Port Authority's headquarters were located in the World Trade Center, and that complex is still owned and being partially redeveloped by the Authority.

2. Federal Transit Administration Requirements

This Contract is part of a program funded by the Federal Transit Administration (FTA) and the successful Bidder will be required to comply with and complete the attached certificates with the "Federal Transit Administration Requirements" annexed hereto as Attachment A.

3. Form and Submission of Bid

The Bidder shall review carefully every provision of this document, provide all the information required, and sign and return one entire copy to the Port Authority in accordance with the instructions on the Cover Sheet and Part II – Contract Specific Information for Bidders. The Bidder should retain one complete duplicate copy for its own use. The "Signature Sheet" contained herein must be completed and signed by the Bidder. The Pricing Sheet(s) contained herein must also be completed. The bid shall be sealed in the enclosed self-addressed envelope conspicuously marked with the Bidder's name, address, and Vendor Number, if available. In addition, the outside of the package must clearly state the Bid Title, the Bid Number and the Bid

Due Date. Failure to properly label submissions may cause a delay in identification, misdirection or disqualification of the submissions. In submitting this bid, the Bidder offers to assume the obligations and liabilities imposed upon it herein and expressly makes the representations and warranties required in this document.

All Bids must be received by the bid custodian on or before the due date and time specified on the cover page, at which time they will be publicly opened and read. Bids are only accepted Monday through Friday, excluding Port Authority holidays, between the hours of 8:00 a.m. and 5:00 p.m., via (1) regular mail, (2) express delivery service (e.g. UPS), or (3) hand delivery. If your bid is to be hand-delivered by messenger or you are planning to attend the formal bid opening, please note that only individuals with valid photo identification will be permitted access to the Authority's offices. Individuals without valid identification shall be turned away and their packages not accepted. Bids that are not received by the bid custodian by the scheduled bid opening date and time will be considered late.

4. Vendor Profile

To ensure maximum opportunities, it is important that Bidders keep their vendor profiles up to date with an appropriate e-mail address, as this will enable their firm to receive timely notice of advertisements, reminders, solicitations and addenda. Bidders may update their vendor profile or register as a Port Authority Vendor by accessing the online registration system at https://panynjprocure.com/VenLogon.asp. Bidders that register, as a Port Authority Vendor by accessing the on-line registration system will be sent an acknowledgement with their assigned Vendor Number.

5. Acknowledgment of Addenda

If any Addenda are posted or sent as part of this Bid, the Bidder shall complete, sign and include with its Bid the addenda form(s). In the event any Bidder fails to conform to these instructions, its Bid will nevertheless be construed as though the Addenda had been acknowledged.

If the Bidder downloaded this solicitation document, it is the responsibility of the Bidder to periodically check the Port Authority website at http://www.panynj.gov/business-opportunities/bid-proposal-advertisements.html and download any Addenda that might have been issued in connection with this solicitation.

6. Firm Offer

The Bidder offers to provide the Port Authority Trans-Hudson Corporation ("PATH") the services and to perform all Work in connection therewith required under this Contract, all as specified by the terms and conditions of the Contract, based on the Pricing Sheets provided herein. As used herein, the term "Port Authority" shall mean the Port Authority of New York and New Jersey acting on behalf of PATH.

EXCEPTIONS TAKEN OR CONDITIONS IMPOSED BY A BIDDER TO ANY PORTION OF THE CONTRACT DOCUMENTS WILL RESULT IN REJECTION OF THE BID.

7. Acceptance or Rejection of Bids

The acceptance of a bid will be by a written notice signed by an authorized representative on behalf of the Authority. No other act of the Port Authority, its Commissioners, officers, agents or employees shall constitute acceptance of a bid. The Port Authority reserves the unqualified right, in its sole and absolute discretion, to reject any or all bids or to accept any bid, which in its judgment will best serve the public interest and to waive defects in any bid. No rights accrue to any Bidder unless and until its bid is accepted.

8. Bidder's Questions

Any questions by prospective Bidders concerning the Work to be performed or the terms and conditions of the Contract may be addressed to the Contracts Specialist listed on the Cover Sheet of this document. The Contracts Specialist is only authorized to direct the attention of prospective Bidders to the portions of the Contract. No employee of the Port Authority is authorized to interpret any portion of the Contract or to give information in addition to that contained in the Contract. When Contract interpretation or additional information as to the Contract requirements is deemed necessary by the Port Authority, it will be communicated to all Bidders by written addenda issued under the name of the Manager, Purchasing Services Division of the Port Authority and will be posted on the Port Authority website. Addenda shall be considered part of the Contract.

9. Additional Information To and From Bidders

Should the Authority require additional information from the Bidder in connection with its bid, such information shall be submitted within the time frame specified by the Port Authority.

If the Bidder is a corporation, a partnership, or a joint venture, a statement of the names and residences of its officers, partners, or authorized representatives, as applicable, should be submitted on the "Name and Residence of Principals Sheet", directly following the Signature Sheet in Part IV.

10. Union Jurisdiction

All prospective Bidders are advised to ascertain whether any union now represented or not represented at the Facility will claim jurisdiction over any aspect of the operations to be performed hereunder and their attention is directed to the paragraph entitled "Harmony" in the Standard Contract Terms and Conditions.

11. Assessment of Bid Requirements

The Bidder should carefully examine and study the entire contents of these bid documents and shall make its own determinations as to the services and materials to be supplied and all other things required to be done by the Contractor.

12. Bidder's Prerequisites

Only Bidders who can comply with the prerequisites specified in Part II hereof at the time of the submission of its bid should submit bids, as only bids submitted by such Bidders will be considered. By furnishing this document to the Bidder, the Port Authority has not made a

determination that the Bidder has met the prerequisites or has otherwise been deemed qualified to perform the services. A determination that a Bidder has met the prerequisites is no assurance that it will be deemed qualified in connection with other bid requirements included herein.

13. Qualification Information

The Port Authority may give written notice to the Bidder to furnish the Port Authority with information and to meet with designated representatives of the Port Authority relating to the Bidder's qualifications and ability to fulfill the Contractor's obligations hereunder. The requested information shall be submitted no later than three (3) days after said notice unless otherwise indicated. Matters upon which the Port Authority may inquire may include, but not be limited to, the following:

a. The Bidder may be required to demonstrate that it is financially capable of performing this Contract, and the determination of the Bidder's financial qualifications will be made by the Port Authority in its sole discretion. The Bidder shall submit such financial and other relevant information as may be required by the Port Authority from time to time including, but not limited to, the following:

1. (i) Certified financial statements, including applicable notes, reflecting the Bidder's assets, liabilities, net worth, revenues, expenses, profit or loss and cash flow for the most recent calendar year or the Bidder's most recent fiscal year.

   (ii) Where the certified financial statements set forth in (i) above are not available, then either reviewed or compiled statements from an independent accountant setting forth the aforementioned information shall be provided.

   (iii) Where neither certified financial statements nor financial statements from an independent accountant are available, as set forth in (i) and (ii) above, then financial statements containing such information prepared directly by the Bidder may be submitted; such financial statements, however, must be accompanied by a signed copy of the Bidder's most recent Federal income tax return and a statement in writing from the Bidder, signed by an executive officer or their authorized designee, that such statements accurately reflect the present financial condition of the Bidder.

Where the statements submitted pursuant to subparagraphs (i), (ii) or (iii) are dated prior to forty-five (45) days before the bid opening, then the Bidder shall submit a statement in writing, signed by an executive officer of the Bidder or their designee, that the present financial condition of the Bidder is at least as good as that shown on the statements submitted.

2. Bidder's statement of work on hand, including any work on which a bid has been submitted, containing a description of the work, the annual dollar value, the location by city and state, the current percentage of completion, the expected date for completion, and the name of an individual most familiar with the Bidder's work on these jobs.

3. The name and address of the Bidder's banking institution, chief banking representative handling the Bidder's account, the Bidder's Federal Employer Identification Number (i.e., the number assigned to firms by the Federal Government for tax purposes), the Bidder's Dun and Bradstreet number, if any, the name of any

other credit service to which the Bidder has furnished information, and the number, if any, assigned by such service to the Bidder's account.

b. Information relating to the Bidder's Prerequisites, if any, as set forth in this document.

c. A statement describing the legal and financial form of the entity submitting the bid, including ownership, financial structure and a point of contact. Such entity must legally exist and be qualified to do business within the state required under this bid as of the date that bids are submitted. As applicable, provide copies of the Articles of Incorporation, By laws and Amendments, partnership agreement, joint venture agreement and/or other appropriate organizational documents for the Bidder, its officers, financial guarantors and, if any such entities are joint ventures or partnerships, for all those of ventures or partners. Describe the rationale for the selection of the structure of the entity. Describe contractual, financial, legal commitments and agreements and functional relationships among financial guarantors and officers with relation to the Work required by this bid, to the extent that they are not disclosed in the organizational documents.

d. A statement setting forth the names of those personnel to be in overall charge of the service and those who would be exclusively assigned to supervise the service and their specific roles therein, setting forth as to each the number of years of experience and in which functions and capacities each would serve.

e. Information to supplement any statement submitted in accordance with the Standard Contract Terms and Conditions entitled "Contractor's Integrity Provisions."

f. In the event that the Bidder's performance on a current or past Port Authority or PATH contract or contracts has been rated less than satisfactory, the Manager, Purchasing Services Division, may give oral or written notice to the Bidder to furnish information demonstrating to the satisfaction of such Manager that, notwithstanding such rating, such performance was in fact satisfactory or that the circumstances which gave rise to such unsatisfactory rating have changed or will not apply to performance of this Contract, and that such performance will be satisfactory.

g. The Bidder recognizes that it may be required to demonstrate to the satisfaction of the Port Authority and PATH that it in fact can perform the services as called for in this Contract and that it may be required to substantiate the warranties and representations set forth herein and the statements and assurances it may be required to give.

Neither the giving of any of the aforesaid notices to a Bidder, the submission of materials by a Bidder, any meeting which the Bidder may have with the Port Authority, nor anything stated by the Port Authority and/or PATH in any such meeting shall be construed or alleged to be construed as an acceptance of said Bidder's bid. Nothing stated in any such meeting shall be deemed to release any Bidder from its offer as contained in the bid.

14. Facility Inspection

If a Facility Inspection is deemed necessary, details regarding the Facility Inspection for all parties interested in submitting a bid will be stipulated in Part II hereof. All Bidders must present company identification and photo identification for access to the Facility.

15. Available Documents - General

Certain documents, listed in Part II hereof, will be made available for reference and examination by Bidders either at the Facility Inspection, or during regular business hours. Arrangements to review these documents at a time other than the Facility Inspection may be made by contacting the person listed in Part II as the contact for the Facility Inspection.

These documents were not prepared for the purpose of providing information for Bidders upon this Contract but they were prepared for other purposes, such as for other contracts or for design purposes for this or other contracts, and they do not form a part of this Contract. PATH makes no representation or guarantee as to, and shall not be responsible for, their accuracy, completeness or pertinence, and, in addition, shall not be responsible for the inferences or conclusions to be drawn there from.

16. Pre-award Meeting

The apparent lowest responsive and responsible Bidder may be called for a pre-award meeting prior to award of the Contract.

17. Disadvantaged Business Enterprises (DBE's)

This Solicitation is subject to the United States Department of Transportation regulations on Disadvantaged Business Enterprises (DBE's) contained in Part 26 of Title 49 of the Code of Federal Regulations. The requirements for the DBE Program are located in Part III of this Solicitation.

For more information on the Port Authority certification process, please refer to the following website: http://www.panynj.gov/business-opportunities/sd-become-certified.html.

18. Certification of Recycled Materials

Bidders are requested to submit, with their bid, a written certification entitled "Certified Environmentally Preferable Products / Practices" attached hereto as "Attachment I-A", attesting that the products or items offered by the Bidder contain the minimum percentage of post-consumer recovered material in accordance with the most recent guidelines issued by the United States Environmental Protection Agency (EPA), or, for commodities not so covered, the minimum percentage of post-consumer recovered materials established by other applicable regulatory agencies. The data submitted by the Bidder in Attachment I-A is being solicited for informational purposes only.

Recycling Definitions:

For purposes of this solicitation, the following definitions shall apply:

a. Recovered Material" shall be defined as any waste material or by-product that has been recovered or diverted from solid waste, excluding those materials and by-products generated from, and commonly reused within, an original manufacturing process.

b. "Post-consumer Material" shall be defined as any material or finished product that has served its intended use and has been discarded for disposal or recovery having completed its life as a consumer item. "Post-consumer material" is included in the broader category of "Recovered Material".

c. "Pre-consumer Material" shall be defined as any material or by-product generated after the manufacture of a product but before the product reaches the consumer, such as damaged or obsolete products. Pre-consumer Material does not include mill and manufacturing trim, scrap, or broken material that is generated at a manufacturing site and commonly reused on-site in the same or another manufacturing process.

d. "Recycled Product" shall be defined as a product that contains the highest amount of post-consumer material practicable, or when post-consumer material is impracticable for a specific type of product, contains substantial amounts of Pre-consumer Material.

e. "Recyclable Product" shall be defined as the ability of a product and its packaging to be reused, reconditioned for use, or recycled through existing recycling collection programs.

f. "Waste Reducing Product" shall be defined as any product that will result in less waste generated due to its use rather than another product designed to serve the same function with a greater waste generation rate. This shall include, but not be limited to, those products that can be reused, refilled or have a longer life expectancy and contain a lesser amount of toxic constituents.

19. City Payroll Tax

Bidders should be aware of the payroll tax imposed by the:

a. City of Newark, New Jersey for services performed in Newark, New Jersey;

b. City of New York, New York for services performed in New York, New York; and

c. City of Yonkers, New York for services performed in Yonkers, New York.

These taxes, if applicable, are the sole responsibility of the Contractor. Bidders should consult their tax advisors as to the effect, if any, of these taxes. The Port Authority provides this notice for informational purposes only and is not responsible for either the imposition or administration of such taxes. The Port Authority exemption set forth in the Paragraph headed "Sales or Compensating Use Taxes", in the Standard Contract Terms and Conditions included herein, does not apply to these taxes.

20. Additional Bidder Information

Prospective Bidders are advised that additional vendor information, including but not limited to, forms, documents and other information, including protest procedures, may be found on the Port Authority website at: http://www.panynj.gov/business-opportunities/become-vendor.html

21. ATTACHMENT I-A - Certified Environmentally Preferable Products/Practices

Bidder Name: _____Date: _____

In line with the Port Authority's efforts to promote products and practices which reduce our impact on the environment and human health, Bidders are encouraged to provide information regarding their environmentally preferable/sustainable business practices as they relate to this contract wherever possible. Bidders are requested to complete this form and submit it with their response, if appropriate. Bidders are requested to submit appropriate documentation to support the items for which the Bidder indicates a "Yes" and present this documentation, in the proper sequence of this Attachment.

1. Packaging

Has the Bidder implemented any of the following environmental initiatives? (A checkmark indicates "Yes")

____ Use of corrugated materials that exceed the required minimum EPA recommended post-consumer recycled content
____ Use of other packaging materials that contain recycled content and are recyclable in most local programs
____ Promotes waste prevention and source reduction by reducing the extent of the packaging and/or offering packaging take-back services, or shipping carton return
____ Reduces or eliminates materials which have been bleached with chlorine or chlorine derivatives
____ Eliminates any packaging that may contain polyvinyl chloride (PVC), or polystyrene or heavy metals.

If yes, a description of the practices being followed should be include with the submission.

2. Business Practices / Operations / Manufacturing

Does the Bidder engage in practices that serve to reduce or minimize an impact to the environment, including, but not necessarily limited to, the following items? (A checkmark indicates "Yes")

____ Recycles materials in the warehouse or other operations
____ Use of alternative fuel vehicles or vehicles equipped with diesel emission control devices for delivery or transportation purposes
____ Use of energy efficient office equipment or signage or the incorporation of green building design elements
____ Use of recycled paper (that meets federal specifications) in their marketing and/or resource materials
____ Other sustainable initiative

If yes, a description of the practices being followed should be included with the submission.

3. Training and Education

Does the Bidder conduct/offer a program to train or inform customers and employees of the environmental benefits of the products to be offered under this contract, and/or does the Bidder conduct environmental training of its own staff?

☐ Yes ☐ No If yes, Bidder shall attach a description of the training offered and the specific criteria targeted by the training.

4. Certifications

Has the Bidder or any of its manufacturers and/or subcontractors obtained any of the following product / industry certifications? (A checkmark indicates "Yes")

____ ISO 14000 or adopted some other equivalent environmental management system
____ Other industry environmental standards (where applicable), such as the CERES principles, LEED Certification, C2C Protocol, Responsible Care Codes of Practice or other similar standards
____ Third Party product certifications such as Green Seal, Scientific Certification Systems, Smartwood, etc.

If yes, Bidders should attach copies of the certificates obtained.

I hereby certify under penalty of law, the above statements are true and correct.

_____Name _____Date

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PART II - CONTRACT SPECIFIC INFORMATION FOR BIDDERS

The following information may be referred to in other parts hereof, or further detailed in other parts hereof, if applicable.

1. **Service(s) Required**

   The Work consists of, but is not limited to, the manufacture and delivery of one (1) Track Inspection Vehicle, as further explained in the Specifications, outlined in Part V and associated spare parts.

   The Track Inspection Vehicle must be manufactured, delivered and ready to run.

   Any reference to a specific product in these Contract Documents is to indicate approved products or details. Other products or details will be considered suitable if they meet the intent of the performance characteristic cited or are comparable to the product or detail cited. PATH shall be the sole judge of as to whether a proposed substitution will be approved, and no substitution shall be ordered or utilized without the PATH's prior written approval. PATH may require the Contractor to furnish at the Contractor's expense a special performance guarantee or other assurance with respect to any approved substitution. Furthermore, the approval of any substitute proprietary item or make shall not in any way entitle the Contractor to additional compensation therefor. If the Contractor fails to deliver a suitable approved equal that is acceptable to PATH, then the Contractor shall supply item as specified herein., as more fully described in the Specifications, located in Part V of this Contract.

   Delivery Location(s)

   PATH Consolidated Maintenance Shop, 120 Academy Street, Jersey City NJ 07302, as more fully described in the Contract Specific Terms and Conditions, located in Part III of this Contract.

2. **Delivery Date:**

   The date of delivery shall be coordinated with PATH, as more fully defined in Part III – "Contract Specific Terms and Conditions," hereof.

   FOB Destination

3. **Expected Contract Commencement Date:**

   A Purchase Order to be forwarded on or about October 1, 2015.

4. **Contract Type:**

   Lump Sum

5. Duration of Contract:

The Contractor shall complete delivery of one (1) Track Inspection Vehicle under this contract as follows:

Complete the satisfactory delivery of the Track Inspection Vehicle and the delivery of all other equipment and the performance of all other obligations by the Contractor under this Contract four hundred and twenty (420) days after the issuance of a Purchase Order and/or notice to proceed, in accordance with the Progress Payment Schedule in Part III of this Contract.

As used herein, "Satisfactory Delivery" shall mean the delivery to PATH of equipment and other items meeting the requirements of this Contract and shall include passing such tests and inspections at PATH's facility as are required under this Contract.

6. Available Documents

None

7. Facility Inspection

Not Applicable

8. Specific Bidder's Prerequisites (Submit with your bid proof that the following prerequisites have been met)

a. The Bidder shall have had at least five (5) years of experience immediately prior to the date of submission of its bid in the management, design and manufacturing of track mounted rail equipment of a design similar to that required herein and during that time shall have actually been engaged in design and manufacturing said or such equipment for sale to commercial or industrial accounts under contract. The Bidder may fulfill this prerequisite if the Bidder can demonstrate to the satisfaction of the Port Authority that the persons or entities owning and controlling the Bidder have had a total of at least five (5) year(s) of experience immediately prior to the date of the submission of its bid in management, design and manufacturing of track mounted rail equipment of a design similar to that required herein and were actually engaged in providing such equipment to commercial or industrial accounts under contract during that time, or have owned and controlled other entities which have actually engaged in providing the above described equipment during that time period.

b. During the time period as stated in (a) above, the Bidder, or persons or entities owning and controlling the Bidder, shall have satisfactorily performed or be performing under at least one (1) contract requiring track mounted rail equipment and services similar to those required under this Contract.

c. In the event a bid is submitted by a joint venture the foregoing prerequisites will be considered with respect to such Bid as follows: The prerequisite in subparagraph (a) and (b) above, will be considered satisfied if the joint venture itself, or any of its participants individually, can meet the requirements. If a joint venture which has not been established as a distinct legal entity submits a bid, it and all participants in the joint venture shall be bound jointly and severally and each such participant in the joint venture shall execute the bid and do each act and thing required by this Invitation for Bid. On the original bid and wherever else the Bidder's name would appear, the name of the joint venture Bidder must appear if the joint venture is

a distinct legal entity. If the Bidder is a common law joint venture, the names of all participants must be listed, followed by the words "acting jointly and severally". All joint venture Bidders must provide documentation of their legal status.

9. Contractor Staff Background Screening

The Contractor awarded this Contract may be required to have its staff, and any subcontractor's staff working under this Contract, authorize the Authority or its designee to perform background checks. Such authorization shall be in a form acceptable to the Authority. The Contractor (and subcontractor) may also be required to use an organization designated by the Authority to perform the background checks. The cost for said background checks for staff that pass and are granted a credential shall be reimbursable to the Contractor (and its subcontractors) as an out-of-pocket expense. The cost for background checks for staff that are rejected for a credential for any reason are not reimbursable.

As of January 29, 2007, the Secure Worker Access Consortium (S.W.A.C.) is the only Port Authority approved provider to be used to conduct background screening, except as otherwise required by federal law and/or regulation. Information about S.W.A.C., instructions, corporate enrollment, online applications, and location of processing centers can be found at http://www.secureworker.com, or S.W.A.C. may be contacted directly at (877)522-7922.

10. FTA Bid Submission Requirements:

The following items are additional bid submittal requirements. They are contained within the Federal Transit Administration (FTA) Requirements and/or Solicitation Document and shall accompany your bid submission:

1. Certification Regarding Lobbying Pursuant to 31 U.S.C. 1352
2. Standard Form LLL - Disclosure of Lobbying Activities
3. Certification Regarding Debarment, Suspension, Ineligibility And Voluntary Exclusion - Lower Tier Covered Transactions
4. Buy America – Certification Requirement For Procurement of Buses, other Rolling Stock And Associated Equipment (Rolling Stock)
5. Certificate of Cost and Pricing Data contained in Part IV Pricing Sheet(s)
6. Appendix A1 DBE Goals Statement in accordance with Part III clause entitled "DBE Program"
7. Appendix A2 DBE Participation Plan and Affirmation Statement
8. Appendix A3 Information on Solicited Firms

11. Background Qualification Questionnaire (BQQ)

The Bidder shall submit a completed Background Qualification Questionnaire (BQQ), for itself and for all subcontractors and Contractors known to the Bidder at the time of bid submission. This document and instructions for submitting the completed BQQ to the

Authority's Office of Inspector General can be obtained at the Authority's website through the following link:
http://www.panynj.gov/wtcprogress/pdf/PANYNJ_OIG_WTC_BQQP.zip

12. Bid Submission Requirements

The following shall be submitted for approval within the bid package:

Where the Specification refers to "or approved equal" or where the Contractor is submitting an alternate item for approval, the Contractor shall submit a side by side comparison of the Specification required item and the proposed alternate. The proposed alternate item will then be evaluated by PATH to determine if the performance requirements and characteristics of the proposed alternate item meet the requirements of the Specification required item. PATH's determination will be final.

PART III – CONTRACT SPECIFIC TERMS AND CONDITIONS,
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PART III – CONTRACT SPECIFIC TERMS AND CONDITIONS

1. General Agreement

Subject to all of the terms and conditions of this Contract, the undersigned ("Contractor") hereby offers and agrees to manufacture and deliver one ready-to-run (1) Track Inspection Vehicle and associated spare parts, and all other things necessary to perform the Work required by this Contract as specified in Part II, and as fully set forth in Part V, ("Specifications"), at the location(s) listed in Part II and fully set forth in the Specifications, and to do all other things necessary or proper therefor or incidental thereto, all in strict accordance with the provisions of the Contract Documents and any future changes therein; and the Contractor further agrees to assume and perform all other duties and obligations imposed upon it by this Contract.

In addition, all things not expressly mentioned in the Specifications but involved in the carrying out of their intent and in the complete and proper execution of the matters referred to in and required by this Contract are required by the Specifications, and the Contractor shall perform the same as though they were specifically delineated, described and mentioned therein.

2. Order of Precedence

Anything to the contrary herein notwithstanding, all Contract Specific Terms and Conditions shall be deemed to control in the event of a conflict with the Standard Terms and Conditions contained in this Contract.

3. Specific Definitions

To avoid undue repetition, the following terms, as used in this Contract, shall be construed as follows:

Government, United States Government, Federal or words of like import shall mean the United States of America.

UMTA or FTA - shall mean the United States Department of Transportation, Federal Transit Administration (formerly known as the Urban Mass Transportation Administration).

DOT - shall mean the United States Department of Transportation.

DCAA - shall mean the Defense Contract Audit Agency.

The Port Authority or Authority - shall mean The Port Authority of New York and New Jersey. As used herein, the term "Port Authority" shall also mean the Port Authority of New York and New Jersey acting on behalf of PATH.

PATH - shall mean the Port Authority Trans-Hudson Corporation

Project Manager - means the Project Manager of the Authority assigned to this project acting either personally or through his duly authorized representatives acting within the scope of the particular authority vested in them.

Investigation - Any inquiry made by any federal, state or local criminal prosecuting agency and any inquiry concerning civil anti-trust investigations made by any federal, state or local governmental agency. Except for inquiries concerning civil anti-trust investigations, the term does not include inquiries made by any civil government agency concerning compliance with any regulation, the nature of which does not carry criminal penalties, nor does it include any background investigation for employment, or Federal, State, and local inquiries into tax returns.

Item(s) – shall mean the goods, merchandise, supplies, equipment, services or articles specified.

Manufacturer – shall mean the person or entity who will actually build the specific Item to be provided as described herein.

4. Delivery Requirements

Delivery shall be FOB Destination. The Contractor shall bear all cost of freight and insurance for delivery to PATH. Delivery locations shall be coordinated with Edward Perara, the Project Manager, 201-216-6021 or his designee. All deliveries shall be made between the hours of 8:00 am and 2:00 pm, unless otherwise noted in the Specifications. The Contractor shall follow the instructions for the proper method of making deliveries. Failure to do so may result in delayed payments.

A. All deliveries must be accompanied by an original packing slip, which shall always contain:

1. The Port Authority Purchase Order and/Contract Number.
2. A description of each item.
3. The quantity shipped of each item.
4. The Contractor's packing slip/invoice number.

B. Shipping cartons shall not contain loose and/or unmarked item(s).

5. Delivery Schedule

The Contractor shall complete delivery of the Track Track Inspection Vehicle under this contract as follows:

Complete the satisfactory delivery of the Track Track Inspection Vehicle and the delivery of all other equipment and the performance of all other obligations by the Contractor under this Contract **four hundred and twenty (420)** days after the issuance of a Purchase Order.

As used herein, “Satisfactory Delivery” shall mean the delivery to PATH of equipment and other items meeting the requirements of this Contract and shall include passing such tests and inspections at PATH’s facility as are required under this Contract.

6. Progress Schedule

Within **ten (10)** calendar days after receipt of a Purchase Order and/or Notice to Proceed, the Contractor shall prepare a detailed delivery schedule, based on the schedule below and the additional items listed in Part V of this Contract, for the approval of the Project Manager. The delivery schedule shall show the date for the commencement and completion of the different portions of the Contract.

After the approval of the schedule, no changes shall be made therein without the written approval of the Project Manager. Approval of any delivery schedule shall not relieve the Contractor of his obligation to complete the Contract by the time required in the Contract, even though the schedule approved may be inconsistent with such completion, nor shall it constitute a representation by the Authority that the Contractor will be able to proceed or complete in accordance with the schedule.

Progress Schedule:

The Contractor shall meet the following milestones:

1. Within **ninety (90)** calendar days after receipt of a Purchase Order and/or Notice to Proceed, Contractor must submit for approval, the Configuration, Dimensional, Working and Shop drawings.
2. Within **three hundred and ninety (390)** calendar days after receipt of a Purchase Order and/or Notice to Proceed, Contractor must schedule the inspection of the Track Track Inspection Vehicle at the Contractor’s plant and receive approval to ship to PATH
3. Within **four hundred (400)** calendar days after receipt of a Purchase Order and/or Notice to Proceed, deliver Track Track Inspection Vehicle to PATH.
4. Within **four hundred and twenty (420)** calendar days after receipt of a Purchase Order and/or Notice to Proceed, place the Track Track Inspection Vehicle into service for clearance and test runs.
5. Within **four hundred and twenty (420)** calendar days after receipt of a Purchase Order and/or Notice to Proceed, deliver all required spare parts.

7. Time is of the Essence

The Contractor's obligation for the performance within the time provided for this Contract is of the essence of this Contract. The Contractor guarantees that it can and will complete such fabrication, supply, delivery, factory and field testing, and on-site training within the time herein stipulated.

The delivery times shall be extended (subject, however, to the provisions of this numbered clause) only if, in the opinion of the Project Manager acting personally, the Contractor is necessarily delayed in the delivery solely by fault of PATH. Further, the Contractor shall be entitled to an extension of time to the extent that delay in its performance results from floods, earthquakes, storms, lightning, fire, epidemic, strike, force majeure, civil disturbance or any other cause which is beyond the reasonable control of the Contractor as determined by the Project Manager.

Any reference herein to the Contractor shall be deemed to include suppliers and others performing on behalf of the Contractor, whether or not in privity of contract with the Contractor, and employees and others will be considered as agents of the Contractor.

8. Bill of Sale

The Contractor warrants that the item(s) is free of liens and other encumbrances. The Contractor shall promptly furnish to PATH such bills of sale and other instruments as may be required by it, properly executed, acknowledged and delivered, assuring to it title to the item(s), free of liens and other encumbrances, upon delivery of such merchandise to PATH.

9. Title to Materials

All manufactured equipment, drawings, specifications, spare parts, training programs/ materials, provided to the Port Authority shall be and become the property of the Authority upon successful completion of commissioning and acceptance testing by PATH. All equipment stored by the Contractor shall be individually marked and identified in a conspicuous manner "Property of the Port Authority of New York and New Jersey – BID # _____. Contractor shall arrange for the Project Manager to have access for inspection of equipment stored as requested. The Contractor shall bear the risk of loss for any equipment stored until its delivery and acceptance by PATH. As a prerequisite to making any payments under this clause, the Contractor shall furnish whatever documents evidencing transfer of title of equipment to the Authority that the Project Manager requires, including bills of sale and affidavits of title in forms acceptable to the Project Manager. The making of milestone payments shall not be deemed to be a final acceptance of equipment nor shall it relieve Contractor of responsibility for such equipment.

10. Invoices

An invoice with a unique invoice number and the backup delivery receipts with Contract number shall be submitted to PATH before payment can be made. The Contractor's invoice shall state:

a) The date of the delivery; and
b) Specific items for which the Contractor is billing.

All invoices shall be mailed to the address indicated on the Contract.

11. Payment

Subject to the provisions of this Contract, the Port Authority agrees to pay to the Contractor and the Contractor agrees to accept from the Port Authority as full and complete consideration for the performance of all its obligations under this Contract and as sole compensation for the items(s) and/or service(s) provided by the Contractor hereunder, a compensation calculated from the respective prices inserted by the Contractor in the Pricing Sheet(s) for actual services and goods performed/provided, forming a part of this Contract. The manner of submission of all bills for payment to the Contractor for Service(s) and/or item(s) provided under this Contract shall be subject to the approval of the Port Authority in all respects, including, but not limited to, format, breakdown of items presented and verifying records. All computations made by the Contractor and all billing and billing procedures shall be done in conformance with the clause entitled "Invoices" and the following procedures:

a) Payment shall be made in accordance with the Contract set forth below, minus any deductions and/or any applicable liquidated damages to which the invoice may be subject.

b) No certificate, payment, acceptance of any item(s) or any other act or omission of any representative of the Port Authority shall operate to release the Contractor from any obligation under or upon this Contract, or to estop the Port Authority from showing at any time that such certificate, payment, acceptance, act or omission was incorrect or to preclude the Port Authority from recovering any monies paid in excess of those lawfully due and any damage sustained by the Port Authority.

c) In the event an audit of received invoices should indicate that the correct sum due the Contractor for the relevant billing period is less than the amount actually paid by the Port Authority, the Contractor shall pay to the Port Authority the difference promptly upon receipt of the Port Authority's statement thereof. The Port Authority may, however, in its discretion elect to deduct said sum or sums from any subsequent payments payable to the Contractor hereunder.

"Final Payment", as the term is used throughout this Contract, shall mean the final payment made for the supply, delivery and acceptance of all item(s) required under this

Contract. The Contractor's acceptance of Final Payment shall act as a full and complete release to the Port Authority of all claims of and of all liability to the Contractor for all item(s) furnished in connection with this Contract and for every act and neglect of the Port Authority and others relating to or arising out of this Contract, including claims arising out of breach of contract and claims based on claims of third persons. No payment, however, final or otherwise shall operate to release the Contractor from any obligations in connection with this Contract.

Milestone Payment Schedule

Payment Schedule: The Contractor shall render invoices to PATH according to the following payment schedule:

12.
13.
14.

Payment		Payment Milestones
An amount equal to 15% of the. Unit Price for Item #1 of Part IV of the Pricing Sheet,		Upon approval of the configuration, dimensional, and Working and Shop drawings.
An amount equal to 20% of the Unit Price for Item #1 of Part IV of the Pricing Sheet		Upon approval of the Track Inspection Car at the Contractor's plant after inspection of the unit.
An amount equal to 30% of the Unit Price for Item #1 of Part IV of the Pricing Sheet		After satisfactory delivery to PATH of the Track Inspection Car.
An amount equal to the Unit Price of Item #1 of Part IV of the Pricing Sheets minus the amounts paid pursuant to sections 1, 2, and 3 above.		After satisfactory completion of the Track Inspection Car's placement into service for clearance and test runs.
An amount equal to the Unit Price of Item #2 for the spare parts.		After satisfactory delivery of all the required spare parts.

15.
16.

17. Default- Delays

If the Contractor fails to perform in accordance with the terms of this Contract, the Authority may obtain the goods or services from another Contractor and charge the Contractor the difference in price and a reletting cost, if any, plus any other damages that the Port Authority may deem appropriate.

18. Equipment Warranty

Notwithstanding the Specifications forming a part of this Contract, any inspection or approval of the item(s) by the Port Authority or the existence of any patent or trade name, the Contractor nevertheless unconditionally warrants that the item(s) specified herein shall be of the best quality and shall be fully fit for the purpose for which it is to be used.

The Contractor unconditionally warrants all equipment furnished against defects or failures of any kind, including defects or failures in design, workmanship and materials, failure to operate satisfactorily for any reason, excepting such defects or failures which the Contractor demonstrates to the satisfaction of the Project Manager have arisen solely from accident, abuse or fault of the Port Authority occurring after acceptance by the Port Authority and not due to fault on the Contractor's part for the warranty period(s) described below. In the event of defects or failures in said equipment, then upon receipt of notice thereof from the Project Manager, the Contractor shall correct such defects or failures by immediately reconstructing, repairing or making such alterations or replacement of said item(s) as may be necessary or desirable in the sole opinion of the Project Manager to comply with the above warranty and at no cost to the Port Authority.

The foregoing warranty shall not, however, be a limitation on any rights which the Authority would have, either expressed or implied, in connection with this Contract in the absence of such warranty, said warranty being given only for the greater assurance of the Port Authority. In addition, the Contractor shall provide the following specific warranties to the Port Authority:

- All equipment shall be warranted for two (2) years from date of in-service installation.
- Contractor agrees that it will make available to PATH replacement equipment, parts and service of equipment either under the warranty set forth above, or through purchase for (5) years from the date of installation. If the Contractor discontinues manufacturing or support of any product supplied, Contractor shall provide PATH with the latest drawings, parts lists and Contractor contacts and PATH shall have the right to have the product or services manufactured or provided by any other source at PATH's discretion without any additional fees.

19. Insurance Procured by the Contractor

The Contractor shall take out, maintain, and pay the premiums on Commercial General The Contractor shall take out, maintain, and pay the premiums on Commercial General Liability Insurance, including but not limited to premises-operations, products-completed operations, and independent contractors coverage, with contractual liability language covering the obligations assumed by the Contractor under this Contract and, if vehicles are to be used to carry out the performance of this Contract, then the Contractor shall also take out, maintain, and pay the premiums on Automobile Liability Insurance covering owned, non-owned, and hired autos in the following minimum limits:

Commercial General Liability Insurance - $2 million combined single Limit per occurrence for bodily injury and property damage liability.

Automobile Liability Insurance - $2 million combined single limit per accident for bodily injury and property damage liability.

Railroad Protective Liability Insurance:

$5 million combined single limit per occurrence for bodily injury and property damage. If Work is to be performed on or within 50 feet of railroad property, then the contractual liability coverage shall contain an endorsement deleting any railroad exclusion.

In addition, the liability policy (ies) shall name The Port Authority of New York & New Jersey, its related entities, their commissioners, directors, officers, partners, employees and agents as additional insured, including but not limited to premises-operations, products-completed operations on the Commercial General Liability Policy. Moreover, the Commercial General Liability Policy shall not contain any provisions for exclusions from liability other than provisions for exclusion from liability forming part of the most up to date ISO form or its equivalent unendorsed Commercial General Liability Policy. The liability policy (ies) and certificate of insurance shall contain separation of insured conditions and severability of interests clauses for all policies. These insurance requirements shall be in effect for the duration of the contract to include any warrantee /guarantee period and any maintenance period . An act or omission of one of the insureds shall not reduce or void coverage to the other insureds. Furthermore, the Contractor's insurance shall be primary insurance as respects to the above additional insureds. Any insurance or self-insurance maintained by the above additional insureds shall not contribute to any loss or claim

The certificate of insurance and liability policy (ies) must contain the following endorsement for the above liability coverages:

"The insurer(s) shall not, without obtaining the express advance written permission from the General Counsel of the Port Authority, raise any defense involving in any way the jurisdiction of the Tribunal over the person of the Port Authority, the immunity of the Port Authority, its Commissioners, officers, agents or employees, the governmental nature of the Port Authority, or the provisions of any statutes respecting suits against the Port Authority."

The Contractor shall also take out, maintain, and pay premiums on **Workers' Compensation Insurance** in accordance with the requirements of law in the state(s) where work will take place, and Employer's Liability Insurance with limits of not less than $1 million each accident.

Each policy above shall contain a provision that the policy may not be canceled, terminated, or modified without thirty (30) days' prior written notice to the Port

Authority of NY and NJ, Att: Facility Contract Administrator, at the location where the work will take place and to the General Manager, Risk Financing.

The Port Authority may at any time during the term of this agreement change or modify the limits and coverages of insurance. Should the modification or change results in an

additional premium, The General Manager, Risk Financing for the Port Authority may consider such cost as an out-of-pocket expense.

Within five (5) days after the award of this agreement or contract and prior to the start of work, the Contractor must submit an original certificate of insurance, to the Port Authority of NY and NJ, Facility Contract Administrator, at the location where the work will take place. This certificate of insurance MUST show evidence of the above insurance policy (ies), stating the agreement/contract number prior to the start of work. The General Manager, Risk Financing must approve the certificate(s) of insurance before any work can begin. Upon request by the Port Authority, the Contractor shall furnish to the General Manager, Risk Financing, a certified copy of each policy, including the premiums.

If at any time the above liability insurance should be canceled, terminated, or modified so that the insurance is not in effect as above required, then, if the Manager shall so direct, the Contractor shall suspend performance of the contract at the premises. If the contract is so suspended, no extension of time shall be due on account thereof. If the contract is not suspended (whether or not because of omission of the Manager to order suspension), then the Authority may, at its option, obtain insurance affording coverage equal to the above required, the cost of such insurance to be payable by the Contractor to the Port Authority.

Renewal certificates of insurance or policies shall be delivered to the Facility Contractor Administrator, Port Authority at least fifteen (15) days prior to the expiration date of each expiring policy. The General Manager, Risk Financing must approve the renewal certificate(s) of insurance before work can resume on the facility. If at any time any of the certificates or policies shall become unsatisfactory to the Port Authority, the Contractor shall promptly obtain a new and satisfactory certificate and policy.

The requirements for insurance procured by the Contractor shall not in any way be construed as a limitation on the nature or extent of the contractual obligations assumed by the Contractor under this contract. The insurance requirements are not a representation by the Authority as to the adequacy of the insurance to protect the Contractor against the obligations imposed on them by law or by this or any other Contract. ***[CITS#4526N]***

20. Materials and Workmanship

All Item(s) and/or Service(s) shall be manufactured and/or provided in accordance with the best current practice in the industry and free from defects. All Item(s) and/or Service(s) shall at all time and places be subject to the inspection of the Project Manager. Should any Item(s) or Service(s) fail to meet the Project Manager's approval, they shall be forthwith made good, replaced or corrected, as the case may be, by the Contractor, at its own expense. All item(s) shall be new item(s).

21. Inspection and Acceptance

Inspection and acceptance will be conducted at the destination, unless otherwise provided and agreed upon by the Port Authority and the Contractor. Any risk of loss will be the Contractor's responsibility until such delivery, inspection and acceptance is made, unless loss results from negligence of the Port Authority.

22. Errors and Omissions

If the Contractor discovers any errors or omissions in the Specifications or in the Work undertaken and executed by it, it shall immediately notify the Project Manager and the Project Manager will promptly verify the same. If, with the knowledge of such error or omission and prior to the correction thereof, the Contractor proceeds with any work affected thereby, it shall do so at its own risk, and the work so done shall not be considered as work done under and in performance of this Contract.

23. Approval by the Project Manager

The approval by the Project Manager of any item(s) shall be construed merely to mean that at that time the Project Manager knows of no good reason for objecting thereto; and no such approval shall release the Contractor from its full responsibility for the satisfactory construction and operation of the item(s). The decision of the Project Manager shall be conclusive, final and binding on the parties as to all questions arising out of, under, or in connection with this Contract (including questions of breach of Contract).

24. Changes

Acceptance of Contractor's bid will be by Contract signed by the Port Authority. The Port Authority may at any time, by a written order, make changes within the general scope of this Contract in any one or more of the following: (a) drawings, designs, or specifications; (b) method of shipment or packing; and (c) place of delivery. If any such change causes an increase or decrease in the cost of, or the time required for, performance of this Contract, an equitable adjustment shall be made in the Contract price or delivery schedule, or both, and the Contract shall be modified in writing accordingly. Any claim by the Contractor for adjustment under this section must be asserted within 30 days from the date of receipt by the Contractor of a notification of change, provided, however, that nothing in this section, "Changes," shall excuse the Contractor from proceeding with the Contract as changed. Except as otherwise provided herein no

payment for Changes shall be made, unless the Changes have been authorized in writing by the Authority.

25. Variations in Quantity

The quantities set forth in the Price Schedule are estimates; actual total quantity purchased may be greater or lower. The Port Authority reserves the right to increase or decrease the quantity of Items called for under this Contract at the Unit Prices specified. The Port Authority may exercise the option to vary the quantity by written notice to the Contractor. Delivery of the additional quantity of Items shall continue at the same rate as the like items called for under the Contract, unless the parties otherwise agree. All items to be added shall be set forth in a Change Order.

26. DBE Program

This Contract is subject to the United States Department of Transportation regulations on Disadvantaged Business Enterprises (DBEs) contained in Part 26 of Title 49 of the Code of Federal Regulations. The following goal for DBE participation has been set for this Contract:

One (1) % for firms owned and controlled by socially and economically disadvantaged individuals[1] and certified as DBE's by the Authority. Eligible DBE firms are listed on the following Uniform Certification Programs (UCPs) websites:

New York UCP – http://www.nysucp.net/

New Jersey UCP – http://www.njucp.net/

By bidding on this Contract, the bidder assures the Authority that it will meet the foregoing goal and shall submit the DBE Goals Statement form (Appendix A1) with its Bid. If the bidder determines it cannot make this assurance it may nevertheless submit a bid but in such event it shall note on the DBE Goals Statement form the percentage of DBE participation it anticipates, including documentation supporting the good faith efforts made to achieve the goals set forth in the Contract.

The bidder shall submit with his Proposal the DBE Participation Plan and Affirmation Statement (Appendix A2) for each DBE firm he intends to use on this Contract. The DBE Participation Plan and Affirmation Statement shall provide the name and address of each DBE firm, a description of the work to be performed, the dollar value of each DBE subcontract and the signature affirmation from each DBE firm participating in this Contract.

A bidder who fails to meet the DBE goal for this Contract and fails to demonstrate to the Port Authority that the bidder has made good faith efforts to meet same shall not be eligible to be awarded the Contract. The following are illustrative of good faith efforts:

A. Attendance at a pre-bid meeting, if any, scheduled by the Authority to inform DBEs of subcontracting opportunities under a given solicitation;
B. Advertisement in general circulation media, trade association publications, and minority-focused media for at least 20 days before bids or proposals are due. If 20 days are not available, publication for a shorter reasonable time is acceptable;
C. Written notification to DBEs that their interest in the Contract is solicited;

D. Efforts made to select portions of the work proposed to be performed by DBEs in order to increase the likelihood of achieving the stated goal;
E. Efforts to negotiate with DBEs for specific sub-bids including at a minimum;
    1. The names, addresses, and telephone numbers of DBEs that were contacted;
    2. A description of the information provided to DBEs regarding the plans and specifications for portions of the work to be performed; and
    3. A statement of why additional agreements with DBEs were not reached;

[1] Individuals who are rebuttably presumed to be socially and economically disadvantaged include women, Blacks, Hispanics, Native Americans, Asian-Pacific Americans, and Asian-Indian Americans. A bidder may meet the DBE goal by using any combination of disadvantaged businesses.

F. Information concerning each DBE the bidder contacted but rejected as unqualified, and the reasons for the bidder's rejection;
G. Efforts made to assist the DBEs contacted that need assistance in obtaining bonding or insurance required by the bidder or Authority.

The bidder shall submit with its Bid the completed Information on Solicited Firms form (Appendix A3) listing every firm that provided a quotation to the bidder for any subcontract to be performed under this Contract, whether or not the firms are DBE certified and whether or not the firms' quotes were included in the final Bid.

27. Attachment A – Federal Transit Administration Requirements - (Attached)

28. Attachment B – Standard Contract Terms and Conditions – (Attached)

PART IV – SIGNATURE SHEET, NAME AND RESIDENCE OF PRINCIPALS SHEET AND PRICING SHEET(S), TABLE OF CONTENTS

PART IV – SIGNATURE SHEET, NAME AND RESIDENCE OF PRINCIPALS SHEET AND PRICING SHEET(S)

1. SIGNATURE SHEET

OFFER: The undersigned offers and agrees to furnish to the Port Authority of New York and New Jersey the services and/or materials in compliance with all terms, conditions, specifications and addenda of the Contract. Signature also certifies understanding and compliance with the certification requirements of the standard terms and conditions as contained in the Standard Contract Terms and Conditions. This offer shall be irrevocable for 90 days after the date on which the Port Authority opens this bid.

ONLY THE COMPANY NAMED AS THE BIDDING ENTITY BELOW WILL RECEIVE PAYMENT. THIS MUST BE THE SAME NAMED COMPANY AS INDICATED ON THE COVER SHEET

Bidding Entity _____
Bidder's Address _____
City, State, Zip _____
Telephone No. _____ FAX _____
Email _____ EIN# _____

SIGNATURE _____Date _____
Print Name and Title _____

Note: This offer shall be irrevocable for 90 days after the date on which the Port Authority opens this bid.

_____

Signature of Person Signing Above

ACKNOWLEDGEMENT:
STATE OF: _____
COUNTY OF: _____-

On this____day of_____, 20___, personally came before me, _____,who, duly sworn by me, did depose that (s)he has knowledge of the matters herein stated, that they are in all respects true and that (s)he has been authorized to execute the foregoing offer and statement of irrevocability on behalf of said corporation, partnership or firm.

_____
Notary Public

NOTE: If a joint venture is allowed, duplicate this Signature Sheet and have each party to the joint venture sign separately and affix to the back of this Signature Sheet.

Bidder attention is called to the certification requirements contained in the Standard Contract Terms and Conditions, Part III. Indicate below if a signed, explanatory statement in connection with this section is attached hereto. ☐

If certified by the Port Authority as an SBE or MWBE:_____(indicate which one and date).

2. NAME AND RESIDENCE OF PRINCIPALS SHEET

Names and Residence of Principals of Bidder. If general or limited partner, or individual, so indicate.

NAME	TITLE	ADDRESS OF RESIDENCE (Do not give business address)

3. PRICING SHEET(S)

Entry of Prices

a. The prices quoted shall be written in figures, in ink, preferably black ink, where required in the spaces provided on the Pricing Sheet(s) attached hereto and made a part hereof.

b. All Bidders are asked to ensure that all charges quoted for similar items in the Contract are consistent.

c. Prices must be submitted for each Item required on the Pricing Sheet(s).

d. All Bidders are asked to ensure that all figures are inserted as required, and that all computations made have been verified for accuracy. The Bidder is advised that the Port Authority may verify only that Bid or those Bids that it deems appropriate and may not check each and every Bid submitted for computational errors. In the event that errors in computation are made by the Bidder, the Port Authority reserves the right to correct any error and to recompute the Total Delivered Contract Price, as required, based upon the applicable Unit Price inserted by the Bidder, which amount shall govern in all cases.

e. In the event that a Bidder quotes an amount in the Total Price column but omits to quote a Unit Price for that amount in the space provided, the Port Authority reserves the right to compute and insert the appropriate Unit Price.

f. The Estimated Total Delivered Contract Price is solely for the purpose of facilitating the comparisons of Bids. Compensation shall be in accordance with the section of this Contract entitled “Payment”.

Pricing Sheet

Item No.	Description	Estimated Qty	Unit	Unit Price
1	Inspection Vehicle - Design, Manufacture, Deliver	1	each	$
2	Spare Parts	1	lot	$
	TOTAL DELIVERED CONTRACT PRICE:			$

LEAD TIME:
Indicate lead-time necessary for completion of fabrication testing and delivery of equipment in accordance with Part III, paragraph entitled "Delivery Requirements"):

_____ Weeks after return of approval drawings

Bidder shall certify in the form prescribed below (CERTIFICATE OF CURRENT COST OR PRICING DATA) that, to the best of its knowledge and belief, the cost or pricing data submitted was accurate, complete and current.

AWARD WILL BE MADE TO THE RESPONSIVE AND RESPONSIBLE BIDDER WITH THE LOWESTTOTAL LUMP SUM BID PRICE.

CERTIFICATE OF CURRENT COST OR PRICING DATA:

This is to certify that, to the best of my knowledge and belief, the cost or pricing data submitted, either actually or by specific identification in writing, to The Port Authority of NY & NJ or to The Port Authority of NY & NJ's representative in support of:

Bid No#_____ are accurate, complete, and current as of [Insert Date]*.

This certification includes the cost or pricing data supporting any advance agreements and forward pricing rate agreements between the offeror and The Port Authority of NY & NJ that are part of the bid.

Firm:_____

Signature:_____

Name:_____

Title:_____

Date:_____

TECHNICAL SPECIFICATIONS FOR PATH'S TRACK INSPECTION VEHICLE

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SECTION 1

1.0 GENERAL DESCRIPTION AND REQUIREMENTS

(Figures at the beginning of section indicate the serial numbers of sections.)

1.1 Work to be Done

1.1.1 The Contractor shall design, furnish and deliver one (1) Track Inspection Vehicle and associated spare parts, Manuals and training, complete with all accessories and appurtenances as specified herein, and shall perform all work, including incidental and miscellaneous work, as set forth in these Contract Documents. The self-propelled Track Inspection Vehicle shall be capable of recording and analyzing the geometry of PATH tracks as set forth in these Specifications, including: track gradients; measurement of tunnel clearances, rail geometry, internal rail flaw detection, guard rail gauge, third rail and platform gauge and height, and thermal imaging. The Track Inspection Vehicle shall be designed for a minimum of fifteen (15) years of life and shall have operating cabs on both ends of the vehicle.

1.1.2 The details of the work are given in this Part V, and in the Contract Drawings and Technical Specifications herein mentioned, ("Specifications") which form a part of this Contract.

1.1.3 The Track Inspection Vehicle to be furnished and delivered under this Contract shall be of the latest type in production at the time of delivery and shall be designed for use on the rapid rail transit lines of the Port Authority Trans-Hudson Corporation ("PATH"). These Specifications are intended to set forth the performance requirements for the Track Inspection Vehicle. The Contractor is solely responsible for its design, arrangement, construction, satisfactory operation and conformance to the Contract Documents in a manner which is consistent with the best engineering and construction practices.

1.1.4 The Track Inspection Vehicle, as herein specified, shall be delivered duty paid (D.D.P.) to a location on PATH property to be designated by the Project Manager. Spare parts shall be addressed as specified by the Project Manager.

1.1.5 Parts which in the course of normal operation and maintenance will require replacement or repair shall, whenever possible, be standard stock items.

1.1.6 Where required, the Contractor shall submit documentation (drawings, analyses, etc.) with detailed technical information in order to demonstrate compliance with these Specifications. PATH's review, comments, or approval will not relieve the Contractor of his sole responsibility for the Track Inspection Vehicle design. In addition, if requested by the Project Manager, the Contractor shall submit any additional documentation.

1.2 Quality of Work

1.2.1 In the event of any doubt as to the meaning of any portion of the Specifications or of the text of the Contract, they shall be interpreted as calling for the best quality, both as to materials and workmanship, to be supplied and applied. Where no specific requirements are given, the equipment shall conform to the latest standards.

1.2.1.1 U.S. origin components shall comply with **Institute of Electrical and Electronic Engineers (**IEEE) standards for electrical/electronic details, American Socity forTesting and Materials (ASTM) for materials, ISO 9000 for quality standards, both **Occupational Safety and Health Administration (**OSHA) and Environmental protection Agency (EPA) for emission requirements, and Association of American Railroads (AAR) and/or American Institute of Steel Construction (AISC) for other details and Federal Railroad Administration (FRA) and American Railway Engineering and Maintenance (AREMA).

1.2.1.2 Although not required, but if used, European origin components shall comply with the latest standards set forth by International Electrotechnical Commision (IEC) for electrical/electronic details, ISO, E.N., N.F. for materials, ISO 9000 for quality standards and Universal Instruments Corporation (UIC) for other details.

1.2.1.3 U.S. equivalent standards: In the interest of safety and equipment maintenance, the Contractor shall furnish U.S. equivalent standards of any foreign-made components. When requested by the Project Manager, the Contractor shall be responsible for obtaining and comparing non-U.S. standards of Contractor parts with the corresponding U.S. standards and shall furnish this information to the Project Manager for his concurrence. If, in the Project Manager's sole opinion, specific materials, parts, equipment, or workmanship on the Inspection Car may concern PATH regarding safety under all conditions or availability and compatibility for future repairs, replacements and maintenance, the Contractor shall compare applicable foreign standards against the corresponding U.S. standards and present the comparison to the Project Manager for his concurrence.

1.2.1.4 In all specific references to such standards, or to similar general Specifications contained herein, only those figures representing the fixed designation are cited. Any requirements referring to any of PATH's Specification(s) shall be of the latest revision at the time of the award date of the Contract.

1.2.2 The Contractor is required to do all things required by this Contract, even if the requirement is not listed explicitly in the Specifications. The Specifications, the other provisions of this Contract, and the Contract Drawings and Technical Specifications attached to this Part V and made a part of the Specifications are intended to be explanatory of one another. Any work shown on the Contract Drawings but not mentioned in the Specifications and/or any work mentioned in the Specifications but not shown on the Contract Drawings shall be done in the same manner as if mentioned in the Specifications and set forth on the Contract Drawings to the true intent and meaning of said Contract Drawings and Specifications or either of them. Should a discrepancy or

need for clarification arise, as to the import of a requirement contained in either, the explanation or decision of the Project Manager shall be final and conclusive.

1.2.3 Equipment Protection and Access Requirements. All equipment furnished and installed on the Track Inspection Vehicle shall be designed for maximum protection against dust (including steel dust), dirt and moisture entry. All items of equipment and the parts thereof shall be constructed of high quality modular units allowing for fast, easy and efficient removal and replacement of said units and parts thereof. All covers, doors, access panels, etc. on the equipment that are opened for regular periodic inspection and maintenance shall be held captive and designed to permit quick and convenient access for inspection and maintenance. Also, they shall be designed so that for all positions, they remain within the car clearance envelope and do not come into physical contact with other components. Covers, doors, access panels, etc. which cannot be designed so that for all positions they remain within the car clearance envelope, shall have safety locks as approved by the Project Manager. Generally, all covers shall be hinged at the top unless approved by the Project Manager. Heavy equipment, which cannot be removed by hand, shall be designed for quick and easy removal using PATH's standard lifting equipment. Manuals for such equipment shall include detailed procedures for removal and installation.

The Contractor shall be solely responsible for the proper design of all such equipment to meet these requirements.

1.3 Operation, Inspection and Maintenance Manuals, Parts Catalog, and Quick Schedule Maintenance and Reference Handbook.

1.3.1 Requirements. The Contractor shall furnish five (5) Operation Manuals, five (5) Inspection Manuals, five (5) Maintenance Manuals, five (5) Part Catalogs; and five (5) Quick Schedule Maintenance and Reference Handbook for all systems, all in separate volumes, and shall deliver the Manuals and catalogs as directed by the Project Manager. No platform or sidewalk deliveries of packages heavier than seventy five (75) pounds will be accepted. In addition, two (2) copies of each Manual shall be provided on electronic format, using latest version of Microsoft Word at the time of delivery. The electronic copy shall be furnished on CD-ROM disks or flash drive.

1.3.2 The Manuals and Catalogs shall comply with the following requirements:

1.3.2.1 The Manual and Catalogs shall be designed for continuous, long-term service. At least two (2) copies of the above mentioned Manuals shall be laminated.

1.3.2.2 All publications shall be in loose-leaf form on 60 pound (minimum) offset paper. Indexing sheets shall be twenty four (24) pounds stock white paper with punch holes reinforced with plastic, cloth, or metallic material, in a binder with at least three (3) rings. Five or seven ring binders are acceptable in lieu of reinforced paper. Each page of the Manual shall be numbered at the bottom.

1.3.2.3 Manuals and Catalogs shall have pages that are 8 $^{1}/_{2}$ inches wide by 11 inches high, plus appropriate bindings and cover(s).

1.3.2.4 All covers shall have a high degree of resistance to oil, moisture, and wear commensurate with their intended use. A sample of the binder covers and a laminated page of a manual shall be submitted to the Project Manager for approval.

1.3.2.5 Diagrams and illustrations shall not be loose or in pockets. Submit key plans showing equipment locations and line drawings, as well as functional connections for each subsystem.

1.3.3 Submission and Procedures. At the time of delivery of the Track Inspection Vehicle, the Contractor shall submit three complete draft copies of the Operation Manual, Inspection Manual, Maintenance Manual, Quick Maintenance and Reference Manual, and Parts Catalog for approval. The Project Manager will review the Manuals and return them to the Contractor after acceptance of the Track Inspection Vehicle. Additional draft sets may be required to resolve all comments. Two (2) months after f the final PATH approval of the draft Manuals and Parts Catalog, the Contractor shall deliver the required number of copies.

1.3.4 Manual Update/Correction. Following the issuance of each publication, the Contractor shall provide new and/or revised insert pages covering changes, whether by change of design or procedures or due to error, and the revisions shall be kept current during the warranty period. Manual and Catalog revisions shall be supplied on or before delivery of any altered parts or components.

1.3.5 Content of Documentation. The Track Inspection Vehicle's documentation shall consist of five (5) books, namely, Operation Manual, Inspection Manual, Maintenance Manual, Quick Maintenance and Reference Manual and Parts Catalog, which shall address all systems included in the Track Inspection Vehicle. The description and outline of each document is as follows:

1.3.5.1 Operation Manual

The Operation Manual shall serve to instruct personnel on how to safely operate the equipment. It shall contain a general overview of the equipment, pre-startup and post-startup inspection procedures to be performed by the operator and specific instructions for the Track Inspection Vehicle's operation and detailed emergency rescue procedures in case of failure. The Operations Manual shall address train movement and the working measurement systems portion as separate subjects. This Manual shall be outlined is as follows:

1.3.5.1.1 Description - A description of all operating controls and all the equipment that is subject to an operator's inspection. The descriptions shall cover operating principles so that the operator will have a better understanding of how the equipment functions.

1.3.5.1.1.1 Transit Portion – Shall consist of a description of all equipment related to the movement

and control of the equipment.

-Operation - Specific line item operating instructions for the equipment.
-Pre-Startup Inspection
-Engine Starting
-Post-Startup Inspection
-Brake Equipment Set Up, Testing, and Operation
-Track Inspection Vehicle Movement
-Track Inspection Vehicle Shutdown
-Minor Troubleshooting

1.3.5.1.1.2 Track Measuring Systems Portion - Shall consist of a detailed description of the principles and the operating function of all the equipment related to the Track Measuring Systems.

-Operating Principles- Specific description of operating principles and operating instructions for the equipment.
-Preliminary Inspection
-System Startup
-Track Measuring Systems Operation
-Track Measuring Systems Shutdown
-Quality of Data and Minor Troubleshooting

1.3.5.2 Inspection Manual

The Inspection Manual shall serve as a guide for inspection personnel to ensure that the equipment is in proper working order so that it may operate safely and efficiently. The Manual shall include a detailed periodic inspection procedure, specifications and capacities of all fluids and lubricants on the equipment, and a troubleshooting chart. The Manual shall also address the Track Measuring equipment separately from the travel portion. This Manual shall be outlined as follows:

1.3.5.2.1 Periodic Inspection - This section shall consist of a list of all required inspection procedures (including tolerances) that are to be performed on a regular basis in order to ensure the safe operation of the equipment. The material shall be organized by the most frequent cycle to the least frequent cycle of recommended inspection interval and major subassembly. For example:

Transit Portion
- Daily Inspection:
  - Diesel Engines
  - Hydraulic Systems
  - Air Systems
  - Electrical Systems
  - Rotating Equipment
  - Mechanical Equipment

-Monthly Inspection: Diesel Engines, etc.
-Quarterly Inspection
-Semiannual Inspection
-Annual Inspection, etc.

Track Measuring Portion
-Daily Inspection
-Monthly Inspection
-Quarterly Inspection
-Semiannual Inspection
-Annual Inspection, etc.

Note: The inspection interval of the transit portion of the equipment is based on the inspection intervals that are currently in use by PATH. The inspection intervals of the Track Measuring portion of the equipment may be organized in a fashion that is more applicable to the equipment, such as hours of operation, or fuel consumed.

1.3.5.2.2 Fluids, Lubricants and Capacities - This section shall consist of detailed specifications of all liquid substances that are in use on the equipment and their required capacities. The Contractor shall include the Material Safety Data Sheets (MSDS) for each fluid and lubricant used on the Track Inspection Vehicle. In the event an MSDS is not available for a substance, the Contractor shall provide detailed specifications of the substance and its required capacities that are in use on the equipment, and the data shall be presented in a fashion similar to MSDS in terms of content and organization. The data shall provide PATH the means to cross-reference the materials in use with those of their regular suppliers.

1.3.5.2.3 Troubleshooting - This section shall consist of a troubleshooting matrix to be used as a quick reference chart for diagnosing problems with the equipment. The material shall be organized by major systems, and it shall address common problems associated with each system in a manner similar to the following example:

Diesel Engine

SYMPTOM	POSSIBLE CAUSE	REMEDY
Engine misfires or runs rough.	Fuel pressure is low.	Check fuel tank level (Pg.1-23). Check fuel pressure. The outlet pressure of the fuel transfer pump must be 30psi (207kPa) at full load. If fuel pressure is lower than 20 psi (140kPa), replace primary and secondary fuel filter elements (Pg.II-2.1). If fuel pressure is still low, replace fuel transfer pump (Pg.V-2.3.1).
	Air in fuel system.	Locate and repair air leak as necessary.

	Leak would most likely be located on the suction side of the fuel transfer pump (See Drawing X.123).
Leak in fuel line.	Check for leaks or bad bends in fuel lines between fuel tank and fuel transfer pump. Leak may also occur between injection pump and injection valve. Repair as necessary (injection pump, Position 34).

Symptom, Possible Cause and Remedy items shall be placed in the order from the most to the least frequent/possible.

Instructions for the use of the diagnostic system shall also be included in this section.

1.3.5.3 Maintenance Manual

The Maintenance Manual shall provide a detailed analysis of each component so that maintenance personnel can efficiently and safely service, inspect, maintain, adjust, troubleshoot, repair and replace the equipment. The front portion of the Manual shall consist of the bulk of the material presented in the inspection Manual so that the maintenance personnel shall have the same point of reference that the inspection personnel have. The remaining portions of the Maintenance Manual shall be organized by the major systems of the Track Inspection Vehicle, and each section shall contain the information needed for maintenance and repair of the components used in each system. The outline shall be as follows:

1.3.5.3.1 Periodic Inspection - Same as 1.3.5.2.1.

1.3.5.3.2 Fluids, Lubricants, and Capacities - Same as 1.3.5.2.2.

1.3.5.3.3 Troubleshooting - Same as 1.3.5.2.3.

1.3.5.3.4 Electrical Systems:

1.3.5.3.4.1 Electrical Schematics and Wiring Diagrams - This section shall consist of a complete set of electrical schematics and wiring diagrams of the Track Inspection Vehicle.

1.3.5.3.4.2 Electrical Component Description - This section shall consist of a brief description of the function of each electrical component. It shall include a description of what must occur to activate the component and what the component shall do once it is activated.

1.3.5.3.4.3 Control Theory - This section shall consist of a narrative description of the control logic employed on the equipment of the Track Inspection Vehicle. This section shall be organized as follows:

Transit Portion
Engine Start Circuits

Engine Stop Circuits
Operating Control Circuits
Fail-Safe Circuits (if applicable)

Track Measuring Systems
Operating Control Circuits
Low Voltage Circuits
High Voltage Circuits
Fail Safe Circuits/Features (if applicable)

1.3.5.3.4.4 Electrical Component Maintenance - This section shall consist of the procedures involved in the inspection, adjusting, testing, maintenance, disassembly and assembly of the electrical components used on the equipment of the Track Inspection Vehicle.

1.3.5.3.5 Air Systems - This portion of the Maintenance Manual shall be arranged and described as follows:

Transit Portion
-Main Air System
Air Brake Schematic
Air Brake Control Logic - This section shall consist of a description of the function and theory of operation of each component as well as of the entire air brake system.
Air Brake Maintenance - This section shall consist of the procedures involved in the inspection, adjusting, testing, maintenance, disassembly and assembly of the air brake components used on the Track Inspection Vehicle.
Air Compressor Maintenance - This section shall consist of the maintenance and repair procedures outlined in the air compressor manufacturer's documentation.
Miscellaneous Air Equipment Maintenance - This section shall consist of the maintenance and repair procedures of miscellaneous air equipment, such as air dryers, filters, drain valves, magnet valves, etc.

Track Measuring Systems Portion - This section shall consist of the inspection, adjusting, testing, maintenance, disassembly and assembly procedures required for the servicing of the air systems that are employed in the Track Measuring Systems portion of the vehicle, if applicable.

1.3.5.3.6 Diesel Engines - This portion of the Maintenance Manual shall be arranged and described as follows:

-Diesel Engine - Propulsion
Operation and Maintenance - This section shall consist of the engine manufacturer's standard operating and regular maintenance procedures.

-Specifications - This section shall list the detailed specifications and tolerances of the diesel engine system.

-Testing and Adjusting - This section shall consist of the engine manufacturer's recommended procedures for the testing and adjusting of the diesel engine system.

-Disassembly and Assembly - This section shall consist of the engine manufacturer's procedures for the disassembly and assembly of the diesel engine systems.

-Engine Cooling Systems - This section shall consist of the manufacturer's procedures for the maintenance and repair of the diesel engine cooling system.

-Engine Air Intake Systems - This section shall consist of the manufacturer's procedures for the maintenance and repair of the diesel engine air intake system.

- Engine Exhaust System - This section shall consist of the manufacturer's procedures for the maintenance and repair of the diesel engine exhaust system.

1.3.5.3.7 Hydraulic Transmission - This portion of the maintenance shall be arranged and described as follows:

- Operation and Maintenance - This section shall consist of the transmission manufacturer's standard operating and regular maintenance procedures.

- Specifications - This section shall list the detailed specifications and tolerances of the transmission system.

- Testing and Adjusting - This section shall consist of the transmission manufacturer's procedures for the testing and adjusting of the transmission system.

- Disassembly and Assembly - This section shall consist of the transmission manufacturer's procedures for the disassembly and assembly of the transmission system.

1.3.5.3.8 Rotating Equipment - This section shall consist of the manufacturer's procedures for the maintenance and repair of electrical and mechanical rotating equipment. The propulsion and Track Measuring systems shall be discussed separately. Examples of the equipment to be discussed are pumps, generators, alternators, drive motors, etc.

1.3.5.3.9 Mechanical Equipment - This portion of the Maintenance Manual shall be arranged and described as follows:

-Cabs or interior operating compartment – This section shall consist of the procedures for the cab(s) or operating ends inspection, maintenance and repair.

-Carbody – This section shall consist of the procedures for the carbody structure inspection, fasteners, welds, etc.

-Brake Rigging - This section shall consist of the procedures for brake rigging

inspection, brake cylinder piston travel adjustment and brake shoe renewal.

-Side Bearing and Safety Hooks - This section shall consist of the procedures for side bearing and safety hooks inspection and wear plate removal.

-Truck Removal and Repairs - This section shall consist of the procedures for the different methods of truck removal and installation with jacks, drop table and overhead crane. This section shall also include procedures for truck spring renewal, equalizer bar spacing and truck frame structural repairs.

-Center Bearing - This section shall consist of the procedures for center bearing lubrication, inspection, and wear ring renewal.

-Pedestal-Guide Wear Plates and Journal Bearing Adapters - This section shall consist of the procedures for the inspection and wear plate renewal of the pedestal-guide and journal bearing adapters.

-Journal Bearings - This section shall consist of the procedures for journal bearing inspection, removal from and installation on the axle, bearing disassembly and re-assembly and lubrication.

-Gear Unit - This section shall consist of procedures for the inspection, maintenance and repair of the gear unit.

-Wheels, Gears and Axle Assembly - This section shall consist of the procedures for the inspection, maintenance, repair, disassembly and assembly of the wheels, gears and axle assemblies.

-Parking Brake - This section shall consist of the procedures for the inspection, lubrication and maintenance of the parking brake assembly.

1.3.5.3.10 Track Measuring Systems – Shall provide a detailed description of each system that is used to inspect and measure the tracks and tunnels of the PATH rail system. This section shall describe each component so that maintenance personnel can efficiently and safely service, inspect, maintain, adjust, troubleshoot, repair and replace the equipment.

1.3.5.4 Parts Catalog

The Parts Catalog shall enumerate and describe each component and its related parts including the name and part number of the prime manufacturer and a generic description of parts, which will allow PATH to purchase any part competitively. The Parts Catalog shall be formatted in such a manner as to be easy to understand and use. The end user of the catalog should be able to locate a part number of an item by using the table of contents and illustrations when the part number is not known. The user should be able to locate a description, a part's location on the vehicle, and an illustration of the part when

its number is known. Each part listed in the catalog shall have an assigned Contractor part number, the name and part number of the Contractor's supplying Contractor. The Parts Catalog shall consist of an introductory section followed by a numerical index and the illustrated parts listing. The outline of the catalog shall be as follows:

1.3.5.4.1 Introduction - The introduction shall consist of an explanation of how to use the Parts Catalog when a part number is either known or not known, and it shall also contain an explanation of all symbols and abbreviations used in the various sections of the catalog. The introduction shall also include the names and addresses of all manufacturers that supply items that do not have a Contractor part number.

1.3.5.4.2 Numerical Index - The numerical index shall consist of a complete listing of all parts listed in the Parts Catalog, and it shall be sorted by Contractor part number in alphanumeric sequence. The index shall include all Contractor parts numbers, and original manufacturer's part number (where applicable). A brief description of the part listed in the index shall be shown, followed by the figure and index number at which the part appears in the catalog.

1.3.5.4.3 Illustrated Parts List - The illustrated parts list shall contain a breakdown of all systems, assemblies and subassemblies that can be disassembled, reassembled or replaced. The listings shall consist of an illustration that shall be assigned a figure number, and it shall be followed by a parts list that indicates the description and part numbers of the parts shown in the illustration. Each illustration shall incorporate index number call outs of each specific part shown, and these index numbers shall be listed in the parts list for reference.

1.3.5.4.4 Illustrations - The illustrations shall be organized in a fashion that shall reflect the hierarchical relationship from the top assembly to the lowest level subassembly, and the figure numbers that are assigned should reflect this relationship. For example:

Fig. #: 1 - Top Assembly Shown in Catalog

1.1	Engine Systems
1.1.1	Cooling System Assembly
1.1.1.1	Radiator Assembly
1.1.1.2	Cooling Fan Assembly
1.1.2	Exhaust Assembly
1.1.2.1	Catalytic Converter Assembly
1.1.2.2	Muffler Assembly
1.2	Air Systems
1.3	Electrical Systems
1.4	Mechanical Systems
1.4.1	Truck Assembly
1.4.1.1	Brake Rigging Assembly
1.4.1.1.1	Slack Adjuster Assembly

1.4.1.2 Journal Bearing Assembly

1.3.5.4.5 Parts Listing - The information in the parts list portion of each figure shall be arranged in five columns as follows:

1.3.5.4.5.1 Index Number - This column shall list the index number as shown on the corresponding illustration of the part being referenced.

1.3.5.4.5.2 Contractor's Part Number - This column shall list the Contractor's name and parts number of the part being referenced.

1.3.5.4.5.3 Omitted.

1.3.5.4.5.4 Part Description - This column shall list a brief written description of the part being referenced. Where applicable, the description field shall be indented to show the relationship of the item being referenced and the next higher assembly within the figure. For example:

Top Assembly Shown in Figure
Subassembly #1
Subassembly #2
Sub-Subassembly #1

The wording of the description field shall be arranged so that the identifying noun or key word shall always be the first part of the description, followed by any modifying words and separated by a comma. The following examples show the wording and capitalization arrangements:

Contactor, Generator field
Bearing, Journal

1.3.5.4.5.5 Units per Assembly - This column shall list the quantity of the part listed per next higher assembly. For example, there would be a quantity of four (4) journal bearings per truck assembly, and there would be a quantity of two (2) truck assemblies per car.

1.3.5.4.6 PATH Submission – Once the draft of the Manual is done, submit the draft to PATH for comments. Upon receipt of these comments, the necessary edits will be completed and the Manual shall be resubmitted for review. Any additional edits will be incorporated as necessary. When all the Manuals have been given final approval by PATH, the required number of copies shall be printed and delivered to PATH, in accordance with paragraph 1.3.1 above.

1.3.5.5 Quick Maintenance and Reference Handbook:

This Manual shall provide a list of all the parts that need to be serviced on all the systems in the Track Inspection Vehicle. This list shall be color coded according to the maintenance scheduled and it shall refer to a Track Inspection Vehicle picture or drawing so that unseasoned maintenance personnel can quickly and efficiently service, inspect,

maintain, adjust, troubleshoot, repair and replace the equipment. The parts listed shall refer to a page in other Manuals for further information. In the same manner, this Manual shall also list the part number and location of circuit breakers, relays, circuit boards, pressure gauges, air valves and other parts that are essential for everyday operation. Finally, it shall provide steps to follow in emergency situations such as when the Track Inspection Vehicle needs to be towed.

1.4 Car History Books.

The Contractor shall submit to the Project Manager one (1) Car History Book for each car at the time of delivery. Each book shall contain the following specific car information:

1.4.1	Index
1.4.2	General Arrangement Drawings
1.4.3	Car Number
1.4.4	Approved test reports
1.4.5	Truck data
1.4.5.1	Serial numbers of frames and major components (motor, air brake valves, trip cocks, etc.)
1.4.5.2	Wheels, axle and journal bearing assembly data
1.4.5.3	Wheel press recordings
1.4.5.4	Truck weight and dimensions
1.4.5.5	Final inspection sheets
1.4.6	Carbody
1.4.6.1	Serial numbers of major components (motors, pumps, compressors, etc.)
1.4.6.2	Underframe arrangement
1.4.6.3	Final inspection sheets
1.4.6.4	Carbody weight
1.4.7	Track Measuring Systems
1.4.7.1	Serial numbers of major components
1.4.7.2	Final inspection sheet
1.4.8	Completed car
1.4.8.1	Weight and dimensions
1.4.8.1.1	The weight of each end of each car fully equipped in readiness for delivery
1.4.8.1.2	The weight ticket from certified scale shall be furnished with the car
1.4.8.1.3	The weight of each fully equipped truck
1.4.9	Shipping documents
1.4.9.1	The Contractor shall furnish to the Project Manager for inclusion in the Car History Book, documentation recording changes made during the acceptance and warranty periods.

1.5 Systems Manager

The Contractor shall be solely responsible for the design, interface and performance of

each system and subsystem. As "Systems Manager," the Contractor shall promptly notify all subsystem suppliers of any and all changes in car design which may affect size, weight, application or performance (or any other characteristic) of such subsystem supplier's equipment. There shall be no degradation of performance of any component, system or subsystem due to design change of another component, system or subsystem.

1.6 Meetings and Correspondence

All meetings between PATH and the Contractor and/or Contractor's suppliers shall be held at PATH or at a location approved by the Project Manager. All meetings, including teleconference meetings, held between PATH and the Contractor or Contractor's suppliers shall be confirmed by the Contractor in writing. A set of draft meeting notes shall be submitted by the Contractor no later than five (5) business days after the meeting to PATH for review and concurrence by the Project Manager. The Contractor must reconcile comments, if any, and finalize meeting minutes within five (5) business days of receipt.

1.7 Close Observation Required

Close observance of all the requirements of these Specifications is required and no departure therefrom will be allowed, except upon the written permission of the Project Manager.

1.8 Inspection

1.8.1 The Contractor shall inspect and physically or functionally acceptance test all items to be delivered under the terms of this Contract. Inspection shall be in accordance with the Contractor's quality control program.

1.8.2 PATH reserves the right to conduct thorough and detailed inspection(s) by the Project Manager and his representatives or subordinates of all work and materials. PATH has the right to draw the Contractor's attention to all defects in workmanship or materials and other errors or variations from the requirement of this Contract. But no omission on the part of PATH or the Project Manager or any of their representatives or their subordinates to point out such errors, variations or defects shall give the Contractor any right or claim against the Contracting Party or PATH or shall in any way relieve the Contractor from his obligations according to the terms of this Contract.

1.8.3 The right of inspection by PATH herein provided is intended solely for PATH's benefit; and the Contractor covenants and warrants that the Equipment furnished and delivered hereunder shall be free from patent and latent defects, which PATH is not in any manner bound by inspection or otherwise to discover.

1.8.4 The Contractor shall, within thirty (30) business days from the date of Notice of Award, start submitting to the Project Manager, in writing, the name of the manufacturer of major parts entering into the work under this Contract and shall continue to submit the names of

such manufacturers promptly. The Project Manager's approval shall be obtained before any approved equal device or material may be installed or used. The Contractor shall not purchase material or apparatus disapproved by PATH for installation under this Contract.

1.8.5 The Project Manager and his representatives shall have all the necessary facilities at the Contractor's site to perform their work in accordance with this Contract.

1.8.6 The Contractor shall notify the Project Manager at least twenty (20) business days in advance of the time when an item is ready to be inspected.

1.8.7 Within ten (10) business days of completion of each inspection, a complete inspection report shall be submitted to the Project Manager for approval.

1.9 Shipment of the Track Inspection Vehicle

The Contractor shall be fully responsible for all costs for the Track Inspection Vehicle during shipment and until it is in a ready-for-service condition on PATH's tracks as approved by the Project Manager. Twenty (20) business days prior to the shipping date, the Contractor shall submit a complete shipping plan to the Project Manager for approval.

1.9.1 The Track Inspection Vehicle shall be delivered ready for service by the Contractor, if a two car consist is supplied, which means the cars are recoupled and all of the electrical connections between the two cars are re-established. The Contractor shall be responsible for all costs associated with the delivery of the Track Inspection Vehicle, including the unloading onto PATH Tracks.

1.9.2 At the Contractor's option, the Track Inspection Vehicle may be shipped via rail on its own wheels or on flat car, via road on rubber-tire flat bed trailer trucks or by water on a railcar float. The Track Inspection Vehicle must be delivered with the trucks and wheels attached.

1.9.2.1 If shipping by rail or barge with the Track Inspection Vehicle supported on its own wheels, the Contractor shall remove the air brake trip cock line hoses between the carbody and its trucks and any other devices as may be required. Such removed equipment shall be shipped with the vehicle. This equipment shall be properly marked and numbered to ensure its replacement in the location from which it was removed. The equipment shall be crated or blocked to prevent damage or loss to either the vehicle or the equipment. The air lines from which the hoses have been removed shall be plugged and the trip devices on the trucks shall be wired in the open (upper) position.

1.9.2.2 In the event that the Contractor elects to ship the vehicles loaded on rail flat car or rubber tired flat bed trailer trucks, it shall be Contractor's responsibility to ensure that all clearances are met and that delivery to PATH is made on the car's own wheels.

Prominent signs reading "Do Not Hump" shall be displayed on the vehicles if being transported by rail.

1.9.2.3 Regardless of the manner of shipment, all equipment on the Track Inspection Vehicle requiring lubrication shall be thoroughly lubricated by the Contractor before shipment of the Car, so that it will be in good operating condition when delivered. Valuable and easily pilfered parts shall be shipped in a manner to resist pilferage.

All switches and controls shall be in "off" position.

Sufficient block and tie down devices shall be provided to securely lock any loose equipment during shipment of the vehicles. These shipping restraints shall relieve all strain from the locking devices on loose equipment.

1.9.2.4 After delivery, the shipping restraints shall be removed, equipment that was disconnected or removed shall be restored, and the Contractor shall make the vehicle ready for service on PATH's track. Upon fueling, the Track Inspection Vehicle shall be ready for immediate service.

1.10 Repairs and Adjustments

After the receipt of the Track Inspection Vehicle at its designated destination and before starting regular operation, the Track Inspection Vehicle shall be carefully inspected and tested by the Contractor under PATH's observation. Any part, device or apparatus requiring adjustment, repair or replacement will be called to the attention of the Contractor, who shall make such adjustment, repair or replacement at no additional expense to PATH.

Said work shall be done as directed by the Project Manager or in such manner as PATH and the Contractor shall agree upon. PATH has the option to perform further inspections and tests for which the Contractor shall provide the appropriate assistance.

Any defect or departure from specifications disclosed by any inspection or test in the equipment, its apparatus, material or workmanship, shall be corrected by the Contractor at his expense.

1.11 Design and Arrangement

1.11.1 General

1.11.1.1 The Track Inspection Vehicle to be furnished shall operate and test on all sections of PATH except for curves with less than 100 feet (30.5 m) radius, but must be able to travel on a 90 feet curve. The Track Inspection Vehicle shall meet the requirements of, and be equipped as required by, the U. S. Department of Labor Occupational Safety and Health Standards, and all applicable laws. Noise insulation shall be as required elsewhere in these Specifications. Speed shall be measured in mph, distance shall be measured in feet.

1.11.1.2 Track Inspection Vehicle will be used primarily to measure, evaluate and record various track and tunnel parameters while operating on all PATH systems. If two cars are used, they shall be permanently linked.

Design, construction and materials used in the equipment, repair parts and accessories shall ensure that the equipment will function reliably and efficiently in sustained operation under hard usage in the tracks and tunnels of PATH system.

All materials used in the construction of the Car shall be fireproof where applicable. In certain applications, materials that are fire resistant with self-extinguishing properties may be used provided that the temperature at which smoke is emitted is well above the temperature that can be tolerated. No materials shall be used which emit toxic fumes. Materials shall be suitable for the intended service and shall be resistant to rust, corrosion, wear and the harmful effects of dust, water and cleaning solutions. All equipment shall be designed for maximum protection against the entrance of dust (including steel dust), dirt and moisture normally encountered in transit operation. No air exchange shall exist between engine room and personnel compartment. The air exchange between the exterior and the Track Inspection Vehicle personnel compartment shall be kept at a minimum.

The design shall provide for ease of servicing, replacement and adjustment of component parts and accessories with minimum disturbance of other parts.

All equipment shall be safety hung so that in the event of mounting fastener failure, the equipment is held captive by suitably arranged support structure. Said mounting fasteners shall not be used in tension or shear against the force of gravity.

1.11.1.3 In the event of any doubt as to the meaning of any portion of these specifications, the same shall be interpreted as calling for the best quality, both as to materials and to workmanship, to be supplied and applied. Where no specific requirements are given, the equipment shall conform to the latest Standards of the IEEE for any electrical or electronic details; A.S.M.E. and A.S.T.M. for any materials; AAR and AISC for other details. The editions in effect on the date of the Contract shall be used. To prevent disputes and litigation, the Project Manager shall in all cases determine the acceptability and fitness of the equipment to be paid for under this Contract. His determination shall be final and conclusive upon the Contractor.

1.12 General Dimensions of the Car and Trucks

The Track Inspection Vehicle shall conform to the following general dimensions:

Parameter (each car unit)	English Units (Feet-Inches)
Car Length - end-to-end, maximum:	51'- 1/2"
Car Height - top of rail to top of Car and appurtenances, maximum:	140.44”

Camber:	Positive
Top of rail to coupler centerline on tangent level track:	2'-10", $+^{1}/_{2}$, -0
Car Width, maximum at any point:	8'-6"
Trucks center to center, maximum:	33'-0" **[**

1.13 Scheduling.

1.13.1 Within twenty (20) business days after the Award Date of the Contract, the Contractor shall submit to the Project Manager for approval the Contractor's proposed work schedule. The work schedule shall be in the form of a Critical Path Method **(CPM)** chart, which shall include all work activities, including activities of Contractor's main subcontractors.

1.13.2 The schedule shall be updated monthly by the Contractor. The Contractor shall review the job progress and the proposed work schedule at monthly meetings with the Project Manager. The Contractor shall further bring to the attention of the Project Manager all problems that may affect the scheduling of the work.

1.14 Port Authority Trans-Hudson Corporation Fixed Facilities Description, All Divisions.

1.14.1 General. This section of the technical Specifications describes the fixed facilities and environmental conditions of PATH, all divisions. Fixed facilities descriptions furnished are to be considered by the Contractor as ancillary information to the technical Specification for use in developing the technical definition of the Car meeting the requirements therein. Values given here are nominal and are subject to variation due to tolerance plus wear. Inclusion of this description of fixed facilities in the Specifications does not relieve the Contractor of the responsibility to have its engineers and suppliers visit, view, inspect and become thoroughly familiar with the operating transit system, including track, structures, maintenance and storage facilities.

1.14.2 Fixed Facilities.

1.14.2.1 Clearances. The Track Inspection Vehicle must meet the clearance requirements of being able to travel around a 115 foot curve with bench wall 2'11" (Attachment 4,) from gauge of running rail and third rail in highest position (Attachment 7, Drawing File #98, Serial #4488) above track rail by a minimum of 1 ½"

The vehicle kinematic envelope shown on the drawing 2P395305-1041-C (Carbody Kinematic Envelope) represents the spatial envelope within which the Track Inspection

Vehicle shall remain under all operating conditions. Attachment 1-2 shows the maximum dimensions of the Track Inspection Vehicle. The Track Inspection Vehicle shall be constructed so that it meets all of the clearance requirements for the worst case car and wayside conditions, including wheel wear, rail wear and suspension deflection conditions.
Platform dimensions are approximately as follows: platform height above base of rail: 3'6" to 3'7 ½"; and minimum distance from edge of finished platform to centerline of track in tangent: 4 feet 7 1/2 inches (see Attachment 4) (for curved platform, this dimension varies).

The Track Inspection Vehicle shall be able to travel safely on curves with a radius as sharp as 90 feet. There shall be sufficient clearance between the various parts to permit any rotation necessary to negotiate a 90-feet radius curve.

1.14.2.2 Contact Rail (Third Rail) and Protection Board Location.

1.14.2.2.1 Contact rail type: steel of 150 pounds/yard (68.04 kg/m), 75# Umbrella Rail or 84C Composite rail

1.14.2.3 Track.

1.14.2.3.1 Rail Type: 100-lb./yard ARA-B rail and 115-lb./yard RE rail, some 39-foot (11.887 m) bolted, some Continuous Welded rail, 1:40 cant.

1.14.2.3.2 Standard Gauge:

Tangent to 7500 ft.	4 ft. 8 $^{1}/_{2}$ in. gauge
7500 ft. to 500 ft.	4 ft. 8 $^{1}/_{2}$ in. gauge
500 ft. to 200 ft.	4 ft. 8 $^{3}/_{4}$ in. gauge
200 ft. to 100 ft.	4 ft. 9 in. gauge

1.14.2.3.3 Horizontal curves and superelevation - Minimum lateral radius at centerline of tracks:

Yards, -- 90 feet $\pm$ 5 ft.
Mainline -- 115 feet. $\pm$ 5 ft.
Maximum superelevation -- 6 $^{1}/_{2}$ inches. $\pm$ 0.5 in. (165 mm $\pm$ 13 mm)
Minimum tangent length between reverse curves -- 0 feet (0 m).
Minimum radius of reverse curves -- 110 ft. $\pm$ 5 ft. (33.5 m $\pm$ 1.5 m) with no transition.
Radius of smallest turnout -- 126 feet =/- (number 4 turnout)

1.14.2.3.4 Vertical curves and grades - Vertical curves, rate of change of grade. (The radius being approximately 2,000 ft. with the corresponding length of vertical curve of not less than 200 ft.).

Vertical Curves

Mainline:	4 % per 100 feet
Yard:	5 $^{1}/_{2}$ % per 100 feet
Other:	5 $^{1}/_{2}$ % per 100 feet

Grades

Maximum grade: 5.0 %

1.14.2.3.5 Rail Wear

Vertical wear, maximum: ¾ in. (19 mm); and
Horizontal wear, maximum: $^{3}/_{4}$ in. (19 mm).

1.14.2.3.6 Frog gauges:
4 feet 9 inch to 4 feet 8 $^{1}/_{2}$ inch (1.448 m to 1.435 m);
Flangeway: minimum: 1 $^{3}/_{4}$ inches (44.5 mm); maximum: 2 $^{1}/_{4}$ inch (57.2 mm).

1.14.2.3.7 Omitted

1.14.2.3.8 Track centers' spacing: minimum 12 feet (3.66 m).

1.14.2.3.9 Track Maintenance Tolerances

Gauge: + 1 $^{1}/_{4}$ inch, - $^{1}/_{2}$ inch (from 4 feet 8 $^{1}/_{2}$ inch).

Deviation of the designed alignment in 31 foot-chords: 1 $^{1}/_{2}$ inch

Deviation from uniform profile in 31 foot-chords: 1 inch

Variation in crosslevel on spirals in 31 foot-chords: 2 inch.

Deviation from established crosslevel at any point: 3 inch.

Differences in crosslevel between any two points less than 31 feet apart (other than spirals): 3 inch.

1.14.2.4 Third Rail Voltage

Nominal Voltage: 650 VDC
Minimum normal voltage: 450 VDC
Maximum normal voltage: 780 VDC

As information, the third rail voltage is not a parameter measured by the Track Inspection Vehicle.

1.14.3 Exterior Ambient Conditions. All equipment shall be capable of being operated, stored and maintained at the specified performance levels without impairment resulting from the impact of the natural or induced environment within which PATH intends to operate the Track Inspection Vehicle in service. If conditions exceed the design parameters, the equipment shall continue to operate but at a degraded mode. Exterior ambient conditions for design purposes shall be as follows:

Summer - Surface.
105° F (41° C) dry bulb temperature;
35 % Relative Humidity;
41° Latitude, maximum solar heat rate;
and 105° F (41°C) condenser ambient

Summer - Tunnel
120°F (46°C) dry bulb temperature;
35 % Relative Humidity;
105°F (41°C) condenser ambient

Winter - Surface
-15° F (-26° C) dry bulb temperature;
41° Latitude, (minimum solar heat rate);
and 11 mph (18 km/h) wind velocity.

Winter - Tunnel
-15° F (-26° C) dry bulb temperature

Except as otherwise specified, minimum temperature for material selection purpose shall be -30°F (-34°C) and for material operation purpose shall be -15°F (-26°C).

1.15 Organizational Chart

Within twenty (20) business days after the Award Date of the Contract, the Contractor shall submit to the Project Manager for his approval the Contractor's Organizational Chart for this project.

1.16 Contract Drawings.

1.16.1 The Contract Drawings referred to in this Contract shall be those issued by PATH and shall include but not be limited to the latest revision of those that are numbered and designated in Appendix A.

1.16.2 PATH shall have the right, during the progress of the work, to amplify the Contract Drawings, and to add explanatory specifications.

1.16.3 PATH further reserves the right to alter, in any way it may deem necessary for the public interest, the Contract Drawings and/or Specifications in part or altogether, at any time during the progress of the work, without constituting grounds for any claim by the Contractor for payment or allowance for damages or extra service, provided the said alteration does not change the scope of work.

1.17 Design and Drawings Procedures.

1.17.1 The Contractor shall make all general and detailed drawings and engineering calculations

required to carry out the work. Such drawings shall be sufficient for PATH to obtain or have spare parts fabricated from other than the Contractor The Contractor shall submit catalog cuts and other data that fully describe the equipment and components shown on the drawings. The Contractor shall submit a drawing tree drawing categorizing all drawings in each system and corresponding subassemblies. Drawings prepared and submitted to PATH in the course of this Contract shall be retained by PATH and may be used by PATH as desired.

1.17.2 Design Review Program. The Contractor and the Project Manager shall conduct regularly scheduled design reviews at PATH or at a location approved by the Project Manager for the purpose of monitoring the progress on a real-time basis.

1.17.3 Preliminary Design Review (PDR). Within forty-five (45) calendar days after award date, the Contractor shall submit the documentation listed below. Within fifteen (15) business days of PATH's receipt of this documentation, a PDR meeting will be held for the purpose of PATH approval.

1.17.3.1 The General drawing shall detail the Track Inspection Vehicle's interior and exterior layout and location of all major components and a complete car layout. Contractor shall incorporate any modification required by the Project Manager and shall resubmit the drawing(s) within ten (10) business days.

1.17.3.2 Wheel loads distribution

1.17.3.3 Clearance drawings

1.17.3.4 Design data reflecting available information from the manufacturer will be provided by the Contractor, for the purpose of PATH approval of procurement, for the following equipment:

Measuring Systems
Trucks
Braking Systems (including compressors and reservoirs)
Propulsion Equipment (diesel engines, transmission system, auxiliary power system supplies)
Hydraulic Equipment (Pumps, Motors, etc.)
Car layouts

The documentation shall consist of the following items:

- The basic design parameters provided by the supplier along with the Contractor's basic calculations to support Contractor's selection of equipment.

- The corresponding technical solutions with associated commercial documentation.

1.18 Critical Design Review (CDR)

CDR shall begin within two (2) months after PATH issues a Notice of Award at the discretion of PATH's Project Manager and it shall be completed within four (4) months after the Notice of Award date. The CDR meetings' purpose and function is to enable the Contractor to present design concepts, general arrangement layouts, and other equipment interface issues for the Project Manager to review and comment upon. CDR shall also be used to establish and revise production, manufacturing, and shipping schedules. CDR meetings shall be held on mutually agreeable dates at PATH, or at a location approved by the Project Manager.

The Contractor shall submit all CDR presentation material to the Project Manager at least ten (10) business days in advance for PATH's preliminary review.

The following drawings are required from the Contractor for the initial CDR meeting:

- General arrangement schematics of major equipment on the Track Inspection Vehicle
- Assembly drawings for each subassembly indicated in the general arrangement.
- Sufficient detail drawings to clarify the equipment locations, facilitate an understanding of the overall design, and review the maintainability of all components and sub-components
- Electrical, hydraulic and pneumatic schematics and diagrams illustrating the principal of operation

1.19 Working Drawings

1.19.1 Working drawings prepared by the Contractor shall show in detail all dimensions with tolerances, and as may be required to permit construction, furnishing, delivering, installation of equipment by the Contractor and inspection, operation, maintenance and repair of the Track Inspection Vehicle by PATH.

1.19.2 The working drawings shall be fully cross-referenced and two (2) prints of each shall be submitted to the Project Manager. All working drawings shall be folded to letter size. Drawings whose proper review depends on the availability of other drawings and equipment shall be submitted accompanied by or following such other drawings, with sufficient engineering information for the referenced equipment. Every drawing, unless otherwise approved, shall reference the next higher-level drawing, which shall show how its subassembly is incorporated into a higher-level assembly. The prints will be reviewed by the Project Manager and comments, if any, will be brought to the Contractor's attention in writing (a mutually agreeable drawing processing procedure will be established). When a drawing is revised, the date and all changes shall be listed by descriptions in the block for that revision. The Contractor shall promptly resubmit at least two (2) prints, as required by the Project Manager, of each drawing revision, whether in response to the Project Manager's comments or otherwise.

1.19.3 The Project Manager's review and comments on working drawings and other documents will not relieve the Contractor of his sole responsibility for the proper completion of the work, including the design, arrangement, construction and satisfactory operation of the Track Inspection Vehicle to meet the requirements specified herein, nor shall it impair any of the Contractor's warranty obligations.

1.19.4 Prior to or simultaneously with the submission of the working drawings, the Contractor shall assure the Project Manager in writing that the submitted drawings were reviewed and approved by the Contractor's safety engineer with regard to the safety of PATH's operating and maintenance personnel in operating, inspecting and maintaining the Track Inspection Vehicle.

1.19.5 Ten (10) days before the delivery of the Track Inspection Vehicle the Contractor shall submit to the Project Manager a complete set of working drawings incorporating all the modifications and comments. The Project Manager will review and, subject to his discretion, approve printing them as record drawings.

1.20 Record Drawings

1.20.1 All technical information contained on the final approved working drawings of the Track Inspection Vehicle as built shall be submitted as Record Drawings.

1.20.2 After approval of the Record Drawings by PATH, the Contractor shall supply two (2) sets of CD-ROMs or flash drives of all finalized Record Drawings and Index, on an approved computer format. The CD-ROMs or flash drives shall include an indexing system to facilitate searches for drawings by typing drawing title or number. The Contractor shall also provide PATH with any additional material or equipment that may be needed to decipher, read and print the drawings.

1.20.3 The Contractor shall furnish one set of Record Drawings within thirty (30) business days after delivery of the Track Inspection Vehicle. The Contractor shall furnish Computer Assisted Design (CAD) and CD-ROM's or flash drives within thirty (30) business days after the approval of the last Record Drawings.

1.20.4 The Record Drawings shall include assembly and system drawings in sufficient detail to describe the form and function of the Track Inspection Vehicle and its major subsystems. These drawings shall show parts as finally furnished and delivered. Assembly and system drawings shall also be included in the Parts Catalog described in Section 1.3.5.4.

1.21 Failed Parts Handling

Parts of the Track Inspection Vehicle that, during the Contract warranty period, fail in their normal course of operation, maintenance or inspection shall be removed, replaced and disposed by the Contractor, with an equivalent or better Contractor supplied spare part. The Contractor shall be responsible for promptly furnishing a complete and conclusive failure analysis report on the failed part to the Project Manager. A report shall

be prepared for each failure analysis performed. The report shall include complete details of the failure, the failed part's service history, and proposed corrective actions to eliminate the failure mode. Upon the Project Manager's approval of a proposed corrective action, the Contractor shall implement the corrective measure on the equipment in question and in accordance with a Contractor-proposed, Project Manager's approved schedule.

1.21A General - Hazard Analysis

A hazard analysis (per MIL-STD 882C) shall be performed by the Contractor as approved by PATH to qualitatively address the safety concerns associated with the Track Inspection Vehicle's system/equipment failure modes, back-up contingencies and probabilities of failure mode occurrence and their corresponding levels of criticality. The analysis shall cover, but not be limited to, failures of the following Track Inspection Vehicle's systems:

-Measuring Systems
-Propulsion System, Power Requirements
-Air Brake System
-Horn
-Compressed Air Generation & Distribution
-Coupler Equipment
-Track Inspection Vehicle' Exterior and Interior Lights
-Hydraulic System
-Transmission, Gearbox, and shafts

1.22 Tests

General and specific requirements are specified in Section 13, Testing, including tests on PATH property.

1.23 Not Used

1.23.1

1.24 Noise Control

1.24.1 The Contractor shall ensure compliance with the noise control criteria specified herein. Appropriate effective materials and methods shall be incorporated into the vehicle design to adequately attenuate the noise and vibration generated by wheels, rails, wind, motors, and all other elements and equipment. Maximum permissible noise levels from equipment not specified herein shall be minimized such that the interior noise limitations are not exceeded for the complete vehicle. Equipment, parts and components shall be designed to eliminate rattling and audible resonance at speeds up to 40 mph (64.36 km/h).

1.24.2 Noise Level Limits. Noise levels shall be within the following limits:

With the Track Inspection Vehicle in normal operation and all auxiliary systems in operation except for braking, the car's interior noise level shall not exceed 72 decibel (dBA).

With the Track Inspection Vehicle running at 40 mph (64.36 km/h) and all auxiliary systems in operation, the car's interior noise level shall not exceed 75 dBA. This measurement is to be made while operating in the tunnel.

1.24.3 Distinctive car Interior Noise and Pure Tones. Any identifiable, distinctive noises, such as whining, rasping, grinding, banging, knocking, rattling and rapping, as measured at a distance not greater than 6 ft (1.8 m) from the apparent noise source, shall be at least 2 dBA below the ambient noise level from the Track Inspection Vehicle operation in the absence of the identifiable, distinctive noise, or 2 dBA below the specified noise level, whichever is lower. Any pure tone or narrow-band tonal noises inside the cab, as measured at a distance not greater than 6 ft (1.8 m) from the apparent noise source, shall be at least 2 dBA less than the noise level from the Track Inspection Vehicle operation in the absence of the pure tone, as measured by using a $^1/_3$-octave band filter, or 2 dBA below the specified noise level, whichever is lower.

1.24.4 With all the systems running except for braking, the exterior noise level measured at a distance of 15 feet (4.6) from the side sill line of the train and at a height of eight feet (2.44m) above the rail shall not exceed 85 dBA.

1.25 Vibration

The two (2) operating ends of the Track Inspection Vehicle shall be designed for the ergonomic comfort of the operators in all operating conditions to eliminate Vibrations as much as possible.

1.26 Electromagnetic Compatibility and Interference

1.26.1 The Track Inspection Vehicle shall be electro magnetically compatible within itself, with other Track Inspection Vehicles provided by the contractor, with all other trains in operation at PATH, with PATH signal system, with PATH communication system, with other PATH electronic equipment as specified elsewhere within this specification, and with equipment owned by neighbors of PATH along its right-of-way. The Track Inspection Vehicle shall not be capable of any operation that causes unsafe conditions in the signal system. All transmission signal frequency allocations shall be subject to approval by PATH.

Electromagnetic Interference (EMI) with transit signaling circuits, communication circuits and power substation supervisory circuits generated by the unit shall be at the minimum level acceptable to PATH and shall not affect any vital safety function. Conversely, EMI susceptibility of the unit from external sources shall be at the acceptable minimum level to PATH and shall not affect any vital safety function. EMI emissions

must not affect the operation of the programmable logic controls (PLC) and the Field Control Units (FCU). Electronic Emissions must conform to MIL STD 461.

Line transients generated by the Track Inspection Vehicle shall be suppressed to the extent that neither conducted currents nor induced currents will interfere with any on-board or wayside system.

1.26.2 Radiated Emissions

The Systems and Subsystems in the Track Inspection Vehicle must satisfy the following criteria:

a. The radiated emissions shall not exceed the emission limit of MIL-STD-461C, Curve RE02 for broadband emissions, which applies to Class B equipment, "Equipment and Subsystems in Non-Critical Areas."

b. The Radiated emissions shall not exceed the following table:

Emissions limits shall be, on a plot of dB micro volts per meter per megahertz (dbu V/m/MHZ) versus log frequency:

· At 150 KHZ, the lower limit, a level of 108dbuV/m/MHZ

· A straight line from 108 dbuV/m/MHZ at 150 kHz to 75 dbuV/m/MHZ at 200 MHZ

· A straight line from 75 dbuV/m/MHZ at 200 MHZ to 90 dbuV/m/MHZ at 1000 MHZ

Measured 50 feet (15.24 m) from the center of line of the rail.

The Contractor shall document the Radiated test results in a report that shall be submitted for approval. The report shall identify the source of all narrow band emissions from 150 KHZ to 1000 MHZ.

The Contractor shall cooperate towards the satisfactory resolution of any complaints received by PATH and attributed to the Units. Complaints of radio, television and telephone interference are included.

1.27 Training

1.27.1 Training Class. The Contractor shall provide an adequate education and training program as outlined below and as approved by the Project Manager to familiarize and instruct PATH's personnel on the operation, maintenance and servicing of all equipment on the Track Inspection Vehicle. The training program shall include instructional materials in the form of Manuals, diagrams, parts catalog, videos, and interactive software. The Contractor shall assume that PATH's personnel possess no knowledge on the various

features and workings of the Track Inspection Vehicle's equipment. Therefore, the Contractor shall ensure that the training program thoroughly addresses all the details required for satisfactory operation, maintenance and servicing of the Track Inspection Vehicle. However, the Contractor may assume that maintenance personnel possess the basic skills pertinent to their crafts.

The training course shall be four (4) weeks (160 hours) in duration consisting of two (2) weeks (80 working hours) for measuring systems' operation, one (1) week (40 working hours) for operation and one (1) week (40 working hours) for troubleshooting and maintenance. Training shall include instruction and reference material for the safe operation, maintenance, overhauling, and troubleshooting of the Track Inspection Vehicle. Recommended equipment inspection and test procedures as well as safe equipment access, removal, dismantling and hoisting instructions shall be included in the program. Training shall also include emergency rescue instructions in case the Track Inspection Vehicle should ever break down on the system. Laser related safety training must be conducted by an OSHA authorized/certified instructor.

A participant guide must be provided for each course attendee. The Contractor shall furnish three (3) sets of Instructor's Guide Books (IGB), which may consist of excerpts from the Operation, Maintenance, Inspection Manuals, and the Quick Maintenance and Reference Handbook. The Project Manager, however, shall specify the location and class time, and PATH shall be permitted to videotape the training course.

The Contractor shall supply a DVD documenting all training classes and instructions or instructions that the Contractor and Subcontractors offer for any of the systems of this project and PATH shall have the right to reproduce the instruction materials for the instruction of future operators of the Track Inspection Vehicle.

In addition to the training course, the Contractor shall offer an introductory three (3) day course which will cover operation of all systems of the Track Inspection Vehicle and it shall be offered on the first week after the delivery of the Track Inspection Vehicle.

The Contractor shall, no later than three (3) months prior to the delivery of the Track Inspection Vehicle, submit for approval an outline and presentation schedule of his proposed training program. The Project Manager will then review the material and either approve the outline and/or schedule or require such changes thereof as he may deem desirable and within the intent of this Specification.

The Contractor shall deliver four (4) sets of all instructional materials to the Project Manager after completion of the course. Such material shall contain all pertinent information given in the course.

The Project Manager will make available, upon proper notice, at no cost to the Contractor, access to the Track Inspection Vehicle at PATH shop locations for instructional purposes and will arrange for road operation, furnishing power, dispatching and operational supervision as necessary.

The classroom instruction shall be conducted at a designated location, with classes not exceeding eight (8) hours per day. The location and class time, however, shall be as specified by the Project Manager. All training courses shall include on-board car segments.

1.27.2 Engineering Assistance. In addition to training requirements, engineering assistance shall be provided for a period of time which shall not be less than the warranty period.

1.28 Diagnostic Test Equipment

1.28.1 On-Board and Off-Board Diagnostic System

If diagnostics is not provided by the onboard system software, a microprocessor based diagnostic system shall be provided to perform the functions described herein for the car systems, including propulsion, braking, lighting and the measuring systems. At least two (2)units portable test equipment (PTE) shall be supplied for the Track Inspection Vehicle to aid staff in maintaining, troubleshooting, and repairing the engine system, measuring system and others. These PTEs shall include all associated software (including licenses) and accessories (industrial grade).

1.28.2 Systems Check Routine

Provisions shall be provided to select and exercise each system to ensure its proper operation, including safety interlock inhibitions.

1.28.3 Failure Indications

All system failures during operation or during the system check routine shall be stored and the nature of the failures during operation or during the system check routine shall be indicated on a display convenient to maintenance personnel. The nature of the failure data needed to identify the replaceable unit shall be included.

If message coding is used, a permanently legible and protected decoding chart must be mounted where it is convenient to the display location.

1.29 Quality Control

1.29.1 The Contractor shall be solely responsible for quality assurance and for ensuring that the equipment conforms to the Specifications. The Contractor shall maintain an effective quality program, which is planned and developed in conjunction with Sub-Contractors' functions necessary to satisfy the Contract requirements. The quality program shall establish and implement procedures to ensure that only acceptable equipment is presented to the Project Manager, and shall demonstrate both recognition of the quality requirements of the Contract and an organized approach to satisfy these requirements. The program shall ensure that quality requirements are determined and satisfied

throughout all phases of Contract performance, including, as applicable, design, development, purchasing, fabrication, construction, processing, assembly, inspections, repair, testing, packaging delivery and storage systems check; and shall provide for the early and prompt detection of actual or potential deficiencies, trends, or conditions which could result in unsatisfactory quality for timely and effective corrective action. The Contractor must be prepared to demonstrate to the Project Manager that the program is effective and in operation.

1.29.2 The Contractor shall submit its quality control program and those of its suppliers of major components (e.g. measuring systems, truck, coupler, air brake, propulsion, etc.). Procedures for inspections to be performed in construction, assembly and testing, including appurtenances shall be submitted, for the approval of the Project Manager at least thirty (30) business days prior to actual construction of the Car and major components.

1.29.3 Inspection reports shall be submitted to PATH to document that the requirements of this Contract are met.

1.29.4 The quality control groups of the Contractor and its suppliers shall maintain an independent role in their monitoring of their respective manufacturing sections.

SECTION 2

CAR CONSTRUCTION AND ASSEMBLY

2.1 General

2.1.1 The Track Inspection Vehicle shall be constructed in conformity with the general arrangement and the dimensions of the finished Carbody as defined in the Specifications.

Materials and workmanship used in the equipment shall ensure that the equipment will function reliably and efficiently in sustained operation under hard usage.

All parts shall be joined in a workmanlike manner and shall be free from sharp corners, sharp edges or burrs which may cause injury to operating or maintenance personnel. Careful, neat, workmanlike construction and assembly are required, and shall be thoroughly inspected by the Contractor and will be subject to thorough inspection by the Project Manager.

2.1.2 The Track Inspection Vehicle, if two (2) cars are required, shall be made of permanently linked two-car units; the first car unit shall be the Measuring Car Unit, and the second car shall be the Power Car Unit. The two-car unit train shall be referred hereinafter to as the "Track Inspection Vehicle." Each car unit of the Track Inspection Vehicle shall have at least two swivel trucks equipped with two axles per truck. Each axle of the power trucks shall be driven. Journal bearings shall be AAR standard roller type or approved equivalent.

The passage between the two car units of the Track Inspection Vehicle shall be airtight, watertight and walkable under all conditions while the car is moving. The passage shall be enclosed with a flexible barrier that provides for the above requirements while negotiating the minimum radius curve in PATH system.

2.1.3 The Power Car Unit shall house the power plant, engine(s), transmission and other auxiliary equipment located between the two ends. The Measuring Car Unit shall house the majority of all the measuring systems and auxiliary equipment located between its two ends. All major components shall be housed in their own weatherproof enclosures. Small components in the same area may be housed in one enclosure. Control stations shall be located at both ends of the Track Inspection Vehicle and shall be arranged for convenient operation by the train operator and the operator of the track measuring systems; all controls, gauges, and switches required for operation shall be housed in a console, shall be clearly identified as to function and shall be within comfortable, efficient reach of the operators.

2.1.4 Anti-climbers shall be provided at both ends of each unit of the two-car unit Track Inspection Vehicle. The anti-climber shall be designed so that Car, under compressive forces, will mate in a manner that prevents one car from climbing the other. This arrangement shall withstand, using only two of the three "flanges of the channels," a

vertical load of 100,000 pounds (444.8 kN) in either direction, without exceeding the yield strengths of either anticlimber and its adjacent car structure, when engaged with a similar anticlimber or with the anticlimber of one of the existing PATH Cars. The anticlimber may be an assembly of two 3-inch, 7.1 pounds per foot ship channels welded together with the assembly welded to the end sills, provided this construction meets the load requirements of this Section.

2.1.5 The Track Inspection Vehicle shall be of welded low-alloy, high-tensile (LAHT) steel construction, or the closest approved equivalent (or better) steel may be used.

2.1.6 The Track Inspection Vehicle shall be equipped as necessary for function and safety with approved safety chains, sill steps and grab handles and other such equipment as specified herein. Grab handles, steps and walkways shall conform to FRA Safety Appliance Standards. Steps for car access shall be located on all entrances of each Track Inspection Vehicle.

2.1.7 Omitted.

2.1.8 Each end of the Track Inspection Vehicle shall be provided with a mechanical Coupler with rubber draft gear element of WABCO, Part #057719-3001, and yoke (Part # 0698750, adjusted to 34-1/2" on knuckle centerline above the rails, 28 ½" from the center of the pin. Each end of the Track Inspection Vehicle shall be arranged for the support and clearance of a coupler. The weight of the entire structure shall be carried to the trucks through the center and side bearings.

2.2 Strength Requirements

2.2.1 The entire Track Inspection Vehicle, which includes the car bodies structure, trucks and all appurtenances, shall be capable of resisting without permanent deformation or failure, the loads inherent in the type of service for which the car is intended.

An analysis, locating the center of gravity (CG) in three dimensions (3-D) of a fully equipped Carbody shall be provided for each unit. The location of the CG in the horizontal plane shall be verified.

2.2.2 Stress Analysis. The Contractor shall submit to the Project Manager the frame's working drawings for the Track Inspection Vehicle with a complete stress analysis for major components, including supports for equipment over 5500 pounds (2500 kg). The stress analysis shall include assumptions for the worst-case conditions, and the maximum allowable stress shall be 80 % of the yield stress. The stress analysis shall verify the stresses in the welds.

The stress analysis will be reviewed by the Project Manager and comments (if any) brought to the Contractor's attention in writing. The Project Manager will return comments to the Contractor as soon as possible, but nothing herein shall prevent the Project Manager from making comments at any later date, if he deems them appropriate.

For specific details or drawings submitted that might have a direct impact on the delivery of the Track Inspection Vehicle, the Project Manager will return the comments as soon as possible.

Review and comment by the Project Manager of the Contractor's stress analysis shall not relieve the Contractor of his sole responsibility for the proper completion of the work, including the design, arrangement, construction and satisfactory operation of the Car to meet the requirements specified herein, nor shall it impair any of the Contractor's warranty obligations.

All stress analysis sheets shall be signed and dated by the author and checked by a second stress analyst who shall also sign and date each sheet that has been checked.

2.2.3 The collision posts, their attachments and the support structure shall withstand a static load of 75,000 pounds (333.6 kN) applied to the collision posts at 1'-6" (45.72 cm) from the top of the anticlimber.

2.2.4 Loading. For any part of the structure, the combination that governs the design shall be used. The minimum loads used by the Contractor in designing the various members of the car bodies' structure, their attachments and supporting structures, shall include the following combinations:

2.2.4.1 Combination A - Operating Condition:

2.2.4.1.1 Dead load of completely equipped Track Inspection Vehicle, with fuel and maximum live load, plus

2.2.4.1.2 An allowance for vertical impact of 30 % of the total static load consisting of loading (1) above, exclusive of Carbody mounted equipment, plus

2.2.4.1.3 A horizontal buff or draft of 50,000 pounds (222.4 kN) applied at the centerline of the coupler faces, plus

2.2.4.1.4 A force caused by the maximum acceleration or deceleration resulting from a 25 % coefficient of friction, plus

2.2.4.1.5 A force caused by running on a sharp curve without superelevation at a speed sufficient to throw the entire weight of the fully loaded Track Inspection Vehicle including trucks on the four wheels on the outside rail.

2.2.4.1.6 Under operating conditions, the loading factors to be applied simultaneously to each piece of equipment shall be as follows:

Vertical:	$1.00 \pm 0.30g$
Lateral:	$\pm 0.50g$
Longitudinal:	$+ 1.00g$

2.2.4.2 Combination B - Buff or Draft Condition:

2.2.4.2.1 Dead load of completely equipped Track Inspection Vehicle, with fuel and maximum live load, plus

2.2.4.2.2 A horizontal buff of 200,000 pounds (889.6 kN) applied at the centerline of the underframe and distributed over a 1' 3" (380 mm) width of the anti-climber or a horizontal buff or draft of 150,000 pounds (667kN) applied at the centerline of the coupler pulling faces.

2.2.4.2.3 Under buff or draft conditions, the loading factors to be applied simultaneously to each piece of equipment shall be as follows:

Vertical:	1.00g
Lateral:	0g
Longitudinal:	$\pm$2.00g

2.2.4.3 Combination C - Lifting or Jacking:

The Track Inspection Vehicle shall be designed to withstand lifting, supporting and jacking without binding or permanent deformation due to deflections. Jacking conditions shall include lifting at one corner-jacking pad until the truck nearest the jacking pad is completely lifted off of the ground and the truck on the opposite side shall remain on the ground.

Jacking or lifting at the pads or supporting by the support pads of the drop table shall not produce stresses greater than 75% of the yield point of the materials of the Track Geometry Car structure.

Each lifting, jacking and supporting point and its associated structure shall be capable of supporting a vertical load of 45,000 pounds (222 kN) combined with a horizontal component of 4,000 pounds (18 kN)

2.2.5 Allowable Stresses. The maximum allowable stresses in the various Carbody structural members, their attachments and supporting structures, under the loading conditions specified above, shall not exceed the following:

Allowable Stress

	Combinations A and B		Combination C
Nature of Stress In Rolled steel	Allowable stress in Bolsters	In All Other Members	Allowable Stress In All Members
Tension	0.40Fy	0.50Fy	0.75Fy
Compression	0.40Fy	0.50Fy	0.75Fy
Shear	0.26Fy	0.33Fy	0.50Fy

Bearing	0.60Fy	0.75Fy	1.00Fy

Fy = Specified minimum yield stress of the type of steel being used.

In no case, except bearing, shall the maximum allowable stress for the Carbody structure exceed 40 % of the minimum ultimate tensile stress of the material.

The minimum factor of safety on buckling of the various portions of the car structure, under the loads specified above, shall be 2, according to calculation method of the critical load defined with the linear buckling method (EULER).

The allowable stresses given above shall be reduced, if necessary, for structural elements or connections between structural elements, which are critical in fatigue.

2.2.6 Equipment Supports. All undercar equipment shall be mounted with at least four (4) supports, unless otherwise approved by the Project Manager. All undercar equipment greater than 50 pounds (222.4 N) shall be safety hung so that in the event of mounting fastener failure, the equipment is held captive by suitably arranged support structure. Said mounting fasteners shall not be used in tension or shear against the force of gravity. Following the loss of one support point, the remaining supports shall withstand the loading conditions specified in this section (2.2.3) for fully supported equipment without exceeding 80 % of yield.

2.3 Clearances

The Track Inspection Vehicle shall be assembled so that when the appurtenances are applied in the worst-case condition, no part or parts will be beyond the clearance lines of PATH's System.

The Contractor shall be solely responsible for the clearance of any measuring buggies while functioning effectively over the track and related structures for all operating conditions. The Track Inspection Vehicle, when operating or coupled to a retrieving work car or revenue car, shall be able to negotiate all PATH's fixed facilities. The clearances between the measuring equipment, underframe, coupler, propulsion equipment, piping, trucks, brakes and other parts shall provide for safe operation of the Track Inspection Vehicle over the fixed facilities as specified in Section 1.14.2. There shall be safe clearance between all moving parts of the car and between the car and the clearance envelope.

The completed Track Inspection Vehicle shall be capable of negotiating, with the measuring equipment, a 100 ft. $\pm$ 5 ft. (30,480 mm) radius curve, a 120 ft. $\pm$ 5 ft. (36,576 mm) radius reverse curve, a No. 3 ½ turnout, and a maximum grade of 5 ½ % (the radius being approximately 2,000 ft. (609,600 mm)) with corresponding length of vertical curve of not less than 200 ft. (609,600 mm). The 100 ft. (30,480 mm) radius curve and 120 ft. (36,576 mm) radius reverse curve may include up to 6½ inches $\pm$ 0.5 in. of superelevation. The Contractor shall submit to the Project Manager analyses

demonstrating compliance with these requirements.

2.4 Weight of Car

Reduction of weight is desired and the Contractor shall endeavor to keep the weight to a minimum consistent with strength and stability requirements and maximum wheel load requirements. The weight of each car unit in the two-car unit Track Inspection Vehicle, fully equipped, including personnel and supplies, shall not exceed 120,000 lbs.

2.5 Maximum Permissible Wheel Loads

The maximum wheel load has been established for safe operation on the railroad structure of PATH's System using specified Track Inspection Vehicle and truck dimensions.

The maximum wheel load shall apply to a fully equipped and loaded Track Inspection Vehicle ready for operation. The Project Manager will review the wheel loads as calculated by the Contractor to determine if they are within the acceptable limits.

The Contractor shall provide all the required information, early in the design stage, so that the design development of the Track Inspection Vehicle will consider the maximum permissible wheel loads.

The maximum wheel loads shall be established in accordance with the length of each car of the Track Inspection Vehicle (two-car unit), truck centers, wheelbase, speed, and dimension and weight of the adjacent rescue vehicles.

As an example, a car with a length over pulling face of couplers of 51'-4" (15,646 mm), truck centers of 36' (10,973 mm), truck wheel base of 6'-10" (2,083 mm) and a maximum weight of 106,400 pounds (473 kN) has a maximum uniform wheel loading of 13,800 pounds (61.4 kN).

Excessive wheel loading could cause overloads that are likely to result in damage to the railroad structure. Therefore, if any car has a wheel load exceeding the safe load at any wheel, it will be subjected to automatic rejection.

2.6 Car Interior

2.6.1 The interior of the Track Inspection Vehicle shall be arranged for two (2) operating areas at each end, evaluation areas, engine compartment and utility areas. It shall be sound insulated to meet OSHA requirements. The Contractor shall also demonstrate that the Car' interior air quality will meet the requirements of New York State Law Air Quality

Standards as specified in Section 5.4.2. All desk and workstations surfaces shall be non-skid and furnished with computer lights and electrical connectors. The minimum interior height of the Car shall be 6'-6.75. The control consoles shall be located so that they do not obstruct the operator's view of the track and shall have all controls, gages and switches clearly identified as to function. The consoles shall be designed to prevent glare under all operating conditions. A key (same key for both ends) shall activate the Car controls and the controls in each end shall be interlocked to prevent propulsion operation from both ends simultaneously.

2.6.2 An operating and workstation console shall be located at each end of the Track Inspection Vehicle and shall contain all equipment necessary for the operation of the car and the operation of computer system respectively. Each end shall contain two operating positions as follows:

2.6.2.1 A train operator's position shall be on each end of the Track Inspection Vehicle, at the right side of the car, facing the direction of travel, and shall contain all controls, switches, instruments and indicating lights necessary for the operation of the Track Inspection Vehicle. There shall be a pilot position next to the train operator's position on each end. The console shall include a big-red mushroom button with a transparent, protective cover to activate the engine shutdown feature in case of emergency. Among the controls to be furnished are:

-Forward Reverse Switch. A three position rotary key operated lock shall be provided to activate the control and select the direction of travel. The switch shall be wired so that it will be necessary to pass the "off" position when the direction of travel is reversed. The key shall be removable in the "off" position only. Two keys shall be furnished with each lock.

-Master Controller. The master controller handle shall be so designed that it must be held down against a spring pressure for operation of the train. The master controller handle, in any position, shall, except when the brake valve is in a service application position, cause an emergency application of air brakes, which shall interrupt the main propulsion control circuit.

-Brake Valve. The brake valve shall provide for a brake application, increasing from a minimum value when the brake valve handle is moved out of "release" position to a maximum value when the handle is moved to "full service" position. An emergency application shall be provided when the handle is moved to the "emergency" position.

-Speedometer and diesel gauge

-Emergency diesel engine shutdown switch

2.6.2.2 A workstation console shall be located at each left end of the two-car unit Track Inspection Vehicle if two cars are used. This console shall be the track measurement operator's position, facing towards the direction of travel, and shall contain all controls,

switches, instruments and indicating lights necessary to operate the measuring and video systems. Among the controls to be furnished are:

Computer terminals

Gauges and controllers to deploy the measuring apparatus;

Switches to provide ancillary data, such as mileposts or event markers, to the computer system;

Cameras, videos and monitors

Under-car lights switch.

A completely upholstered and adjustable seat shall be provided for each operating position, capable of swiveling 90 (degrees) to each side of the center position and able to move forwards and backwards. The seats shall be designed for comfortable operation and be able to withstand the shock and vibrations. They shall be lined with weather resistant material, easy to clean. The seat and back, as a unit, shall be capable of the following adjustments:

-Vertical adjustment of 5 inches

-Forward\backward movement of 4 inches

-Swiveling through 180^{o} (degrees)

The seat assembly shall be capable of being moved in a horizontal direction with the seat positioned under the motorman's console and the seat back resting on the vertical edge of the console, to provide additional space. All fixed seats of design similar or equal to the operator's seat in the Track Inspection Vehicle shall have the same movement and adjustments as specified above.

2.6.3 Evaluation Area. The primary or main evaluation area shall be located in the Measuring Car Unit of the Track Inspection Vehicle. This evaluation area shall contain all equipment, controls, switches, instruments, indicator lights and other devices necessary for the deployment of the measuring equipment, evaluation of the specified track parameters and operation of the equipment. Among other equipment to be furnished are:

-Desks, containing a printer, computer terminal, instrumentation, controls and equipment and storage lockers. A suitable number of upholstered seats shall be provided for the operator and observers;

-Electronic racks containing computers, power supplies and interface equipment; and consoles containing the necessary equipment to operate and monitor the performance of the diesel generators.

The secondary evaluation area shall be located in the Power Car Unit of the Track Measuring Car and it shall contain equipment, controls, switches, instruments, indicator lights and other devices necessary to operate and monitor the diesel engines.

2.6.4 Diesel Engine Compartment in the Power Car Unit. The diesel engine compartment shall contain the diesel engines, air compressors, hydraulic system, propulsion system and other equipment necessary to meet the specified requirements. It shall be ventilated and the exterior wall of the compartment shall be removable to facilitate inspection, maintenance and the removal of equipment. It shall also be insulated to meet the maximum noise level requirements inside the Track Inspection Vehicle as specified herein.

2.6.5 Utility Area. The utility area shall contain a hot and cold water fountain, storage and tools compartments. Equip the tool compartment with a complete set of hand tools necessary to maintain, repair, and adjust the various Car systems. The utility area must provide adequate and secure storage for a two-channel oscilloscope, voltmeters, hand held lasers and/or laptops, and it shall be lockable. The Track Inspection Vehicle shall also include a permanently mounted lockable toolbox with padlock and keys.

2.6.6 The skid-resistant floor covering shall be selected according to PATH's recommendations and furnished and installed by the Contractor. Sound dampening floor mats shall also be installed where required. Provisions shall be made for the car's floor to include heat and electrical insulation material, finished in a neat, workmanlike manner. The car's floor shall support the loads for the intended use without any deformation for the life of the Track Inspection Vehicle. The car's walls and ceiling shall be thermally insulated.

2.6.7 The operating console shall include controls for propulsion, brakes and direction. A deadman's feature shall be incorporated in the propulsion control such that if activated, it will deactivate propulsion, and activate the emergency brake.

The speed shall be controlled by a throttle lever, which shall regulate the diesel engine output when traveling.

An emergency dump valve shall be installed at each end with easy access to the train operator and pilot.

The control equipment shall cut off motive power when any pneumatic emergency brake application is initiated.

Each control instrument panel shall have an audio and digital display to warn the operator that the engine's electronic control system has put the engine in degraded mode, or has shut down the engine because of overheating, overspeed, loss of fuel pressure and/or loss of oil pressure. Three (3) battery-operated portable data collection and transfer devices shall be provided for the engine's diagnostic system so that a technician may reset the engine to normal operation after whatever corrective action has been taken. The data recorded with the diagnostic system must be able to be viewed on a standard notebook computer.

A voltmeter, a zero-centered ammeter, and a red battery discharge warning light shall be provided in the battery charging circuit and shall be located on each console instrument panel.

A 3-position diversion valve shall be located inside the cabs, which shall deactivate the trip cocks in the center position. A digital display shall show the trip cocks that have been activated or deactivated

A radio complying with the latest PATH's specification shall be furnished and permanently installed at each end of the car; and it shall be placed at the height of a seated train operator's right elbow. Radio control head, with all required controls and indicators shall be mounted on each operating console. The radio shall be powered when the console is activated.

An intercom system shall be mounted on each console, desk and end of each car. Train operator shall be able to communicate with the other end, desks, evaluation or utility areas of the Track Inspection Vehicle and with ground personnel.

2.6.8 All car's windows and doorways shall be provided with rain gutters. All glass shall conform to the requirements of Section 6.4.12.1.

2.6.9 Automatic Fire Suppression System (AFSS)

- A UL Listed, and FM Approved automatic fire suppression system complete with a protection control panel, vehicle interface, and extinguishing system shall be provided within the engine compartment of the diesel engine.
- **Contractor Qualification**: The provider of the AFSS must be factory trained and have been in the train fire protection business for at least three years prior to the contract award. The selected contractor shall have provided similar systems on at least three types of railroad MOW (maintenance of way) equipment in the preceding thirty six months.
- The system shall operate as follows: Upon detection of a fire the protection control panel shall alert the operator of the machine with visual and audible signals as the system is automatically, and immediately activated.
- The system shall be manufactured in the United States of America and is electronically actuated.
- **Area to be Protected:** The scope of this specification is to cover an area for an enclosed engine compartment
- **Protection Control Panel :** The protection control panel shall be clearly visible and within reach of the machine operator. The function of all controls, gauges and switches shall be clearly identified. The control panel shall be supplied with a self-recharging nickel metal hydride back-up battery to provide protection to the machine in the event of a temporary power loss for up to twenty-four (24) hours. The protection control panel shall incorporate the following operator controls:
  1. Alarm Silence
  2. Visual and audible alarm test which verifies LED, alarm, and relay function.

- Delay engine stop
- Relay Reset
- Relay circuit that includes both closed and open contacts which transfer at the end of the time delay period.
- The protection control panel shall provide a programmable time delay after activation (0,15,or 30 seconds) prior to activating the engine shutdown circuits. The audible alarm shall produce 85 decibels at three feet distance. A green light will indicate system is operating normally. Red service lights will indicate system trouble, and Red Fire lights will indicate system activation.

- **Manual Discharge Switch:**The manual discharge switch shall be provided within easy reach of the operator and clearly marked. The switch shall be protected against inadvertent activation by means of a protective guard held in place through the switch. The protection control panel shall indicate a manual discharge event with a unique visual display that cannot be reset by the operator. A second manual discharge switch shall be located outside the operator's compartment easily accessible by ground personnel.
- **Fire Detection :**Fire detection shall be located in the engine compartment of a modular linear detection type assembly utilizing AMP connectors. The linear detection shall have a spring guard cover on it to protect it from false-sensing due to vibratory or mechanical damage. Detection shall be placed under all horizontal bulkheads, above and downwind of heat sources, and in areas where fluid leakage from the engine may be present. The sensor shall have a detection value of 356F degrees, and a length of at least ten (10) feet. The contractor and the AFSS manufacturer shall determine the location of the sensor. The sensor shall be immune to typical false alarm sources found on a railroad MOW machine.
- **Fire Suppression:** The pre-engineered fire suppression system shall consist of a cylinder with fire suppression agent, at least four nozzles, and a distribution system designed for the application for a railroad MOW machine that shall be installed in accordance with the AFSS manufacturer installation Manual.
- **Suppression Agent Storage Cylinder:** The agent tank shall be of the stored pressure type and consist of a valve and Department of Transportation (DOT) approved cylinder. The cylinder shall be functional in a horizontal position charged with a minimum of twenty-five (25)pounds of BC rated Purple K pressurized to a minimum of 350 psi. The valve shall incorporate the pressure gauge and accept a linear actuator via a brass electric control head which retains an actuator piston and locking ring, which presses down on the cylinder valve when the linear actuator is activated.
- **Electrical Requirements:** The input voltage shall be 24VDC. The fire suppression system shall be compatible with SAE recommended practice J1211, and has passed SAE J1113. It also shall have passed UL 1254 Environmental Test Standards. The AFSS shall not require more that 47ma (milliamps) of current for normal operating conditions, 47-52ma in a fault condition, and no more than 78ma in an alarm condition.
- **Harness:** The modular harness shall be UL listed complete with AMP connectors.
- **Location of Work to be Performed :** Port Authority Trans-Hudson specifies that the system shall be installed at PATH Consolidated Maintenance Yard, 120 Academy Street, Jersey City, NJ 07302.

2.6.9 **Doors. There shall be four doors i**nstalled on each unit of the Track Inspection Vehicle: one at each end, and one at each side of each car unit. The end doors in the Track Inspection Vehicle shall be manually operated; the side doors shall bemanually operated and installed with an option for alarm. The end doors, where the Power Car and Measuring Car Units couple, shall be sliding or swing. All doors must be watertight and air tight.

2.7 Miscellaneous Equipment

The following additional accessory equipment shall be furnished and installed in/at each driving desk:

Windshield wipers with washers controlled from the control console

Retractable heavy duty "shades" on the inside of all operating ends and inspection area windows and windshields.

- Oil Pressure gage
- Heater / air conditioner with controls
- Speedometer
- Mechanical tachometer
- Odometer
- Running hour meter
- Lights for illuminating gage panel.
- Adjustable sun visor padded.
- Seats with adjustable and swiveling features.
- Fuel level gage.
- Duplex air gage.
- Brake cylinder pressure gage.
- Controls to start, stop, and throttle engine (including a key operated switch).
- Air brake system control valves.
- Emergency brake controls.
- Work-lights switch.
- Buzzer pushbutton

2.7.1 The Track Inspection Vehicle shall be compliant with PATH's new CBTC Signal System. The EMI emissions must not affect the operation of the CBTC-ATS and its related Control Track Equipment, per MIL STD 461. CBTC requirements for the Track Inspection Vehicle are detailed in Appendix B of these Specifications. The final layout

shall be subject to the Project Manager's approval.

2.8 Construction

2.8.1 The connections of the Track Inspection Vehicle structure shall be made with approved mechanical fasteners or welds or with combinations of mechanical fasteners and welding, whichever can be most advantageously applied. The welded primary built up underframe structure, including crossties and crossbearers, shall have continuous welds.

2.8.2 The Track Inspection Vehicle structure shall be a welded structural steel arrangement made of LAHT steel, or approved better. The Track Inspection Vehicle structure shall be designed to carry safely the load conditions and combinations described in Section 2.2 without exceeding the allowable unit stresses given in Section 2.2.5. The underframe of the Track Inspection Vehicle shall be provided with a steel support structure for the equipment.

The body bolster or similar structures shall be capable of transferring working loads passing between the trucks and the Carbody. The bolsters shall be capable of withstanding any design load transferred from the draft sill. Fatigue-resistant design shall be a prime requirement of the body bolster structure. All non-US standards shall be compared against the US standards and the comparison submitted for the Project Manager's approval.

Provisions shall be made to permit easy inspection, maintenance and removal of major equipment (engine, motors, pumps, compressors, etc.) from the Track Inspection Vehicle.

2.8.2.1 The underframe of the car shall be provided with steel support structure for the equipment. The diesel hydraulic propulsion units shall have, from the exterior, vertical hinged, horizontal hinged, or sliding doors to provide access to inspect and maintain engine room equipment. These doors shall be able to open in tight clearance areas.

2.8.3 Jacking and Hoisting Loads

The Track Inspection Vehicle, with trucks attached, shall be lifted with four jacks, one at each quadrant of the Track Inspection Vehicle at corners or bolsters, in any combination, without permanent deformation of any Track Inspection Vehicle structure. When two cars are used, they shall be capable of being separated for lifting.

The Track Inspection Vehicle jack pad and its supporting structure shall have a load factor of two based upon supporting Track Inspection Vehicle weight. The vertical load on each jack shall be combined with a horizontal load of 10 percent of the vertical load (including the load factor of two) applied in any horizontal direction. Under this loading condition, there shall be no permanent deformation of any Track Inspection Vehicle structure.

The same load factors as above shall apply for lifting pads and supporting pads. For location and other requirements see Section 3.0 below.

2.8.3.1 Jacking and Lifting Provisions

The lift, jack and support pads shall suit the construction of the Track Inspection Vehicle and the hoists, jacks and stands in use in PATH. The side frames shall be designed to provide lifting, jacking and support pads as specified below.

The Track Inspection Vehicle shall also be capable of withstanding, with the load factor used in computing the calculated stress without exceeding yield or causing degradation of the water tightness of any glazing, all loads caused by any lifting, jacking or supporting condition, and also torsion loads caused by diagonal jacking of the Track Inspection Vehicle with trucks attached as described in the diagonal jacking test in Section 2.2.4.3. Trucks shall be retained with the body during jacking or hoisting.

2.8.3.2 Jacking and Lifting Pads

The jacking, lifting and support pads shall have a bearing area at least 6-inches (152mm) long by 4-inches (102mm) wide, with a ½ inch lip on either end, and shall project a minimum of ½ inch (13mm) below the bottom of the side sill. Also, there shall be a minimum of 2 inches (51mm) clearance to any obstruction around each jack pad. The bottoms of all jack pads shall have non-skid surfaces to provide frictional resistance against incidental horizontal loading between the jack pad and jack head.
The pads shall be located as follows:

- Jacking pads shall be located at the extreme corner, designed for jacking of the Track Inspection Vehicle along the right-of-way with Track Inspection Vehicle supported on one truck at the non-lifted end with truck attached at the lifted end. There shall be no obstructions in the projected space below the jacking pad.

- Pads shall be located as near the centerline of bolsters as possible, to permit jacking the Track Inspection Vehicle with PATH standard floor jacks so that the truck can be rolled from under the Track Inspection Vehicle without removing any equipment or structure; and

- Pads shall be located between bolsters, designed for lifting or Track Inspection Vehicle with both trucks attached with an overhead crane with lift hooks.

The Track Inspection Vehicle shall also be capable of being supported at one end by the pads, without its truck attached, by the drop table support pads while the other end is supported on its truck.

2.9 Carbody Balance

2.9.1 The load difference between the ends of the completed and fully equipped Car shall not exceed 500 pounds (2,221 N).

2.9.2 For the lateral balance of the completed and fully equipped Track Inspection Vehicle, less trucks, the center of gravity shall be maintained within a maximum of 0.8" (20 mm) from the center line of the vehicle.

2.10 Safety Features

The Contractor shall incorporate safety features into the design of all systems and sub-systems to ensure protection of the crew against injury.

- Vehicle shall be equipped with Safety sills steps and grab handles; these shall conform to FRA Safety Appliances Standards.
- Safety signage shall be painted or displayed on the car body or inside the Car (e.g. “Watch your step” in proximity to step. “ No Smoking” inside cabin)
- All covers, doors and access panels shall have safety locks as approved by Project Manager; these shall open or close only when operated by crew. Engine room shall be provided with a door lock that can be opened from the interior regardless of whether or not it is locked.
- All live portion(s) of the protected circuitry shall be completely concealed so that no danger of electric shock exists.

2.11 Painting

The color scheme for painting the Car and the lettering and numbering layouts shall be as directed by the Project Manager. American Railway Engineering and Mechanical Association (AREMA) approved paint, shall be used on exterior surfaces. Enamel, or an approved equivalent, shall be used on the interior surfaces. Running gear shall be black and all surfaces walked upon shall be black (non-skid). The under-car structure and equipment shall be primed and painted black. Grab handles and steps shall be given two coats of primer and paint. Manufacturer shall use paints that meet OSHA regulations and standards, and do not have any known history of biological hazards due to long-term exposure. Passive respirators and eye protection shall be the only safety or health equipment necessary to protect workers while making repairs.
Manufacturer shall also utilize proper surface preparation, including primer, to provide a high quality durable finish coat.

Exposed parts of the machine shall be painted AREMA YELLOW except as follows:

Diesel Fuel Tank.	GREEN
Hydraulic Reservoirs	BLUE
Coolant Tank.	GRAY

Wheels and Handrails	BLACK
Liftting Lugs	BLACK
Safety Locks.	RED
Jacking Points or pads.	BLACK
Engine and Other Parts	Manufacturer's Option

The name of the fluid and the words "CHECK DAILY" shall be stenciled on each tank in 1" letters. Total machine weight with all tanks filled shall be plainly marked on both sides of the machine in 1 1/2" letters:

WEIGHT _____ lbs. (Manufacturer/Contractor to fill in the blank.)

All equipment shall be protected by finishes suitable to the environment. Moving parts shall be self-lubricated or shall contain provisions for full application of all lubricants.

Exteriors exposed to the elements shall be finished by a minimum three (3) coat process. The base coat shall contain a rust inhibitor phosphatized coating and be thoroughly bonded to base.

2.11.1 Paints, Coatings and Protection.

2.11.1.1 Paints and Coatings. All surfaces shall be completely free of rust, scale, grease and other foreign material immediately preceding application of each coat of primer or finish paint. All body dents, roughness or other surface imperfections shall be removed by straightening, filing and sanding prior to application of the first priming coat. All surfaces to be painted shall be prepared as recommended by the paint supplier. All paint shall be mixed, thinned or otherwise prepared for application in accordance with the paint supplier's recommendations. Thinning materials or paint additives shall be those recommended by the paint supplier. Paint specifications, sample paint and samples shall be submitted to the Project Manager for inspection and approval. Paint and materials shall be brushed, sprayed or dipped and baked-on or air-dried in accordance with the paint manufacturer's written instructions, the service requirements of the surface or part to be painted, and the application method. Each coat shall be uniformly applied to the thickness recommended by the paint supplier over all surfaces to be covered and shall present a neat appearance, free from runs, sags or other application defects. All painted surfaces which become scratched or chipped during shipment, storage, handling or installation shall receive touch-up paint as required to restore the Car exterior to in-plant, pre-delivery finished appearance. Touch-up paint shall be identical in all respects to original paint.

For coatings on aluminum, refer to Sections 6.5.1.3.

2.11.1.2 Colors. Colors shall conform to AREMA Standards, except where otherwise indicated. The Contractor shall submit color samples of all finish coat paints to be used for approval

by the Project Manager. Paints and varnishes submitted shall match as to color with the original approved samples and the materials in final application shall conform to the original samples.

2.11.1.3 Low-Alloy, High-Tensile Steel. Following fabrication, low-alloy, high-tensile steel parts shall be prepared for painting in conformance with ASTM-D-2200 and immediately thereafter shall be painted with one coat of a PATH approved primer plus one coat of PATH approved sealer gray paint to prevent rusting.

2.11.1.4 Enclosure Interior. Equipment enclosure interiors shall be primed and single-coated with PATH approved white insulating varnish or shall be single-coated with insulating varnish and finish-coated with PATH approved white enamel.

2.11.1.5 Fire Retardation. Only paints that conform to the fire retardation requirements of ASTM D-1360 shall be used.

2.11.2 Application Methods.

Thorough and careful methods of application shall be used to provide a durable, fully protective, as well as attractive coating for the Car. Painting shall be done in a suitable building under special precautions to prevent dust or other foreign matter from collecting on the freshly painted surfaces. The temperature of the paint shop shall be not less than 60°F (16°C) during the progress of the work.

2.11.3 Rust Protection and Preparation of Joints.

Parts of the Car manufactured elsewhere than at the Contractor's plant shall be thoroughly cleaned of rust, scale, grease and other foreign matter at the place of manufacture and painted with one coat of approved primer as protection during transit, or prior to assembly on the vehicle. This does not apply to steel mill and foundry products in general or to non-ferrous metal parts. Immediately prior to assembling, all parts or surfaces brought permanently in contact (except roof joints) shall be thoroughly cleaned and given a heavy coating of approved waterproofing compound. This coat shall not be allowed to become dry before riveting or bolting, and all surplus compound squeezed out shall be wiped off.

The joints between aluminum and steel shall receive a heavy priming coat of approved zinc chromate paint. Joint surfaces between roof sheets shall be thoroughly coated with approved elastic sealing compound. The contact surfaces of spot welded connections shall be thoroughly coated with an approved spot weld sealer.

2.11.4 Surface Treatment and Paint Application - All surfaces shall be cleaned of dirt, rust, grease, oil and surplus joint compound. Special attention shall be given to removing all traces of foreign matter, including the cleaning medium, immediately before priming. Trucks shall be cleaned, but not sandblasted, before painting.

Surfaces that become covered at assembly and are afterwards concealed or inaccessible, shall be cleaned as specified in the preceding paragraph, and painted with two coats of an approved preservative paint.

Immediately after cleaning, exposed surfaces of the vehicle shall be primed with the first coat of approved priming paint. Priming coats are to be carefully applied and thoroughly worked around bolts, rivet heads, laps, joints and all irregular surfaces. Approved metallic primers shall be applied as received from the manufacturer. No surfaces on which oxidation has started shall be primed. Such surfaces shall again be cleaned before priming.

Each coat of primer and paint shall be applied and ample time shall be allowed to elapse for drying in accordance with the manufacturer's recommendation before applying the succeeding coat. If any coat of paint does not cover, an additional coat shall be applied. The use of thinners, as to both quantity and quality, must have the approval of the manufacturer of the paint in which they are to be used. All coats of paint subsequent to primers shall be brushed or sprayed. Paint shall be applied as follows, or as directed by the Project Manager:

- Carbody and battery enclosure exterior: Two coats of approved primer and two coats of approved safety aliphatic urethane or approved equivalent
- Equipment under floor: One coat of primer and one coat of black aliphatic urethane or approved equivalent
- Grab handles and steps: Two coats of approved primer and two coats of approved black or yellow paint to contrast with the background
- Trucks: One coat of approved metal primer and two coats of aliphatic urethane black paint. The first coat shall be a lighter shade than the second. Wheels and axles shall not be painted
- Battery Enclosure Interior: Two coats of approved primer and two coats of approved battery electrolyte resistant paint
- All paint systems shall be lead free
- Miscellaneous forgings under the car shall be given one coat of a PATH approved primer and one coat of PATH approved black paint

The exterior surfaces of control equipment, if any, after its installation under the car, shall be given one coat of PATH approved black insulating varnish. One coat of primer and one coat of black paint shall be applied to exposed galvanized iron.

Emergency brake valve cord handle shall be painted a PATH approved red color. A red marker shall indicate the normal position of the emergency brake valve handle.

Wireways shall be color code painted as follows:

High Voltage - red; (³ 100 volts)
Low Voltage - yellow; (<100 volts)

The following items of equipment shall be coated with high visibility yellow paint or similar:

Supply reservoir cutout cock;
Main reservoir cutout cock at feed valve;
Drain cock on operating unit filler;
Test horn cutout cocks.

The following items shall be painted as indicated:

Brake cylinder cutout (BCO) cock;
handle inside car – red;
underframe level – red;

Trip cock arm - white.

Exposed Areas. Areas exposed to corrosive fluids or cleaning solutions listed in Section 6.10 shall be protected with coatings resistant to those fluids.

Safety Devices – All safety devices as required per Section 11.2.9.1 shall be painted red.

2.11.5 Lettering and Numbering

All lettering and numbering shall be standard medium type face lower case except for the first letter of the first word of the sentence, which shall be in upper case, all of approved colors. All lettering shall be applied with an approved process.

The Track Inspection Vehicle shall be provided with a number or name, assigned and approved by the Project Manager, affixed at four (4) locations per car on the exterior of the Track Inspection Vehicle. The color of the numbers or letters shall be white and the background black.

Truck serial numbers shall be applied to both sides of each truck at the center of side frame in figures ¾ inch (19 mm) high, with the bottom of the figures ¼ inch (6.4 mm) from the tangent point of the bottom of the member, and shall be distinctly stamped into the frame with steel numbers.

PATH Ownership Plates: A small stainless steel ownership plate shall be attached to the body side sill, right side, “A” side, No. 2 end of each car the Track Inspection Vehicle over the center of the bolster; and to each truck at the corner toward the center of the Track Inspection Vehicle, left side.

The following equipment shall be stenciled with high visibility white paint:

MR in four-inch (102 mm) letters on both sides of the main reservoir,

IHR in four-inch (102 mm) letters on both sides of the independent horn reservoir.

Cutout cocks on reservoirs and drain cocks.

SECTION 3

AIR BRAKE SYSTEM

3.1 General

The Track Inspection Vehicle shall be equipped with both service and emergency air brake equipment. The air brake equipment shall be subject to the Project Manager's approval.

The braking performance of the air brake system shall meet the stopping distance requirements as specified by PATH. The Track Inspection Vehicle shall be equipped with composition brake shoes as approved by the Project Manager. The Track Inspection Vehicle shall also be equipped with a parking brake. With the brake valve turned to "OFF" at the operating end control station(s), the air brake system shall be designed so that the Track Inspection Vehicle can be towed unpowered.

All electric terminals, studs and air connections on each part of the air brake apparatus shall be clearly and permanently marked. All drawings of equipment shall indicate such markings.

3.2 System Operation

3.2.1 Pressures: Brake pipe pressure shall not exceed 110 psi (758 kPa) unless approved by the Project Manager. For compressor pressures see Section 3.3.2.

3.2.2 Fail Safe Provisions: When functioning properly, the braking system shall be completely self-protected against overload and damage due to all possible combinations of speed, the operator's actions, and prior state of propulsion controls. For friction brake fail safe provisions see Section 3.2.7.

3.2.3 Propulsion - Emergency Brake Interlock: A deadman's feature to remove power and initiate emergency braking pneumatically and electrically shall be incorporated into the operator's propulsion control handle and shall be operative at all times when the system is charged except when the brake handle is in the full service position. The design of the deadman's feature shall be submitted to the Project Manager for review and approval.

The air brake system shall cut off motive power when an emergency application of the air brake is made. An emergency brake shall vent the pneumatic brake pipe.

3.2.4 Emergency Braking. At any time after the system is charged emergency braking shall be initiated when the brake valve handle is placed in the emergency position, release of the deadman's feature, when the emergency brake valve or trip cock is actuated, or upon the parting of the brake pipe or brake pipe hose or uncommanded uncoupling. The activation of the emergency brake shall disconnect traction power and disengage the hydraulic drive.

The fully loaded Track Inspection Vehicle, when placed in emergency, on level, dry tangent trac,k shall meet the stopping distance requirements by PATH.

All braking, including emergency, shall be friction only. An emergency brake shall be obtainable during release or any stage of service application and shall be propagated pneumatically. In order to ensure that emergency braking brings the Track Inspection Vehicle to a full stop before emergency braking can be released, emergency braking shall result in an irretrievable brake application that cannot be released for a time interval (adjustable by replacement of a choke orifice between 15 and 35 seconds) initially set to 17 seconds following venting of the brake pipe. Afterwards brake pipe recharge time shall not exceed 45 seconds for the Track Inspection Vehicle.

If the Track Inspection Vehicle cannot meet the required stopping distances for all speeds, then the Contractor must modify the brake system to meet all stopping distance requirements without detrimental effects on the wheels, or the Track Inspection Vehicle will be subjected to automatic rejection.

3.2.5 Service Braking: The brake valve shall be self-lapping and shall provide for control of the friction brakes. There shall be a full range of analog brake control between minimum service and up to full service. Service and release operations shall use pneumatic components primarily, and shall apply and release the service brakes.

The fully loaded Track Inspection Vehicle (maximum number of personnel, fluids, tools and equipment) when placed in a full service brake, on level dry tangent track, shall meet dead time and average peak deceleration rate shown in Table below:

FULL SERVICE BRAKING REQUIREMENTS

INITIAL SPEED MPH (KM/H)	DEAD TIME MAXIMUM SECONDS	AVERAGE PEAK DECELERATION RATE (+/- 10 %) MPH/S (KM/H/S)
10 (16.1)	1	2.9 (4.67)
20 (32.2)	1	2.7 (4.35)
30 (48.3)	1	2.65 (4.26)
40 (64.4)	1	2.6 (4.18)

The air brake system shall be sufficiently redundant and fail-safe so that no single failure in any part of the air brake system will result in a reduction of the emergency brake rate below 2 mph per second.

The brake system in the Track Inspection Vehicle shall be equal or similar to the one in the Track Geometry Car. It shall have at least three (3) operating modes.
- With the Track Inspection Vehicle operating under its own power
- When the Track Inspection Vehicle is towed and braked using the locomotive brake

system
- When the Track Inspection Vehicle is towed and its entire brake system is disabled

3.2.6 Jerk Limiting. During service breaking the rate of change of deceleration shall be 2.5 mph/sec/sec (1.1 m/s/s/s). Jerk rate shall remain within the specified limits for deceleration during the time period commencing with the initial deceleration until 90 % of the requested deceleration has been achieved. The specified jerk limit is not applicable to emergency braking, or to the moment of stop in service braking. Failure of jerk rate limiting shall not reduce the maximum available braking effort.

3.2.7 Friction Brake. Friction brake system controls shall be fail-safe to the extent that no single failure or combination of common mode or common cause failures, which can be anticipated by the Contractor shall result in less than 50 % emergency braking effort being available with the specified Track Inspection Vehicle. Brake systems previously used by PATH that have been proven in service are considered as having met this fail-safe requirement. The friction brake system shall be controlled in conjunction with the propulsion system and specified mutual lockouts. An Operating Unit at the control station(s) on the Track Inspection Vehicle shall control friction brake effort.

3.2.8 Brake Cut Out (BCO) – Provisions shall be made on the brake system to release the air in all brake cylinders. BCO levers shall be provided on both sides of each car of the Track Inspection Vehicle for easy access by the crew.

3.3 Air Brake Equipment

3.3.1 Truck Mounted Equipment

3.3.1.1 Trip Cocks. Two self-resetting trip cocks per end on each car of the Track Inspection Vehicle shall be furnished. D-1 WABCO part number 583164 trip cock or approved equal located on the outer end of both trucks. Trip cock mounting bolts shall be SAE Grade 5 with castle nut, cotter pin, lock washer and one hardened flat washer.

Trip cocks shall be mounted on the truck frame by means of connections, which shall provide for trip cock height adjustment utilizing PATH's standard washboard type mounting. The trip cocks shall be mounted with the trip arm located $1\ ^{1}/_{2}$", +0, $-^{1}/_{4}$" (38.1mm, +0, -6.3 mm) above the rail. The trip lever shall be of a proper length and shape and shall be located so that it will positively engage the track trip arm.

The trip cocks shall be connected to a three-way cock (diversion valve) in such a way that only one of the two trips cocks at each end is connected to the brake pipe.

The trip cock shall be designed so that opening of the cock will vent the brake pipe sufficiently to cause an emergency application of the air brake system.

The self-resetting trip cock valve shall remain open until brake pipe pressure is reduced to a sufficiently low value to reliably initiate an emergency brake application and it shall

not be necessary to manually reset the trip cock.

All working parts of the trip cocks shall be made of corrosion-resistant materials and provisions shall be made for periodic lubrication.

3.3.1.2 Omitted

3.3.1.3 Brake Actuator - The brake actuator shall have automatic slack adjusters to compensate for brake shoe and wheel wear. The brakes shall be designed to permit adjustments to accommodate the allowable wheel and shoe wear of 3 $^{1}/_{4}$" (82.55 mm) on both wheels and shoes.

The brake actuator shall be designed for long wear life with a minimum of maintenance. It shall meet general strength requirements and withstand the combined loads induced due to braking, plus the effects of pressurization with a margin of safety to accommodate a pressure regulation malfunction.

3.3.1.4 Brake Shoes. Brake shoes shall be selected so that the Track Inspection Vehicle meets PATH's stopping distance requirements. The brake shoe and its assemblies shall be designed for ease of maintenance.

3.3.1.5 Omitted.

3.3.1.6 Omitted.

3.3.1.7 Brake Levers, Rods, Hangers and Pins

3.3.1.7.1 Brake Levers, Rods & Hangers: Brake levers, rods and hangers shall be steel conforming to requirements of Section 6.4 and shall be designed to the following requirements:

Brake rigging applied stresses are based on brake actuator pneumatic pressure of 140 psi (966 kPa) combined with normal parking brake forces. The applied stresses shall not exceed 90 % of the elastic limit of the brake rigging material.

For brake parts of mild open-hearth steel having an elastic limit of 33,000 psi (228 MPa) allowable stresses shall not exceed the following:

	TENSION PSI / MPa	COMPRESSION PSI / MPa	SHEAR PSI / MPa	BEARING PSI / MPa
Rods	17,000 / 117	----------	----------	----------
Levers	23,000 / 159	23,000 / 159	10,000 / 69	10,000 / 69
Jaws	23,000 / 159	----------	10,000 / 69	10,000 / 69
Pins	----------	----------	10,000 / 69	12,000 / 83

3.3.1.7.2 Brake Pins: Brake pins shall conform to the requirements of ANSI 1049 or 1050 fine grained, killed special bar quality steel. Brake pins of 0.67 inch (17.02 mm) diameter and more shall be induction hardened to a minimum effective depth of 0.100 inch (2.5 mm) and a minimum hardness of 60 Rockwell on the C scale, leaving the core soft and ductile (Maximum of 30 Rockwell "C"). Brake pins of less than 0.67 inch (17.02 mm) diameter shall be induction hardened to a minimum effective depth of 15 % of the pin diameter and a minimum hardness of 55 Rockwell on the C scale, leaving the core soft and ductile (maximum of 30 Rockwell "C"). Effective depth is defined as the distance measured perpendicularly from the surface to a point below the surface where the hardness drops below Rockwell 50.

The hardened area shall extend from not more than $^1/_4$" (6 mm) under the heads to: the ends of plain pins; within $^1/_8$" (3 mm) of the cotter hole, where applicable; and within $^1/_8$" (3 mm) of threads on threaded pins.

Brake pin bodies shall be ground after hardening. They shall have a maximum finish of 32 micro-inch (0.81 micrometer). Pin body diameters, unless otherwise specified, shall be held to a maximum tolerance of plus 0.000 minus 0.002 inch (plus 0.00 minus 0.05 mm). Pins shall be finished in a workmanlike manner to given dimensions with a clearance of $^1/_{64}$ inch (0.4 mm) in the hangers and truck frame.

Pin heads and retaining pin holes shall not be hardened. The sides and tops of heads may remain rough forged. If pins are turned centering holes in the end and head, approximately $^1/_8$" (3 mm) deep, will be permitted. All pins shall be legibly and permanently marked on head end by metal stamp with part number and manufacturer's identification, and shall be retained by an PATH approved method.

Threads shall not be hardened. Threads shall be National Standard having a Class 3 fit and may be formed either by a milling operation, thread rolling machine or grinding.

3.3.1.8 Truck Mounted Brake Equipment Loading. The brake system shall be designed to meet the general strength requirements in Section 2.2.

3.3.1.8.1 The braking performance requirements and the parking brake force are in Section 3.2. The effects of worst-case temperatures in terms of forces, thermal stresses and component life shall be included in the affected component analysis.

3.3.1.8.2 The entire brake system shall be designed to withstand pressurization to one and one-half times the main reservoir safety valve pressure (see Section 3.3.2.1.4).

3.3.2 Car-Mounted Equipment

3.3.2.1 Air Compressor. The compressor(s) shall produce the total required compressed air capacity for operating the Track Inspection Vehicle brakes, horn, and any pneumatic controls or accessories.

Two (2) compressors shall be installed on the Track Inspection Vehicle one as the priminary the other as a backup. Each air compressor unit shall contain: a heavy-duty compressor, cooling system, safety valve, automatic drain valve with heater, dryer, governor, intake filter, and other required accessories. If one compressor fails, the other shall produce the total required compressed air capacity for operating the Track Inspection Vehicle's air systems. The Contractor shall provide necessary calculations to substantiate the chosen design. It is recommended that the capacity shall not be less than 24 CFM per unit.

The compressor(s) shall be automatically controlled by a governor to hold the main reservoir pressure to the Contractor's specified pressures. The compressor(s) shall be automatically controlled on a per set basis to provide optimal operation of each compressor. The design shall provide for operation of compressor sets to share the load, and shall provide for alternating sequential operation of each compressor set when required. Output pressure control shall be readily adjustable and positive in action. Positive action of the compressor control shall not be influenced by a slow rate of depletion of the main reservoir pressure.

An approved safety valve shall be provided by the Contractor

3.3.2.1.1 Automatic Drain Valve. An automatic drain valve shall be applied directly to the air dryer sump. An automatic drain valve that is in satisfactory use at PATH shall be provided. The automatic drain valve shall be actuated by a device to guarantee the periodic openings of the valve with the compressors running continuously. A switch shall be provided in a weather tight enclosure for turning the drain valve heater off during the summer.

Before leaving the manufacturer's plant, all automatic drain valves shall withstand an air pressure test of 160 psi (1,103 kPa) minimum, and shall operate satisfactorily under all conditions.

3.3.2.1.2 Drain Valve Heater: A thermostatically controlled heater sized for the worst-case conditions shall be installed in each compressor drain valve.

3.3.2.1.3 Intake Filter: The compressor intake filter shall be at least a 10 microns disposable element type of adequate size to permit the passage of the air required for the maximum capacity of the compressor. Filter element replacement under normal maintenance requirements shall be 10,000 miles (16,090 km) or one-year operation, whichever occurs first. The Project Manager may approve an alternate filter design.

3.3.2.1.4 Subsystem Pressure: Maximum pressure in the pneumatic system shall be specified. The system shall be protected by a main reservoir safety valve.

3.3.2.1.5 Discharge Temperature: The air discharge temperature of the compressor unit shall be within nine degrees plus or minus one degree Fahrenheit (five degrees plus or minus 9

degrees Centigrade) of inlet ambient temperature with the compressor running continuously under full load for one hour. The cooling coil shall be designed for parallel air flow to prevent air flow reduction caused by ice blockage.

3.3.2.1.6 Vibration: All parts of each compressor shall be designed to produce a reasonably noiseless and vibration free performance at the nominal voltage. The compressor units shall be mounted to the car in such a manner as to prevent vibrations from being transmitted to the car structure.

3.3.2.2 Air Dryer: A regenerating-type air dryer shall provide a minimum of 15°F (8°C) of dew-point depression throughout the desiccant's useful life, which shall be a minimum of one year. The dew-point depression shall be maintained after one hour of operation under the most severe ambient conditions specified in Section 1.14.3. Dryer inspection shall be required not more frequently than every 10,000 miles (16,090 km). Replacement desiccant for dryers shall be available in bulk from multiple sources. The replacement of desiccants shall require only minimal disassembly, preferably unscrewing and screwing on the desiccant. The air leakage of the dryer, if any, shall be included in the allowable system leakage specified in Section 13.3.2.

3.3.2.3 Brake Valve: The brake valve shall have the following positions: RELEASE, RUNNING, FULL SERVICE and EMERGENCY.

Release and running positions of the brake valve shall produce release of the brake system. When the brake valve is in the release or running position fluctuations of air pressure in the brake pipe shall not cause the brakes to creep.

Full service position shall produce maximum service application. These shall be a full range of control between the minimum service and up to full service cut off pressure with full service position providing full brake pressure on the Track Inspection Vehicle.

A distinct handle position beyond full service shall produce an emergency brake application by rapid venting of the brake pipe. An emergency pneumatic application shall ensure positive interruption of propulsion and shall cause positive application of pneumatic emergency braking.

3.3.2.4 Horn - The Track Inspection Vehicle shall be equipped with two roof-mounted horns, one on each end, facing opposite sides. The horns shall be operable from both operating ends. The horns shall have a minimum output of 97 dBA at a distance of 100' (30.5 m) from the end of the Track Inspection Vehicle on surface or elevated track.

3.3.2.4.1 If the horn is air operated, the consumption of the horn shall not exceed 20 cubic feet per minute (0.566 cubic meters per minute). A cutout cock shall be provided in the air supply line to each horn. If the Track Inspection Vehicle is placed in emergency, the air-operated horns shall remain operable and functional with air supplied from a dedicated air reservoir.

3.3.2.5 Air Pressure Indicators: Pressure indicators shall be furnished at each operator's position. Indicators shall display brake pipe, brake cylinder, main reservoir and equalizing reservoir/straight air pressures. The Project Manager will finalize needle assignments on each gage if it is necessary.

3.3.2.6 Air Brake Pipe & Test Fittings: Test connections shall be installed in the cab near the operator's position. These connections shall enable attachment of air pressure indicators for measurement of brake cylinder pressure, brake pipe pressure, and straight air pipe pressure. Test connections shall be ARO Corporation's 210-style coupler or approved equivalent. A rotary cutout cock of approved design shall be provided for each connection to prevent leakage.

3.3.2.7 Hand brake indicators: Two LED lights (LED) shall illuminate on each operator position when the handbrake is applied: one yellow LED to indicate minimum hand brake activation and the second LED to indicate maximum hand brake activation.

3.3.2.8 Reservoirs: The Track Inspection Vehicle shall have one or more main and supply reservoir(s). The main reservoir shall be protected by a suitable check valve against loss of air in the event of air hose rupture or other failure between the compressors and the main reservoir. The main reservoir shall be provided with a manual drain valve. Reservoirs shall be low alloy steel with flange fittings. Reservoirs shall be painted with a primer and approved topcoat urethane paint system for the exterior and interior surfaces. Reservoirs shall comply with ASTM section VIII Division 1 code tanks as the preferred tanks for Maintenance of Way equipment. A manufacturer’s certificate for the tanks must be supplied.

Pneumatic Capacity: When operated as a single unit, in the event of a compressor failure, the system shall be able, with the air available from the main and supply reservoirs, to make five (5) consecutive full-service braking applications and releases without initiating an emergency application due to low air. It shall be assumed that a compressor failure occurs when the main air reservoir is at the cut-in pressure setting of the air compressor governor.

3.3.2.9 Air Hose: All flexible connections on the Car and the trucks, including those at the brake cylinders shall be made with approved hose combinations.

3.3.2.10 Air Brake Pipe & Pipe Fittings

3.3.2.10.1 All piping and fittings shall be arranged to ensure moisture drainage into reservoirs installed at the lowest points in the system. Each reservoir shall be fitted with a manual drain. A minimum of two (2) drain valves shall be provided to completely drain the air system.

3.3.2.10.2 Test fittings on the Track Inspection Vehicle shall be furnished for measuring pressures in the brake pipe, brake cylinder and straight air pipe and in various other pneumatic lines and pipe brackets. These test fittings shall permit quick connection of gauges or

transducers for testing and troubleshooting.

3.3.2.10.3 Piping shall be used throughout below the deck except where hoses are required for flexible connections between moving parts. Air piping below deck shall be Schedule 80 black pipe or other approved finish open hearth, extra heavy, welded steel pipe conforming to ASTM Specification A-53 and provided with an approved rust preventative finish. The Project Manager may approve alternate piping materials.

3.3.2.10.4 Carbody airlines above deck shall be the same used in 3.3.2.10.3.

3.3.2.11 Parking Brake: A spring applied, pneumatically released parking brake shall be applied to both trucks. The parking brake shall transmit force to the parking connections on the brake actuator. The parking brake shall incorporate a self-contained, readily accessible self-resetting manual override feature. The manual override feature shall be arranged such that the receipt of a normal pneumatic brake release signal shall permanently cancel any manual release then in force. Brake chambers shall be fitted with spring applied/air released parking brakes. Caging bolts are to be used to manually release the brakes in the absence of air.

The parking brake shall apply when the brake pipe pressure is exhausted and the brake cylinder pressure is below an approved value. The parking brake shall release when the brake cylinder pressure is above the foregoing approved value.

The parking brake rigging shall be rattle-free. The swivel of the truck on curves shall not cause the parking brake to be applied.

The parking brake system, with all parking brakes applied, shall hold the Track Inspection Vehicle, the maximum load including all fluids full, all equipment on-board and with the maximum number of personnel on-board on a 5½ % grade indefinitely with a safety factor of 2.

3.3.2.12 Cutout Cocks: Cutout cocks shall be provided for all pneumatic components and subsystems as necessary for maintenance, troubleshooting, and failure recovery. All handles shall be arranged so that in the open position they shall be parallel to the air flow and in the closed position, crosswise of the air flow.

3.4 Friction Subsystem Service Braking Requirements

3.4.1 Ambient Conditions: All portions of the brake system shall be suitable for operation in ambient conditions specified in Section 1.14.3.

3.4.2 Reliability: The brake system, including mechanical linkages, shall be designed for reliable operation without failure.

3.4.3 Painting: Exterior surfaces of all components shall be thoroughly cleaned of rust, scale and other foreign matter and while in a clean condition shall be painted at the place of

manufacture with an approved rust-resisting paint. Paints, coatings and colors shall conform to Section 2.11.

3.4.4 Air Leakage Rate: Allowable air leakage for the Car shall not exceed 5 psi (34.4 kPa) in 10 minutes following a five minute settlement period from the point at which the subsystem had been charged to 140 psi (965 kPa) and the air compressors have been shut off.

3.4.5 Mounting & Interchangeability: All parts of the air brake system shall be mounted in close proximity to minimize piping and arranged so that it will not be necessary to remove piping, conduits, or a complete assembly for replacement, repairs, lubrication or inspection. All corresponding parts of the air brake apparatus shall be interchangeable.

3.4.6 Brake Arrangement Clearances: The brake arrangement and piping will be subjected to clearance limitations, specified in Sections 1.14 and 2.3.

3.4.7 Apparatus Supports: The brake apparatus shall be safely hung and supported per Section 2.2.6.

3.4.8 Valves, Valve Seats & Fittings: These parts shall be of the type, size and design, in satisfactory service on PATH, and shall be standard air brake parts. All drain cocks shall be installed to open by a pull toward the nearest side of the vehicle.

3.4.9 Lubricants: Lubricants shall be selected from Section 6.11.

SECTION 4

COUPLER EQUIPMENT

4.1 General

Each end of the Track Inspection Vehicle shall be equipped with an approved coupler see section 2.1.8, arrangement furnished new and capable of negotiating minimum curves as specified herein when coupled to a flat car, locomotive, crane car, hopper car or any other PATH work equipment and passenger Car now in use on PATH system.

The Track Inspection Vehicle shall be able to negotiate the fixed facilities of the PATH system considering coupler and coupler adapter when the Car is coupled with any of the car types mentioned above.

If two cars are used, a linkage bar capable of keeping the two car units connected under any conditions at all speeds and complying with all PATH's specifications shall connect the two-car units of the Track Inspection Vehicle. This arrangement shall be capable of negotiating PATH's minimum radius curves as specified herein.

4.1.1 Coupler

Both ends of the Track Inspection Vehicle shall be provided with a PATH type approved type coupler head, see section 2.1.8.

An approved, uncoupling mechanism operable from either side of the Track Inspection Vehicle when standing on the wayside shall be provided for each coupler.

4.1.2 Coupler Carrier Support. The Coupler Carrier Support shall consist of a wear plate with a radial front edge, ample top surface area, and made of rolled manganese steel.

4.1.3 If two cars are used, a linkage bar capable of keeping the two Cars together and complying with all PATH's specifications shall unite the two-car units of the Track Inspection Vehicle. The Linkage bar and supports shall be designed and constructed to permit the two connected Cars to negotiate all horizontal and vertical curves specified for the worst case conditions. Under no conditions shall the linkage bar interfere with truck parts, wheels, cables or other equipment

The coupler to be used shall be the Ohio Brass Form 8501 hook type as manufactured by Wabco Transit Division
The coupler carrier and its connection to the body structure shall be designed to resist a vertical thrust (both directions) from the coupled shank of 100,000 pounds for any horizontal position of the coupler without exceeding the yield points of the materials used.

4.1.4 One (1) heavy duty pintle hook shall be provided at each end of the Car. The pintle hook shall be approximately 15" + or - 1/2", from the top of rail to centerline of tow eye as

measured with new wheels.

4.1.5 One (1) Tow Bar six (6) feet in length and of a strength equal to 150% of the Draw Bar force required by the maximum load coupled to the UTV shall be provided and stowed in an accessible area of the Car.

4.2 Performance Requirements.

4.2.1 Operation

4.2.1.1 Curving - The coupler and carrier support shall be designed and constructed to permit the coupled Cars to negotiate all horizontal and vertical curves specified for the worst case conditions, including maximum mismatch between Cars, such as spring deflection, wheel wear and track irregularities. Under no conditions shall the coupler interfere with truck parts, wheels, cables or other equipment.

4.2.1.2 Gathering Range - The operation of the mechanical coupler shall be completely automatic within a gathering range of such proportions that approaching couplers will couple when the vertical distance between the center lines of couplers does not exceed 3" (76 mm); or the horizontal distance between the center lines of the couplers does not exceed 3 $^{3}/_{8}$" (86 mm). The coupler configuration shall provide the maximum practical gathering range when both vertical and horizontal misalignments exist in combination with the limits stated above. Layouts and calculations verifying that the coupler meets these requirements shall be submitted to the Project Manager for approval.

4.2.1.3 Lateral Force - When uncoupled, the coupler assemblies shall move laterally when a force not to exceed 200 pounds (889.6 N) is applied to the face of the coupler head.

4.2.1.4 Emergency Operations - The coupler shall be designed to provide satisfactory service in emergency operations in order to move a fully loaded Track Inspection Vehicle under the most unfavorable conditions. The Track Inspection Vehicle must be able to tow another Track Inspection Vehicle at 10 mph (16 km/h) on a 3½ % grade.

The Linkage bar between the car units shall be designed to be removed only in emergency circumstances.

4.3 Strength Requirements

The various components of the coupler structure shall withstand the following static loads without yielding or buckling:

Coupler Loading

Component	Draft		Buff	
	lbs.	kN	lbs.	kN
Coupler Housing	200,000	890	200,000	890
Anchor Assembly and Attachment to the Track Inspection Vehicle	300,000	1,330	300,000	1,330
Coupler Pin	300,000	1,330	300,000	1,330

For any horizontal position of the coupler, the coupler, its carrier and the car structure shall withstand, without yielding, a vertical load (both directions) of 50,000 pounds (222.4 kN) applied at the coupler face.

Linkage Assembly Loading

Component	Draft		Buff	
	lbs.	kN	lbs.	kN
Linkage Assembly and Pin	300,000	1,330	300,000	1,330
Anchor Assembly and Attachment to the Track Inspection Vehicle	400,000	1,780	400,000	1,780

For any horizontal position of the linkage, linkage components, its carrier and the car structure shall withstand, without yielding, a load (pushing/pulling) of 100,000 pounds (445 kN) applied at the linkage end.

A finite element analysis is to be conducted to confirm stress levels and submitted to the Project Manager.

4.4 Mechanical Detail

4.4.1 For the coupler pocket, drainage shall be provided for rain and car wash water.

4.4.2 Uncoupling levers shall be provided in the coupler to permit manual uncoupling from track level. Uncoupling shall be possible from either side of the Track Inspection Vehicle without personnel going between Cars. The force required for uncoupling shall not exceed 30 pounds (133 N) applied at the center of the handgrip surface.

4.4.3 Pin Removal

Accessibility shall be provided for the removal of the coupler pin/linkage pin either in the field or in maintenance shops.

4.4.4 Wearing Surfaces
All wearing surfaces shall have ample surface area and the material shall be rolled manganese steel.

4.4.5 Mating Surfaces
All surfaces mating to Carbody attachments shall be machined where required.

4.4.6 Coupler material, unless otherwise specified, shall conform to the requirements of AAR Specification M-20l Grade C, or ASTM 572, Grade 50 as appropriate.

4.4.7 Anchorage
An anchorage assembly shall be provided for the attachment of the coupler/linkage assembly to the car underframe. The anchorage shall be high strength steel and shall comply with the strength requirements of Section 4.3.

If a casting is used, the steel shall conform to the requirements of ASTM A-145 grade 90-60, with additional requirements specified in Section 6.4.2.3. If a weldment is used, the steel shall conform to ASTM 572 Grade 50.

The anchorage assembly shall be secured to the underframe of the Track Inspection Vehicle
with bolts made of ASTM A-490 or ASTM A-325.

4.4.8 Coupler Carrier
The carrier shall be designed to allow a sufficient range of movement in the transverse direction to enable the coupler head to move in a horizontal plane to the extent required to negotiate curves.

SECTION 5

PROPULSION EQUIPMENT

5.1 General

The Track Inspection Vehicle shall be self-propelled and shall include a main diesel engine or engines with a hydraulic transmission to provide tractive power to each of the axles of the two power trucks. The engine or engines shall be located in the Power Car Unit and it shall be possible to operate the Track Inspection Vehicle from either end. The propulsion control system shall be electrically interlocked to prevent simultaneous operation from both operating ends. If two main engines are used to power the Track Inspection Vehicle, these engines shall be capable of working in tandem as well as

independently and each engine shall have all the necessary equipment to work according to manufacture specifications and efficiency.

5.2 Train Operating Conditions

The Track Inspection Vehicle shall operate under the following traveling conditions:

5.2.1 When the Track Measuring Systems are not in operation, the Track Inspection Vehicle shall be capable of traveling from 0 – 60 mph (0 – 96.5 km/h). On PATH's tracks, the Track Inspection Vehicle shall travel, with the inspections systems in operation, at speeds equal to or below to 40 mph.

5.2.2 From a stand still on level track, a fully loaded Track Inspection Vehicle shall be capable of accelerating at 1.0 mph/sec or better.

5.2.3 On a 3 % grade, the Track Inspection Vehicle shall be capable of an acceleration of 1.0 mph/sec (1.609 km/h/s) or better.

5.2.4 Track Inspection Vehicle. The Track Inspection Vehicle must be capable of negotiating and maintaining a minimum of 10 mph or better on a 5 ½% grade.

5.2.5 If two main engines are installed, the Track Inspections Car shall be capable of negotiating a 3 ½ % grade with either one of the two engines.

5.3 Diesel Engines

The Power Car Unit of the Track Inspection Vehicle shall house a heavy duty diesel engine or engines equipped with all necessary equipment, such as a radiator for cooling, fuel and oil pumps, filters and an emergency engine shut-off. The engine or engines must be new and of the latest model, and certified to meet the applicable EPA regulations given in CFR 1039 "Control of Emissions for New and In-Use non-road Compression-Ignition Engines." Quick and convenient access shall be afforded for engine checklist items, such as oil dipsticks, coolant level, fan drive and battery charger drive belts.

A radiator shall be provided for the engine to cool the pressurized engine jacket coolant system. A fan shall cool the radiator. A petcock shall be provided in a suitable location for draining the radiator. The radiator cap shall be located for quick and convenient checking of the coolant level and shall be chain-secured to the radiator.

A diesel power unit shall provide power to drive the Track Inspection Vehicle. The gearbox, transmission, torque converter and other drive components shall be connected directly to the output shaft of the diesel engine or engines. The control shall provide an acceleration rate of 2.5 mph/sec

One or more diesel units shall provide the power to drive electrical generating equipment. The equipment, consisting of generators and/or alternators, shall be connected directly to

the output shaft of the diesel engine. The electrical generating equipment shall provide power to charge the batteries and other low voltage auxiliaries and to supply power at standard commercial voltages and frequency for the lighting, heating, measuring systems and other devices.

An emergency electrical compressor unit (125V) shall provide air pressure to the main tanks in case of main compressor unit failure. This emergency electrical compressor shall be able to get electricity from the main generator or emergency generator or external power.

The engines shall have an automatic shutdown feature to protect the engine from damage in the event of overheating, overspeed and/or loss of lubricating oil pressure. A manual override shall be provided so that the Track Inspection Vehicle can be towed from the mainline track in case of shutdown.

The engines shall be equipped with a paper type air filter suitably sized for operation in a dust-laden environment. The air filter element shall be designed for maximum protection against the entrance of dust, including steel dust, dirt, and moisture normally encountered in subway operations. The air filter element shall be sized for a 6-month replacement cycle for the worst case of PATH's system conditions.

The engine shall have a pressure lubricating system with a full flow filter for reserve and a by-pass valve. The by-pass valve shall operate to permit flow when the oil is cold or if the full flow filter becomes clogged to ensure a constant flow of oil to the engine.

All components of the power unit that may be damaged by vibration or that may induce damaging vibration to the system shall be equipped with suitable vibration isolators and shall be connected to other components by means of suitable flexible connectors. The lengths of flexible connections shall be minimized.

All filters shall be readily accessible for replacement.

SAE standards shall apply to fuel and oil line fittings, throttle connections and engine mounting.

The Contractor shall furnish drain hoses with a lockable shut-off for radiator, engine oil and hydraulic system. The hoses shall be suitably routed to the outside of the Track Inspection Vehicle and protected from damage.

5.4 Exhaust, Air Contaminants and Noise

5.4.1 The engine's exhaust shall meet the latest EPA requirements for Tier 4 Engines. The engine's exhaust system shall cause no adverse pressure or temperature rise to the engine or any other part of the engine enclosure. The system shall be designed so that the manufacturer's maximum allowable exhaust backpressure requirements are not exceeded. The exhaust shall not be routed to discharge under the Track Inspection Vehicle. At the

exhaust diffuser (exhaust conditioner), fan driven air shall be mixed with the engine exhaust, which shall be discharged to the atmosphere.

5.4.2 Noise. The Track Inspection Vehicle shall meet OSHA regulations CFR 1910.95 for occupational noise requirements. The system shall be designed so that the manufacturer's maximum allowable exhaust back pressure requirements are not exceeded. The noise level within the cab interior must be as low as possible, and is not to exceed 78 dBA.

5.5 Fuel Tank

The fuel tank shall have a minimum capacity to permit at least 10 hours of uninterrupted track inspection operation. The tank shall be epoxy coated over its interior and shall be corrosion and fuel resistant. If the tank does not include an epoxy coating, then the tank must be warranted against corrosion for the life of the Track Inspection Vehicle. The tank shall be designed in such a way that it can be filled with fuel from sources other than the fuel pump in case of need.

The primary fuel filter shall be located at the fuel tank. The tank shall be outfitted with a drain valve and clean-out ports to facilitate removal of dirt and sludge and shall be vented. Each tank shall be designed to reduce fluid motion or imbalance when the Track Inspection Vehicle is traveling at rated speed, accelerating or decelerating. Fuel baffle plates, if required for reduction of fluid motion in the fuel tank, shall not obstruct removal of dirt and sludge. The tank shall be located to minimize fire hazard from spilling, overflow and draining of fuel.

The Contractor shall ensure that the fuel tank is within the clearance diagram for the worst-case conditions, including deflection of the spring suspension with the tank positioned above the top of the third rail protection board. The tank shall be protected from contact with the third rail or its appurtenances in the event of derailment.

The tank shall contain a filler opening with a minimum internal diameter of 1 ¾” (44.4 mm), a strainer, a chain-secured or hinged filler cap and a flash arrester as manufactured by Protectoseal Co. or approved equal. The filler neck shall be located and oriented to prevent the fuel nozzle or fuel can from contacting electrical components during refueling.

Each tank shall include a sight-glass type gage visible from the side of the Track Inspection Vehicle. A gage shall also be installed on the operator’s console inside of both operating ends.

5.6 Starting Equipment

The engine starter shall be mounted on the diesel power unit. The starting equipment shall be operated from the control consoles and shall include a suitable interlock so that the starting button is inoperative from both operating ends when the engine is running.

For emergency starting, two approved 2-point receptacles shall be mounted, one on each side of the Track Inspection Vehicle, permanently connected to the battery/batteries and connected so that this receptacle may be used to start the diesel engine from an outside source with a jumper. Receptacles and permanent wiring shall be rated with a safety factor to carry the worst case starting current and current required for auxiliary loading.

5.7 Battery and/or Battery Enclosure

The proposed battery/batteries shall be submitted for PATH review and approval.

The battery/batteries shall be capable of supplying power for engine starting and for auxiliary power, including for lighting required by the Track Inspection Vehicle.

The battery/batteries shall have sufficient capacity for a minimum of six consecutive engine starting attempt of 30 seconds discharge followed by a 60-second open circuit period at ambient temperature. A battery disconnect switch shall be mounted at a location approved by the Project Manager.

All intercell connectors shall be corrosion resistant with low joint resistance and shall have ample current carrying capacity as recommended by the battery manufacturer.

The battery enclosure box shall be made of an approved steel construction material and designed to accommodate batteries of at least two different approved manufacturers. The cells shall be cushioned against the worst-case vibration encountered during track inspection operation.

Compartments shall be well ventilated to vent off explosive gas mixtures. Drains shall be provided at the bottom of the box and tray so that electrolyte leakage and wash water will drain clear of other Track Inspection Vehicle parts. Electrolyte-resistant covers shall be provided to permit quick and convenient inspection and maintenance. A voltmeter shall be provided on the instrument panels (both operating ends).

5.8 Alternator

A battery-charging alternator equipped with a rectifier and regulator shall be furnished and installed. It shall be capable of fully charging the battery/batteries, when at 50 % discharge, in four hours and while also supplying full auxiliary power.

The alternator shall have suitable voltage regulation to provide direct current at constant battery charging potential to the battery/batteries and the auxiliaries over the full operating range of engine speed. Should two or more alternators be furnished, a means shall be provided to prevent harmful interaction between the outputs of their regulators.

5.9 Hydraulic System

The hydraulic system, if required, shall be designed to provide power for transport operation. The Track Inspection Vehicle shall be equipped with suitable hydraulic pumps. The hydraulic system shall be dual filtered and shall operate at a pressure sufficient to operate the equipment. The Track Inspection Vehicle shall be equipped with a hydraulic tank of adequate capacity.

The hydraulic system shall be equipped with a fluid level gage suitably protected from damage and vandalism. Appropriate pressure test fittings to measure various sections of the hydraulic system shall be located inside the operating ends. An indicator, readily visible to the operator, shall provide positive indication of the condition of the hydraulic return filter.

A shut-off valve with provisions for a lock shall be installed on all lines exiting the hydraulic tank.

The hydraulic fluid shall be environmentally safe.

All information on the proposed hydraulic system shall be sent to the Project Manager for review.

SECTION 6

MISCELLANEOUS MATERIALS

6.1 General

This section specifies the requirements for workmanship, processes, and materials to be applied in the design and construction of the Track Inspection Vehicle. These requirements shall serve as basic guidelines for all equipment. For standard or catalog equipment installed as a unit, except safety or load carrying equipment, these requirements shall serve as procurement guidelines only.

The quality of material used on this Contract shall be of the highest standard conforming to the best practice, and as per the Contractor's past experience, and shall meet the physical and chemical requirements of the latest release of the designated ANSI, SAE, ASTM, AAR, OSHA, EPA or other applicable specifications. Any new issues or revisions to these specifications subsequent to award that have a significant impact on the Contract, such as price, weight and delivery, shall be negotiated under the Extra Work provision of the Contract. All consumable parts shall be U.S. standard, unless otherwise approved by the Project Manager.

The Contractor shall be responsible for the inspection and quality of all materials. However, PATH reserves the right of inspection. Therefore, all materials shall be subject to thorough inspection and to physical and chemical tests by the Contractor at his expense. Tests may be conducted at the mills, the car builder's plant, the supplier's plant or PATH's shops or laboratories, whichever is deemed appropriate by the Project Manager. Non-conforming material shall be rejected on the basis of such inspection or tests.

6.2 Electrical Wiring

6.2.1 This section details wiring performance and physical requirements for the Track Inspection Vehicle systems, its subsystems and for all components. All wire and cable installation shall be executed in accordance with rules and regulations of the National Board of Fire Underwriters.

6.2.1.1 Wiring Layout. All wiring shall be standard harnesses, if required, and shall be installed with identical arrangement and location in each Track Inspection Vehicle.

6.2.1.2 Conductors. Conductors #12 AWG and smaller shall be soft, annealed nickel-plated copper constructed in accordance with MIL-W-22759/6B. Conductors #10 AWG and larger shall be soft, annealed tinned copper in accordance with ASTM B-33. Minimum stranding shall conform to ASTM B-172 Class K for AWG-8 and larger, to ASTM B-174 Class K for AWG-10 to AWG-16, and to Class L or 19 strand for size AWG-18 and smaller.

6.2.1.3 Ratings

6.2.1.3.1 Conductor Size. The selection of wire sizes shall be based on the current carrying capacity, voltage drop, mechanical strength, temperature and flexibility requirements in accordance with applicable AAR, IPCEA, ASTM, NEC and/or MIL Specifications. Maximum wire ampacities shall conform to the National Electric Code Table 310-16 for wires with an insulation rating of 194°F (90°C) and to Table 310-18 for wires with an insulation rating of 230°F to 482°F (110°C to 250°C) for 1-3 conductors. Where more than three conductors are routed in a raceway or conduit, the ampacities shall be derated as detailed by NEC. Note 8 of Tables 310-16 through 310-19.

In no case shall wires smaller than the following sizes be used:

Wire that is pulled through conduits or wireways - No.12, or as approved by the Project Manager for each application.

Wire on electronic units, cards, and card racks - No.22, or as approved by the Project Manager; and all other wire, including that which is laid in, rather than pulled through, wireways - No.18.

6.2.1.3.2 Insulation. High voltage circuits (greater than 100 volts) using irradiated cross-linked polyolefin insulation shall use wire rated at 2000 VAC minimum. High voltage circuits (greater than 100 volts) using TFE Teflon mineral filled insulation shall use wire rated at 1000 VAC minimum, constructed and tested in accordance with MIL-W-22759/10B. Low voltage circuits (up to 100 Volts) using irradiated cross-linked polyolefin insulated shall use wire rated at 600 VAC minimum. For low voltage circuits using abrasion resistant mineral filled TFE Teflon, the wire shall be rated at 600 VAC minimum, constructed and tested in accordance with MIL-W-22759/8B.

TEFLON TFE, mineral filled insulation shall be used on all sizes from AWG 12 to AWG 22.

Wire sizes AWG 10 and larger shall be insulated with irradiated cross-linked polyolefin.

Exceptions: Wires connected to heater elements that contain irradiated cross-linked polyolefin insulation are not allowed.

6.2.1.4 Multiconductor Cable. Multiconductor cable shall meet the above requirements for single conductors. Outer jacket material shall be chemically cross-linked polyolefin, except for the coupler cable, which shall have a jacket of low temperature (MIL-C-13777) neoprene.

6.2.1.5 Shielding. Shielding, when required, shall be metal foil, tape shields, or braided using AWG-38 minimum copper/tin-plated ASTM B-33 wire with minimum effective shield coverage of 85 %.

6.2.1.6 Junction Boxes. Junction boxes shall be used, as required, for wire termination. Harness connections to the boxes, as well as internal wiring to terminal boards, shall be as

specified in Section 6.2.3. Exposed exterior junction boxes shall be weather tight.

6.2.1.7 Wire Identification. Each wire and cable shall have printed on the outer surface, the manufacturer's identification, insulation identification, conductor size, and voltage rating. For wire size l/0 and larger, stranding shall be given in addition to the other parameters.

Each wire shall be permanently and legibly marked along its entire length. Blank spaces between markings shall measure approximately 6" (152.4 mm). Wires shall be marked with their alphanumeric circuit designations in accordance with PATH standards. A circuit designation shall change only when it goes through an active or passive component such as a relay coil or relay contact, fuse or circuit breaker, lamp, motor or resistor. A circuit designation shall remain unchanged when it goes through a terminal strip or junction box stud regardless of how many wires of that circuit are common to that point. There shall be no duplication of wire codes in unrelated circuits throughout the car. Where there is more than one of a particular assembly per car, each assembly shall be wired identically to the other (s) and wire marking of harnesses shall be identical in each assembly.

The Contractor may at his option provide the following, instead of the above requirements:

All cables and wires shall be color-coded and marked on both ends with cable/wire identification. The color-coding and cable/wiring shall be used as reference on all documents, including drawings and Manuals.

6.2.1.8 Insulation to Ground. With all ground returns disconnected, resistance between all car wiring combined and the Carbody shall be at least fifteen (15) mega-ohms for the high voltage system and seven (7) mega-ohms for the low voltage system under all humidity conditions. Resistance between any one circuit when isolated and the Carbody and all other circuits when grounded shall be at least one hundred (100) mega-ohms. All terminal insulators shall be chosen to be consistent with these requirements.

6.2.1.9 Standard Voltages. Source supply voltages shall use standard values and the number of different voltages shall be limited.

6.2.2 Wire Harnesses, Conduits, and Raceways.

6.2.2.1 Wire Harnesses. Multiple conductor harnesses containing more than two wires shall be completely interchangeable. Each harness between equipment enclosures shall contain a minimum of 10 % spare, but no fewer than two spares for each wire size and cable type. Each harness shall be permanently marked within 1" (25.4 mm) of each termination using machine-printed, permanent plastic sleeves. Markings shall be black on white or yellow background.

6.2.2.2 Wire Runs. Wire runs shall be continuous and unbroken between connection points, supported at no greater than 2' (609.6 mm) spacing, and protected at each support point

against mechanical crushing and abrasion. A watertight bushing and drip loop shall be provided on all exposed cable entries. All cable bundles and wires shall be routed a minimum of 1" (25.4 mm) above the bottom of equipment enclosures.

6.2.2.3 Wire Length. Slack shall be provided in cables at equipment terminals to accommodate shock-and vibration induced movements, equipment shifting, alignment, cover removal, and component replacement. Sufficient wire length shall be provided at points of termination to permit at least two re-terminations per wire without splicing.

6.2.2.4 Conduits. In no case shall deformed, split or otherwise defective conduit be installed.

All conduit bends and offsets shall be made by the use of special forms or tools and shall have the largest radius possible so that wires can be drawn in by hand without the use of tackle or power.

Channel conduits for all wiring are preferred, and they shall be integrated, as much as possible, in the frame of the car.

Flexible conduit shall be the best grade, water tight, interlocking spiral strip steel and protected with a rust-resisting coating.

Conduit shall be sized such that the sum of the cross sectional areas of the conductors and their insulation does not exceed 40 % of the cross sectional area of the conduit for three or more conductors. For two conductors a limit of 32 % will be permitted while for a single conductor a limit of 53 % will be permitted. Where conduit nipples having a length not exceeding 2' (609.6 mm) without bends of more than 15° are used between enclosures, a maximum fill of 60 % will be permitted.

All conduits and their connections to electrical equipment shall be installed to make a continuous ground.

6.2.2.5 Conduit Fittings and Boxes. All conduit fittings shall be provided with covers and approved gaskets. Fittings and boxes shall be mechanically connected to the conduit runs in an approved manner, and the conduit system shall be securely fastened to the Track Inspection Vehicle frame to provide a continuous electrical ground.

Open ends of conduit shall be pointed downward and provided with strain relief type fittings with extended rubber bushings, bell mouth fittings or insulated throat box connections.

6.2.2.6 Raceways. Except as otherwise specified or approved, all wiring between separate devices shall be laid and secured into protective metal raceways. Metal raceways and the elbows, couplings and similar fittings shall be electrically and mechanically coupled, while protecting the wires from abrasion, and shall make a continuous ground. Heads of screws or bolts inside the raceway shall be flush with the metal surface. The sum of the cross-sectional areas of all contained conductors and their insulation at any cross section

of a raceway shall not exceed 40 % of the cross section unless otherwise approved. Raceways shall be provided with drain holes and shall preclude water entrapment. Raceways shall be provided with covers, which may be interrupted wherever desired for entry and exit of wires and cables. Edges of such interruptions shall be completely covered with protective bushings. Points of screws or fasteners shall not be directed toward the interiors of raceways.

6.2.2.7 Circuit Separation. Conductors of low (less than 100 volts) and high (equal or more than 100 volts) voltages shall be placed in separate raceways or in raceways containing a barrier to segregate circuits. Raceways for wiring of low and high voltages shall be different colors. Color-coding of raceways shall be indicated in the electrical drawings.

6.2.2.8 Truck wiring shall be of a loop coil design to ensure sufficient slack, and shall be provided with clamp supports and abrasion protection. T-splices will not be permitted.

6.2.2.9 Cables shall be cleated and bushed when passing through bulkheads and structural members. Sufficient slack shall be provided to prevent mechanical strain where movement might occur between any wire and terminals, and drip loops shall be provided to prevent standing moisture. Cleats and cable supports shall have inert abrasion shields to prevent chafing and cutting of the cable.

6.2.2.10 Exposed Cable or Harness. Short cable runs or harness entering or leaving exposed raceways shall have approved fire-resistant flexible dielectric sleeving over the raceway edges and grommet-type insulation of any wire penetration holes. Wiring shall be retained to the sleeving with tie-wraps.

6.2.2.11 Drip Loops. Drip loops shall be provided on all cables or harnesses to prevent water or moisture damage to electrical devices or equipment.

6.2.3 Connectors

6.2.3.1 All equipment enclosures, terminal blocks and junction boxes, except primary power circuits, shall be fitted with terminal boards or connectors. Terminal boards or connectors shall have binding screws or threaded studs on each side for incoming and outgoing connections. Each board or connector shall have the required number of terminations plus a minimum of 10 % spares, but not fewer than two spares, except for the microphone backbox and the microphone/intercom backbox, which shall have a minimum of one (1) spare. A permanent marking strip on each terminal board shall be provided and attached adjacent to the wire junction point. A maximum of two wires shall be connected to any one binding screw or threaded stud. Wiring connected to threaded studs shall use brass hardware for spacers when spacers shall be required, and shall have a minimum of 2 $^{1}/_{2}$ threads exposed beyond the final nuts. Space shall be provided to permit connecting wire terminals with standard tools.

6.2.3.2 Grounding Connections. All grounding connections for low voltage circuit returns which are to be made directly to the Track Inspection Vehicle structure shall be bolted through

l/8" (3 mm) thick copper pads. Ground returns shall not be attached to aluminum alloy members. All terminals shall be properly torqued to ensure sound connections. Multi-pin connectors shall meet the requirements of Section 6.3.2.5.

6.2.3.3 Wire Termination. Except as otherwise approved, all wire termination shall be crimp-style ring type terminal lugs. Solder connections shall not be permitted, except for printed circuit applications. Corrosive protection shall be required on all base materials. Wherever several wires are connected to terminals of a terminal strip on a device which is removable from the car for maintenance, the wires shall be terminated, with double ring termination, which shall be screwed to an insulated fanning strip, which shall serve to keep the termination in the correct relative locations while removed from the device, unless otherwise approved by the Project Manager.

6.2.3.4 Power Cables. Power cables shall be terminated with an approved compression terminal. Sufficient slack shall be provided to preclude breaking or pull-out from bushings or terminals and to allow two terminal changes. Cable conductors shall be nick-free and cleaned prior to swaging of terminals. Terminals shall be applied using tools and procedures recommended by the terminal manufacturer for that purpose.

6.2.3.5 Multi-pin Connectors, Multi-pin, positive lock, crimp-style connectors shall be provided where required and shall meet the mechanical and electrical requirements of MIL-C-5015 or approved equal.

6.2.3.6 Cable Identification. The Contractor shall use a basic identification system in conformance with ANSI Y32.16 and shall submit the system selected for approval to the Project Manager for review and approval.

6.2.3.7 Quick-Disconnect Terminals. Quick-disconnect terminals shall be provided to facilitate maintenance and shall be provided with positive terminal engagement and be shock/vibration proof. All terminals shall be provided with insulation equal to that of the wire.

6.2.3.8 Knuckle Joint Connectors. Knuckle joint connectors shall be crimp-type connectors and shall be of pin and groove design. They shall be constructed of brass, shall be silver plated, shall have an extended bell-mount cable entry and shall be AMP, Inc., Ampower Style A or approved equal.

6.2.4 Electrical Enclosures

All under car electrical enclosures shall be NEMA 4. All conduit entries into equipment boxes shall be made weather-tight with a replacement O-ring seal that cannot be dislodged without removing the conduit. All open-ended conduits shall be installed in such a manner as to ensure gravity-drainage. Where a single wire enters an equipment box without a conduit, the entry shall be made watertight by a suitable strain-relief bushing with an O-ring seal.

6.2.5 Printed Circuit Boards

Printed circuit boards, except proprietary ones, shall be designed and manufactured to the following criteria:

6.2.5.1 Printed circuit boards shall be of the glass epoxy type with components mounted only on one side. The copper laminate shall be firmly attached to the board and shall not blister or peel when heated to soldering temperature.

6.2.5.2 The Printed circuit boards shall conform to MIL Standard 275, latest revision.

6.2.5.3 Circuit board material shall be Type FL-GB-062C-212-B-1-B per MIL-P-143943/2.

6.2.5.4 Clearance shall be provided between components to permit testing, removal and replacement without difficulty. Printed circuit board connectors shall be heavy duty, high reliability, and proven in prior successful service in rail transit applications.

6.2.5.5 Both sides of the assembled printed circuit board shall be coated with an insulating and protective coating that fully coats all conducting surfaces. Connections and wire terminations shall be easily removable with a brush-applied solvent or penetrated by a hot soldering iron when a component must be unsoldered. Coating material shall be Type AR per MIL-I-46058.

If a coating is not provided on the circuit boards, then they shall be installed in a dust-resistant enclosure. This enclosure shall not require any accessories to maintain the operation of the boards, other than a fan-assisted filter. If a filter is used, then it shall be sized for proper filtering without replacement for a 6-month inspection period.

6.2.5.6 The component side of the board shall be printed with the component references and such additional information as may be useful or required. The component side of the board shall be marked to indicate capacitor polarity and at least two leads of all transistors.

6.2.5.7 All printed circuit boards shall be inherently stiff or shall be reinforced to prevent damage due to vibration or handling.

6.2.5.8 All boards having edge card connectors shall plug into sockets and shall be keyed to prevent insertion into the wrong socket. Contact fingers and edge connectors shall have gold plating 50 microns (1.27 μm) thick unless otherwise approved by the Project Manager. Suitable guides, locking tabs, retaining pins, grab handles, etc., shall be on each board.

6.2.6 Electrical Design Standards

6.2.6.1 All equipment shall be designed to minimize adjustments unnecessary for operation. The need for adjustments shall be avoided wherever possible by the use of appropriate circuitry, stable components and high-tolerance circuits. Adjustable components shall not be used unless absolutely required. Any adjustable component used during design

development to determine the correct operational settings shall be eliminated in the final design. All same design plug-in boards shall be interchangeable without any additional adjustment.

6.2.6.2 Electrical Design Practices. All electrical and electronic control systems shall be designed, and components shall be selected, using the "Reliability Design Handbook" MIL-338B as a guide. All devices shall be derated to operate within the "Acceptable" region for electrical stress versus temperature for "Airborne Applications," at Ground Mobile Severity. If there is a conflict between guidelines given elsewhere in this Specification and the "Reliability Design Handbook," the more restrictive specification shall govern.

6.2.6.3 Electrical Design Criteria. Hardware, including the case, heat sinks, mounting brackets, etc., shall be protected against moisture, oxidation and common air-borne contaminants. Hinges and latches shall be of corrosion-resistant metal.

Hermetically sealed, dry tantalum capacitors, in metal cases, shall be used in place of aluminum electrolytics, except for very high values, which are not commercially practical or available. In this case, long-life grade aluminum electrolytics shall be used, except in the case of commutating capacitors, which shall incorporate a nontoxic impermanent capacitor and shall be chosen to give a service life of at least 20 years. Filter capacitors shall have high ripple-current ratings for long life.

Capacitors shall be derated 20 % for voltage based on the nominal supply voltage and maximum case temperature. If filter capacitors are exposed to low ripple voltages, lower values of departing may be accepted if it can be shown that reduced operating temperatures can be achieved due to lower dissipation. The sum, however, of the DC and AC ripple voltage shall always be less than the capacitor's voltage rating at its maximum allowable case temperature, normally 185°F (85°C).

All resistors shall be derated 50 % for power dissipation.

Transformers and inductors shall be derated 10 % for current.

Germanium semiconductors shall not be used unless otherwise approved.

All semiconductor junction temperatures shall be limited to 302°F (150°C) or to the maximum rated temperature for the device if the rating is less than 302°F (150°C) or less at maximum ambient temperature and at maximum rated output power.

6.2.6.4 Semiconductor Standards. The Contractor shall be responsible for ensuring that all electrical and electronic circuitry, whether of his own design and manufacture or those of their manufacturers and suppliers, shall meet, as a minimum, the criteria listed in this Section with regard to the use of semiconductors, unless otherwise approved by the Project Manager.

6.2.6.4.1 Semiconductors for electronic circuits shall be adequate in current, Peak Inverse Voltage (PIV) ratings, and performance characteristics for the application intended.

6.2.6.4.2 Discrete semiconductors shall have the following minimum voltage breakdown rating, depending on use:

6.2.6.4.2.1 Transistors and thyristors operated from the nominal battery supply, or those connected to trainlines, shall have minimum breakdown ratings of four times the maximum circuit voltage. Suppression devices shall be provided as necessary to protect the devices and limit the circuit voltage.

6.2.6.4.2.2 Diodes operated from the nominal battery supply or those connected to trainlines, shall have a minimum breakdown rating (PIV) of 1000 volts. Suppression devices containing diodes may have a breakdown rating of less than 1000 volts if they are sufficiently protected from transients; each case shall be submitted for written approval by the Project Manager.

6.2.6.4.2.3 All discrete semiconductors operated from inverters or other isolating devices shall have minimum breakdown ratings of twice the maximum circuit voltage. Suppression devices shall be provided as necessary to protect the devices and limit circuit voltage.

6.2.6.4.3 All semiconductors shall be operated at less than 50 % of the maximum continuous current rating or 50 % of the maximum continuous power rating, with the more restrictive rating being the controlling value.

6.2.6.4.4 Circuits shall be designed to limit excessive current to semiconductors, to prevent damage from high discharges (spikes), and to limit excessive temperature through properly designed heat sinks.

6.2.6.4.5 Semiconductors shall be placed in a clean and ventilated environment, which shall favor easy replacement.

6.2.6.4.6 Integrated circuits operated from the battery supply through inverters or other isolating devices shall be operated within the voltage and current ratings specified by the manufacturer, derated to less than 50 % of the maximum stress level at a maximum operating temperature of the device as specified by the manufacturer. Where the supply to integrated circuits is regulated and surge protected, the voltage ratings shall be 15 % below the manufacturer's recommended maximum. In addition, the maximum power shall be limited to 50 % of the manufacturer's specified maximum at the maximum operating temperature.

6.2.6.4.7 Except as otherwise approved, all semiconductors shall be hermetically sealed and rated for operation over the temperature range of –67°F to 257°F (-55°C to +125°C).

6.2.6.4.8 All thyristors, transistors, and diodes shall be Joint Electron Device Engineering Counci (JEDEC) registered and numbered, and shall be available from at least two (2) different

manufacturers, unless otherwise approved by the Project Manager. However, non-JEDEC-registered, which carry more than 10 amps, may be used provided that the Contractor obtains prior approval based on submission of complete procurement specifications defining each device and evidence of availability from two or more manufacturers based on those specifications.

Sole source components may be approved by the Project Manager. However, the Contractor must provide, at no additional cost, technical assistance in providing replacement components if the original component is no longer available for the life of the Track Inspection Vehicle.

6.2.6.4.9 All integrated circuits shall be standard and available from at least two different manufacturers.

6.2.6.4.10 All integrated circuits shall be "burned-in" and screened for defects to a level equivalent to MIL-STD-883, Method 5004, Reliability Class B or by alternate methods of screening for infant mortality as approved by the Project Manager.

6.2.6.4.11 Heat sinks shall be oriented so as to preclude accumulation of dust and dirt on horizontal surfaces.

6.2.7 Electrical Devices and Hardware

6.2.7.1 Contactors. All contactors used shall meet or exceed the requirements of MIL-R-6106.

All contactors shall be constructed and utilized in a fail-safe manner; all failures shall be in a direction such that neither the crew nor the equipment would be subjected to any hazard.

All contactors shall be installed such that they are fully accessible for inspection, repair-in-place or removal and replacement.

There shall be only two wires connected to any one terminal of the device.

The coil of each contactor shall be suppressed with a solid state device to protect against transients generated on the low-voltage network.

Under no circumstances shall either the main or auxiliary contact tips of a contactor be placed in parallel for the purpose of carrying a current load at or above the manufacturer's tip rating.

Bifurcated wiping contacts shall be used in low-voltage applications wherever necessary due to "dry circuit" switching requirements.

Device installation shall be such that the arc spray is directed by an arc chute away from

ground and any other electrical devices proximate to the contactor.

The contactor shall be constructed in an extra heavy-duty fashion suitable for use in transit service. The Project Manager reserves the right to review and approve the design and selection of all contactors.

All contactors shall be constructed such that the main tips make and break with a rolling and wiping motion in order to preclude the build-up of deposits and pitting.

All contactors shall be readily identifiable by means of a permanent, durable marking strip giving the device circuit designation.

6.2.7.2 Relays. All relays used which switch ten (10) amps or less through their contacts shall meet or exceed the requirements of MIL-R-5757 or approved equal. All relays shall be constructed and utilized in a fail-safe manner; that is, all failures shall be in a direction such that neither the crew nor the equipment is subjected to hazard. There shall be only two wires connected to each terminal of the device.

The coil of each relay shall be suppressed with a solid-state device to protect against transients generated along the low-voltage network.

Under no circumstances shall the contact tips of a relay be placed in parallel for the purpose of carrying a current load at or above the Manufacturer's contact tip rating.

Bifurcated contacts shall be used in low voltage applications whenever necessar due to dry circuit switching requirements.

All relays shall be constructed in an extra heavy-duty fashion suitable for use in transit service. The Project Manager reserves the right to review and approve the design and selection of all relays.

All relays shall be installed such that they are easily accessible for inspection, removal and replacement.

6.2.7.3 Switches and Pushbuttons. All switches supplied for the Track Inspection Vehicle specified herein shall meet or exceed the requirements of MIL-S-3950. The Contractor may submit its standard switches to the Project Manager for approval, providing that the switches have been in successful operation on previous Track Inspection Vehicle or Track Geometry Car without any incident.

Under no circumstances shall poles of switches be placed in parallel in order to carry currents equal to, or in excess of, the contact pole rating given by the manufacturer.

Switches shall be provided with a "keying" feature such that, after installation, the body of the switch will be constrained from mechanical rotation.

All switches provided shall be of the highest quality procurable and shall be fully suitable for the rigors of a transit service environment.

There shall be only one wire connected to each terminal of the device.

Switches and Pushbuttons that can cause door opening or are otherwise critical to safety shall be designed to withstand a high potential test of 1,500 volts for one second without damage and without false conduction in a clean, dry condition.

6.2.7.4 Circuit Breakers

6.2.7.4.l All circuit breakers shall be extremely rugged and fully suitable for the service intended.

Separate circuit breakers shall be provided for each major assembly or function.

They shall be of the highest quality. Design and selection of all circuit breakers shall be subject to review and approval by the Project Manager.

The ON, OFF, and TRIPPED positions of all circuit breakers shall be permanently marked on the handle or the case of the circuit breaker. The circuit breakers, when tripped, shall assume a distinct position between the ON and OFF positions to permit determination of the fact that it has been tripped by either its overcurrent or shunt trip elements. All circuit breakers shall be mounted in the vertical direction with the ON position up. No circuit breaker shall protect more than one circuit unless otherwise approved.

All circuit breakers shall be sized by current rating and tripping time to protect the smallest size wire used for power distribution within the protected circuit.

Circuit breaker poles may be connected in series if necessary to achieve the stated voltage interruption requirements. Circuit breaker poles shall not be connected in parallel.

Each circuit breaker pole shall be equipped with adequate means of arc extinction to prevent flashover.
The continuous current rating of thermal-magnetic trip circuit breaker shall be selected in accordance with ANSI C37.16 for the load and type of service specified.
All thermal-magnetic trip circuit breakers shall conform to the requirements of ANSI C37.13 and ANSI C37.14.

Circuit breaker current rating shall be clearly and permanently visible after installation.

B+ Power. B+ for communications, static control equipment, lighting and other equipment shall come from separate breakers in the cab and their returns to the Carbody also shall be separated.

Remote electrically reset circuit breakers shall be arranged for operation from the low-

voltage DC supply.

6.2.7.4.2 High-Voltage Circuit Breakers. All high-voltage circuit breakers shall be three- or four-pole devices with the positive feed interrupted by three poles connected in series.

Each breaker shall have both a thermal and a magnetic trip element.

The circuit breaker handle shall protrude from the circuit breaker panel cover sufficiently to be operational in all positions.

6.2.7.4.3 Low-Voltage Circuit Breakers. Low-voltage circuit breakers shall be either one- or two-pole devices depending on the intended function.

Trip elements shall be thermal-magnetic, or magnetic, as is appropriate for the application.

6.2.7.4.4 Circuit Breaker Panel. Circuit breaker panels shall be of an approved safety type, constructed of Class 130 insulating material conforming to ANSI C37.14-1969, and shall conform to the latest and best practices. The number of branch circuits and the capacities thereof for each panel shall conform to the requirements specified herein.

The circuit breaker panel shall conform to Article 384 of NFPA 70 National Electric Code.

All live portions of the protected circuitry shall be completely concealed so that no danger of electric shock exists from the accidental touching of the panel, or any appurtenances or devices mounted thereto.

A raceway shall be provided for the routing of high voltage leads to their designated circuit breakers.

The panel shall be grounded and shall be configured for easy removal so that maintenance and repairs are not impeded.

6.2.7.5 Fuses. The circuit protection function performed by fuses shall normally be performed by use of appropriately rated circuit breakers. Fuses shall only be used where specified in the specification or where use of circuit breakers is not technically feasible.

All fuses shall be permanently identified and readily accessible.

The fuse holder shall contain fuse retention devices at both ends.

Air gap and creepage distances shall be as approved by the Project Manager.

The rating of each fuse shall be clearly and permanently marked on the fuse itself.

Except as otherwise approved by the Project Manager or as otherwise specified herein, all fuses shall be of current limiting, arc-confining type providing a clear visible indication of a blown condition.

6.2.7.6 Bus Bars. Bus bars shall be fabricated from hard drawn copper. As a minimum, the connection points shall be plated to improve and maintain good conductivity throughout the life of the equipment.

The bus bar conductivity shall be 98 % of the "Annealed Copper Standard" for a straight bar of rectangular cross section.

The maximum bus bar operating temperature shall be 194°F (90°C) or less unless plating is incorporated to prevent oxidation of the bus bar surface.

6.2.7.7 Insulated Bolts. All insulated bolts for the support of electrical apparatus shall have an approved protective finish and may be lubricated, but shall not be coated with any substance such as white lead that will act as a conductor of electricity.

6.2.8 Interference and Transient Suppression.

6.2.8.1 Interference. The wiring shall be carefully planned and selected to avoid electrical interference in the operation of the train radio, public address, intercom, and other sensitive high frequency systems. This shall include the use of coaxial cables, chokes, filters, capacitors, etc., as required by good design standards to avoid possible interference with these systems. Adequate voltage transient suppression shall be provided for the protection of panels and circuitry involving semi-conductor devices.

6.2.8.2 Transient Suppression.

6.2.8.2.l Suppressors. Suppressers shall be incorporated across inductive devices to minimize switching transients.

6.2.8.2.2 Magnet Valves and Relay/Contactor coil activated contacts. All magnet valves and relay/contactor coil activated contacts shall have arc suppression except where this results in degradation of performance.

6.2.8.3 Circuit Shielding. The wire shields shall be connected through all applicable connectors and junction boxes. Circuits shall be categorized. Shields contained in one circuit category shall not be interconnected with shields contained in another category.

Shields on low-level signal wires shall not be interconnected with shields on high-level signal wires in the same category. Each group of shields shall be carried through on a connector pin or pins, or on terminal strips which shall be in the immediate proximity of the categorized group of circuits. Loops due to interconnections of shields shall not be permitted.

Shields used to suppress electromagnetic interference (EMI) as specified in Section 1.26 at all frequencies shall be terminated only at the low potential side of the interference circuit, at the termination which exhibits maximum susceptibility.

Shields used to protect against the effect of, or to exclude, EMI at frequencies below 150 kHz, shall be terminated either to the low potential side or at the balance point of the protected circuit at the termination that exhibits maximum susceptibility.

Cables requiring both audio frequency (AF) and radio frequency (RF) shields shall be electrically isolated from each other. The resistance between these circuits shall be at least 500 mega-ohms when 500 VDC is applied. Double shielding shall be required on circuits that are both AF-susceptible and RF-susceptible. Coaxial cables used as constant impedance transmission lines shall be terminated as dictated by the circuit termination design and shall not be considered to be shielded conductors. Triaxial cables may be used as coaxial impedance transmission lines with the outer conductor employed as an RF shield.

6.2.9 Communication. Cables shall be in accordance with the requirements in this Section. Each conductor shall be color coded or otherwise identified. All wiring shall be cabled, when practicable, and clamped to the chassis. Wiring insulation shall be uniquely identified by means of mark coding and shall be installed in accordance with the requirements of this Section. All transformer terminals and leads shall be permanently and legibly marked to permit identification on schematic and wiring diagrams. Terminal boards shall be of non-hygroscopic insulation materials that shall not deteriorate when leads are soldered to the terminals. All components fastened to the chassis by means of machine screws and nuts shall require lock nuts or other means to prevent them from vibrating loose. Rivets or self-tapping screws shall not be used for electrical connections or to secure components which must be removed for maintenance.

6.2.9.1 All resistors, capacitors and other components, shall be securely mounted on printed circuit boards. All transistors and capacitors shall be of the silicon "plug-in" type and mounted both for easy removal and also to preclude loosening due to vibration.

6.2.9.2 All terminals and wires shall be properly identified. All leads shall be uniformly color-coded and a master drawing showing circuit wiring and component location on both sides of the boards shall be supplied.

6.2.9.3 Fixed resistors and similar small parts shall be mounted on a component board where they cannot be incorporated in normal solid-state design.

6.2.9.4 All circuit components shall be mounted in the chassis assemblies in such a manner as to permit replacement without removal of other components. Controls shall be accessible to authorized maintenance personnel and shall be secure against Track Inspection testing.

6.3 Piping

6.3.1 Material. Unless otherwise described herein, all piping shall be seamless copper tubing. Copper tubing shall conform to Sections 6.4.16 and 6.7.4 Wrought copper or cast brass shall conform to ANSI B16.22 and B16.18. Air brake piping shall be as specified in Sections 3.3.2.10.3

Air piping on trucks shall be Schedule 80 Black or other approved finish open hearth, welded steel pipe conforming to ASTM Specification A-53. All truck and air hose fittings shall be air furnace, malleable iron provided with an approved rust preventive finish. All truck fittings shall be extra heavy cast malleable iron conforming to AAR Specification M-404, and provided with an approved rust preventive finish. The pipe shall be free of burrs, etc. and shall be blown out with dry compressed air at the time of assembly.

Where necessary, wrapping material for piping shall be Armaflex FR or other approved fire retardant, closed cell foam insulation. An approved sealing compound shall be used to seal threaded pipe connections and fittings.

6.3.2 All pipes and hoses shall be labeled.

Piping shall be clamped to prevent vibration, rubbing and chafing. Clamps shall be insulated to prevent noise generation.

Piping shall be installed using a minimum number of fittings. Unions shall be used between tees or where necessary to permit replacement of apparatus and hoses without disassembling or cutting the brake pipe.

All fittings shall be visible and readily accessible for maintenance. All inaccessible runs of tubing shall be without joints. Lines subject to sweating shall be insulated. Vibration isolators or flexible connectors shall be used in piping connections to all resiliently mounted units.

Piping shall be supported by brackets and clamps located no more than 4" (101.6 mm) from joints, fittings, valves and bends of 45° or more. Supports shall be spaced no more than 2 ft. (610 mm) apart for pipe sizes up to $^{1}/_{2}$" (12.7 mm) and no more than 3 ft. (914 mm) apart for larger pipe sizes on straight pipe runs. All piping shall be protected from chafing and dissimilar metals. Piping shall be installed in such a manner as to provide drainage to prevent freezing.

6.3.3 Pressure Vessels. All unfired pressure vessels furnished under these Specifications shall conform to Section VIII of the ASME Boiler and Pressure Vessel Code for Unfired Pressure Vessels. Test reports shall be furnished for each pressure vessel, and each pressure vessel shall be stamped to document the test.

6.3.4 Requirements. All air hoses shall be as specified in latest revision of the Association of American Railroad (AAR) Specification AAR M-618 with AAR approved reusable fittings meeting AAR Specification M-927. A date label shall be applied to all hoses in

an approved manner. Vulcanizing of any label to any hose shall not be permitted. The date of application of the hose shall be properly indicated.
The pneumatic system shall utilize SAE-Jl402 air hose and reusable fittings.

Air hose applications shall not be permitted in locations where adequate visual inspection cannot be made.

6.4 Materials

6.4.l All combustible materials used in the construction of the Track Inspection Vehicle, trucks and equipment shall meet flammability and smoke emission requirements of Sections 6.9.2.

All exposed materials shall be capable of repeated and long-term exposure to all of the relevant cleaning compounds listed in Section 6.10 without degradation, except as otherwise specified.

Where dissimilar metals, or metals and other materials, are in contact which may result in electrolytic or other corrosive action, Contractor shall furnish and install suitable preventative coatings or separators.

Commercial materials not covered by a specification shall be clearly identified by the commercial trademark and name and address of the manufacturer. A description of the material composition and chemical and physical properties shall also be made available to the Project Manager for approval. Substitution of materials shall require prior approval. Prior to attachment or joining, all materials shall be mill-finished, unless otherwise specified.

6.4.2 Carbon and Low Alloy Steels

6.4.2.1 Heat-Treated Alloy Steel. Structural heat-treated alloy steel, suitable for welding, shall conform to the requirements of ASTM A-514 and ASTM A-36. Nickel-copper-columbium-type steels exposed to atmospheric corrosion shall meet the requirements of ASTM A-242.

6.4.2.2 Low-Alloy, High-Tensile Steel. Low-alloy, high-tensile structural steel shall conform to the requirements of ASTM A-606 or ASTM A-588 and shall have a minimum of four times the corrosion resistance of carbon steel.

6.4.2.3 Castings

6.4.2.3.l Steel castings. Steel castings if used, shall conform to the requirements of ASTM A-27, Grade 70-36 or AAR M-201, Grade B. High-strength steel castings shall conform to the requirements of ASTM A-148, Grade 90-60, or AAR M-201, Grade C.

Steel castings for truck spring seats and body castings other than the center plate shall

conform to the requirements of ASTM A-27, Grade 70-36 normalized or AAR M-201, Grade B.

The castings shall be true to drawings and shall have smooth surfaces. Fins and risers shall be trimmed in a workmanlike manner. The castings shall be cleaned and free from flaws, cracks, and excessive shrinkage. They shall be well cleaned by tumbling, shaking and/or shot blasting, as appropriate, to remove all baked-on sand, and shall be finished as required by the Specifications.

Unless otherwise specified by Project Manager, qualification tests for castings may be required; this shall include radiographic examination for material soundness using reference radiographs to ASTM E-446 and any mechanical testing, as specified herein.

All radiographs shall meet the requirements of ASTM E-94 and ASTM E-142. The radiograph quality level in the area of inspection shall be at least 2 %.

All radiographs which resulted from the qualification test shall be made available to the Project Manager for review. In case the casting selected for qualification fails to qualify, an intended plan of action shall be included in the Qualification Test Report. Once a design is qualified, no changes may be made in foundry practice, heat treatment or material composition without written notice to and approval of the Project Manager. All structural castings supplied shall be equal to or better than the design qualification casting in all respects. The Contractor shall shall arrange for the casting supplier to test, inspect and accept castings in accordance with procedures described in AAR Specification M-201. In addition, the following inspections shall be performed:

-magnetic particle inspection of all surfaces of each casting by personnel certified to MIL-STD-410A, latest revisions; and

-radiographic inspection meeting the requirements of ANSI/ASTM E-94 and using reference radiographs to ASTM E-446. A sampling frequency shall be selected and submitted to the Project Manager for approval.

A written report of the results of the tests and inspections as specified above shall be furnished to the Project Manager for each lot of castings produced.

All welding on castings shall be performed by welders qualified to ASTM A-488. Prior to design qualifications, Contractor shall arrange for the Casting Supplier to submit to the Project Manager certified test results of the following tests to ASTM A-488:

-weld procedure qualifications;
-personnel qualification; and
-materials and equipment qualification.

Unless the casting supplier can demonstrate that heat treatment is not necessary and the procedure is approved by the Project Manager, all welds or welded castings shall be

stress relieved. Localized stress relief is permitted for attached brackets, etc.

At least two tension specimens of sound metal shall be provided for each heat cast and each annealing charge. These specimens may be either attached to the gate of the castings or cast separately in the same mold or by other approved methods and shall be provided with markings to identify them with the corresponding castings, heat and annealing charge. The specimen shall conform to the mechanical properties specified. High-strength steel castings for center plates, truck height adjusters, bolster center fillers (if cast) and drawbar castings (if any) shall conform to the requirements of ASTM, A-148, Grade 90-60 normalized.

6.4.2.3.2 Malleable Iron Castings

Malleable iron castings shall conform to the requirements of ASTM Specification A-47, Grade 35018. The iron shall be produced by the Air Furnace, Open Hearth or Electric Furnace Processes. The physical properties shall conform to the following minimum requirements.

Tensile Strength	53 Ksi (365 MPa)
Yield Point	35 Ksi (241 MPa)
Elongation in 2" (50.8 mm) minimum	18 %

Workmanship. Castings shall be cleaned and free from flaws, cracks and excessive shrinkage. They shall be well tumbled and finished as indicated in the above referenced ASTM Specification.

6.4.2.3.3 Gray Iron Castings. Gray iron castings shall conform to the requirements of ASTM Specification A-48 (Class 25). The castings shall be free from sand holes, cold shuts, blow holes, air bubbles, blisters, cracks, flaws, or other imperfections, being clean, smooth and true, neatly chiseled, ground and machined as called for on the drawings.

6.4.2.3.4 Ductile Iron Castings

6.4.2.3.4.1 General Use. Ductile iron castings shall conform to the requirements of ASTM Specification A-536. The ductile iron grade selected shall be 60-40-18, unless the manufacturer deems another grade better suited to the intended usage if approved by the Project Manager. Where usage of ductile iron components could affect safety, the impact properties of the cast components shall be demonstrated to be adequate for the lowest expected temperature of operation.

6.4.2.3.4.2 Omitted.

6.4.2.3.4.3 All castings shall be cleaned and free from flaws, cracks and excessive shrinkage. The

microstructure shall contain less than 10 % of Type 4 and Type 5 classifications of graphite distribution, as illustrated by the ATSM Metals Handbook, 8th Edition, Figure 24, p. 393. The castings shall be well tumbled and finished as specified on the drawings.

6.4.2.4 Steel Forgings. Steel Forgings shall conform to the requirements of AISI C-1045, normalized and tempered.

6.4.2.5 Hot-Rolled Bar Steel. Hot-rolled bar steel shall conform to the requirements of AISI C-1020, Grade 50.

6.4.2.6 Rivet Steel. Rivet steel of $^{3}/_{8}$" (9.5 mm) or less, except that used on the body underframe, shall conform to the requirements of ASTM A-31, Grade A. Rivet steel of greater than $^{3}/_{8}$" (9.5 mm), and that used on the body underframe, shall conform to the requirements of ASTM A-131.

6.4.2.7 Steel Bolts. Carbon-steel bolts for structural joints shall conform to the requirements of ASTM A-325.

6.4.2.8 Spring Steel. Spring steel for general purposes such as wear plates, coil and leaf springs, shall conform to the requirements of ASTM A-689 ASTM A-229 or approved equal.

Spring steel for truck bolster and equalizer springs shall be in accordance with AAR specification M-114.

Coupler head coil shall conform to the requirements of ASTM A-125.

Oil tempered spring steel not conforming to ASTM A-125 shall conform to the requirements of ASTM A-229.

6.4.2.9 Rolled Manganese Steel. Rolled manganese steel is to be used for wear plates. The chemical constituent breakdown shall be consistent with the TA Grade VIII Steel Characteristics Table and must have a percentage of manganese between 11.00 and 14.00.

6.4.3 Corrosion-Resistant Steel

6.4.3.1 Austenitic Stainless Steels. Corrosion-resistant steels shall be Austenitic stainless, conforming to AISI Type 201L, 301L or equal. Structural and sheathing stainless steel shall contain no more than 0.03 % carbon. Non-Structural stainless steels used for decorative purpose may be chosen from AISI Types 201, 201L, 202, 301, 301L, 302, 304, 304L, 309, 310, 316, or 316L.

The material shall be free from precipitated carbides and scale before and after fabrication.

For coil stock, obtain from the manufacturer and forward to the Project Manager a report

for each coil of the material. The report shall include the chemical analysis, physical properties (each end of master mill coil), mill coil number, invoice number, date and mill order number of each coil.

For sheet stock a ladle analysis and single physical property test on each heat and each size shall be furnished.

Corrosion resistant steel fasteners where used to attach corrosion resistant steel parts shall conform to the requirements of Specification AISI Types 301 or 302 and 304.

6.4.3.2 Cold-Rolled Stainless Steel. Stainless steel used in the cold-rolled condition shall not be more than $^{3}/_{4}$ hard.

6.4.4 Aluminum Alloys

Aluminum alloys shall conform to the composition, strength, quality and corrosion-resistance requirements of the Aluminum Industry Association (AIA) specifications. Aluminum alloy designations shall be those registered with the AIA. Aluminum alloys joined by fusion welding shall be weldable, high strength, corrosion-resistant and shall not require heat treatment after welding. Sheet and plate aluminum alloy shall be 3002-H14, 5052-H32, 5052-H34, 5083-H321, 5083-H323, or 6061T6. Aluminum alloy castings shall conform to the requirements of ASTM B-26, B-85, and B-108. Castings shall be free from blowholes, cracks, shrinkage and other defects that may act to jeopardize completion of design life. Aluminum alloy rivets used in structural applications shall be 6061-T6, 6053-T61, or 2117-T4.

Aluminum conduit shall be 6061-TO or other approved aluminum alloy tubing for use with clamp type fittings and dimensions and weights as given in the following table. This table may be used as a guide in selecting the closest dimensions to the dimensions shown in the table. Conduit shall be smooth, straight and free from scale, burrs and other imperfections. It shall bend cold 90° about a radius equal to ten diameters without flaws or fractures.

Nominal Size (Inches)	Inside Diameter (Inches)	Outside Diameter (Inches)	Wall Thickness (Inches)	Weight (lbs./100 ft.)
$^{3}/_{8}$	0.493	0.577	0.042	8.21
$^{1}/_{2}$	0.622	0.706	0.042	10.19
$^{3}/_{4}$	0.824	0.922	0.049	15.63
l	l.049	1.163	0.057	23.04
$1\ ^{1}/_{4}$	1.380	l.510	0.065	34.32
Special	1.530	1.660	0.065	37.88

6.4.4.1 Fabrication and Fastening

6.4.4.1.l General. The forming of aluminum parts, their joining by bolting, riveting and welding and the protection of contact surfaces shall conform to requirements of Aluminum Company of America Technical Report 524, "Specification Covering Use of Aluminum in Passenger Carrying Railway Vehicles," except as otherwise Specified herein.

6.4.4.1.2 Joining of Materials - Specific measures to be taken to preclude the possibility of contact with resultant electrolytic corrosion shall be applied and shall be subject to approval by the Project Manager.

Aluminum alloys surface shall not be secured to, nor shall they make direct metal-to-metal contact with, surfaces of copper, brass, bronze, silver, lead, tin, nickel, or alloy thereof. In the car structure, where the parts shall be permanently covered and concealed following assembly, components made of copper, copper bearing aluminum alloys, brass, bronze, silver, and nickel shall not be employed. The surfaces of aluminum alloy parts secured to ferrous parts shall be protected as prescribed herein, with a one-part polysulphide or silicone sealant used as the joint insulating compound. Alternatively, an insulating joint material completely covering the facing surfaces may be used. Such a material shall be non-hygroscopic, free from chlorides and heavy metal ions and, if fibrous, shall be impregnated with bitumen or other water repellent substance.

6.4.4.1.3 Insulation - Surface covering or insulation shall be provided for all bolts, rivets, securing clips, and devices to preclude contact with aluminum alloys if the bolts or other devices are not formed of a compatible aluminum alloy.

6.4.4.1.4 Bolting and Riveting - The head and unthreaded portion of the shank of the bolt shall be in contact with the aluminum part when secured in place. Bushings may be used. Rivets driven hot may be covered by a protective oxide coating. The preferred method of riveting shall be with the formed rivet head in contact with the aluminum alloy.

6.4.5 Interior Hardware

Interior hardware shall be securely attached with recessed Phillips oval-head screws. Where machine screws are used, tapped metal shall be reinforced by welding or by the use of clinch-type nylon-collared stop nuts. Screws shall neither tap into nor engage threads in aluminum hardware, moldings, etc.

6.4.6 Non-Metallic Materials. Non-metallic materials used for interior appointments shall not be affected by industrial cleaning agents. Flame spread and smoke generation characteristic of all combustible interior materials and the service life of those characteristics shall be certified by an approved independent testing laboratory applying the requirements specified in Sections 6.9.2 and 6.9.3.

6.4.7 Caulking and Sealing Compound

6.4.7.1 General. The use of caulking compounds and sealants shall be minimized. Application shall be in accordance with manufacturer’s recommendations.

Caulking primers shall be quick-drying, colorless, non-staining sealers of the type and consistency recommended by the caulking materials' manufacturer for the specific application. Packing (backstop) shall be non-staining resilient material, such as glass-fiber roving, neoprene, butyl, other closed-cell foams, or other compressible material compatible with the caulking compound used. Butyl-type shall be extruded polyisobutylene sealer compound of 100 % solids.

6.4.7.2 Application and Workmanship. Joints, spaces, and junctures to be packed and caulked or sealed shall be completely dry and thoroughly cleaned of all dirt, dust, oil, and other foreign materials, which could adversely interact with the caulking compound or sealant. When so stipulated by the manufacturer, protective coatings shall be removed from surfaces to be caulked or sealed. When caulking against aluminum frame members with adhesive-type compounds, all film-type isolation or separation coatings, which have been applied to the aluminum surfaces, shall be removed to the maximum depth of the caulking seam immediately before applying the caulking. All voids and joints shall be completely filled. The entire perimeter of each opening shall be caulked. The finish of caulking joints on flush surfaces and in internal corners shall be neatly pointed. Excess material shall be removed. Exposed caulking shall be free of wrinkles and uniformly smooth. Storage shall be at temperatures below 50°F (10°C). Compounds shall not be used when they have become too jelled to be discharged in a continuous flow. Modification of caulking compounds by adding liquids, solids, or powders shall not be permitted. When using two-part compounds, only the amount of caulking which can be installed within four hours shall be prepared. All adjoining surfaces, finishes, and fixtures shall be protected throughout the caulking operations, and any stains, marks, or damage thereto as a result of caulking and sealing work shall be corrected.

6.4.8 Lubricants. Lubricating oils, greases, and wearing (bearing) pads shall be as approved by the Manufacturer of the item requiring lubrication and by the Project Manager.
For the purpose of standardization and to reduce storeroom requirements, the lubricating oils and greases shall be compatible with or be selected from those being used by PATH. Typical lubricants presently being used are listed in Section 6.11. This list is to be considered representative, but not all-inclusive.

6.4.9 Elastomers

6.4.9.1 Elastomeric parts include: door and window seals, glazing strips, truck bumpers and snubbers, structural and compressible gaskets, and mounting pads, and shall be of neoprene or equivalent material as approved by the Project Manager.

Elastomeric parts shall be capable of withstanding operational temperatures from -10°F (- 23°C) to 130°F (54°C) for above floor locations from -10°F (-23°C) to 150°F (66°C) for below floor locations. Elastomeric parts shall not be painted unless specifically approved by the Project Manager.

6.4.9.2 Elastomeric parts shall be resistant to ozone, oxidation, heat, oil, grease and acid, and

shall maintain their physical properties under the environmental conditions in which the Track Inspection Vehicle may be operated, stored, or maintained.

6.4.9.3 Properties. Except as otherwise specified and/or PATH approved, elastomeric materials shall demonstrate the following minimum properties when tested in accordance with the applicable test method specified in the following table:

Elastomeric Minimum Properties

Physical Property	**ASTM Test**	**Requirement Value**
Hardness, Durometer A	D-2240	45 to 75
Tensile Strength	D-412	1,500 psi (10,333 kPa), minimum
Ultimate Elongation	D-412	300 %, minimum
Flame Resistance	C-542	Must not propagate flame or exhibit flame dripping
Ozone Resistance	D-1149	No cracks
Heat Aging Resistance	D-573	------
Oil Aging Resistance	D-471	+80 % change in volume, maximum
Permanent Set Resistance	D-395 (Method B)	25 % compression set, maximum
Tear Resistance	D-624	200 psi (35.7 kg/cm) minimum

6.4.9.4 Metal Parts. Metal parts to which elastomeric parts or materials are cured shall be made of SAE 1020 or AISI 1045 hot-rolled steel.

6.4.9.5 Finish. Unless otherwise specified, all elastomeric parts shall be natural finish, smooth and colored as specified by the Project Manager.

6.4.9.6 Truck Parts. Truck bumpers, snubbers and sound isolating elastomers shall be made of natural rubber or PATH approved equal. They shall be resistant to abrasion, oil, grease and acid.

6.4.10 Decals, Labels and Films. All marking films, decals and adhesives shall conform to the manufacturer's recommendations. Film shall be opaque and shall completely hide a contrasting black printed legend and white surface. There shall be an initial degree gloss

value of 40 when tested in accordance with ASTM D-523. Films shall retain adhesive properties after one week of continuous exposure to a temperature of 150°F (66°C). Films shall conform to the contours of the car interior and exterior surfaces. Overall thickness of the processed film shall be between 0.0015" and 0.0045" (0.04 and 0.11 mm).

Films shall withstand immersion in either distilled water or SAE No. 20 motor oil for 24 hours at a temperature from 70°F to 80°F (21°C to 27°C) without degradation of adhesion, color or appearance.

6.4.11 Glass Reinforced Plastics. Resins shall be thermosetting, fire-retardant polyester materials, selected to meet the physical and molding process requirements. On parts to be painted, the prime coat shall consist of two-component epoxy zinc chromate composed of PATH approved base, activator and thinner elements. The primed surface shall be filled and sanded before applying the finish coat.

6.4.11.1 Reinforcement. Glass fiber reinforcement shall meet the physical and process requirements of Section 6.9 - Fire Safety. Glass content by weight shall be 25% to 30% chopped strand mat for non-structural applications and 40% to 45% alternating layers of mat and woven roving on structural applications. Gel coat shall be resistant to scuffing, fire, weather, perspiration and cleaning agents. Glass fiber shall be pigmented throughout to match the color of the surface unless otherwise specified. The minimum thickness of gel coat shall be 0.015" (0.38 mm) and shall remain craze-free over the design life of the Car. Additives, fillers, monomers, catalysts, activators, inhibitors, pigments and flame-proofing materials shall be added to the resin mixes as required to obtain finished products with the characteristics specified. Mineral filler shall not exceed 28% of the finished weight for the performed matched die molding process.

6.4.11.2 Glass fiber reinforced plastic shall be manufactured by one of the following methods:

Method I	**Method II**
-Opening molding	-Matched die molding
-Hand layup	-Preform
-Spray layup or chopped strand blown	

6.4.11.3 Requirements. Production techniques shall ensure that the glass fiber reinforcement is distributed throughout the final product in such a manner as to preclude formation of resin-rich sections. Reinforced plastic parts shall have greater thickness at attachment joints, edges and flanges. Exposed sharp edges shall not be permitted. All open-molded parts shall be gel coated. Plastic laminates that are to be painted shall be sanded and filled before the prime and finish coats are applied. Plastic laminates that are not to be painted shall be gel coated to match the color specified. Surfaces shall be uniform, smooth and free of porosity and crazing.

Compressive Strength - Heat Resistance - Thickness

Independent laboratory test certificates shall be provided stating that the production reinforced plastic material complies with the requirements of the following standards. Test specimens shall be conditioned in accordance with ASTM D-618.

		Minimum Requirements	
Mechanical Property	ASTM Test	Open Moldings	Matched Die Moldings
Tensile Strength	D 638	10,000 psi	12,000 psi
Compressive Strength	D 695	18,000 psi	22,000 psi
Flexural Strength	D 790	15,000 psi	22,000 psi
Impact Strength	D 256	6 ft-lb/in. of notch	8 ft-lb/in. of notch
Hardness		45 Barcol	45 Barcol

6.4.12 Omitted.

6.4.13 Windows

6.4.13.1 All windows shall be of the single-glazed, fixed type, supported directly by the Track Inspection Vehicle structure with an approved fastener arrangement or by glazing strips. Carbody and windows shall be maximized in size to provide clear viewing. Where frames are specified the frames shall be designed to be vandal resistant. The front of the cab windshields and their glazing strips shall meet the FRA Type I impact and ballistics requirements. All other cab windows and their attachments to the Carbody shall meet the FRA Type II impact and ballistics requirements. Side windows shall have a thickness of $^{3}/_{8}$ in. (9.5 mm), and end windows shall be at least $^{9}/_{16}$ in. (14.5 mm) thick.

All sash frames, where used, and glazing strips shall be arranged so that they are easily removable from the inside of the Track Inspection Vehicle for repair and replacement. The glazing sections shall be designed specifically for this Track Inspection Vehicle, considering both the Track Inspection Vehicle wall material thickness and configuration and windows material thickness in order to make a watertight seal without the need for sealing compounds.

Glass shall be free from sharp projections and rough edges and shall be bedded in rubber molding.

6.4.14 Omitted.

6.4.15 Foams. Foams shall be used in the operator's seat and other applications as listed below. All foam material shall be graded and labeled in accordance with the requirements indicated and with manufacturer's standards.

6.4.15.1 Latex and Neoprene Foam. Latex foam shall not be used.

Neoprene foam shall be used for sealing strips and fillers for side windows, cab doors, finger guards, grommet, gaskets, tubing, sleeves, tape, weather-strip and operator's seat padding.

6.4.15.2 Urethane Foam. Urethane foam shall not be used.

6.4.16 Copper Alloys. Castings shall be made of new metals, and shall be sound and free from blowholes, sand holes, honeycomb, dirt, sand and other defects. They shall be smooth and true to pattern, and where finish is required, shall be machined to produce a good fit and proper alignment.

6.4.16.1 Copper Tubes. Seamless copper tubes, in accordance with the following specification, shall be used for all Carbody air and air conditioning piping, except where brass pipe of iron pipe size is required.
Air conditioning refrigerant lines and condensate drain lines shall be of seamless copper tubing, type "K," with wrought copper sweat type fittings.

6.5 Assembly

6.5.1 Corrosion Deterrence

6.5.1.1 Carbon and Low Alloy Steels. Chromium plating on steel shall meet the requirements of ASTM B 177. Epoxy primer meeting the requirements of MIL-C-22750 may be used.

All ferrous metals, unless specified elsewhere to be protected by other methods or not requiring protection, shall be galvanized in accordance with the requirements of ASTM A-123, and of ASTM A-383. Galvanizing, if required, shall follow fabrication.

6.5.1.2 Corrosion Resistant Steel. Corrosion-resistant steels, except stainless steel, shall be plated or coated, except in dissimilar metal contact applications as specified in Section 6.5.2.

6.5.1.3 Aluminum Alloy. Aluminum alloys shall be prepared and coated for corrosion protection in conformance with Aluminum Industry Association (AIA) standards. Aluminum alloy parts with limited access shall have a coating conforming to A31 of the AIA standards. Unexposed aluminum parts shall be prepared and coated for corrosion protection in conformance with Alcoa's Finishing Systems for Aluminum, Passenger-Carrying Vehicles or approved equivalent.

6.5.1.4 Other Metals. Brass, bronze, copper, and nickel alloys shall not require surface treatment.

6.5.2 Dissimilar Metals Protection. Dissimilar metals shall be protected in conformance with MIL-STD-889. Requirements for selection and protection of dissimilar metals relative to electrical wiring and electronic equipment shall be in conformance with MIL-STD-454F, Classes 2 and 3. Isolation of incompatible metals and materials shall be provided in all installations except air conditioning and heating coils.

6.5.2.1 Copper. Copper other than used in grounding pads shall not come in contact with

dissimilar metals, except copper alloys, tin, lead or stainless steel. Where copper abuts, overlaps or is joined to tin, lead or stainless steel, it shall either be coated with bituminous plastic cement or separated by other inert material.

6.5.2.2 Fastenings. All ferrous metal fasteners, clips, and brackets shall be separated from aluminum and copper by nylon or equivalent washers installed during fabrication and assembly of the Car and its components.

6.5.3 Connections

6.5.3.1 Metal-to-Metal Connection. Where metal is riveted or bolted to metal, contact surfaces shall be free of dirt, grease, rust, and scale and shall be coated, except for stainless steel parts, with a metal base primer. If aluminum parts are used for any purpose, metal connections shall be in accordance with the latest revision of Alcoa Technical Report Number 524 or approved equivalent.

6.6 Fasteners

U.S. dimensions that conform to ANSI standards shall be provided for U.S. components; ISO (metric) fasteners shall be provided for non-U.S. components. All mechanical fasteners shall conform to ISO for metric fasteners and ANSI Standards for U.S. This shall include nut and bolt threads and heads, pipe, conduit, electrical connectors and plugs, and other items available from catalogs. All fasteners shall be stainless steel, chromium plated steel or zinc steel with supplemental clear chromate coating, depending on specific application. All threaded fasteners shall either be self-locking or provided with locking devices. Sheet-metal screws shall not be used. Self-tapping machine screws shall be permitted.

6.6.1 Nuts and Bolts. Nuts and bolts (except for nuts and bolts with metric dimensions for which the thread and dimensions shall conform to the applicable standards) shall meet the following requirements, except in cases where the Specification states otherwise. Steel bolts shall conform to the requirements of ASTM A-325, Grade BD, or A-490, as applicable. Nuts shall meet the requirements of ASTM A-194, A-325, or A-563, as applicable. Nuts and Bolts shall be cut to U.S. threads with a Class 2 fit, minimum. Peening of bolts shall not be permitted. A minimum of l 1/2 threads and a maximum of 6 threads shall protrude beyond the nut or fastener. Bolts used in structural applications shall be no smaller than $^{3}/_{8}$" (9.5 mm) in diameter.

Use of aluminum alloy bolts, nuts and screws is not permitted. All steel screws, bolts and nuts not plated as per Section 6.6 shall be zinc-chromate treated, except for stainless-to-stainless joints where stainless steel bolts and nuts shall be used. All carbon steel bolts shall be SAE J 429 Grade 5 strength minimum and sized for common hardware. Non-load carrying applications in the coupler are excluded from this requirement. The number of different sizes of bolts shall be kept to a minimum and approved by the Project Manager. Lock bolts with swaged collars will be permitted.

6.6.2 Car-Proof Fasteners. Car-proof fasteners shall be used to secure the microphone plate, the logo emblem and other such devices as directed by the Project Manager.

6.7 Metal Joining

6.7.1 General. In special cases not covered under the American Welding Society Specifications, the Contractor shall submit to PATH his welding, brazing and soldering procedures for approval.

6.7.2 Welding

6.7.2.1 Conformance. All welding, unless otherwise specified, shall be in accordance with the requirements of the applicable American Welding Society (AWS) Specifications, including AWS D1.1, AWS D1.3 and AWS C1.1.

6.7.2.2 Materials and Welding Practice

6.7.2.2.1 Aluminum-Welding rod, wire or filler material shall be chosen with respect to make, type, size, composition and in accordance with Chapter 94 of the AWS Handbook. Welding electrodes for steel and manual shielded metal-arc welding shall conform to E60 or E70 series. The welding of aluminum shall conform to the provisions and recommendations of the AWS publication, Welding Aluminum.

6.7.2.2.2 Stainless Steel. The materials for welding stainless steel shall conform to the provisions and recommendations of AWS processes or other approved code.
All parts to be joined by welding shall be adequately supported during the welding operation to ensure minimal distortion. Sealing compounds shall be used between surfaces of the joint to ensure sealing against environmental elements. All welding shall produce complete and adequate fusion with the basic material throughout the weld.

6.7.2.3 Resistance Welds. Resistance welding operations shall employ accurate control of cleanliness, current, time, electrode size and shape, and tip force to produce uniform welds of specified strength, which shall not be subject to surface corrosion. For each type of metal joint or built-up assembly to be resistance welded, a prior sample of the joint shall first be welded with the prescribed settings of current, time and tip pressure, and then either static tested for shear strength or tested to destruction by tearing to ensure that a weld nugget is pulled out of one of the plates

6.7.2.4 Defect Repair Welding or Special Cases. Welding to repair defects shall be accomplished in accordance with a PATH approved written procedure.

6.7.3 Brazing. All brazing unless otherwise specified shall be in accordance with the requirements and recommendations of the applicable Contractor procedure. Brazing shall not be permitted to stainless steel structural members.

6.7.4 Soldering. Soldering shall be used only in non-structural applications. Tin-antimony

solder shall be used for all copper tubes and fittings, except for air conditioning tubing, which shall be soldered with silver solder. The use of any other type of solder, or the use of solder for any other application, shall be submitted for written approval by the Project Manager in each case.

The flux used shall be non-corrosive. Solder joint fittings shall conform to American Standards Specifications B16.22 for wrought copper and B16.18 for cast brass. Only silver solder, containing no antimony, shall be used on brass.

6.7.4.1 Tin-Antimony Solder. Tin-Antimony solder shall conform to the following chemical composition or better:

Tin	95.0 % nominal 94.5 % minimum
Antimony	5.0 % nominal 4.5 % minimum
Copper	0.8 % maximum
Other Impurities	0.10 % maximum

6.7.4.2 Silver Solder. Silver solder shall conform to the requirements of AWS BAG-3 or improved requirements approved by the Project Manager.

6.7.5 Non-Destructive Inspection.

6.7.5.1 Magnetic Particle Inspection. Magnetic particle inspection shall be performed in accordance with either ASTM E 109 or ASTM E 138.

After magnetic particle inspection, parts shall be sufficiently demagnetized so that the residual field will not interfere with future processing or operation of the part.

6.7.5.2 Penetrant Inspection. Penetrant inspection, both fluorescent and dye penetrant, shall be performed in accordance with ASTM E-165.

6.7.5.3 Radiographic Inspection. Radiographic inspection, when required, shall be performed in accordance with ASTM E 142. Sensitivity shall be 2 % (2-2T hole visible in the appropriate penetrometer). Film density shall be between 3.0 and 5.0 for areas being inspected.

6.8 Protection - Filters

6.8.1 Filters for use on auxiliary equipment shall be selected in accordance with the manufacturer's recommendations or the specific equipment involved. All filters shall be the replaceable media type, unless otherwise indicated. Filters shall be designed to meet the performance requirements of each installation, as indicated and as approved by the Project Manager.

6.8.2 Selection Requirements. Filters size shall be selected to meet airflow velocity and capacity requirements of the air distribution system for the intended service life of the filter in PATH system dusty environment. They shall also be sized to function throughout the entire PATH inspection cycle.

6.9 Fire Safety

6.9.1 All material shall be selected in accordance with the standards referenced herein, used for this type of track inspection equipment. The Contractor shall be responsible for complete conformance with these standards for itself and its subcontractors and suppliers. The Contractor shall submit specific test certificates or perform certain tests of his proposed materials in their end-use configurations to determine conformance specifications. PATH may, at its discretion, require that the materials being provided for this Contract be retested for conformance with these standards.
All materials used in the construction of the Track Inspection Vehicle shall meet the requirements of this Section and AREMA

All materials used in the construction of the Track Inspection Vehicle shall be fireproof or fire resistant and self-extinguishing. In certain applications, materials that are fire resistant with self-extinguishing properties may be used provided that the temperature at which smoke is emitted is well above the temperature that can be tolerated by human beings. No material shall be used which emits toxic fumes. Polycarbonate Biphenyl (PCB), Poly Vinyl Chloride (PVC), lead-based paint and asbestos are forbidden. No material shall be used that is known to degrade so as to be hazardous.

The Contractor must notify PATH of all materials which cannot meet the smoke and flammability requirements required in this section. The Contractor shall submit the name of the material, quantity of material to be installed on the Track Inspection Vehicle, its intended use and the specific requirement that it cannot meet. The Project Manager may grant a waiver for a specific material depending upon the information submitted.

6.9.2 Flammability and Smoke Emission

6.9.2.1 Scope. Materials used in the Track Inspection Vehicle shall be compliance with the requirements set forth in this section. The requirements in this section apply to all combustible materials; they apply to all remaining items including but not limited to seats, seat cushions, upholstery fabric, flooring, floor covering, exterior vehicle shell, wall and ceiling panels, lighting diffusers, thermal and acoustical insulation, elastomers, and ducting. PATH shall have the right to request test results. Contractor shall submit the manufacturer's testing results that the material meets the requirements.

REQUIREMENTS FOR VEHICLE MATERIAL
FIRE RISK ASSESSMENT

Function of Material	Test Procedures	Performance Criteria
Seat Cushion	ASTM D 3675	$I_s \leq 25$

	ASTM E 662	D_s (1.5) ≤ 100
	ASTM E 662	D_s (4.0) ≤ 175
Seat Frame and Shroud; Wall,	ASTM E 162	I_s ≤ 35
Ceiling, Partition, and Windscreen	ASTM E 662	D_s (1.5) ≤ 100
Panels; Exterior Non-metallic	ASTM E 662	D_s (4.0) ≤ 200
Shrouding and Equipment Box Covers; Battery Cases		
Upholstery	FAR 25.853 (vertical)	Flame Time ≤ 10 sec. Burn Length ≤ 6 in. (152 mm)
	ASTM E 662	D_s (4.0) ≤ 125 (cloth)
Light Diffusers and Non-glass	ASTM E 162	I_s ≤ 100
Window Glazing	ASTM E 662	D_s (1.5) ≤ 100
	ASTM E 662	D_s (4.0) ≤ 200
Floor Assembly - Structural	ASTM E 119	Pass (with a minimum 30-min. endurance period at AW3 Loading)
Flooring (Covering)	ASTM E 648	CRF ≤ 0.5 W/cm^2
	ASTM E 662	D_s (1.5) ≤ 100
	ASTM E 662	D_s (4.0) ≤ 200
Thermal and Acoustical Insulation	ASTM E 162	I_s ≤ 25
	ASTM E 662	D_s (4.0) ≤ 100
Elastomers	ASTM C 542	Pass
	ASTM E 662	D_s (1.5) ≤ 100
	ASTM E 662	D_s (4.0) ≤ 200
Wire Insulation	Flammability	D_s (4.0) ≤ 200 (flaming)
	ASTM E 662	D_s (4.0) ≤ 75 (non-flaming)

NOTES:

- Materials tested for surface flammability shall not exhibit any flaming running or flaming

dripping, except light diffusers.

- The surface flammability and smoke emission characteristics of woven or coated fabrics shall be demonstrated to be permanent in accordance with one of the following methods:
    - Washing, if appropriate, according to FED-STD-191A Textile Test Method 5830.
    - Dry cleaning, if appropriate, to ASTM D 2724.
    - Materials that cannot be washed or dry-cleaned shall be so labeled and shall meet the applicable performance criteria after being cleaned as recommended by the manufacturer.
- ASTM E 662 test limits must comply with Specification limits in both modes.
- Seat cushion material that is to be tested for surface flammability and smoke emissions shall be first preconditioned in accordance with the procedures in ASTM D 3574, Test I2, Dynamic Fatigue Test by Roller Shear at Constant Force, Procedure B. After conducting the roller shear test, the same test sample shall be tested for flammability and smoke emission. Test reports for the roller shear test shall be forwarded for review with the flammability and smoke emission test reports.

The following information shall be supplied for all materials tested:

- Test Description,
- Test Facility, and
- Test Results.

6.9.2.2 Thermal and Acoustical Insulation shall meet the requirements of NFPA 130, latest version. Seat cushions and thermal and acoustical insulation shall pass the ASTM E-162 Radiant Panel Test with a flame propagation index (Is $\leq$ 25) not exceeding 25 and ASTM E662 (Ds $\leq$ 100). Additional provisions are as follows: (a) There shall be no flaming, running or dripping; (b) Wire mesh screening shall be used (as per Section 5.9.2 of ASTM E-162); (c) 6" (152.4 mm) long pilot flame shall be used (burned tip situated 1 $^{1}/_{4}$ inch (31.7 mm) beyond the flame to prevent extinguishment); and (d) Aluminum foil shall be used to wrap the back and sides of the specimen.

Seat cushions shall also meet the requirements set forth in ASTM D-3675.

The fire-resistant properties of the materials shall be demonstrated to be permanent by washing according to Federal Test Method 19lb, Method 5830.

6.9.2.3 Panels, Moldings, etc. Wall and ceiling panels, seat members, seat shrouds, partitions and ducting shall pass the ASTM E-162 Radiant Panel Test with a flame propagation index (Is) not exceeding 35, with the added provision that there shall be no flame dripping.

Upholstery fabric materials shall be tested by FAA Regulation 28.853 vertical test, with the following modifications:

- The average flame time after removal of the flame source shall not exceed 10 seconds.

- Burn length shall not exceed 6" (152.4. mm).

- Flaming dripping shall not be allowed.

Fabrics that must be machine washed or dry-cleaned shall meet the above requirements after leaching according to Federal Test Method 191a or having been dry-cleaned according to American Association of Textile Chemists and Colorists Standard AATCC-86-1976. Fabrics that cannot be machine washed or dry-cleaned shall be so labeled accordingly and shall pass the above requirements after being cleaned as recommended by the manufacturer.

6.9.2.4 Floor Covering. Floor covering shall pass Floor Covering Critical Radiant Flux NFPA 253 with minimum critical radiant flux greater than or equal to 0.5 watts per centimeter squared.

6.9.2.5 Flooring. Flooring shall provide 30-minute fire resistance as determined by the Standard Fire Test conforming to ASTM E-119 for an unrestrained floor. The test specimen shall be a composite of the entire floor assembly including side sills, center sills, cross members, floor panels, floor covering, insulation, floor pans, isolating strips, caulking and fasteners, and shall be truly representative of the car floor between bolsters. The test specimen shall also include two of each type of floor penetration used anywhere in the car. These specimen penetrations shall be typical of the design but need not be located in the design location. Such penetrations shall exhibit the same fire resistance as is required for the floor composite itself. The width of the specimen shall be the designed width of the car. The floor shall not be loaded for the test.

6.9.2.6 Equipment Panels. All panels that provide separation between the vehicle interior and any electrical or mechanical equipment, other than communication panels, light switches, etc., shall also pass the requirements of ASTM E-119 for 15 minutes fire resistance.

6.9.2.7 Elastomers. Elastomers shall pass the requirement of ASTM C-542-90, with the added requirement that there shall be no flame dripping.

6.9.2.8 Plastic Lighting Lenses and Diffusers. Plastic lighting lenses and diffusers shall be capable of passing the ASTM E-162 Radiant Panel Test with a flame propagation index (Is) not exceeding 100.

6.9.3 Smoke Emission. Actual tests are not required if the Contractor can supply the testing data from the manufacturer of the material used.

6.9.3.1 Scope. This specification relates to all combustible materials as listed in Section 6.9.2.1 with exceptions as noted. Whenever the Project Manager deems necessary, the Contractor shall provide sufficient information concerning smoke emission for combustible materials used in the Track Inspection Vehicle.

6.9.3.2 Testing Requirements. All materials shall be tested for smoke emission in accordance

with NFPA Standard No. 258, Standard Test Method for Measuring the Smoke Generated by Solid Materials. The optical density, Ds, in either flaming or non-flaming modes, determined in accordance with the test, shall have the following limits.

6.9.3.2.1 For upholstery fabric material, air ducting, thermal and acoustical insulation panel, vibration damping compounds, and insulation covering, the Ds shall not exceed 100 within 4 minutes after the start of the test.

6.9.3.2.2 For foam seat cushioning, the Smoke Density (Ds) shall not exceed 200 within 4 minutes after the start of the test. The Dm shall not exceed 300 for the maximum Optical Density.

6.9.3.2.3 For all other materials, the Ds shall not exceed 100 within 90 seconds after the start of the test, and shall not exceed 200 within 4 minutes after the start of the test.

6.9.4 Toxicity – Those materials and products generally recognized to have highly toxic products of combustion shall not be used.

All materials used in construction, except for materials used in small parts (such as knobs, rollers, fasteners, clips, grommets and small electrical parts) that would not contribute significantly to fire propagation or to smoke or toxic gas generation shall be tested for toxicity using Boeing Specification Support Standard BSS-7239. Materials shall meet the following maximum toxic gas release limits (ppm) as determined per BSS-7239:

· Carbon Monoxide (CO)		· 3500 ppm
· Hydrogen Fluoride (HF)		· 200 ppm
· Nitrogen Dioxide (NO2)		· 100 ppm
· Hydrogen Chloride (HCL)	□□	· 500 ppm
· Hydrogen Cyanide (HCN)		· 150 ppm
· Sulfur Dioxide (SO2)		· 100 ppm

The tests are to be run in the flaming mode after 240 seconds using the NBS Smoke Density Chamber for sample combustion. The gas sampling may be conducted during the smoke density test. The test report shall indicate the maximum concentration (ppm) for each of the above gases at the specified sample time.

6.10 Cleaners

Note: If a specific cleaner is necessary for the Track Inspection Vehicle, the Contractor shall supply PATH with all necessary information for approval.

6.11 Lubricants.

Note: If a specific lubricant is necessary for the Track Inspection Vehicle, the Contractor shall supply PATH with all necessary information for approval.

SECTION 7

TRUCKS

7.1 General

7.1.1 During the design of the Track Inspection Vehicle, the Contractor shall provide the necessary information, including drawings and stress analysis, for the trucks and adjacent parts used on the Track Inspection Vehicle. The information will be reviewed and approved by the Project Manager.

7.1.1.1 Omitted.

7.1.1.2 The assembled trucks shall not exceed the clearance limits required between truck parts, truck and Carbody, and truck and roadway for safe operation with maximum wear and load deflection over the track specified.

7.1.1.3 The bolster shall be provided with an integral center bearing, and side bearing supports. The center bearing shall be provided with an approved locking center pin and self-lubricating plastic pad liner such as Holland or approved equal.

7.1.1.4 Side bearings. The side bearings shall be an approved by PATH type and shall allow the maximum rotation of the Carbody as required to negotiate all curves on PATH as specified in Section 1.14.

7.1.1.5 Journal roller bearings shall be AAR approved or an equivalent as approved by the Project Manager and shall be installed outside the wheels in separate axle bearing housings.

7.1.1.6 The truck shall have a suspension that can absorb the worst case**,**as may be found in the FRA Track Safety Standards, Part 213 for shock and vibration conditions, that the Track Inspection Vehicle will encounter in both operating and travel modes. It shall be of a proven design and have a record of successful use on other rail systems.

7.1.1.7 The truck frame and journal bearing assembly shall permit future access for wheel truing with PATH's wheel truing machines, which are manufactured by the Simmons-Stanray Wheel Truing Machine Corp. The procedures for wheel truing shall be written on the respective Manual.

7.1.1.8 The Contractor may propose an alternate truck design for the Project Manager's review and approval.

7.2 Assembly of Wheels, Gear Units and Axles

7.2.1 Assembly of wheels, gear units and axles shall be in accordance with the following requirements. Stresses in axles and wheels are required to meet the standards of the AAR, Mechanical Division, with emergency brake pressure, and a fully loaded Track Inspection Vehicle. It is of the greatest importance that all machining and fitting processes involved in the production of the truck and its subassemblies shall be of the highest quality.

Wheel, gear unit and axle machining, pressing and pressure diagrams shall be in accordance with AAR regulations.

7.2.2 Wheels. The wheels shall be supplied by a manufacturer who has furnished wheels for similar service in the PATH system or is capable of furnishing wheels of the same general type as specified under this Contract which either have been in successful operation or shall be capable of successful operation; and the wheels proposed to be furnished by the Contractor must be suitable for the service specified herein. Except as otherwise specified or with better quality and standards, the wheels shall be made in accordance with A.S.T.M. Specification A-25, Class A. Carbon content to be 0.47 to 0.52 percent. Wheels shall be pressed on solid axles by a suitable and approved apparatus. There shall be no reverse taper in the wheel bore. Electrical continuity is required between each pair of wheels assembled on an axle. The wheels and axles shall be compatible with PATH wheel and bearing press machines.

7.2.3 Tolerance. Dimensions for finishing wheel bore are based on press-fit allowances of 0.001 inch per inch (0.0254 mm per mm) of diameter per foot of wheel seat.

Two wheels mated to the same outside diameter shall be pressed on an axle. Upon the completion of this operation, the axle shall be revolved on its center to permit the Contractor to verify that the wheels are concentric with the axle, are of the same diameter and that the inner faces of rims are true and parallel.

The tolerance for the gauge of wheels (53 $^{3}/_{8}$" or 1,355.73 mm, between backs of wheel flanges) shall be +0, -$^{1}/_{8}$" (+0, -3.175 mm).

Wheel pairs shall be matched, not to exceed one-half tape size per axle set. Mounted wheels shall be concentric between bearing seat diameters and tread at the plane of the taping line within 0.007 inches TIR and not to exceed 0.015 TIR, inches out of parallel to each other or to a plane perpendicular to the center line of the axle per AAR requirements.The eccentricity of any wheel shall not exceed $^{1}/_{64}$" (0.40 mm) when measured at the centerline of tread.

Inner faces of rims shall not be out of true more than $^{1}/_{32}$" (0.79 mm) either individually or when measured between the two wheels on an axle.

The Contractor shall carefully inspect the assembly of wheels and axles using AAR gages, templates and instruments of suitable precision.

7.2.4 Pressure Diagrams. Pressures at which the wheels are pressed on the axles shall be measured and recorded by means of a recording gage, which shall be monitored for agreement with the wheel press dial pressure gage at each mounting operation. The dial pressure gage shall be inspected and tagged in accordance with AAR wheel press practice. Prior to pressing wheels on axles, the pressure gage shall be calibrated. The Contractor shall furnish to the Project Manager the original pressure record diagram with each pair of wheels.

7.2.5 Axles. The axles shall be forged carbon steel in accordance with ASTM A-729 and inspected in accordance with AAR specification M-101. Steel used in the manufacture of axles shall be grade G and shall be produced by a manufacturer who has furnished axles for service in PATH or is capable of furnishing axles of the same general type as specified under this Contract, and which either have been in successful operation or shall be capable of successful operation. The axles proposed to be furnished by the Contractor shall be suitable for the service specification herein.

7.2.6 Material. Steel for wheels and axles shall conform to the requirements of AAR M-107 and of ASTM A-504, Class A except that the carbon content shall be 0.47 % to 0.52 %.

7.3 Strength Requirements

7.3.1 Stress Analysis. The Contractor shall submit, prior to or with submittal of the working drawings, a complete stress analysis of the entire truck structure to show compliance with the latest applicable AAR Specifications. The loading conditions shall be as specified in Section 13.2.1.3. The Contractor may make partial submittals of completely self-contained portions.

The Project Manager will review the stress analysis and his comments, if any will be brought to the Contractor's attention in writing. The Project Manager will return comments to the Contractor as soon as possible, but nothing herein shall prevent the Project Manager from making comments at any later date, if he deems them appropriate.

Review and comment by the Project Manager of the concerning stress analysis shall not relieve the Contractor of his sole responsibility for the proper completion of the work, including the design, arrangement, construction and satisfactory operation of the trucks to meet the requirements specified herein, nor shall it impair any of the Contractor's warranty obligations.

All stress analysis sheets shall be signed and dated by the author and checked by a second stress analyst, who shall also sign and date each sheet that has been checked.

If the trucks will have similar design and the loading will be considered for the most severe conditions, the stress analysis may be performed only for one type of truck.

All trucks must meet or exceed the loading criteria specified in Sections 13.2.1.3 and 13.2.1.5.

7.4 Truck Quality Tests

7.4.1 The quality assurance tests applicable to a welded truck frame shall be appropriately specified by the Contractor in a quality assurance test procedure to be submitted to the Project Manager for revision.

7.4.1.1 Before commencing truck manufacturing, the Contractor shall provide a list of all manufacturing and inspection procedures. PATH shall be notified of all proposed changes therein, and its approval shall be obtained before proposed changes are placed into effect.

7.4.1.2 Each casting shall show the heat number of the steel and the serial and pattern number of the casting. Each fabricated part shall show the heat number of the steel.

7.4.1.3 All truck castings or fabricated parts in which defects are found during any of the following tests and which, in the judgment of the Contractor, can be successfully repaired may be deemed acceptable after such repairs have been made in accordance with these specifications and the approved quality control procedures. All repairs shall be retested in accordance with the procedures specified herein. Casting or fabricated parts, which

cannot be successfully repaired, shall be scrapped. All defects shall be carefully monitored, and corrective action shall be taken as required.

7.4.1.4 If a rejectable internal defect as defined in Section 7.4.2 is discovered by means of radiography or if the Contractor decides at any time, as an integral process procedure, to repair a consistently repeating internal defect by means of welding instead of further process changes, or if any repairs are made subsequent to final stress relief heat treatment of an entire casting, the Contractor shall prepare an informational sketch showing the locations of the defects and/or the repaired area(s) and promptly forward it to the Project Manager.

7.4.2 Radiography and Dimensional Requirements

7.4.2.1 Radiographic inspection and dimensional checks are to be done on a sample truck to ensure that the manufacturing process is capable of and uniformly maintains the specified levels of fabrication quality, wall thickness and overall dimensions. Radiographs shall be evaluated in accordance with ASTM Specifications E-142 and E-446.

7.4.2.2 The permissible severity levels of defects in any truck casting shall be Class 3 in critical areas and Class five in non-critical areas, as indicated on a manufacturer furnished drawing approved by the Project Manager, for gas porosity, inclusions and shrinkage. Cracks and hot tears shall not be permitted.

7.4.2.3 For all major truck parts, such as bolster, side frames, etc., the Contractor shall furnish marked drawings showing measurement locations of wall thickness and overall dimensions, and the required thickness and dimensions, including wall thickness on both sides of any and each core joint. In addition, the minimum thickness of the top wall and the outside wall of the frame's center transoms at the first core joint from the side rail shall be measured and recorded for every truck frame casting. All casting dimensions shall be in accordance with the Specifications and the approved quality control procedures.

7.4.2.4 The Contractor shall be responsible for a satisfactory production process using the following qualification guidelines: prior to stress relief heat treatment and after routine surface repairs, only the first truck shall be subject to 100 % radiograph inspection. Wall inspection shall be performed only on this first equipment. If repairs are made to any truck, 100 % radiographic inspection will be required. Contractor shall perform dimensional checking on all trucks.

7.4.2.5 Surface defects that do not require repair shall be marked on the radiographic film and initialed by the Contractor.

7.4.2.6 The latest ASTM standards shall be used for film density and resolution, and for type of source, film and penetrometer to assure proper quality of the radiographs.

7.4.2.7 For the record, a complete set of all radiographs marked with all pertinent information

shall be submitted to the Project Manager.

7.4.3 Magnetic Particle Inspection

The overall quality of each casting shall be ensured by careful visual and magnetic particle inspections according ASTM E-125.

7.4.3.1 Just prior to stress relief heat treatment, the entire surface of each truck system shall be shot-blasted and inspected by the dry powder magnetic particle method. Specific areas, indicated in the Specifications**]**, of each casting shall be ground and inspected by the dry powder magnetic particle method.

7.4.3.2 Magnetic Particle Inspection Acceptance Criteria.

ASTM E-125 -- Type of Defect on ASTM E-125 Reference Photograph:	
Cracks:	None
Linear Indication:	I-1
Shrinkage:	II-2
Inclusions:	III-2
Porosity:	V-1

Defects revealed by this inspection shall be repaired as provided in the approved quality control procedures. Such repaired defects shall be again magnetic particle inspected.

7.4.4 Omitted.

7.4.5 Wheels and Axles that are found defective during inspection at PATH's shops, before going into service, or which prove defective in service, by reason of defective material or workmanship, shall be replaced by the Contractor at no additional cost to PATH or its funding agency.

SECTION 8

HEATING, VENTILATING AND AIR CONDITIONING (HVAC)

8.1 General

The Track Inspection Vehicle shall include a Heating, Ventilating and Air Conditioning (HVAC) system for personnel in the business and operating areas of each car unit. The Track Inspection Vehicle shall also include an Air Cleaner System that cleans/recirculates the air in the operating and business areas at least four (4) times per hour. The HVAC system shall be a self-contained unit or units. It shall be designed for ease of servicing, including unit removal/reinstallation, easy access to inspection items such as gages and filters, and easy removal/replacement of items such as filters and refrigerant.

The HVAC unit shall be designed and installed such that condensate water will not drip inside of the cab/inspection area, but will be directed outside to the roadbed.

8.1.1 Operating and Business Areas of Each Car Unit

Heaters may consist of air-blown or static floor heaters. They must maintain the ends of each car and the inspection area temperatures as specified in Section 8.3. The maximum temperature at the surface of the cab heating grills or air outlets shall not exceed 125°F (52°C).

8.1.2 Design Data Submittal

All heat load calculations, in addition to the manufacturer's selection tables, curves, etc., necessary for the design and selection of the HVAC unit shall be submitted to the Project Manager for approval.

When designing the Heating Ventilating and Air Conditioning (HVAC) system in general, the Contractor shall consider the effect of heat produced by the diesel engines and their exhaust on the leading and trailing end for open air (surface) operations and tunnel movements at all speeds. The effect of heat produced by diesel engines and their exhaust shall be considered in addition to the ambient conditions specified in Section 1.14.3.

All equipment shall be of rugged industrial quality proven in transportation service under the operating conditions found on PATH. Every precaution shall be taken by the Contractor to insure maintenance-free operation, adequate protection against corrosion and maximum life-cycle cost-effectiveness.

All components of the HVAC unit shall have the structural integrity and be reliably operational for long life in the worst-case vibration and shock environment existing on PATH system.

8.2 Refrigerant

The base refrigerant in this unit shall be an EPA approved refrigerant. It may be R-22 (HCFC), however, a bid for a different refrigerant medium is encouraged since R-22 is being phased out and to address the potential problem of the possible restriction on the use of fluorocarbon materials. R-12 will not be allowed under any circumstances.

8.3 Design Ambient Conditions

Ends/inspection area Interior Ambient Conditions for Design Purpose are as follows:

Summer:

Normal Conditions:
The air conditioning system shall maintain 70°F (21°C) maximum dry bulb and 60 % relative humidity.
% fresh air – It shall be controlled by crew

Winter:

Normal Conditions:
The heating system shall maintain between 59°F (15°C) and 65°F (18°C).
% fresh air – It shall be controlled by crew

8.3.1 Ventilation and Infiltration

Filtered ventilation air (total of fresh air and recirculated air) of adequate amount during cooling and heating shall be distributed within the operator ends. Operator shall be able to control ventilation and infiltration

8.4 Control

The Contractor shall submit to the Project Manager the HVAC control position for approval or there shall be a 3-position switch to control the amount of heating/cooling provided by the HVAC unit. A manual infinite-control thermostat shall be provided to adjust the air temperature produced by the HVAC unit. The thermostat shall be designed such as to provide only ventilation when the thermostat is adjusted to the operating end temperature.

SECTION 9

LIGHTING SYSTEMS

9.1 General

All components of the lighting system shall withstand shocks and vibrations encountered during inspection and traveling modes.

9.2 **Interior Lighting**. For lamp fixtures, parts shall be U.S. standard and preferably stocked by PATH.

9.2.1 Arrangement. The interior of the Track Inspection Vehicle (operating and business areas) shall be illuminated by lamps in an approved arrangement. Also sufficient lighting shall be provided in the power plant area and other work areas.

The lighting circuits shall be protected by a suitable circuit breaker on the circuit breaker panel.

9.2.2 Workstation Lights. Each workstation on the Track Inspection Vehicle shall have a low voltage bright white halogen intensified personal light with flexible neck installed, similar to the ones installed in PATH's TGC1 and TGC2 Car.

9.3 **Headlights, Taillights and Worklights**.

Two halogen sealed-beam headlights and two red LED-cluster taillights shall be located at each end of the Track Inspection Vehicle, and at the top of each end. Two independent controlled halogen sealed-beam headlights and two red LED-cluster taillights shall be located at ends of the each car where the two Cars are connected.

The taillight shall be mounted above the headlight. The controls shall allow any combination of headlight and taillight illumination on both ends. If no power is being generated, the red LED-cluster taillights shall be able to connect to battery power by means of a manual switch that can be deactivated as soon as the Track Inspection Vehicle is powered by a generator or external power.

The headlight housing shall incorporate provisions for adjusting the beam centerline over a range of 3° in any plane. The headlight and taillight lamps and assemblies shall be arranged for relamping from the exterior of the Track Inspection Vehicle.

9.3.2 Worklights. The Track Inspection Vehicle shall also have swivel-type weatherproof worklights at both ends. Switches for the worklights shall be located at each operating end.

SECTION 10

COMMUNICATIONS

10.1 General

This section specifies functional design requirements for carborne communications equipment including intercommunications (IC), and train-wayside radio communication, all of which shall be installed in each operating end and inspection area of the Track Inspection Vehicle. The specific design requirements of the radio communications equipment must be identical to those of the present PATH equipment, and the equipment shall be installed in such a way as to ensure ease of accessibility to and maintenance or replacement of the main power unit, converter unit, fuse blocks and cross mute assembly. There shall be a radio located on each end of the car.
The cross mute assembly shall have one microphone, one foot switch and one TX lamp located for convenient use of the operator.
Radios shall be a VX-4204 as manufactured by Vertex Standard.
In addition to the two way radio there shall also be an intercom system with external speakers to enable communication to those outside the car.

As used in this Section below, the term "operator" may refer to the Track Inspection Vehicle operator or a crewmember.

10.2 Communications Control Equipment

Communications equipment shall be installed in each end of each Car to provide appropriate interfacing and control between elements of the communication system, including the train operator and the crewmember. The communications equipment shall be “on” when the console has been activated. The control equipment shall include microphones, IC, Radio selector switch, push-to-talk buttons and foot switch. All controls shall be located for easy accessibility by all seated crewmembers.

10.2.1 Circuit Breaker. A circuit breaker shall be provided and located with the equipment in each cab. The equipment shall operate from a power supply as specified in these Specifications. Solid-state silicon devices shall be used in all IC electronic equipment. All circuit components shall be mounted in the chassis assemblies so as to permit replacement without disturbing other components. All switches and controls shall be mounted to permit replacement without removal of other components. Controls shall be readily accessible to maintenance personnel and secure from unauthorized access.

10.2.2 The system shall exhibit no oscillations, acoustical feedback, or other instabilities at any combination of input or gain and speaker level control settings under all operational and test conditions. The hum and noise level shall be 50 dBA below the rated output with the microphone connected and energized.

10.3 Operation

10.3.1 The radio receiver shall always be ON when the console is activated.

10.3.2 An operator shall be able to initiate a IC/Radio call by selecting the function on the selector switch and depressing either the push-to-talk button on the console or the foot switch.

10.3.3 Audio Control. Audio control level knob shall be provided to control both the radio and the intercom speaker outputs. When the control knob is set for minimum output, the sound from the speakers shall be clearly audible in the cab.

10.3.4 Intercom. Intercommunication shall be functional between both operating ends.

10.3.5 The intercom and radio shall have separate speakers and must be located in each operating end.

10.4 Emergency Trainline Communication

A trainline communication system with train-to-train receptacles and connectors, for communication by crewmembers in an emergency towing- train and the Track Inspection Vehicle shall be installed at each end of the Two-Unit Track Inspection Vehicle.

10.5 Intercommunications (IC) System

10.5.1 Each operating end shall be equipped with a completely solid state intercom system. The system shall be designed for maximum intelligibility to permit a crewmember in one end or in an inspection area to communicate with another crewmember in the other operating end.

10.5.2 Controls. The Track Inspection Vehicle IC system shall include controls at each IC amplifier to permit alignment and balancing of the system. These controls shall be readily accessible for servicing upon removal of the protective cover but shall otherwise be secure from unauthorized access.

10.5.3 Amplifier. The IC amplifier shall be assembled from solid-state components. The amplifier shall have amplitude of 2 dBA and a frequency from 300 Hz to 5,000 Hz, and shall furnish sufficient power to provide the specified acoustical output at the other IC station in the Track Inspection Vehicle. The hum and noise level shall be at least 50 dBA below the normal output. The amplifier shall be such that its inputs and outputs may be open circuited or short-circuited without causing damage to the amplifier.

10.6 Buzzer. A buzzer signaling system shall be provided to permit the crew in either end to activate a buzzer in the other operating end.

10.7 Train-wayside Radio Communications System

The radio communication system requirements are noted in PATH's Radio Specification

(see Section 10.1)

10.8 **Interference.** The communication system shall be designed such that the IC and radio will not interfere with each other or with the operation of any other systems or subsystems on the Track Inspection Vehicle. It shall also be impervious to interference from any other system or subsystem. All communication systems in the Track Inspection Vehicle shall be designed such that the IC and radio will not interfere with the radio communications of the Port Authority Police Department (PAPD), all Area police and fire and EMS or other agencies of the Port District.

10.8.1 Circuits - All circuits shall be located away from, or otherwise protected from, any circuit capable of causing or inducing electromagnetic interference (EMI).

SECTION 11

TRACK MEASURING SYSTEMS AND CONTROLS

11.1 General

The Track Measuring Systems installed in this Track Inspection Vehicle shall be designed to inspect the tracks and tunnels of the Port Authority Trans-Hudson Corporation System with new, state-of-the-art measuring systems capable of continuously collecting at all speeds, under all dynamic conditions, track geometry data, including grades; tunnel, platform and third rail clearances; thermal imaging at normal operating speeds; and internal rail flaw detection at a speed of 20 mph. The Track Inspection Vehicle shall be capable of continuously measuring, evaluating, recording and reporting track and structures conditions at all speeds up to 50 mph, in either direction, in all weather conditions and within the tolerances specified by the FRA track safety standards and/or those established by PATH.

All the measuring systems shall have the specific capability of detecting, reporting in hardcopy as well as in software files, in real time, the most critical defects found while surveying the track and tunnels of the Port Authority Trans-Hudson Corporation. Project Manager will issue the specific guidelines to produce these critical defect reports, which will be according to Port Authority Trans-Hudson Corporation standards and the capabilities of the respective systems. Project Manager shall approve these features.

All systems shall collect information at the indicated speeds and all parameters shall be measured to an accuracy of $\pm\ ^{1}/_{16}$ inch (1.5 mm) except for those systems or parameters that must work according to specific conditions, and which are specified in the following paragraphs. The track and structures parameters to be measured are as follows:

- Longitudinal Profile – Left Running Rail
- Longitudinal Profile – Right Running Rail
- Horizontal Alignment – Left Running Rail
- Horizontal Alignment – Right Running Rail
- Track Gauge
- Superelevation or Crosslevel
- 31’ Twist
- Tunnel Clearances
- Running Rail Profile, Cant and Wear
- Guard Rail Gauge and Flangeway Gap
- Corrugation of Running Rail Surface Corrugation shall be measured with a system reporting the depth and wavelength of the corrugation
- Thermal Imaging
- Third Rail (Contact Rail) Gauge and Height
- Gap between the Contact Rail’s Protection Board and the top of the Contact Rail
- Platform Gauge and Height with respect to the nearest running rail
- Internal Rail Flaws

- § Track Gradient (Grade)
- § Rail Surface Monitoring (Visual Inspection System)

The Track Inspection Vehicle shall also be able to videotape the tracks and structures of PATH system from any of both operating ends. The Track Inspection Vehicle shall have the capability to videotape, at close range, each wall and ceiling at the location where a tunnel laser crosscut is obtained.

Furnish and install event boxes at each operating end of the Track Inspection Vehicle to record wayside events. The event box connector shall not be placed in the way of the train operator.

In order to determine the location of the Track Inspection Vehicle, the unit must be capable of using the PATH transponders from the PATH CBTC system, as well as accepting manually entered locations.

11.2 Track Measuring Systems To Be Furnished and Installed

11.2.1 Track Geometry Measuring System

Either an electro-mechanical measuring system or an inertial (non-contact) measuring system, or a combination of both, shall be furnished and installed on the Track Inspection Vehicle so that the following geometry parameters can be measured under load:

- longitudinal profile (surface) of both running rails, measured as the mid-chord offset of a 31.0 ft. vertical chord on top of each running rail;
- horizontal alignment of both running rails, measured as the horizontal mid-chord offset of a 31.0 ft. chord placed $^{5}/_{8}$ inch below the top of the running rails;
- superelevation, or crosslevel, of one running rail with respect to the opposite running rail in a plane perpendicular to the centerline of track;
- track gauge, measured in the track plane ($^{5}/_{8}$ inch below the top of the running rails);
- track curvature and 31 ft. track twist shall be computed from the above parameters.

The Track Geometry Measuring System shall be able to measure all the above parameters at a frequency of every one (1) foot, with an accuracy of $\pm\ ^{1}/_{16}$ inch (1.5 mm) or better, at all operating speeds (0 mph to 50 mph), at any point along the tracks.

The software on board the Track Inspection Vehicle shall be capable of analyzing the most critical defects encountered in the track geometry information and of creating final reports in real time. These reports shall be able to be saved in commercially available software. Project Manager shall approve these features.

11.2.2 Inertial System. If an inertial (non-contact) measuring system is installed, the Contractor must demonstrate to the Project Manager's satisfaction that such system is able to perform the measurements with the accuracy specified herein and that there is no loss, lagging or degradation of the data recorded at very low speeds, including when stopping

and starting the car, at any point in PATH's track system.

If mechanical devices are used to measure some (or all) of the geometry parameters listed above (including, but not limited to, measuring sword assemblies, measuring frames, LVDT transducers, pneumatic systems, etc.), the latest models of transducers and measuring sword assemblies shall be used.

The track grade parameter shall be measured with an accuracy of $\pm$ 0.25 % at 1 sigma.

11.2.3 Guard Rail Gauge, Flangeway Gap and Rail Profile Measuring System. The system shall be the ORIAN v6.0 or the latest model (at the time the Contract is awarded) non-contact optical laser measuring system (including the latest Rail Plot/Rail View Post-Analysis software) from KLD Labs, Inc. of Huntington, NY, or approved equal, capable of measuring the following parameters:

- Flangeway opening (defined as the distance between the gauge face of the running rail and the guarding face of the guard rail adjacent to it, measured $^5/_8$ inch below the top of the rail) with an accuracy of $^1/_{16}$ inch or better. Flangeways shall be measured with a sampling frequency not to exceed every 2 ft. at speeds below or equal to 25 mph and not to exceed every 4 ft. at speeds above 25 mph.

- Guard Rail Gauge, defined as the horizontal distance between the guarding face of the guard rail and the gauge line of the unguarded running rail, measured $^5/_8$ inch below the head of the rail. Guard Rail Gauge shall be measured with a sampling frequency not to exceed every 2 ft. at speeds below or equal to 25 mph and not to exceed every 4 ft. at speeds above 25 mph.

- Contour (profile) of both running rails, including the head, web and top of the base with an accuracy of $^1/_{32}$ inch or better under all measuring conditions, except that in locations where guard rail is present, the gauge side of the web and base of the running rail may not be included (or partially displayed). The sampling frequency shall be such that a minimum of one complete profile of both running rails is obtained every 4 ft. (or less) at speeds below or equal to 30 mph. At speeds above 30 mph a sampling rate of one rail profile every 8-ft. (or less) will be acceptable.

The ORIAN system shall be capable of displaying the images of both running rail profiles in near real time, including the flangeway opening. The ORIAN system shall also be capable of displaying the values of the following parameters along the track:

- flangeway opening (measured as the deviation from a constant flangeway value to be selected by the user);
- guard rail gauge;
- horizontal (side) and vertical (top) rail wear compared against the standard 100-lb. ARA-B, 115-lb. RE or 136-lb. RE rail profiles;
- rail cant and rollover angle;
- rail height and rail lip.

The ORIAN system shall have a separate application for measuring flangeway and guardrail gauge. While in the flangeway measurement mode, rail profile measurements shall not be performed. The sensor head shall be located in two positions: one for the flangeway measurement and the other for profile measurement. The position of the sensor head shall be controlled by a lateral motion system furnished and installed by the Contractor. While in the flangeway measurement mode the system shall also be capable of displaying the values of the following parameters along the track:

- flangeway opening (measured as the deviation from a constant flangeway value to be selected by the user);
- guard rail gauge.

The display of the flangeway measurements shall be performed in graphical form on a printout chart and VGA display, similar to the display of the other track geometry parameters. The analysis of the flangeway data collected shall be performed in an identical manner to the analysis of the other track geometry parameters, including selectable limits for different classes of defects.

The ORIAN system shall include the latest software used for storage, display and analysis of the data collected, including flangeway and rail profile data.

The ORIAN system shall not lose resolution or camera field of vision at any point along the tracks due to free rotation and lateral movement of the trucks. It must be true at all times under all track configurations.

The software on board the Track Inspection Vehicle shall be capable of analyzing the most critical defects encountered in the Flangeway, Guard Rail Gauge, and Contour (Profile) with its respective parameters and of creating final reports. These reports shall be able to be saved in commercially available software. Project Manager shall review and approve these features.

11.2.4 New Tunnel Laser Measuring System. A new, state-of-the-art rotating laser mirror scanner model Riegl VQ-450 or the latest model (at the time the Contract is awarded), or an an approved equal measuring system capable of performing distance measurements from the center line of the track to any object around the trackway, shall be installed according to the following specifications:

11.2.4.1 Specifications:

· Maximum distance range to be measured: 30.0 ft.; typical distance range: 8 -16 ft.; minimum range: 1.0 m.

· The average minimum accuracy of the distance measurement shall be 1.0 inch (25 mm), or better, for single scans, and $^{1}/_{2}$ inch (12.5 mm), or better, for double scans.

· The system shall allow several measurement modes to be performed, such as single

scan (1x), double scan (2x) or four times scan (4x), defined as the number of scans of data used to compute the position of each measured point. These scan modes shall be selectable via software menus.

- The laser measuring system shall be capable of rotating 360 degrees (minus 10 degrees in the lowest portion of the quadrant) in a plane perpendicular to the track's center line, and obtaining a minimum of 1,000 discrete measurements (1,000 data points minimum) per scan up to a rate of 20 scans/second as the car travels along the track.

- The output of the Enhanced Tunnel Laser Measuring System shall consist, as a minimum, of a graphic display (VGA monitor or better, and hard copy) of the cross-section of the tunnel and/or the horizontal or vertical distances to fixed objects. A minimum of 1,000 points per crosscut shall be displayed, along with the horizontal and vertical axis, at a scale selectable by the user.

- The software used for the analysis shall also be capable of providing the horizontal (X-distance) and vertical (Y-distance) of any point with respect to perpendicular axis passing by the origin, defined by the intersection of the center line of the track and the plane of the top of both running rails. The software shall define the center of track in the middle of the actual track gauge for tangent as well as curved tracks. The actual horizontal alignment of the center line of the track shall be measured and used by the software to compute car excess, and to situate objects with respect to the center line of the track.

- The software used by this system shall be capable of storing, displaying and analyzing the collected data.

The user shall be able to perform analysis of potential encroachments with the stored tunnel laser crosscuts and the clearance diagrams. The user shall also be able to confirm, measure or identify these encroachments with the close-range video of each wall and ceiling.

The software on board the Track Inspection Vehicle shall be capable of analyzing the most critical defects encountered in the Tunnel Laser System with its respective crosscuts and of creating final reports. These reports shall be able to be saved in commercially available software. Project Manager shall review and approve these features.

11.2.4.2 Spare Laser Measuring Unit

A complete identical spare laser mirror scanner unit and interface box (Riegl model VG-450 or latest at the time the Contract is awarded), or approved equal, shall also be delivered to PATH as part of the system.

11.2.4.3 Installation

Mounting arrangements shall be such that replacement of the unit can be accomplished in a maximum time not to exceed an average time of 20 minutes. The system shall be shock-mounted and protected against the intrusion of steel dust and water that could damage the optics, laser or circuit boards. Any boards or components shall be effectively secured against vibrations that can loosen their connections or damage any of their parts. The system shall be designed and constructed for ease of replacement and service. Any moving or rotating parts shall have enough clearance with respect to any parts or components of the car body or trucks, and the system shall not interfere with the coupler and coupler adapter when it is retracted under the car body.

11.2.5 Third Rail Laser Measurement System. The Track Inspection Vehicle shall have two third rail laser scanners, one left and one right scanner, used for 3rd rail/platform distance measurement. These scanners shall measure the following parameters:

- third rail height and gauge from the top and $^{5}/_{8}$-inch gauge line of the closest running rail;
- platform height and gauge from the top and $^{5}/_{8}$-inch gauge line of the closest running rail;
- vertical gap between the bottom of the 3rd rail protection board and the top of the 3rd rail.

Each of the above parameters shall be able to be measured separately from all the others, unless the Contractor can demonstrate, to the satisfaction of the Project Manager, that two or more of the above parameters may be combined in a single measurement of the desired accuracy.

The accuracy of the above parameters shall be $\pm\ ^{1}/_{16}$ inch at speeds equal or less than 20 mph, and $\pm\ ^{1}/_{8}$ inch at speeds greater than 20 mph. These parameters shall be measured with a one-foot sampling frequency at speeds equal or below 20 mph and not to exceed every 2-ft. at speeds above 20 mph.

The Third rail Scanners, with approval of the Project Manager, may be replaced with another system, or else the parameters measured by the Third Rail Units may be incorporated into the other Track Inspection measurement systems, as approved by the Project Manager. All the above-mentioned specifications shall apply.

The software on board the Track Inspection Vehicle shall be capable of analyzing the most critical defects encountered with the Third Rail Laser Measuring System and of creating final reports. These reports shall be able to be saved in commercially available software. Project Manager shall review and approve these features.

11.2.6 Thermal Imaging System. The ThermaCam A615 System or latest model (including all hardware and software) from Flir, Inc., or a system with the same or better capabilities as the 760 Thermal Imaging Radiometer System from Inframetrics, Inc.,or approved equal, shall be furnished and installed and incorporated into the measuring systems of the Track Inspection Vehicle. Any necessary computer hardware and software needed for the capture, storage and analysis of thermal images shall be also included. The Thermal Imaging System shall have an accuracy of $\pm\ 2^{o}$ F. A character generator shall be

furnished and installed and interfaced with the Thermal Imaging System.

11.2.7 Ultrasonic Rail Flaw Measuring System. A state-of-the-art Ultrasonic Rail Flaw Measuring System, capable of detecting flaws continuously in the rail at minimum speeds of 8 mph, and offering real-time pattern recognition and classification, shall be installed in the Track Inspection Vehicle. The rail shall be instantly displayed on screen, and in color, with the precise location of flaws and features clearly marked. The system shall be the latest version of NORDCO Industries' Rail Inspection System, or approved equal. It shall be a complete system with its own Pentium based computer, displays, oscilloscopes to monitor ultrasonic signals and color printer. The Ultrasonic Rail Flaw Measuring System shall have at least the following features:

- Real-time pattern recognition and classification, including quality-control software to analyze and compare previous defect indications. The software shall be capable of analyzing Ultrasonic Testing (UT) information and of making an intelligent decision based on typical defect patterns and known parameters. The software shall be capable of analyzing, displaying, and saving the most critical defects encountered while testing the rails and of warning the Operating Analyst in real time;

- Test results displayed in real-time with a two-dimensional graphic presentation of the rail. The system shall be capable of measuring signal amplitude, signal time and distance traveled;

- Windows XP or latest software compatible computer system to process, display and store UT information. The system shall be capable of measuring signal amplitude, signal time and distance traveled. The test system setup shall enable the operator to control all channel gates, gains and thresholds at the operator's station.

- Video recording to be permanently captured on removable media or similar disk with backup;

- SCC (System Control Computer) with SVGA display that enables the operator to control the operation of the test;

- System self-diagnostics;

- Flaw indications to be displayed via a computer controlled screen with the ability to display them in various color configurations as they relate to their severity or other criteria established by PATH. The system shall also have data input capability to allow the addition of alpha-numerical annotation, position information, rail condition and defect icons;

- Continuous couplant check;

- Test results recorded on a hard disk for review or other removable media.

The Ultrasonic Rail Flaw Measuring System is to be fully operational at time of delivery with all adjustments, inspections and calibration already. The Contractor, or an approved factory representative, shall put the System in service and train PATH's personnel for a minimum of two weeks (80 working hours).

11.2.7.1 Mechanical Features of Ultrasonic Rail Flaw Measuring System. The System shall be designed to operate all auxiliary components from the operator's desk, without interfering with the basic function of the System and the function of any other System of the Track Inspection Vehicle. It shall have a complete test carriage (supplied by the Contractor), capable of housing six multi-channel roller search units (three per rail) (or approved equal), fully equipped with the following channels as a minimum: Two zero (0) degree, four 37.5 degree, four side looking crystals, and an array (gauge, center & field) of 70 degree crystals for a total of 28 active channels (any other orientation optional).

The test carriage shall be equipped with water, hydraulic and pneumatic controls for coupling, gauge, cant lateral, and up and down functions to control placement of the ultrasonic wheels on rail. The system shall have lock/unlock knobs and warning LEDs or lights. The operator station must have all controls for water, cant, lateral, lock out and up and down control of carriage and all of its test functions.

The Track Inspection Vehicle shall be equipped with water tanks for the Ultrasonic Rail Flaw Measuring System with a total minimum capacity of 150 gallons.

11.2.7.2 Ultrasonic Test Capabilities

The Ultrasonic Rail Flaw Measuring System shall have full railhead coverage with 70 degree (+) or (-) sound envelope capable of detecting transverse flaws 5 % or smaller in the railhead, in either 100-lb. ARA-B, 115-lb. RE or 136-lb. RE rails, with a minimum of 90 % repeatability at speeds up to 30 mph. System design shall incorporate a series (gauge, center and field) of 70 degree transducers and channels. Following are the minimum detection capabilities of the system:

Vertical and horizontal head or web separation detectability of one half-inch or smaller, with 90 % repeatability at speeds up 30 mph. System design shall incorporate a zero, web, 37.5 degree and side-looking transducers and channels.

One quarter-inch bolt hole crack detectability with 90 % repeatability at speeds up to 30 mph. System design shall incorporate a zero, web, 37.5 degree transducers and channels to cover bolt hole and web areas.

The Track Inspection Vehicle shall also include transducers for the enhanced detection of detail fracture in head-checked rail, and enhanced vertical split head detection (side-looking transducer). This System shall be able to use GPS position or location data, or shall be able to work independently from GPS.

The Track Inspection Vehicle shall be also equipped with two portable flaw detection

scopes with spare batteries, chargers and full hand-test transducer compliment. Their type and style will be approved by the Project Manager after the Contractor presents their various features.

11.3 **Computer System(s).** The computer system(s) shall be capable of acquiring the raw data obtained by the measuring systems; of integrating the raw data with other data such as stationing, distance, speed event markers, GPS data, etc. and of simultaneously computing, analyzing and recording on hard drives and displaying on monitors and in print data relating to the specified track parameters. The system shall be of proven design and suitable for use on rapid transit systems. The minimum equipment to be furnished in the Track Inspection Vehicle shall include:

- Computer with an Intel Pentium 4, processor with a 1.4 GHz CPU speed, or the latest computer, as approved by the Project Manager
- 768 MB DRAM, with error-checking
- 512 KB cache, for both levels.
- 64 MB of Video Memory
- 60X CD/DVD Read/Write,
- External storage
- DVD/ CD R/W combo for Laptops and Workstations
- Network Cards (high speed)
- Interface boards
- 150 GB SCSI hard drives (PC), 80 GB for Laptops, or equivalent, as approved by the Project Manager.

The computer system shall be installed in an industrial-grade enclosure to ensure maximum protection against dust, dirt, moisture and vibrations encountered in PATH's worst-case conditions **with heavy steel dust in a tunnel environment**. Any filters used shall be sized for proper filtering without replacement for a 6-month inspection period. The onboard computer system shall be able to download the collected information to portable data collectors. The computer rack shall have extra space for additional measuring systems

The system shall be readily available for programming, calibration, playback, printout, track testing, changes in parameters, checking, and system diagnostics.

11.3.1 The Computer system shall have an offboard computer system with graphical capabilities to analyze, play back, create reports, etc. in an office environment.

11.3.2 Computer stations shall be the latest of the Tecra family laptops (i.e., Tecra Z50-A or latest model) or approved equal, with 15" TFT LCD flat panel displays, and one shall be installed at each end of Train. There shall be a minimum of six (6) computer stations**.** These shall have a keyboard, mouse, floppy drive, DVD/CD R/W, external storage, and at least 1 TB hard drives. All the computer terminals shall have access to printers. At least one Laptop PC shall be installed at the central computer area. The Laptop shall be able to be connected at each end station if so required.

11.3.3 Software. The Contractor shall furnish the computer equipped with all necessary software needed to achieve its functions, including operating system software Windows 7 Server (or latest) and Microsoft Office Professional 2007 (or latest) software. In addition, the Contractor shall also provide PATH with four (4) extra copies of said software and any applicable license(s).

Further, the software furnished with the system shall allow the operators to:

- Store all processed track parameters' data to a portable data collector such as DVD or CD; Store all final reports of the exceptions on a DVD or CD in a format ready to print back in the office (the report and the exception).

- Analyze all parameters and print exceptions of parameters that exceed preset levels, in real time, while testing and off track while in playback mode;

- Change of "exception" thresholds shall be readily accomplished in all systems or parameters;

- While in playback mode a program shall be furnished which shall allow partial playback, search of data for particular areas, and print out of parameters on the strip chart, terminal, or both. Program shall be similar to the ones installed on PATH's Track Geometry Car.

- A computer diagnostic program shall be furnished and installed by the Contractor.

- Adequate system documentation shall be supplied by Contractor.

11.3.4 Data Printouts. Onboard printers shall be able to print/plot and sort six (6) reports with their respective defects. At least three (3) new high-speed laser printers/plotters (latest models) shall be delivered for generating data chart printouts. These printers/plotters shall be capable of handling paper sizes from 8.5x11 inches to 11x17 inches. Paper capacities shall be a minimum of 1000 sheets. At least, three (3) printer/plotters shall be installed on board the Track Inspection Vehicle (one to be used for the Ultrasonic Rail Flaw Measuring System) and one (spare) shall be delivered to PATH, Consolidated maintenance Shop, 120 Academy Street, Jersey City, NJ 07302, Attn. John Wargo.

11.3.5 Power Supplies. The measuring/analyzing computer systems shall have a backup power supply capable of providing for an orderly shut-down of the measuring systems in the event of a generator failure.

11.4 **Video System**. A color video system shall consist of color cameras, DVD Recorders/Players, character generator interface, color monitors and all required selection of switches, video, audio and power cables. The DVDs shall be capable of automatic or manual operation. This equipment shall be placed according to the following guidelines, or as directed by the Project Manager:

One (1) color camera shall be located at each exterior end of the vehicle. The camera shall be mounted on the left corner of the analyst's desk and shall be capable of pointing and zooming at the ceiling as well as the walls of tunnels. Either camera shall be capable of being designated as "active" or "not active" from selection switches located in the Center control desk or any other place approved by the Project Manager.

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Two (2) DVDs shall be either rack or cabinet mounted in the Center Control Desk. These DVDs shall be in a format or any video format required by this system. The recorded information shall be capable of correlating with track geometry information by means of the character generator interface (i.e. display of the Division, Line, Track, Date, Station + Footage as a minimum).

The center control desk shall have switches to select the camera to be "active" or "not active" and the type of information to be recorded, such as the video system or thermal imaging system.

A selection switch shall be provided for DVD automatic or manual operation. Automatic operation for DVD recording shall start when vehicle speedometer is moving in direction of selected desk and above 5 mph and stopping with vehicle operation below 5 mph.

Two (2) 10-inch (minimum) color monitors shall be mounted in the overhead of front and rear computer desks. One (1) 10-inch (minimum) color monitor shall be racked mounted in the Center control desk and one (1) 13-inch (minimum) shall be mounted in the area designated for the Thermal Imaging System. All monitors shall receive video signals from the active selected camera or from the thermal imaging system.

11.4.1 Tunnel Video System. This system shall consist of similar hardware and software and may be interlaced with the video system mentioned above. The Project Manager will review and approve the arrangement.

Three (3) color cameras shall be provided, installed at a suitable location between the two car units of the Track Inspection Vehicle. One camera shall be positioned to point towards the centerline of the track, bottom of the tunnel ceiling; one camera shall be positioned to point towards the upper left corner of the left-hand wall and the other camera shall be positioned to point towards the upper right hand corner of the right-hand wall. Either camera shall be capable of pointing and zooming to the ceiling and walls of the tunnels. Either camera shall be capable of being designated as "active" or "not active" from selection switches located in the center control desk or any other place approved by the Project Manager. Software shall be provided to analyze the distances between the car unit profile and any wall structures or equipment that can cause interference with it.

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Two (2) DVDs shall be either rack or cabinet mounted in the Center Control Desk. Two (2) DVD shall be DVD format or any video format as required. One (1) DVD shall record the wall structures and one (1) DVD shall record the ceiling. The recorded information shall be capable of correlating with track geometry information by means of

the character generator interface (i.e. display of the Division, Line, Track, Date, Station + Footage as a minimum). Alternatively, the DVD system may be replaced with DVD-RW hardware and software to record the images from cameras.

The center control desk shall have switches to select the camera to be "active" or "not active" and the type of information to be recorded, such as the video system or thermal imaging system.

A selection switch shall be provided for DVD automatic or manual operation. Automatic operation for DVD recording shall start when vehicle is moving forward in direction of selected desk and shall stop when Track Inspection Vehicle is not moving.

Two (2) 10-inch (minimum) color monitors shall be mounted in the overhead of laser printers at the end of the Measuring Car Unit of the Track Inspection Vehicle. All monitors shall receive video signals from the active selected camera or from the thermal imaging system.

Furnish and install an off board system to analyze/measure video/data collected with the onboard system.

11.5 Rail Surface Monitoring System

A rail surface monitoring system similar to those built by ENSCO or approved equal shall be furnished and installed on the Track Inspection Vehicle in order to provide a visual inspection system capable of recording continuous images of both running rails and their fasteners at all speeds.

The system shall consist of two (2) high-speed line scan cameras, high intensity lighting system, synchronization electronics and a video inspection computer. The line scan cameras shall be mounted on the truck frame and aligned to provide high resolution images of both running rails and their tie plate fasteners. At each scan, the cameras shall capture a line (or lines) across the both rails' surfaces and adjacent areas of the track. The video inspection computer system shall assemble the scans and perform real-time automated image analysis in order to detect possible rail surface defects or missing fasteners. The images containing possible defects shall be tagged with location information (Division, Line, Track and Station + Feet), displayed on a computer monitor and saved on disk for further use.

The minimum requirements of the Rail Surface Monitoring System are as follows:
- Width of image across the running rail: 500 mm;
- Image resolution across the running rail: 2 mm;
- Image resolution along the running rail: 2 mm;
- Survey speed: 0 to 40 mph

The line scan cameras shall be mounted to the truck frame in such a way that they neither interfere with any other systems mounted on the truck nor create a clearance violation at

any point in PATH's tracks. In addition, the cameras and lights shall be protected from dust, grease, water infiltration, etc., and shall be designed for easy cleaning and replacement.

11.6 Safety

The Contractor shall provide detailed engineering documentation and shall certify that all equipment complies with applicable OSHA/ANSI standards and other required safety specifications with respect to their operation in PATH system, including laser measuring equipment and electrical systems.

SECTION 12

SPARE PARTS, REPAIR PARTS AND TOOLS

12.1 Spare Parts

The following Spare Parts shall be delivered with each Track Inspection Vehicle:

One (1) gas pump, alternator and starter for the engines;

One (1) set of mechanical and electric tools to service all systems of the Track Inspection Vehicle;

Two (2) sets of filters.

One (1) 4-channel oscilloscope with automatic setting capable of reading voltages, resistance, currents intensity, etc.;

One (1) multimeter capable of reading all voltages and current capacities in the Track Inspection Vehicle's systems;

Two (2) spare Event Box;

One (1) battery charger;

One (1) set of specialized tools and calibration equipment;

One (1) uninterruptible power supply backup (UPS) for the main computer and workstations, capable of 20 minutes minimum supply of power for all systems;

One (1) set of spare circuit boards for Analog/Digital converter and Ultrasonic Rail Flaw Measuring system units;

One (1) spare encoder.

Two (2) spare ultrasonic measuring wheels.

One (1) spare tunnel laser measuring unit (including interface box).

One (1) high speed line scan camera, for the Rail Surface Monitoring system.

One (1) Hi G camera update, for the Rail Surface Monitoring system.

One (1) lens, 6 mm, for the Rail Surface Monitoring system.

One (1) camera enclosure with wiper, heater, for the Rail Surface Monitoring system.

One (1) set of connectors and cables for the Rail Surface Monitoring system.

One (1) track gauge measuring device (accuracy of +/- 1/32” or better).

One (1) track flangeway measuring device (accuracy of +/- 1/32” or better).

One (1) new high-speed laser printer/plotter (latest model) shall be delivered for generating data chart printouts. This printer/plotter shall be of the same quality and brand as the one onboard the Track Inspection Vehicle (refer to 11.3.4)

A list of all the parts produced or modified for this Contract by the Contractor or Subcontractors shall be given to the Project Manager, so he can request spare parts

12.2 Repair Parts

For a minimum of fifteen (15) years from the date of acceptance of the Track Inspection Vehicle, the Contractor shall supply repair parts at the applicable price stipulated in the Contractor's then current price schedule. The Contractor shall furnish within one (1) week after Notice of Award the location of parts supply depots within or nearest to the Port District.

12.3 Special Tools

The Contactor shall deliver one set of special tools for the Track Inspection Vehicle. A special tool is defined as one which is required for a very narrow or a specific application for the Track Inspection Vehicle, or one that must be custom fabricated for its specific application. Sufficient information to process or fabricate specific tools must be provided with the drawings or in the Manuals.

SECTION 13

TESTING

13.1 General

The Track Inspection Vehicle shall be thoroughly tested before delivery, after delivery, and prior to issuance of acceptance by PATH. All tests required shall be conducted to ensure 100 % compliance with all Specifications and requirements stated in the Contract and Drawings.

13.1.1 All tests required to show that the equipment and the installation work are in accordance with the requirements of the Contract shall be made by the Contractor at no additional expense to PATH.

Any defect in the equipment, its apparatus, material or workmanship, disclosed by any inspection or test, including defects in performance, safety, reliability and maintainability, shall be corrected at no additional expense to PATH. This shall include any re-shipping of the Track Inspection Vehicle or its components back to the Contractor's plant for necessary corrective action.

13.1.2 The Contractor shall be responsible for furnishing all the necessary testing instruments and apparatus to conduct the required tests. All costs associated with the use of test instrumentation, apparatus, materials, labor, and facilities shall be borne by the Contractor.

The Contractor shall notify the Project Manager at least fifteen (15) business days in advance of the time when an item is ready to be tested. All tests shall be conducted in the presence of the Project Manager or his designee. Only the Project Manager may elect to waive a test or PATH's right to witness any test.

13.1.3 All tests to be performed shall be documented by the Contractor. Documentation shall consist of the test's description, procedures, pass/fail criteria, and method of reporting results. This documentation shall be submitted to the Project Manager no later than fifteen (15) business days prior to the start of the test. Within ten (10) business days after the conclusion of each test, the Contractor shall submit a complete test report to the Project Manager for his approval.

13.1.4 In case of failure of any test, the Contractor shall provide a failure analysis for the approval of the Project Manager that includes the cause of the failure and corrective actions to address the failure. Upon the Project Manager's approval of the failure analysis, the Contractor shall implement the approved corrective actions and repeat the subject test. Any subsequent failure of the test shall be handled in the same manner.

13.1.5 Any tests not stipulated in this section or PATH's failure to conduct such tests shall not relieve the Contractor of any obligations specified under this Contract.

The Contractor, its subcontractors and suppliers may perform additional testing as deemed necessary to enssure high-quality standards for all materials and parts of the

Track Inspection Vehicle.

13.1.6 The Contractor shall perform the tests as described in Sections 13.2 through 13.17.

13.1.7 Safety Features. Prior to starting the above tests, the Contractor shall verify that the safety features of all systems and sub-systems operate satisfactorily.

13.1.8 Spare parts shall be tested in a similar manner to parts installed on the Track Inspection Vehicle.

13.1.9 Final acceptance of the Track Inspection Vehicle will be given by the Project Manager in writing upon the Contractor's successful completion of all tests and necessary modifications.

13.2 Track Inspection Vehicle Tests

The following tests are minimum requirements for the acceptance of the Track Inspection Vehicle and if the Contractor has more stringent tests the Project Manager may elect to have them performed and shall have the right approve them. The test procedure shall be proposed by the Contractor and submitted to the Project Manager for review.

13.2.1 Truck Test

13.2.1.1 The Contractor shall perform all truck tests, such as but not limited to static load, dynamic load, primary suspension, equalization, fatigue, , etc. in compliance with the minimum requirements of Sections 2.2 and 7 (Contractor may supply proven truck tests if less than five (5) years old.

13.2.1.2 Static Tests. The truck shall be subjected to load combinations specified under this Section. Individual loads and loads in each combination shall be applied in at least five (5) increments and removed in reverse order.

Maximum stress in any portion of the truck structure under maximum load shall not exceed the criteria specified in this Section.

Strain gages /rosettes shall be located at all high stress areas on the approved stress analysis. They shall verify the calculated stresses. Contractor shall record the readings of each gage at each load level. The stress analysis shall be completed prior to the static test.

13.2.1.3 Static Loads

The static test load shall be:

a. Vertical Dead Load-
Completely Equipped Carbody and truck

Vertical Live Load-
Maximum crew, equipment and fuel load

b. An allowance for vertical impact or 30 % of the total vertical load a. above.

c. Allowances for dynamic motor loads as given below and applied at the motor center of gravity.

ALLOWANCE FOR DYNAMIC MOTOR LOADS

Vertical (V)	Transverse (T)	Longitudinal (L)	
c(1) Low	$\pm$ 5.5g	$\pm$ 5.5g	$\pm$ 3.5g
c(2) Maximum	$\pm$ 10.5g	$\pm$ 10.0g	$\pm$ 5.5g

d. A force of 0.50g caused by running on a sharp curve without super elevation at a speed sufficient to throw the entire weight of the equipped Track Inspection Vehicle, including trucks, on the four wheels on the outside rail.

e. A transverse load of 20 % of the weight of an equipped Carbody and live load applied at the truck center plate.

f. Forces caused by the maximum longitudinal acceleration resulting from a 25 % coefficient of adhesion.

g. Forces caused by the maximum longitudinal deceleration resulting from a 25 % coefficient of adhesion and a brake shoe force of 10,000 pounds (44.5 kN) per brake shoe.

13.2.1.4 Static Load Combinations. The stresses under the first set of test load combinations specified below shall be determined by superposition of stresses obtained from the application of individual loads. A total of four design load combinations from the second and third sets specified below, as approved by the Project Manager, shall be used with all loads in each combination multiplied by a factor of 1.2. These four (4) combinations shall be arrived at by establishing a test matrix derived by superposition of the stresses obtained under the individual specified loads in combination and by selecting, with considered engineering judgment, those four (4) combinations which cause the highest stresses at a representative number of locations.

First Set of Load Combinations:
(a) a + b
(b) a + (c(1)V or c(1)T or c (1)L)
(c) a + e
(d) a + f
(e) a + g

Second Set of Load Combinations:
(a) a + b + c(2)V + c(1)T + c(1)L + e + (f or g)
(b) a + b + c(1)V + c(2)T + c(1)L + e + (f or g)
(c) a + b + c(1)V + c(1)T + c(2)L + e + (f or g)

Third Set of Load Combinations:
a + c(1)V + c(1)L + d

The dynamic motor loads indicated shall be applied to one motor and simultaneously, the c (1) loads shall be applied to the other motor.

All components of the above-specified loads shall be included.

Static loads shall be applied individually and in the four (4) test load combinations specified above.

Individual loads and loads in each combination shall be applied in at least five equal increments and removed in reverse order.

The physical load tests shall cause no observable permanent deformation and no fractures or cracks, as determined by magnetic particle and dye penetrant inspections.

13.2.1.5 Static Loading Criteria. The trucks shall meet each of the following static loading criteria:

13.2.1.5.1 Under each combination from the first set of load combinations, determined by superposition of stresses obtained from the application of individual loads, no stress shall be in excess of $^1/_3$ of the specified minimum yield stress of the material, except as permitted in 13.2.1.5.2 below.

13.2.1.5.2 Under each combination from the second and third sets of load combinations determined by superposition of stresses obtained from the application of individual loads, no stress shall exceed $^2/_3$ of the specified minimum yield stress of the material. If, however, under these load combinations, the stress at any point does not exceed $^1/_2$ of yield, then at these points the stresses in 13.2.1.5.1 above, shall be permitted to exceed $^1/_3$ of yield but shall not exceed $^1/_2$ of yield.

13.2.1.5.3 Under each of the four (4) load test combinations from the second and third sets, including the factor of 1.2 as defined under "Static Load Combinations" above, no stress shall be in excess of $^4/_5$ of the specified minimum yield stress of the material.

13.2.2 Wheel Loads Test. Wheel load measurements shall be made by the Contractor on the sample vehicle to verify that the wheel load at every wheel is within the maximum permissible loads as specified in Section 2.5.

The instrumentation for measuring the wheel load under every wheel shall have an

accuracy of 1 % and shall be coplanar within $^{1}/_{16}$" (1.5 mm). The measurements shall be made simultaneously using a method approved by the Project Manager.

13.2.3 Coupler Test. Each installed coupler shall be tested to demonstrate that it can be moved radially by applying a force of not more than 200 pounds to the side of the coupler. The test shall be performed by moving the coupler three times in both directions throughout its entire range of travel.

13.2.4 Curving Test - The Track Inspection Vehicle shall be checked to verify that car bodies clearances between truck to car bodies and coupler to truck are maintained when the vehicle traverses: a simple minimum radius curve, a reverse curve, and a minimum radius vertical curve, as specified herein, with all possible maximum vertical and lateral movements and wear taken into consideration. This test shall apply when the two-car unit is together or when the Track Inspection Vehicle is coupled to any retrieving car with or without a coupler adapter, and when coupled to a retrieving car with a tow bar.

No interference is allowed between any part of the Carbody and truck, including appurtenances such as pipes, hoses and clamps. Hoses shall not be kinked or stretched. The Contractor shall eliminate any interference. Kinked or stretched hoses shall be replaced with suitable hoses that will withstand the worst case operating conditions.

13.2.5 Clearance Test - The Track Inspection Vehicle shall be dimensionally checked to demonstrate that the car bodies and trucks have been constructed to be within PATH's clearance requirements as per section 1.14.2. This shall also include the worst case of track inspection operations. At the discretion of the Project Manager, the Track Inspection Vehicle shall be tested on all or any part of PATH track system to verify compliance. A list of critical dimensions to be verified shall be provided by the Contractor and approved by the Project Manager.

13.2.6 Camber Test. A test shall be performed to verify the camber on the Car as compared to the camber required on in the specifications If no camber is required for the Car, then a laser beam test shall be performed to verify that there is no negative camber. Under no circumstance shall the Carbody exhibit a negative camber. If the camber requirements are not met, then the Contractor shall either provide another Carbody with the proper camber or provide an explanation (acceptable to the Project Manager) on the impact of the non-conforming camber.

13.2.7 Acceleration Test – An acceleration test shall be performed to verify that the Track Inspection Vehicle will not exceed and remains within 5 % of the acceleration specified.

13.2.7.1 Balance-Speed Test. A balance-speed test shall be conducted on the Track Inspection Vehicle with the minimum on-board equipment and personnel to determine the maximum speed on level tangent track in still air.

13.2.8 Carbody Balance Tests. Tests shall be performed on the Track Inspection Vehicle to

demonstrate that the Carbody balance requirements of Section 2.9 are satisfied. A Diagonal Jacking Test shall be performed on the Carbody to verify its structural integrity according to the following procedure:

13.2.8.1 Diagonal Jacking Test. The Track Inspection Vehicle body shall be loaded to its fully loaded condition, including a full crew, with all trucks (or an equivalent weight) hanging from the body bolsters. The car body shall be supported symmetrically at the jack pads at the four corners of the car body. One of the jacks shall be lowered in five equal increments until the load on the jack is 10 percent of its original load. All gauges shall be recorded at each increment of jack position. The procedure shall be reversed until the load on the jack is returned to its original level.

13.2.8.2 Test Criteria. The Track Inspection Vehicle will be considered compliant with the specification if all the following are met:

Maximum stresses calculated from strain readings in any structural element do not exceed the allowable stresses approved prior to the start of the test program as part of the stress analysis.

Strain readings plotted against load do not vary by more than +/- 5 percent from a straight line (linear) curve, with one end point at the origin (no load) and the other near the point which represents the measured strain at maximum load.

Indicated residual strains at strain gauges following return to original level do not exceed the maximum error resulting from the accuracy of the instrumentation.

There shall be no permanent deformation, fracture, crack or separation in the car body structure. Broken welds shall be jointly inspected by the Contractor and PATH to determine if the failure is the result of weld quality or stress.

13.3 Air Brake Equipment Testing

13.3.1 Contractor shall arrange for the air brake equipment to be tested at the manufacturer's plant in accordance with approved test codes. The following items shall be included:

13.3.1.1 Reservoir Test - The reservoirs shall be subjected to a hydrostatic test of 300 psi (2,067 kPa) and an air test of 160 psi (1,103 kPa) without leakage.

13.3.1.2 Trip Cock - The Contractor shall test the operation of each trip cock in accordance with Section 3.3.1.1

13.3.1.3 Compressor Test - Each compressor unit shall be subjected to an approved commercial test to be performed by Contractor.

13.3.1.4 Brake Actuator - The brake actuator shall be subjected to an approved engineering and commercial test to be performed by Contractor.

13.3.2 Leakage Test.

Upon completion of the Track Inspection Vehicle at the Contractor's plant, air brake apparatus, including piping, shall be leak tested to verify the leakage requirements of Section 3.4.4.

13.3.3 Friction Brake System

The friction brake system and associated apparatus parameters listed below shall be tested and adjusted on the Track Inspection Vehicle for operation in compliance with the requirements of Sections 3.2 through 3.4 of the Specification:

Brake Pipe Pressure

Deadman's Emergency Application

Emergency Application Pneumatic Trainline Initiated

Emergency Application – Initiated by: the operator, emergency brake cord, or trip cock

Irretrievable Emergency Brake Application, Release Time

Brake Cylinder Pressure required to meet emergency and full service braking requirements

Compressor Cut-in/Cut-out Pressures

Air Compressor Drain Valve Operation

Main Reservoir Safety Valve Setting

Brake Handle Resistance Force

Brake Valve and Brake System Operation

Prompt Recharging of Brake Pipe

Friction Subsystem Service Brake Pressure Response

13.3.4 Parking Brake Test

The parking brake on the Track Inspection Vehicle shall be functionally tested to verify requirements of Section 3.3.2.11.

13.3.5 Train Braking Test on Level Tangent Track

Brake test demonstration shall be conducted on the following items:
To meet the performance requirements of Sections 3.2 and 3.3.
To verify proper Service and Emergency braking operation.
To verify that inadvertent brake handle movement at the non-operational cab control station will not affect the brake system.

13.3.6 Stopping Distance Brake Test - A stopping distance brake test shall be performed to verify that during the worst case conditions, the Track Inspection Vehicle meets the stopping distance requirements as specified in the specifications The Track Inspection Vehicle shall be tested at every five (5) mph cumulatively up to the balance speed. Five (5) test runs must be conducted at each speed (three times in one direction, twice in the opposite direction). If the Track Inspection Vehicle does not meet the stopping distance requirements, then it is subject to automatic rejection.

13.3.7 Horn. The horn[s] shall be functionally tested to verify requirements of Section 3.3.2.4.

13.4 Propulsion Equipment Testing

Contractor shall perform the following tests:

13.4.1 Speed Sensor Test. The Track Inspection Vehicle shall be tested to verify the accuracy of the speed indicator. The accuracy shall be based on new wheel diameter.

13.4.2 Horsepower Test. The Track Inspection Vehicle shall have its engines tested at rated rpm to verify that the horsepower developed is within the manufacturer's limits.

13.4.3 Heat Test. The Track Inspection Vehicle shall have its engines tested at full power to verify that the variation between the radiator air inlet and outlet temperatures and the radiator coolant inlet and outlet temperatures do not exceed the manufacturer's recommendations.

13.4.4 Back Pressure Test. The Track Inspection Vehicle shall have its exhaust system tested to verify that the maximum backpressure of the engine exhaust specified by the manufacturer is not exceeded.

13.4.5 Diesel Engine Exhaust Gas Tests. The Track Inspection Vehicle shall be tested to verify that it meets EPA and OSHA requirements as specified in Sections 5.3 and 5.4.

13.5 Electrical and Wiring Tests.

13.5.1 Electrical High Potential Tests. Before leaving the Contractor's plant, all circuits and connected apparatus except electronic solid state devices, alternator and speed sensor of each completed vehicle shall be subjected to dielectric tests by Contractor in accordance with the latest IEEE standards. All circuits shall withstand a potential of twice the rated voltage of the conductor or connected equipment, whichever is less, plus 1,000 VAC, applied continuously for sixty (60) seconds between ground and/or

the current carrying parts. The equipment and apparatus shall be disconnected before the test.

13.5.1.1 Circuit Breaker Test. Circuit breakers shall be subjected to an approved engineering test (to be performed by Contractor) to verify proper coordination and fault interrupting ability, and to meet the specified requirements of Sections 6.2.

13.5.2 Wire and cable shall meet the following test requirements. Certification of satisfactory completion of the indicated tests shall be supplied to the Project Manager.

13.5.2.1 Wire Requirements Tests. All testing requirements for the cross-linked polyolefin irradiated insulation shall be according to test requirements specified

13.5.2.2 Continuity Test. All circuits shall be tested to ensure continuity and correct polarity of equipment and devices. All frame grounds and terminal connections shall be checked for tightness.

Harnesses, conduits, and raceways shall be tested by the Contractor to verify their compliance with Section 6.2.2.

13.5.2.3 Megger Insulation Resistance Test. The Track Inspection Vehicle shall have its wiring megger tested to verify that wiring insulation conforms to the manufacturer's standards.

13.5.2.4 Dielectric - For Teflon wires, test per MIL-W-22759/10B (for 1,000 V wire with tests at 9.5 kV impulse) or MIL-W-22759/8B (for 600 V wire with tests at 8 kV impulse).

13.5.2.5 Crosslinked Insulations and Jackets for Wire and Cable. Test per ASTM D-470. Minimum accepted value shall be l.000 mega-ohms per 1,000 feet (304.8m), using a 1,000 V DC mega-ohm-meter.

13.5.2.6 Spark Test- Test per UL 44-Rubber-Insulated wires and cable.

13.5.2.7 Air Aging - For Teflon wires only, test per ASTM D-638. Age sample for seven (7) days at 302°F (150°C) in an air oven. Minimum tensile strength and elongation shall not be less than 85 % of the unaged values. Also test per IEEE STD 383-1974 and ASTM D-573 for extended life characteristics

13.5.2.8 Cold Bend - For Teflon insulated wires only, Test per NEMA WC3, except the test temperature shall be - 58°F (-50°C).

13.5.2.9 Weight Loss - Weight loss of the insulation material shall not exceed 1 % when subjected to an oven temperature of 266°F (130°C) for 500 hours.

13.5.2.10 Chemical Resistance - An appropriate length of sample wire shall be measured for insulation diameter, and total weight. The initial values shall be recorded. The wire shall be immersed to within 3" (76 mm) of each end in the test fluid for 24 hours at

149°F (65°C). During the immersion stage, the minimum bend radius of the wire shall be 10 times the diameter of the wire being tested. Upon removal from the test fluid, the specimen shall be cooled to room temperature for one (1) hour and the diameter gauged and reweighed for comparison with the original values. The maximum diameter and weight increase shall not exceed 30 % of its original values.

Typical fluids for this test include (but are not limited to):

Humble No. 2214 Railroad Diesel Lubricating Oil and lubricants lists in Section 6.11

Humble Diesel 260 or Railroad T fuel oil;

mineral oil;

hydrochloric acid, nitric acid, sodium hydroxide, sulfuric acid;

potassium hydroxide;

Petroleum distillates and other graffiti removers and cleaning compounds listed in Section 6.10;

trichloroethane;

perchlorethylene and trichlorethylene (vapor as well as liquid);

kerosene solvents;

trisodium phosphate solution; Skydrol 500 B hydraulic fluid; and

water.

13.5.2.11 Temperature Cycling Testing. The test shall be done on an 8-foot (2,438 mm) sample of Teflon in accordance with MIL-W-22759/6B. Thermocouples shall be attached to the outer jacket surface and on the conductor under a small incision in the insulation about 1 ft. (304.8 mm) from one end of the sample. Both ends of the sample shall be securely clamped using hose clamps.

Prior to temperature cycling, the sample shall be conditioned for 2 hours at a temperature of 302°F (150°C).

The sample shall then be temperature cycled between ambient of 257°F (125°C) and -22°F (-30°C) by transferring the sample to-and-fro between an air-circulating oven, set at 257°F (125°C) and an air circulating cold box set at -22°F (-30°C). The time during which the sample stays in each chamber shall be sufficient to allow both thermocouples on the sample to read the same temperature as the environment.

One cycle shall be defined as an approved dwell time at both 257°F (125°C) and -22°F

(-30°C). The sample shall be subjected to a total of 250 cycles, with a visual observation at the end of each cycle for cracks and for other damage. After 250 cycles, the sample shall be immersed in water for 6 hours with both ends out of the water, and then subjected to a dielectric test of 5 kV AC for 5 minutes; and the sample shall also be examined by microscope to verify that no cracks exist.

13.5.2.12 Single Conductor Thermal Overload Test. A continuous current of 115 amperes shall be applied to an 18 ft. (5,486 mm) length of 12 AWG test wires Teflon (TFE) in 25°C still air. A 1,000 VDC potential shall be maintained between the test wire and an 18 AWG bare copper wire wrapped snugly around the outer insulation surface of the test wire. Failure shall be defined to occur when a short circuit is established between the bare copper wire and the test wire. Minimum time to failure shall be three (3) minutes. This test shall also be done on a 10 AWG test wire (cross-linked polyolefin) with a 3 kV DC potential between the test wire and the exterior bare 18 AWG copper wire.

13.5.2.13 Seven Wire Bundle Thermal Overload Test. A seven wire cable bundle shall be formed by twisting six insulated 12 AWG (TFE) conductors around a center insulated 12 AWG (TFE) conductor.

A 120 amperes current shall be passed through the center 12 AWG conductor for seven (7) minutes. After the test period, the cable bundle shall be examined for visible damage to the outer six conductors. Failure shall be defined to occur if any of the outer conductors split, rupture or melt and adhere to the center conductor insulation. This test is not required for the cross-linked polyolefin.

13.6 Communications Test

The communication system shall be subjected to approved engineering and commercial tests to demonstrate satisfactory performance and compatibility as described in Sections and 10.

13.7 Noise Level Test

Tests shall be performed to confirm that the equipment operating noise levels conform to Section 1.24.2.

13.7.1 Environment. Noise criteria specified herein shall be measured in an essentially free-field environment; i.e., out-of-tunnel and away from any reflective surfaces other than the ballast and ties track bed upon which the Track Inspection Vehicle shall be operated and adjacent flat, clear ground. Should a suitable site be unavailable, the characteristics of the site that act to influence sound levels shall be noted and the probable effect on measured noise level shall be estimated.

13.7.2 Auxiliary Systems. For the purpose of Track Inspection Vehicle's noise measurements, an auxiliary system is defined as any functioning apparatus on the Track Inspection Vehicle, other than trucks, propulsion and electrical braking. Auxiliary systems shall include the following items:

diesel engines
friction braking subsystem
auxiliary power subsystem
other motors, air compressors
Track Inspection equipment, fluorescent lamps and inverter ballast

All auxiliary systems shall be active during the tests.

13.8 Acceptance Tests

Before installation on the Track Inspection Vehicle, Contractor shall demonstrate that each major sub-system meets the specifications to the satisfaction of the Project Manager. Where applicable, in the Project Manager's opinion, extreme PATH operating environment shall be simulated during the acceptance testing.

13.9 Quality Control Test

During the manufacturing of all components, assemblies, subsystems and the completed Track Inspection Vehicle, the Contractor shall be responsible for the approved inspection and testing at each station designated on all Quality Control Flow Charts. Check lists and data sheets shall be keyed to the appropriate approved procedure, specification and/or drawing. Any and every correction of a failure to meet a specification of form, fit or function shall be submitted to the Project Manager for approval.

13.10 Inspection Tests

13.10.1 Weld Test. Each weld shall be carefully inspected. At the discretion of Project Manager, a number of sample welds selected by the Project Manager will be nondestructively tested.

13.10.2 Rivet Test. If rivets are used, every rivet shall be visually inspected.

13.10.3 Water Test. In general, the water test shall permit PATH to verify that in case of heavy rainfall the water will reach no sensitive equipment. The driving/Inspection, and diesel engine compartments shall be proven to be water tight when subjected to water pressure sprayed to simulate heavy rainfall and car wash conditions.

Water operating pressure shall be 40 to 55 psi (276 to 380 kPa) at each nozzle. The nozzles shall have an orifice to provide semi-atomization in a conical pattern having approximately 65° included angle. The nozzles shall be held 3 ½ ft. to 7 ft. (1.168 m to 2.134 m) from the Track Inspection Vehicle. The nozzles shall be spaced so as to provide overlap of the spray cones sufficient to cover all of the area being sprayed.

The initial spray application shall be continuous for at least 10 minutes before the inspection for a leak is started. The spray shall be in operation during inspection.

The water test area shall be suitably heated in cold weather, and testing shall be of duration to demonstrate water tightness to the Project Manager.

13.10.4 Maintainability and Demonstration. Contractor shall demonstrate that all equipment is designed to permit quick and convenient access for inspection and maintenance (removal and installation).

13.11 Material Test

All materials used in construction of the Track Inspection Vehicle shall be tested in conformance with Sections 3.2 through 3.4 and 6.4.

13.12 Track Inspection Equipment Test

All Track Inspection equipment shall be tested at the Contractor's plant to verify its functionality, as per the requirements of Section 11.

13.13 Commercial Test

The Contractor shall test all equipment and materials, including wire and cable, prior to shipment to determine that it has been manufactured in accordance with its specification, and within tolerances permitted and that all normal safety and quality assurance specifications have been met as well as all other requirements that affect its form, fit or function.

13.14 Functional Test

All components and subsystems shall be physically and functionally tested to verify compliance with all operational and functional criteria specified prior to delivery of the Track Inspection Vehicle to PATH. A demonstration shall be performed to show that all equipment is designed to permit quick and convenient access for operation, inspection and maintenance.

13.15 HVAC Unit Test

The following tests shall be performed:

- The air conditioning units shall be tested during the first hot season (at the Contractor's plant or PATH's property) in accordance with the requirements of Section 8.
- The heating units shall be tested during the first cold season (at the Contractor's plant or PATH's property) in accordance with the requirements of Section 8.

13.16 Lights Test

Function Test. The control and operation of all lights shall be tested.

13.17 Tests on PATH's Property

Upon delivery the Contractor shall perform car level tests on PATH's property. These shall include, but are not limited to, the following tests:

13.17.1 Complete Track Inspection Vehicle braking and propulsion test on level tangent track.

13.17.2 The parking brake shall be demonstrated to be effective in holding a completely equipped Track Inspection Vehicle, including fuel, on the maximum grade as specified herein. The parking brake calculation shall be provided for the Track Inspection Vehicle.

13.17.3 Curve tests (100 ft. radius curve and 120 ft. radius reverse curve)

13.17.4 Clearance tests

13.17.5 Noise Level and Vibration tests

13.17.6 The Contractor shall perform all necessary tests to demonstrate compliance with the track inspection and measurement requirements of Section 11 at approved locations.

13.17.7 Functional test - All components and subsystems shall be physically and functionally tested to verify compliance with all operational and functional criteria specified after delivery of each Track Inspection Vehicle to PATH. A demonstration shall be performed to show that all equipment is designed to permit quick and convenient access for operation, inspection and maintenance.

13.17.8 A ten (10) day (Monday to Friday), six (6) hour/day performance reliability test of actual track inspection operation shall be conducted prior to acceptance. The Contractor's operator, or a trained PATH's operator with the Contractor present, shall operate the Track Inspection Vehicle to demonstrate the capability of all track measuring systems.

During the test, the Track Inspection Vehicle shall operate in its normal duty cycle to verify that all systems will operate safely and reliably. It is assumed that during this reliability test, normal routine maintenance, as planned in the Maintenance Manual, will be performed by PATH's personnel with the assistance of the Contractor's representative.

Any design or two quality failures will result in a failed test and must be restarted from day one. Design failures are those which require a re-design in a component, system or sub-system to resolve a failure. Quality failures are those in which a component, system or sub-system is replaced in-kind. The Contractor must provide a failure analysis for all failures, including the cause of the failure and how the recommended solution addresses the failure. The failure analysis will be reviewed and approved by

PATH. The decision of PATH in this respect will be final.

13.17.9 Diesel Engine Exhaust Gas Tests on PATH. The Track Inspection Vehicles shall be re-tested to verify that they meet Tier IV emissions.

SECTION 14

DEFINITIONS AND ABBREVIATIONS

Whenever the following abbreviations and terms are used in the Specification, they should be interpreted with the intent and meaning shown below.

- AAR. Association of American Railroads.
- Adhesion, Coefficient of, during rolling, contact, the ratio between the longitudinal tangential force at the wheel-rail interface and normal force.
- AGMA. American Gear Manufacturers Association.
- AIEE. American Institute of Electrical Engineers (now IEEE).
- AISC. American Institute of Steel Construction.
- AISI. American Iron and Steel Institute.
- Allowable Stress. The maximum stress permitted in a structure under specified design conditions. The allowable stress is less than the stress causing damage because of various factors, including: (a) uncertainty as to conditions of service, e.g. loads and forces imposed during the lifetime of the structure, (b) non-uniformity of material, and (c) inaccuracy of stress analysis.
- Approved Equal Equipment or Products. Equipment and Products which have received prior approval by PATH and appear on the Qualified Products Lists. Equipment and Products that have successfully completed 12 months of revenue service testing.
- Ambient Air. The air surrounding the object of interest.
- ANSI. American National Standards Institute.
- Anticlimber. An anti-telescopic device used on subway Car, consisting of a horizontally corrugated face plate secured to the end sill.
- APTA. American Public Transit Association
- ASHRAE. American Society of Heating, Refrigeration and Air Conditioning Engineers.
- ASME. American Society of Mechanical Engineers.
- ASTM. American Society for Testing and Materials.
- Auxiliary System. Any mechanism or structure, other than the Carbody, traction motor or propulsion system gearing, which functions during car operation; e.g., car lighting.
- Availability. The probability that system or system element will be operational when required. Mathematically, the ratio of the mean time between failure (MTBF) to the sum of mean time between failure plus mean down time.
- AWG. American Wire Gauge.
- AWS. American Welding Society.
- B-10 Life. The average car mileage at which no more than 10 % of all bearings in the car fleet shall have failed, with 90 % confidence.
- Braking, Emergency. An irrevocable open-loop braking system designed to insure fail safe brake application.
- Braking, Full Service. A non-emergency brake application which obtains the maximum brake rate consistent with the design of the brake system(s).
- Braking, System. Those elements on board a train and their interconnections that produce speed retardation in response to a control signal.

- Buff Load. A horizontal compressive load applied to the car, usually along car centerline at the couplers. The opposite of Draft.
- Carbody. The car itself, less trucks, equipment, and furnishings. It includes framing, sheathing, interior lining, roof, floor, and end sills.
- Carline. Framing members that extend across the top of a car from one side to the other and support the roof and other loads.
- CCSS. Committee of Chemical Safety and Standardization.
- CDR. Critical Design Review.
- CFR. Code of Federal Regulations
- CG. Center of Gravity
- Circuit, Vital. Any circuit that affects the safety of train operations.
- Commercial Test. A test wherein the equipment is tested to determine that it has been manufactured in accordance with specification and within tolerances permitted, and that all normal safety and quality assurance specifications and any other requirement that affects form, fit or function have been met.
- Contact Rail. A rail mounted on insulators alongside the running rail which provides traction power for train propulsion.
- Contract. Written agreement between PATH and Contractor which details the obligations of both parties.
- Contract Drawings. The drawings which accompany the Specification issued by PATH.
- Coupler. Device for mechanically coupling Car; also applied to connectors which couple electric and pneumatic trainlines between Car.
- CPM. Critical Path Method.
- CPN. Critical Path Network.
- Critical Area. The region of a structure requiring higher than normal quality of material and manufacture because stresses are at or near the limits of allowable stresses specified by the Modified Goodman Diagram.
- Cross Level. Relative transverse elevation of the two running rails on level track or superelevated track.
- dBA. Sound intensity in decibels, measured on the (A) scale.
- Dead Band. That portion of time or moment of a circuit, valve or device during which there is no change in output while an accompanying change in input is in effect.
- Dead Load. Weight at the rail of a fully equipped car.
- Deadman Control. A pressure or activity actuated device to detect inattention or disability of a train operator.
- DOD. Department of Defense
- DOT. Department of Transportation.
- Draft Load. A tensile load applied to the car through the couplers. The opposite of Buff.
- Duty Cycle. The period or percentage of time associated with the activated state of operation, occurring during normal cyclic operations, in relation to the elapsed time of a full cycle.
- Dynamic Outline. The greatest dimensional cross section generated by a moving train under worst case conditions.
- EMI. Electro-Magnetic Interference (includes RFI).
- Endurance Limit. The maximum stress in a material that can be completely reversed an infinitely large number of times without causing fracture.

- Engineering Test. A test wherein the equipment is operated to simulate actual operation either by itself or in a subsystem to determine that all functions specified are met and are within the tolerances permitted. The testing shall provide engineering information of all of the operating parameters of the equipment.
- EPA – Environmental Protection Agency
- Factor of Safety. The ratio of the load that would cause failure of a structure to the design load.
- Fail-Safe Safety. A characteristic of a system and its elements, the object of which is to ensure that any fault or malfunction will not result in an unsafe condition.
- Failure. A breakdown in service caused by a car equipment problem which results in an official report (TT) being issued by PATH.
- Fatigue. Failure of a structure by progressive fracture under a large number of repetitions of stress considerably less than the yield stress.
- FCC. Federal Communications Commission.
- Field Modification. Any change, alteration, adjustment, modification to the equipment or any part not done at the original manufacturer's plant.
- First Article Inspection. A review of the first unit produced to determine that the unit has been designed, manufactured and functions in accordance with the approved pre-production drawings and specifications.
- Freewheeling. The mode of operation of a vehicle in which both propulsion and braking are inactive, that is tractive effort is zero.
- Friction, Coefficient of. See Adhesion, Coefficient of.
- FRA. Federal Railroad Administration
- FTA. Federal Transit Administration, formerly UMTA.
- Frog Track. A track structure used, at the intersection of two running rails, to provide support for wheels and provide passageways for their flanges, thus permitting wheels on either rail to cross the other.
- Gauge Track. Distance between the inside face of rails measured 0.625 inches (15.9 mm) below the top of the running rails at a right angle thereto.
- Headway. The time separation between two trains, both traveling in the same direction on the same track, measured from the time the head end of the leading train passes a given reference point to the time the head end of the train immediately following passes the same reference point.
- HCFC. Hydrochlorofluorocarbon – A refrigerant for HVAC systems
- HFE. Human Factors Engineering.
- HUMP. A method of making up train consists in large train Yards with self-centering couplers; it is not applied to PATH track system.
- HVAC. Heating, Ventilating and Air Conditioning.
- IEEE. Institute of Electrical and Electronic Engineers.
- Impact. The increase in effective mass of an object due to sudden deceleration.
- Interface. The junction points or the points within or between systems or subsystems where matching or accommodation must be properly achieved in order to make their operation compatible with the successful operation of all other functional entities.
- ISO. International Standards Organization.
- JEDEC. Joint Electronic Device Engineering Council.
- Jerk. The time rate of change of acceleration.

- LAHT. Low Alloy High Tensile Steel.
- Live Load. Consists of the maximum on the Track Inspection Vehicle, plus crew and fuel.
- Maintainability. The quality of the combined features of equipment design and installation that facilitates the accomplishment of inspection, test, checkout, servicing, repair, and overhaul with a minimum of time, skill, and resources in the planned maintenance environments.
- Maintenance, Corrective. The action taken to restore a failed item of equipment to an operable state.
- Maintenance Scheduled. Programmed preventive maintenance.
- Manual Train Control. An operating mode in which the train responds to the actions of its operator through manipulation of the brake valve and master controller.
- Manual-Reverse. Controlling cab is at the rear of the train.
- Measuring Car Unit. One of the Car of the two-car unit Track Inspection Vehicle
- MDBF--Mean Distance Between Failures. The arithmetic mean distance (in miles) between service interruptions due to a train mechanical failure. The interruption consists of a train being late by more than five minutes or of an enroute or terminal cancellation.
- Mil-Std. Military Standard.
- Model. An object built to a smaller scale to simulate full-scale preliminary design.
- Modified Goodman Diagram. A diagram used to determine allowable stresses in a structure under fatigue design loads.
- Motorman. That person having direct and immediate control of the movement of a train.
- MOU. Memorandum of Understanding
- MTBF - Mean Time Between Failures. The arithmetic mean of the time between successive failures.
- NEC. National Electrical Code.
- NEMA. National Electrical Manufacturers Association.
- NFPA. National Fire Protection Association.
- OSHA. Occupational Safety and Health Administration
- Particulates. Finely divided solid matter.
- PCB. Polycarbonate Biphenyl
- PIV. Peak Inverse Voltage
- PATH Shall mean the Port Authority Trans-Hudson Corporation and/or the Port Authority of New York and New Jersey.
- Power Car Unit. One of the Car of the two-car unit Track Inspection Vehicle
- PVC. Poly Vinyl Chloride
- Pre-Production Inspection. A review performed on a prototype unit to determine: conformity with drawing concept and specification; that best practice methods and materials are used; suitability for use intended; and ease of maintenance as specified.
- Profile Grade. A straight line along the centerline of track representing an established slope to the horizontal, usually expressed in percent, i.e. rise over run.
- Project Engineer. This term has been changed to reflect the Project Manager in this specification. For definition of Project Manager, see below.
- Project Manager. The technical representative of PATH on the Program.
- Purlin. A longitudinal roof frame member extending over the car lines, extending from one end of the car to the other, to which the roof sheets are fastened.

- Qualification Test. Test performed using a pre-production or production item to determine whether or not the item complies with all Specification and Contract requirements.
- Quality Assurance. The planned and systematic pattern of all actions necessary to provide adequate confidence that the end items will perform satisfactorily in actual operations.
- Quality Control. The discipline which ensures the manufacture of a product in accordance with Specification requirements.
- Redundancy. The existence in a system of more than one means of accomplishing a given function.
- Reliability. The probability that a system or system sub-unit will perform satisfactorily for a given period of time when used under stated conditions.
- RFI. Radio Frequency Interference; same as EMI occurring in the radio communications frequency spectrum.
- Roll. Transverse rotational motion of a Carbody about a longitudinal axis.
- SAE. Society of Automotive Engineers.
- Shell. That part of a Carbody composed of roof, sides, end and underframe structure, floor and sheathing but devoid of any interior finish, windows, doors and exterior accessories.
- SI. International Standard Unit.
- Specifications. The document which defines the basis of the working agreement between PATH and its Contractors.
- Speed, Balancing. The steady state speed attained by the train at which resisting forces exactly equal tractive forces.
- Speed Limit, Civil. The maximum speed allowed in a specified section of track as determined by physical limitations of the track structure, train design and passenger comfort, or administrative decision.
- Subsystem. A defined portion of a system which is in turn composed of subsystems, component parts, or both.
- Superelevation. On a curve, amount by which the outer rail is above the inner rail.
- Supplier. Source of equipment and materials obtained by the Contractor.
- System. A composite of hardware, people, or software subsystems, or any combination, which are integrated to perform a specific operational function or functions.
- TIG. Tungsten Inert Gas.
- Time, Down. The lapsed time during which equipment is not capable of doing useful work because of misadjustment, malfunction or maintenance in progress.
- Time, Reaction. The time used by equipment, operator, or both, that elapses between the moment an action is called for and when the desired results occurs.
- Time, Recovery. The time required for a system or condition to return to its original state (or some stated percentage of its original value) after being disrupted or destabilized.
- Time, Warm-up. The elapsed time from application of power to an operable device until it is capable of performing its intended function.
- Track Tests. Tests of the passenger car or any rail mounted equipment which is run on PATH's track or a track simulating, as far as practicable, the actual track conditions found on PATH's system to verify performance parameters of the Specification.
- Tractive Effort. Propelling or braking force.
- Trainline. shall mean a wire, or bus, for transmitting signals and data to all Vehicles in a train, via a
- continuous circuit connected through appropriate coupling devices.

- Train Operator. Same as motorman, operator is the unisex term.
- Tram. A condition of truck geometry in which the axles are perfectly parallel and the wheels longitudinally in perfect alignment. The centers of the journal bearings represent the corners of a perfect rectangle. Tram is checked by measuring the diagonal and longitudinal distances between reference points on the axle bearing housings.
- Trip Cock. A mechanical device located on the train which when hit by a trip stop, results in an emergency brake application.
- TSC. Transportation Systems Center of the U.S Department of Transportation.
- UL. Underwriters' Laboratories, Inc.
- Ultimate Tensile Stress. The maximum tensile stress that a material can sustain under uni-axial tension, calculated on the basis of the load at rupture and the original unstrained dimensions.
- Wheel Loads-Maximum. That loading representing total car weight transferred to the running rails from each wheel.
- Wheel Slide. The condition wherein the surface speed of the wheel tread is less than the train speed.
- Wheel Spin. The condition wherein the surface speed of the wheel tread is greater than the train speed.
- Worst Case. The condition where the most extreme case is such as the worst track condition as specified by the FRA Safety Standards or the worst environment, such as heavy steel dust in the PATH tunnel.
- Yield Stress. The stress at which a material exhibits a specified permanent deformation or set.

SECTION 15

15.1 Drawings for Inspection Car

Attachment 1-Drawing# 2P395305 Car Body kinematic Envelope
Attachment 1-2 Static Drawing of PA4 car
Attachment 2- Drawing 13023-03501b Clearance Limiting Outline
Attachment 3- Not Used, Not Attached
Attachment 4- Drawing# WPS 124- Equipment Clearance
Attachment 5- Contact Rail and Protection Board in Tunnel
Attachment 6- Contact Rail Assembly-Open Area
Attachment 7- Contact Rail in Highest Position
Attachment 8- Train Stop Tripper Arm
Attachment 9- Ohio Brass Coupler
Attachment 10- Yoke

15.2.1 Appendix A – Drawings and Specifications

15.2.2 Appendix B – CBTC Specifications for the Track Inspection Vehicle

APPENDIX A1: DBE GOALS STATEMENT PA 3752A/ 1 15

The undersigned Bidder has satisfied the requirements of the Contract in the following manner (Complete the appropriate spaces and check one box):

☐ The Bidder is committed to meeting the DBE goal set forth in this Contract.

OR

☐ The Bidder is unable to meet the DBE goal set forth in this Contract, but is committed to a minimum of _____% DBE utilization on this Contract and submits the attached narrative and documentation demonstrating good faith efforts consistent with Appendix A of 49 CFR 26 to meet the DBE utilization goal set forth in this Contract. Attach as many pages as necessary to provide a full and complete narrative and supporting documentation of good faith efforts made. This narrative shall be submitted on company letterhead and signed.

It is the present intent of the Bidder to utilize the specific DBE firms identified in Appendix A2 in the performance of the Work under this Contract. If for any reason, one or more of the DBE firms identified in Appendix A2 are unable or unwilling to participate, the Bidder will make good faith efforts to replace the DBE firm with another DBE firm in accordance with the Information For Bidders clause entitled "Disadvantaged Business Enterprise Program (DBE)".

I _____ (print name), an officer of _____ (company name), certify that I have read the Appendix A1 – DBE Goals Statement and the information contained in it is true. I fully understand that any false statement within this submittal may prevent the company and/or the undersigned from being found to be responsible bidders/proposers in connection with future agreements. In addition, any false statement within this submittal may subject the company and/or the undersigned to criminal charges in the state and federal courts of New York and New Jersey.

Signature _____ Title _____ Date _____

Officer must have ACKNOWLEDGEMENT BY NOTARY PUBLIC completed on the reverse side.

ACKNOWLEDGEMENT BY NOTARY PUBLIC

APPENDIX A1 - DBE GOALS STATEMENT (reverse)

ACKNOWLEDGEMENT
of

STATE OF _____)
S.S.:
COUNTY OF _____)

On this _____ day of _____, before me personally came and appeared _____to be known, who being by me duly sworn, did depose and say that he/she resides at _____ , that he/she is the _____ of _____company, that the seal affixed to said Certification is such corporate seal, that it was so affixed by order of the directors of said corporation, and that he/she signed his/her name thereto by like order.

(Notary's Seal or Stamp)

_____
Notary Public
My commission expires:

Appendix A2: DBE PARTICIPATION PLAN AND AFFIRMATION STATEMENT PA 3752B/ 01-15

Instructions: Submit one DBE PARTICIPATION PLAN AND AFFIRMATION STATEMENT form for each DBE firm used on this Contract.

CONTRACT NUMBER AND TITLE: _____

BIDDER:
Name of Firm: _____

Address: _____Telephone: _____

Email Address: _____

DBE:
Name of Firm: _____

Address: _____Telephone: _____

Description of work to be performed by DBE: _____

Calculation (supply only): _____

The Bidder is committed to utilizing the above-named DBE for the work described above. The estimated dollar value of this work is $_____
or
____% of the total contract amount of $_____. The anticipated start date is _____and the anticipated completion date is _____

AFFIRMATION

The above-named DBE affirms that it will perform the portion of the Contract for the estimated dollar value as stated above.

By: _____ Date: _____
Signature of Principal or Officer of DBE and Name and Title

If the Bidder does not receive award of the Contract, any and all representations in this DBE Participation Plan and Affirmation Statement shall be null and void.

I _____ (print name), an officer of _____ (company name), certify that I have read the Appendix A2 – DBE Participation Plan and Affirmation Statement and the information contained in it is true. I fully understand that any false statement within this submittal may prevent the company and/or the undersigned from being found to be responsible bidders/proposers in connection with future agreements. In addition, any false statement within this submittal may subject the company and/or the undersigned to criminal charges in the state and federal courts of New York and New Jersey.

Signature _____ Title _____Date _____

Please Note: Only 60% of the expenditure to a DBE material supplier will be counted toward the DBE goal. Please show calculation above. Example: $100,000 x 60% = $60,000 estimated DBE dollar value of work. Plan cannot be accepted without calculation.

Officer must have ACKNOWLEDGEMENT BY NOTARY PUBLIC completed on the reverse side.

ACKNOWLEDGEMENT BY NOTARY PUBLIC

APPENDIX A2
DBE PARTICIPATION PLAN AND AFFIRMATION STATEMENT (reverse)

ACKNOWLEDGEMENT
of

STATE OF _____)
S.S.:
COUNTY OF _____)

On this _____ day of _____, before me personally came and appeared _____to be known, who being by me duly sworn, did depose and say that he/she resides at _____ , that he/she is the _____ of _____company, that the seal affixed to said Certification is such corporate seal, that it was so affixed by order of the directors of said corporation, and that he/she signed his/her name thereto by like order.

(Notary's Seal or Stamp)

_____
Notary Public
My commission expires:

APPENDIX A3: INFORMATION ON SOLICITED FIRMS PA 3752C / 1-15

The bidder must complete this form for itself and for all firms which gave the bidder a quotation for any work planned to be subcontracted regardless of whether they are ultimately chosen to participate in the Contract. Provide the information required below for every firm that provided a bid or a quote for a subcontract – even if the bid or quote from the firm is not used in the preparation of the final Proposal.

Name of Firm	Address of Firm	Phone Number	Contact Person	Firm Age	Annual Gross Revenue Range NOTE: See Footnote Below	DBE Certified (Yes/No)

Footnote: Annual Gross Revenue Ranges: Less than $500,000; $500,000 - $1 Million; $1 - $2 Million; $2 - $5 Million; Over $5 Million - Select the category that best identifies the annual gross revenue of the solicited firm.

Officer must have ACKNOWLEDGEMENT BY NOTARY PUBLIC completed on the reverse side.

ACKNOWLEDGEMENT BY NOTARY PUBLIC

APPENDIX A3
INFORMATION ON SOLICITED FIRMS (reverse)

ACKNOWLEDGEMENT
of

STATE OF _____)
S.S.:
COUNTY OF _____)

On this _____ day of _____, before me personally came and appeared _____to be known, who being by me duly sworn, did depose and say that he/she resides at _____ , that he/she is the _____ of _____company, that the seal affixed to said Certification is such corporate seal, that it was so affixed by order of the directors of said corporation, and that he/she signed his/her name thereto by like order.

(Notary's Seal or Stamp)

_____
Notary Public
My commission expires:

FEDERAL TRANSIT ADMINISTRATION
REQUIRED CONTRACT PROVISIONS

1. INCORPORATION OF FEDERAL TRANSIT ADMINISTRATION TERMS

As used herein, the term "Agreement" shall mean "Contract". This Agreement is anticipated to be partially funded by United States Department of Transportation's Federal Transit Administration (FTA).

As used herein, "Contractor" and "Subcontractor" shall have the same meanings as "Consultant" and "Subconsultant", respectively.

Anything to the contrary herein notwithstanding, all mandated terms by the FTA shall be deemed to control in the event of a conflict with other provisions contained in this Contract. The Contractor shall not perform any act, fail to perform any act, or refuse to comply with any Authority requests that would cause the Authority to be in violation of the FTA terms and conditions.

Each and every provision required by the FTA to be inserted in this Contract shall be deemed to be inserted herein and the Contract shall be read and enforced as though it were included herein. If any provision of this Contract shall be such as to effect non-compliance with any FTA requirement, such provision shall not be deemed to form part hereof, but the balance of this Contract shall remain in full force and effect.

2. FEDERAL CHANGES

The Contractor shall at all times comply with all applicable FTA regulations, policies, procedures and directives, including without limitation those listed directly or by reference, as they may be amended or promulgated from time to time during the term of this Contract. Contractor's failure to so comply shall constitute a material breach of this Contract. The most recent Federal laws, regulations, policies, and administrative practices apply to this Contract at any particular time, unless FTA issues a written determination otherwise. All standards or limits within the this docuemnt are minimum requirements, unless modified by the FTA or subagency thereof.

3. NO FEDERAL GOVERNMENT OBLIGATIONS TO THIRD PARTIES

The Authority and the Contractor acknowledge and agree that, notwithstanding any concurrence by the Federal Government in or approval of the solicitation or award of the underlying contract, absent the express written consent by the Federal Government, the Federal Government is not a party to this Contract and shall not be subject to any obligations or liabilities to the Authority, Contractor, or any other party (whether or not a party to that contract) pertaining to any matter resulting from the underlying contract.

The Contractor agrees to include the above clause in each subcontract financed in whole or in part with Federal Assistance provided by the FTA. It is further agreed that the clause shall not be modified, except to identify the subcontractor who will be subject to its provisions.

4. ORGANIZATIONAL CONFLICT OF INTEREST

A. This Contract may give rise to a potential for an organizational conflict of interest. An organizational conflict of interest exists when the nature of the work to be performed

under the contract may, without some form of restriction on future activities; result in an unfair competitive advantage to the Contractor.

1.) The Contractor shall have access to confidential and/or sensitive Authority information in the course of contract performance. Additionally, the Contractor may be provided access to proprietary information obtained from other contracted entities during contract performance. The Contractor agrees to protect all such information from disclosure unless so authorized, in writing, by the Authority and to refrain from using such information for any purpose other than that for which it was furnished.

2.) To the extent that the Contractor either (a) uses confidential and/or sensitive Authority information or proprietary information obtained from other Authority contractors to develop any form of document, report, or plan that is determined by the Authority to be the basis, in whole or in part, of any subsequent solicitation issued by the Authority or (b) develops written specifications that are used in any subsequent solicitation issued by the Authority, the Contractor agrees that it shall not be eligible to compete for such subsequent solicitation(s) as a prime or principal contractor or as part of any teaming arrangement unless the Authority provides, in writing, a specific waiver of this restriction. The duration of any restriction imposed under this subparagraph shall not exceed the length of the initial performance period of any subsequently awarded contract for which the Contractor was ineligible to compete.

B. The Contractor, by submitting its bid or proposal, agrees to the above stated conditions and terms and further agrees to perform all duties under the contract and, in doing so, not to enter into contractual agreements with Authority prime contractors and first-tier subcontractors in such a way as to create an organizational conflict of interest.

C. If the Authority determines that the Contractor has violated any term of this numbered clause, the Authority may take any appropriate action available under the law or regulations to obtain redress to include, but not be limited to, requiring the Contractor to terminate any affiliation or contractual arrangement with an Authority prime contractor or first-tier subcontractor at no cost to the Authority; determining the Contractor ineligible to compete for or be awarded any subsequent or "follow-on" contracts that may be based upon the Contractor's actions under this Contract or violations of this numbered clause, or terminating this Contract, in whole or in part.

5. CERTIFICATION - DEBARMENT AND SUSPENSION

This Contract is a covered transaction for purposes of 2 CFR Parts 180 and 1200. As such, the Contractor is required to verify that none of the Contractor, its principals, as defined at 2 CFR 180.995, or affiliates, as defined at 2 CFR 180.905, are excluded or disqualified as defined at 2 CFR 180.935 and 180.940.

The Contractor is required to comply with 2 CFR 180, Subpart C and must include the requirement to comply with 2 CFR 180, Subpart C in any lower tier covered transaction it enters into.

By signing and submitting its bid or proposal, the proposer certifies as follows:

The certification in this clause is a material representation of fact relied upon by the Port Authority of New York and New Jersey. If it is later determined that the proposer knowingly rendered an erroneous certification, in addition to remedies available to the Port Authority of New York and New Jersey, the

Federal Government may pursue available remedies, including but not limited to suspension and/or debarment. The proposer agrees to comply with the requirements of 2 CFR 180, Subpart C while this offer is valid and throughout the period of any contract that may arise from this offer. The proposer further agrees to include a provision requiring such compliance in its lower tier covered transactions.

A. FTA requires that each potential Contractor, for major third party contracts, complete a certification entitled "Certification Regarding Debarment, Suspension, Ineligibility, and Voluntary Exclusion" for itself and its principals and requires each Subcontractor or Supplier (for Subcontracts and Supplier agreements expected to equal or exceed $25,000) to complete a certification entitled "Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion – Lower Tiered Covered Transactions" for itself and its principals. Copies of the required Certification forms and accompanying instructions are set forth following the clause herein entitled "Integrity Monitor".

B. In the event that the Contractor has certified prior to award that it is not proposed for debarment, debarred, suspended, or voluntarily excluded from covered transactions by any Federal Department or agency and such certification is found to be false, this Contract may be canceled, terminated or suspended by the Authority and the Contractor will be liable for any and all damages incurred by the Authority because of such cancellation, termination or suspension because of such false certification.

C. The Contractor shall obtain certifications from all known potential Subcontractors and Suppliers (for which payments are expected to equal or exceed $25,000) and submit such certifications to the address set forth in E below.

D. Prior to the award of any Subcontracts or Supplier agreements expected to equal or exceed $25,000, regardless of tier, any prospective Subcontractor or Supplier who has not previously submitted a certification for this Contract must execute and submit to the Contractor a certification in the form set forth following the clause herein entitled "Integrity Monitor" which will be deemed a part of the resulting Subcontract and Supplier agreement.

E. The originals of any Certifications or correspondence relating hereto shall be sent by the Contractor to the Contracts Specialist listed in the solicitation document.

F. The Contractor shall not knowingly enter into any Subcontracts or Supplier agreements with a person that is proposed for debarment, debarred, suspended, declared ineligible or voluntarily excluded from covered transactions.

G. As required by FTA, the Contractor and its Subcontractors or Suppliers required to file the certification have a continuing duty to disclose, and shall provide immediate written notice to the Authority if, at any time, it learns that its certification was erroneous when submitted or has become erroneous by reason of changed circumstances.

6. CERTIFICATION - LOBBYING RESTRICTIONS –CONTRACTS EXCEEDING $100,000

A. Definitions as used in this Clause:

1.) "Agency," as defined in 5 U.S.C. 552(f), includes Federal executive departments and agencies as well as independent regulatory commissions and Government corporations, as defined in 31 U.S.C. 9101(1). As used in the Certification set forth following the clause herein entitled "Integrity Monitor" t, it also includes any other public agency.

2.) "Covered Federal action" means any of the following Federal actions:

a. The awarding of any Federal contract;
b. The making of any Federal grant;
c. The making of any Federal loan;
d. The entering into of any cooperative agreement; and
e. The extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement. As used in the above referenced Certification, it includes the award of the contract with which it is associated.

3.) "Indian tribe" and "tribal organization" have the meaning provided in Section 4 of the Indian Self Determination and Education Assistance Act (25 U.S.C. 450B). Alaskan natives are included under the definitions of Indian tribes in that Act.

4.) "Influencing or attempting to influence" means making, with the intent to influence, any communication to or appearance before an officer or employees of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with any covered Federal action.

5.) "Local government" means a unit of government in a State and, if chartered, established, or otherwise recognized by a State for the performance of a governmental duty, including a local public authority, a special district, an intrastate district, a council of governments, a sponsor group representative organization, and any other instrumentality of a local government. It also includes a bi-state agency.

6.) "Officer or employee of an agency" includes the following individuals who are employed by an agency:

a. An individual who is appointed to a position in the Government under title 5, United States Code, including a position under a temporary appointment;
b. A member of the uniformed services as defined in section 101(3), title 37, United States Code;

7.) A special government employee as defined in Section 202, title 18, United States Code;

a. An individual who is a member of a Federal advisory committee, as defined by the Federal Advisory Committee Act, Title 5, United States Code Appendix 2; and
b. An employee of a bi-state agency.

8.) "Person" means an individual, corporation, company, association, authority, firm, partnership, society, State, and local government, regardless of whether such entity is

operated for profit or not for profit. This term excludes an Indian tribe, tribal organization, or any other Indian Organization with respect to expenditures specifically permitted by other Federal law.

9.) "Reasonable Compensation" means, with respect to a regularly employed officer or employee of any person, compensation that is consistent with the normal compensation for such officer or employee for work that is not furnished to, not funded by, or not furnished in cooperation with the Federal Government.

10.) "Reasonable Payment" means, with respect to professional and other technical services, a payment in an amount that is consistent with the amount normally paid for such services in the private sector.

11.) "Recipient" includes all contractors and subcontractors at any tier in connection with a Federal Contract. The term excludes an Indian Tribe, tribal organization, or any other Indian organization with respect to expenditures specifically permitted by other Federal law.

12.) "Regularly Employed" means, with respect to an officer or employee of a person requesting or receiving a Federal Contract, an officer or employee who is employed by such person for at least one hundred and thirty (130) working days within one (1) year immediately preceding the date of the submission that initiates agency consideration of such person for receipt of such contract. An officer or employee who is employed by such person for less than one hundred and thirty (130) working days within one (1) year immediately preceding the date of the submission that initiates agency consideration of such person shall be considered to be regularly employed as soon as he or she is employed by such person for one hundred and thirty (130) working days.

13.) "State" means a State of the United States, the District of Columbia, the Commonwealth of Puerto Rico, a territory or possession of the United States, an agency or instrumentality of a State, and a multi-state, regional, or interstate entity having governmental duties and powers.

B. Prohibition

1.) Section 1352 of Title 31, United States Code provides in part that no appropriated funds may be expended by the recipient of a Federal contract, grant, loan, or cooperative agreement to pay any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with any of the following covered Federal actions: the awarding of any Federal contract; the making of any Federal grant; the making of any Federal loan; the entering into of any cooperative agreement; and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement. For the purposes of the Certification included herein following the clause entitled “Integrity Monitor”, it includes the award of the associated contract.

2.) The prohibition does not apply as follows:

a. Agency and legislative liaison by own employees.

(i) The prohibition on the use of appropriated funds, in subparagraph B.1.) of this Section, does not apply in the case of a payment of reasonable compensation made to an officer or employee of a person requesting or receiving a Federal contract or the contract associated with the certification if the payment is for agency and legislative liaison activities not directly related to a covered Federal Action.

(ii) For purposes of subparagraph B. 2.) a.(i) of this Section, providing any information specifically requested by an agency or Congress is allowable at any time.

(iii) For purposes of subparagraph B. 2.) a.(i) of this Section, the following agency and legislative liaison activities are allowable at any time only where they are not related to specific solicitation for any covered Federal action.

(a.) Discussing with an agency (including individual demonstrations) the qualities and characteristics of the person's products or services, conditions or terms of sales and service capabilities; and,

(b.) Technical discussions and other activities regarding the application or adaptation of the person's products or services for an agency's use.

(iv) For purposes of paragraph B. 2)a.(i) of this Section, the following agency and legislative liaison activities are allowable only where they are prior to formal solicitation of any covered Federal action:

(a.) Providing any information not specifically requested but necessary for an agency to make an informed decision about initiation of a covered Federal action;

(b.) Technical discussions regarding the preparation of an unsolicited proposal prior to its official submission; and

(c.) Capability presentations by persons seeking awards from an agency pursuant to the provisions of the Small Business Act, as amended by Public Law 95-507 and other subsequent amendments.

(v) Only those activities expressly authorized by subparagraph B. 2)a. of this Section are allowable under subparagraph B. 2)a.

b. Professional and Technical Services by Own Employees.

(i) The prohibition on the use of appropriated funds, in subparagraph B. of this Section, does not apply in the case of a payment of reasonable compensation made to an officer or employee of a person requesting or receiving a Federal contract or an extension, continuation, renewal, amendment, or modification

of a Federal contract or the contract associated with the certification if payment is for professional or technical services rendered directly in the preparation, submission, or negotiation of any bid, proposal, or application for that contract or for meeting requirements imposed by or pursuant to law as a condition for receiving that contract.

(ii) For purposes of subparagraph B. 2.) b. (i) of this Section, "professional and technical services" shall be limited to advice and analysis directly applying any professional or technical discipline. For example, drafting of a legal document accompanying a bid or proposal by a lawyer is allowable. Similarly, technical advice provided by an engineer on the performance or operational capability of a piece of equipment rendered directly in the negotiation of a contract is allowable. However, communications with the intent to influence made by a professional (such as a licensed lawyer) or a technical person (such as a licensed accountant) are not allowable under this Section unless they provided advice and analysis directly applying their professional or technical expertise and unless the advice or analysis is rendered directly and solely in the preparation, submission or negotiation of a covered Federal action. Thus, for example, communications with the intent to influence made by a lawyer that do not provide legal advice or analysis directly and solely related to the legal aspects of his or her client's proposal, but generally advocate one proposal over another are not allowable under this Section because the lawyer is not providing professional legal services. Similarly, communications with the intent to influence made by an engineer providing an engineering analysis prior to the preparation or submission of a bid or proposal are not allowable under this Section since the engineer is providing technical services but not directly in the preparation, submission or negotiation of a covered Federal action.

(iii) Requirements imposed by or pursuant to law as a condition for receiving a covered Federal award include those required by law or regulation, or reasonably expected to be required by law or regulation, and any other requirements in the actual award documents.

(iv) Only those services expressly authorized by subparagraph B. 2.) b. this Section are allowable under subparagraph B. 2.) b.

c. Reporting for Own Employees.

No reporting is required with respect to payments of reasonable compensation made to regularly employed officers or employees of a person.

d. Professional and Technical Services by Other than Own Employees.

(i) The prohibition on the use of appropriated funds, in subparagraph B. l.) of this Section, does not apply in the case of any reasonable payment to a person, other than an officer or employee of a person requesting or receiving a covered Federal action, if the payment is for professional or technical services rendered directly in the preparation, submission, or negotiation of any bid, proposal, or application for that Federal contract or for meeting

requirements imposed by or pursuant to law as a condition for receiving that Federal contract.

(ii) For purposes of subparagraph B. 2.) d. (i) of this Section, "professional and technical services" shall be limited to advice and analysis directly applying any professional or technical discipline. For example, drafting of a legal document accompanying a bid or proposal by a lawyer is allowable. Similarly, technical advice provided by an engineer on the performance or operational capability of a piece of equipment rendered directly in the negotiation of a contract is allowable. However, communications with the intent to influence made by a professional (such as a licensed lawyer) or a technical person (such as a licensed accountant) are not allowable under this Section unless they provided advice and analysis directly applying their professional or technical expertise and unless the advice or analysis is rendered directly and solely in the preparation, submission or negotiation of a covered Federal action. Thus, for example, communications with the intent to influence made by a lawyer that do not provide legal advice or analysis directly and solely related to the legal aspects of his or her client's proposal, but generally advocate one proposal over another are not allowable under this Section because the lawyer is not providing professional legal services. Similarly, communications with the intent to influence made by an engineer providing an engineering analysis prior to the preparation or submission of a bid or proposal are not allowable under this Section since the engineer is providing technical services but not directly in the preparation, submission or negotiation of a covered Federal action.

(iii) Requirements imposed by or pursuant to law as a condition for receiving a covered Federal award include those required by law or regulation, or reasonably expected to be required by law or regulation, and any other requirements in the actual award documents.

(iv) Persons other than officers or employees of a person requesting or receiving a covered Federal action include consultants and trade associations.

(v) Only those services expressly authorized by subparagraph B. 2.) d. of this Section are allowable under subparagraph B. 2.) d.

C. Disclosure

1.) Each person who requests or receives from the Authority a Contract with Federal assistance shall file with the Authority a certification entitled "Certification Regarding Lobbying Pursuant to 31 U.S.C. 1352," as set forth following the clause herein entitled “Integrity Monitor” that the person has not made, and will not make, any payment prohibited by subparagraph B. of this Clause.Each person who requests or receives from the Authority a Contract with Federal assistance shall file with the Authority a disclosure form entitled "Disclosure of Lobbying Activities Pursuant to 31 U.S.C. 1352" (Standard Form-LLL), as set forth following the clause herein entitled “Integrity Monitor”, if such person has made or has agreed to make any payment using non-appropriated funds (to include profits from any covered Federal action), which would be prohibited under subparagraph B. of this Clause if paid for with appropriated funds.

2.) Each person shall file a disclosure form at the end of each calendar quarter in which there occurs any event that requires disclosure or that materially affects the accuracy of the information contained in any disclosure form previously filed by such person under subparagraph C.2) of this Section. An event that materially affects the accuracy of the information reported includes:

a. A cumulative increase of $25,000 or more in the amount paid or expected to be paid for influencing or attempting to influence a covered Federal action; or
b. A change in the person(s) or individual(s) influencing or attempting to influence a covered Federal action; or
c. A change in the officer(s), employee(s), or Member(s) contacted to influence or attempt to influence a covered Federal action.

3.) Any person who requests or receives from a person referred to in subparagraph C.1) of this Section a subcontract exceeding $100,000 at any tier under a Federal contract shall file a certification, and a disclosure form, if required, to the next tier above.

4.) All disclosure forms, but not certifications, shall be forwarded from tier to tier until received by the person referred to in subparagraph C.1) of this Section. That person shall forward all disclosure forms to the Authority.

D. Agreement

1.) In accepting any contract resulting from this solicitation, the person submitting the offer agrees not to make any payment prohibited by this Clause.

E. Penalties

1.) Any person who makes an expenditure prohibited under subparagraph A of this Clause shall be subject to a civil penalty of not less than $10,000 and not more than $100,000 for each such expenditure.
2.) Any person who fails to file or amend the disclosure form to be filed or amended if required by the Clause, shall be subject to a civil penalty of not less than $10,000 and not more than $100,000 for each such failure.
3.) Contractors may rely without liability on the representations made by their Subcontractors in the certification and disclosure form.

F. Cost Allowability

Nothing in this Clause is to be interpreted to make allowable or reasonable any costs which would be unallowable or unreasonable in accordance with Part 31 of the Federal Acquisition Regulation. Conversely, costs made specifically unallowable by the requirements in this Clause will not be made allowable under any of the provisions of Part 31 of the Federal Acquisition Regulation.

7. ACCESS TO RECORDS AND REPORTS

The Contractor agrees to provide the Authority, the FTA Administrator, the Comptroller General of the United States or any of their authorized representatives access to and the right to examine and inspect any books, documents, papers and records of the Contractor which are directly pertinent to this Contract for the purposes of making audits, examinations, excerpts and transcriptions. The Contractor also agrees, pursuant to 49 CFR 633.15 to provide the FTA Administrator or authorized representatives thereto including any Project Management Oversight (PMO) Contractor access to the Contractor's records and construction sites pertaining to the project.

The Contractor shall make available records related to the contract to the Authority, the Secretary of Transportation and the Comptroller General or any authorized officer or employee of any of them for the purposes of conducting an audit and inspection.

The Contractor agrees to permit any of the foregoing parties to reproduce by any means whatsoever or to copy excerpts and transcriptions as reasonably needed.

The Contractor agrees to maintain all books, records, accounts and reports required under this Contract for a period of not less than three (3) years after final payment is made by the Authority and all other pending matters are closed, except in the event of litigation or settlement of claims arising from the performance of this Contract, in which case the Contractor agrees to maintain same until the Authority, the FTA Administrator, the Comptroller General, or any of their duly authorized representatives, have disposed of all such litigation, appeals, claims or exceptions related thereto.

This requirement is independent of the Authority's requirements for record retention contained elsewhere in the contract documents.

8. CIVIL RIGHTS

A. Nondiscrimination - In accordance with Title VI of the Civil Rights Act, as amended, 42 U.S.C. § 2000d, section 303 of the Age Discrimination Act of 1975, as amended, 42 U.S.C. § 6102, and section 202 of the Americans with Disabilities Act of 1990, 42 U.S.C. § 12132, the Contractor agrees that it will not discriminate against any employee or applicant for employment because of race, color, creed, national origin, sex, age, or disability. In addition, the Contractor agrees to comply with applicable Federal implementing regulations and other implementing requirements FTA may issue.

B. Equal Employment Opportunity - The following equal employment opportunity requirements apply to the underlying contract:

1.) Race, Color, Creed, National Origin, Sex - In accordance with Title VII of the Civil Rights Act, as amended, 42 U.S.C. § 2000e, and Federal transit laws at 49 U.S.C. § 5332, the Contractor agrees to comply with all applicable equal employment opportunity requirements of U.S. Department of Labor (U.S. DOL) regulations, "Office of Federal Contract Compliance Programs, Equal Employment Opportunity, Department of Labor," 41 C.F.R. Parts 60 *et seq*., (which implement Executive Order No. 11246, "Equal Employment Opportunity," as amended by Executive Order No. 11375, "Amending Executive Order 11246 Relating to Equal Employment Opportunity," 42 U.S.C. § 2000e note), and with any applicable Federal statutes, executive orders, regulations, and Federal policies that may in the future affect construction activities undertaken in the course of the Project. The Contractor agrees to take affirmative action to ensure that applicants are employed, and that employees are treated during employment, without regard to their race, color, creed, national

origin, sex, or age. Such action shall include, but not be limited to, the following: employment, upgrading, demotion or transfer, recruitment or recruitment advertising, layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship. In addition, the Contractor agrees to comply with any implementing requirements FTA may issue.

2.) Age - In accordance with section 4 of the Age Discrimination in Employment Act of 1967, as amended, 29 U.S.C. § 623, the Contractor agrees to refrain from discrimination against present and prospective employees for reason of age. In addition, the Contractor agrees to comply with any implementing requirements FTA may issue.

3.) Disabilities - In accordance with section 102 of the Americans with Disabilities Act, as amended, 42 U.S.C. § 12112, the Contractor agrees that it will comply with the requirements of U.S. Equal Employment Opportunity Commission, "Regulations to Implement the Equal Employment Provisions of the Americans with Disabilities Act," 29 C.F.R. Part 1630, pertaining to employment of persons with disabilities. In addition, the Contractor agrees to comply with any implementing requirements FTA may issue.

C. The Contractor also agrees to include these requirements in each subcontract related to this project, modified only if necessary to identify the affected parties.

9. CARGO PREFERENCE - USE OF UNITED STATES FLAG VESSELS

If this Contract involves equipment, materials, or commodities that may be transported by ocean vessels, the Contractor herein agrees:

A. To utilize privately owned United States-flag commercial vessels to ship at least fifty percent (50%) of the gross tonnage (computed separately for dry bulk carriers, dry cargo liners, and tankers) involved, whenever shipping any equipment, material, or commodities pursuant to this Contract, to the extent such vessels are available at fair and reasonable rates for United States-flag commercial vessels.

B. To furnish within twenty (20) days following the date of loading for shipments originating within the United States or within thirty (30) working days following the date of loading for shipments originating outside the United States, a legible copy of a rated, "on-board" commercial ocean bill-of-lading in English for each shipment of cargo described in paragraph (1) above to the FTA Administrator and grantee (through the prime contractor in the case of subcontractor bills-of-lading) and to the Division of National Cargo, Office of Market Development, Maritime Administration, Washington, DC 20230.

C. To include these requirements in all subcontracts issued pursuant to this Contract when the subcontract may involve the transport of equipment, material, or commodities by ocean vessel.

10. DAVIS-BACON AND COPELAND ANTI-KICKBACK ACTS – CONTRACTS EXCEEDING $2000

The Davis-Bacon and Copeland Acts are codified at 40 USC 3141, *et seq.* and 18 USC 874. The Acts apply to grantee construction contracts and subcontracts that "at least partly are financed by a loan or grant from the Federal Government." 40 USC 3145(a), 29 CFR 5.2(h), 49 CFR 18.36(i)(5). The Acts apply to any construction contract over $2,000. 40 USC 3142(a), 29 CFR 5.5(a). 'Construction,' for purposes of the Acts, includes "actual construction, alteration and/or repair, including painting and decorating." 29 CFR 5.5(a). The requirements of both Acts are incorporated into a single clause (*see* 29 CFR 3.11) enumerated at 29 CFR 5.5(a) and reproduced below and are applicable if this Contract is a construction contract (as delineated above) over $2000.

A. Minimum Wages

1.) All laborers and mechanics employed or working upon the site of the work (or under the United States Housing Act of 1937 or under the Housing Act of 1949 in the construction or development of the project), will be paid unconditionally and not less often than once a week, and without subsequent deduction or rebate on any account (except such payroll deductions as are permitted by regulations issued by the Secretary of Labor under the Copeland Act (29 CFR part 3)), the full amount of wages and bona fide fringe benefits (or cash equivalents thereof) due at time of payment computed at rates not less than those contained in the wage determination of the Secretary of Labor which, if applicable, is attached hereto and made a part hereof (the attachment is the most current determination), regardless of any contractual relationship which may be alleged to exist between the Contractor and such laborers and mechanics. Determinations may change during the term of the Contract, and the wages and fringe benefits required by the most recent determination of the Secretary of Labor are those to be used.

Contributions made or costs reasonably anticipated for bona fide fringe benefits under section 1(b)(2) of the Davis-Bacon Act on behalf of laborers or mechanics are considered wages paid to such laborers or mechanics, subject to the provisions of paragraph (A)(4) of this Section; also, regular contributions made or costs incurred for more than a weekly period (but not less often than quarterly) under plans, funds, or programs which cover the particular weekly period, are deemed to be constructively made or incurred during such weekly period. Such laborers and mechanics shall be paid the appropriate wage rate and fringe benefits on the wage determination for the classification of work actually performed, without regard to skill, except as provided in 29 CFR Part 5.5(a)(4). Laborers or mechanics performing work in more than one classification may be compensated at the rate specified for each classification for the time actually worked therein: Provided, That the employer's payroll records accurately set forth the time spent in each classification in which work is performed. The wage determination (including any additional classifications and wage rates conformed under paragraph (A)(2) of this Section) and the Davis-Bacon poster (WH-1321) shall be posted at all times by the Contractor and its subcontractors at the site of the work in a prominent and accessible place where it can be easily seen by the workers.

2.)

a. The contracting officer shall require that any class of laborers or mechanics, including helpers, which is not listed in the wage determination and which is to be employed under the contract shall be classified in conformance with the wage determination. The contracting officer shall approve an additional classification and wage rate and fringe benefits therefore only when the following criteria have been met:

(i) Except with respect to helpers as defined as 29 CFR 5.2(n)(4), the work to be performed by the classification requested is not performed by a classification in the wage determination;

(ii) The classification is utilized in the area by the construction industry;

(iii) The proposed wage rate, including any bona fide fringe benefits, bears a reasonable relationship to the wage rates contained in the wage determination; and

(iv) With respect to helpers as defined in 29 CFR 5.2(n)(4), such a classification prevails in the area in which the work is performed.

b. If the contractor and the laborers and mechanics to be employed in the classification (if known), or their representatives, and the contracting officer agree on the classification and wage rate (including the amount designated for fringe benefits where appropriate), a report of the action taken shall be sent by the contracting officer to the Administrator of the Wage and Hour Division, Employment Standards Administration, U.S. Department of Labor, Washington, DC 20210. The Administrator, or an authorized representative, will approve, modify, or disapprove every additional classification action within 30 days of receipt and so advise the contracting officer or will notify the contracting officer within the 30-day period that additional time is necessary.

c. In the event the Contractor, the laborers or mechanics to be employed in the classification or their representatives, and the contracting officer do not agree on the proposed classification and wage rate (including the amount designated for fringe benefits, where appropriate), the contracting officer shall refer the questions, including the views of all interested parties and the recommendation of the contracting officer, to the Administrator for determination. The Administrator, or an authorized representative, will issue a determination within 30 days of receipt and so advise the contracting officer or will notify the contracting officer within the 30-day period that additional time is necessary.

d. The wage rate (including fringe benefits where appropriate) determined pursuant to paragraphs A (2)(ii) (b) or (c) of this Section, shall be paid to all workers performing work in the classification under this Contract from the first day on which work is performed in the classification.

3.) Whenever the minimum wage rate prescribed in the contract for a class of laborers or mechanics includes a fringe benefit which is not expressed as an hourly rate, the Contractor shall either pay the benefit as stated in the wage determination or shall pay another bona fide fringe benefit or an hourly cash equivalent thereof.

4.) If the Contractor does not make payments to a trustee or other third person, the Contractor may consider as part of the wages of any laborer or mechanic the amount of any costs reasonably anticipated in providing bona fide fringe benefits under a plan or program, Provided, That the Secretary of Labor has found, upon the written request of the Contractor, that the applicable standards of the Davis-Bacon Act have been met. The Secretary of Labor may require the Contractor to set aside in a separate account assets for the meeting of obligations under the plan or program.

5.)

a. The contracting officer shall require that any class of laborers or mechanics which is not listed in the wage determination and which is to be employed under the contract shall be classified in conformance with the wage determination. The contracting officer shall approve an additional classification and wage rate and fringe benefits therefor only when the following criteria have been met:

(i) The work to be performed by the classification requested is not performed by a classification in the wage determination;
(ii) The classification is utilized in the area by the construction industry; and
(iii) The proposed wage rate, including any bona fide fringe benefits, bears a reasonable relationship to the wage rates contained in the wage determination.

b. If the Contractor and the laborers and mechanics to be employed in the classification (if known), or their representatives, and the contracting officer agree on the classification and wage rate (including the amount designated for fringe benefits where appropriate), a report of the action taken shall be sent by the contracting officer to the Administrator of the Wage and Hour Division, Employment Standards Administration, Washington, DC 20210. The Administrator, or an authorized representative, will approve, modify, or disapprove every additional classification action within 30 days of receipt and so advise the contracting officer or will notify the contracting officer within the 30-day period that additional time is necessary.

c. In the event the Contractor, the laborers or mechanics to be employed in the classification or their representatives, and the contracting officer do not agree on the proposed classification and wage rate (including the amount designated for fringe benefits, where appropriate), the contracting officer shall refer the questions, including the views of all interested parties and the recommendation of the contracting officer, to the Administrator for determination. The Administrator, or an authorized representative, will issue a determination with 30 days of receipt and so advise the contracting officer or will notify the contracting officer within the 30-day period that additional time is necessary.

d. The wage rate (including fringe benefits where appropriate) determined pursuant to paragraphs A (2)(ii)(b) or (c) of this Section, shall be paid to all workers performing work in the classification under this Contract from the first day on which work is performed in the classification.

B. Withholding

The Authority shall upon its own action or upon written request of an authorized representative of the Department of Labor withhold or cause to be withheld from the Contractor under this Contract or any other Federal contract with the same prime contractor, or any other federally-assisted contract subject to Davis-Bacon prevailing wage requirements, which is held by the same prime contractor, so much of the accrued payments or advances as may be considered necessary to pay laborers and mechanics, including apprentices, trainees, and helpers, employed by the Contractor or any subcontractor the full amount of wages required by the contract. In the event of failure to pay any laborer or mechanic, including any apprentice, trainee, or helper, employed or working on the site of the work (or under the

United States Housing Act of 1937 or under the Housing Act of 1949 in the construction or development of the project), all or part of the wages required by the contract, the Authority may, after written notice to the Contractor, sponsor, applicant, or owner, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds until such violations have ceased.

C. Payrolls and Basic Records

1.) Payrolls and basic records relating thereto shall be maintained by the Contractor during the course of the work and preserved for a period of three years thereafter for all laborers and mechanics working at the site of the work (or under the United States Housing Act of 1937, or under the Housing Act of 1949, in the construction or development of the project). Such records shall contain the name, address, and social security number of each such worker, his or her correct classification, hourly rates of wages paid (including rates of contributions or costs anticipated for bona fide fringe benefits or cash equivalents thereof of the types described in section 1(b)(2)(B) of the Davis-Bacon Act), daily and weekly number of hours worked, deductions made and actual wages paid. Whenever the Secretary of Labor has found under 29 CFR 5.5(a)(1)(iv) that the wages of any laborer or mechanic include the amount of any costs reasonably anticipated in providing benefits under a plan or program described in section 1(b)(2)(B) of the Davis-Bacon Act, the Contractor shall maintain records which show that the commitment to provide such benefits is enforceable, that the plan or program is financially responsible, and that the plan or program has been communicated in writing to the laborers or mechanics affected, and records which show the costs anticipated or the actual cost incurred in providing such benefits. Contractors employing apprentices or trainees under approved programs shall maintain written evidence of the registration of apprenticeship programs and certification of trainee programs, the registration of the apprentices and trainees, and the ratios and wage rates prescribed in the applicable programs.

2.)

a. The Contractor shall submit weekly for each week in which any contract work is performed a copy of all payrolls to the Authority for transmission to the Federal Transit Administration. The payrolls submitted shall set out accurately and completely all of the information required to be maintained under section 5.5(a)(3)(i) of Regulations, 29 CFR part 5. This information may be submitted in any form desired. Optional Form WH-347 is available for this purpose and may be purchased from the Superintendent of Documents (Federal Stock Number 029-005-00014-1), U.S. Government Printing Office, Washington, DC 20402. The prime contractor is responsible for the submission of copies of payrolls by all subcontractors.

b. Each payroll submitted shall be accompanied by a "Statement of Compliance," signed by the Contractor or subcontractor or his or her agent who pays or supervises the payment of the persons employed under the contract and shall certify the following:

(i) That the payroll for the payroll period contains the information required to be maintained under section 5.5(a)(3)(i) of Regulations, 29 CFR part 5 and that such information is correct and complete;

(ii) That each laborer or mechanic (including each helper, apprentice, and trainee) employed on the contract during the payroll period has been paid the

full weekly wages earned, without rebate, either directly or indirectly, and that no deductions have been made either directly or indirectly from the full wages earned, other than permissible deductions as set forth in Regulations, 29 CFR part 3;

(iii) That each laborer or mechanic has been paid not less than the applicable wage rates and fringe benefits or cash equivalents for the classification of work performed, as specified in the applicable wage determination incorporated into the contract.

c. The weekly submission of a properly executed certification set forth on the reverse side of Optional Form WH-347 shall satisfy the requirement for submission of the "Statement of Compliance" required by paragraph C(2)(b) of this Section.

d. The falsification of any of the above certifications may subject the Contractor or subcontractor to civil or criminal prosecution under section 1001 of title 18 and section 231 of title 31 of the United States Code.

3.) The Contractor or subcontractor shall make the records required under paragraph C(1) of this Section available for inspection, copying, or transcription by authorized representatives of the Federal Transit Administration or the Department of Labor, and shall permit such representatives to interview employees during working hours on the job. If the Contractor or subcontractor fails to submit the required records or to make them available, the Federal agency may, after written notice to the Contractor, sponsor, applicant, or owner, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds. Furthermore, failure to submit the required records upon request or to make such records available may be grounds for debarment action pursuant to 29 CFR 5.12.

D. Apprentices and Trainees

1.) Apprentices - Apprentices will be permitted to work at less than the predetermined rate for the work they performed when they are employed pursuant to and individually registered in a bona fide apprenticeship program registered with the U.S. Department of Labor, Employment and Training Administration, Bureau of Apprenticeship and Training, or with a State Apprenticeship Agency recognized by the Bureau, or if a person is employed in his or her first 90 days of probationary employment as an apprentice in such an apprenticeship program, who is not individually registered in the program, but who has been certified by the Bureau of Apprenticeship and Training or a State Apprenticeship Agency (where appropriate) to be eligible for probationary employment as an apprentice. The allowable ratio of apprentices to journeymen on the job site in any craft classification shall not be greater than the ratio permitted to the Contractor as to the entire work force under the registered program. Any worker listed on a payroll at an apprentice wage rate, who is not registered or otherwise employed as stated above, shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any apprentice performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. Where a Contractor is performing construction on a project in a locality other than that in which its program is registered, the ratios and wage rates (expressed in

percentages of the journeyman's hourly rate) specified in the Contractor's or subcontractor's registered program shall be observed. Every apprentice must be paid at not less than the rate specified in the registered program for the apprentice's level of progress, expressed as a percentage of the journeymen hourly rate specified in the applicable wage determination. Apprentices shall be paid fringe benefits in accordance with the provisions of the apprenticeship program. If the apprenticeship program does not specify fringe benefits, apprentices must be paid the full amount of fringe benefits listed on the wage determination for the applicable classification. If the Administrator of the Wage and Hour Division of the U.S. Department of Labor determines that a different practice prevails for the applicable apprentice classification, fringes shall be paid in accordance with that determination. In the event the Bureau of Apprenticeship and Training, or a State Apprenticeship Agency recognized by the Bureau, withdraws approval of an apprenticeship program, the Contractor will no longer be permitted to utilize apprentices at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

2.) Trainees - Except as provided in 29 CFR 5.16, trainees will not be permitted to work at less than the predetermined rate for the work performed unless they are employed pursuant to and individually registered in a program which has received prior approval, evidenced by formal certification by the U.S. Department of Labor, Employment and Training Administration. The ratio of trainees to journeymen on the job site shall not be greater than permitted under the plan approved by the Employment and Training Administration. Every trainee must be paid at not less than the rate specified in the approved program for the trainee's level of progress, expressed as a percentage of the journeyman hourly rate specified in the applicable wage determination. Trainees shall be paid fringe benefits in accordance with the provisions of the trainee program. If the trainee program does not mention fringe benefits, trainees shall be paid the full amount of fringe benefits listed on the wage determination unless the Administrator of the Wage and Hour Division determines that there is an apprenticeship program associated with the corresponding journeyman wage rate on the wage determination which provides for less than full fringe benefits for apprentices. Any employee listed on the payroll at a trainee rate who is not registered and participating in a training plan approved by the Employment and Training Administration shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any trainee performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. In the event the Employment and Training Administration withdraws approval of a training program, the Contractor will no longer be permitted to utilize trainees at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

3.) Equal employment opportunity - The utilization of apprentices, trainees and journeymen under this part shall be in conformity with the equal employment opportunity requirements of Executive Order 11246, as amended, and 29 CFR Part 30.

E. Compliance with Copeland Act Requirements

The Contractor shall comply with the requirements of 29 CFR part 3, which are incorporated by reference in this Contract.

F. Subcontracts

The Contractor or subcontractor shall insert in any subcontracts the clauses contained in 29 CFR 5.5(a)(1) through (10) and such other clauses as the Federal Transit Administration may by appropriate instructions require, and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for the compliance by any subcontractor or lower tier subcontractor with all the contract clauses in 29 CFR 5.5.

G. Contract Termination: Debarment

A breach of the contract clauses in 29 CFR 5.5 may be grounds for termination of the contract, and for debarment as a contractor and a subcontractor as provided in 29 CFR 5.12.

H. Compliance with Davis-Bacon and Related Act Requirements

All rulings and interpretations of the Davis-Bacon and Related Acts contained in 29 CFR parts 1, 3, and 5 are herein incorporated by reference in this Contract.

I. Disputes Concerning Labor Standards

Disputes arising out of the labor standards provisions of this Contract shall not be subject to the general disputes clause of this Contract. Such disputes shall be resolved in accordance with the procedures of the Department of Labor set forth in 29 CFR parts 5, 6, and 7. Disputes within the meaning of this clause include disputes between the Contractor (or any of its subcontractors) and the contracting agency, the U.S. Department of Labor, or the employees or their representatives.

J. Certification of Eligibility –

1.) By entering into this Contract, the Contractor certifies that neither it (nor he or she) nor any person or firm who has an interest in the Contractor's firm is a person or firm ineligible to be awarded Government contracts by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).

2.) No part of this Contract shall be subcontracted to any person or firm ineligible for award of a Government contract by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).

3.) The penalty for making false statements is prescribed in the U.S. Criminal Code, 18 U.S.C. 1001.

11. CONTRACT WORK HOURS AND SAFETY STANDARDS ACT – CONTRACTS EXCEEDING $100,000

The Contract Work Hours and Safety Standards Act applies to grantee contracts and subcontracts under 40 USC 3701(b)(1)(B)(iii) and (b)(2), 29 CFR 5.2(h), 49 CFR 18.36(i)(6) for contracts for construction, and non-construction projects that employ "laborers or mechanics on a public work, where the contract amount is greater than $100,000.

A. Overtime Requirements

No Contractor or subcontractor contracting for any part of the contract work which may require or involve the employment of laborers or mechanics shall require or permit any such laborer or mechanic in any workweek in which he or she is employed on such work to work in excess of forty hours in such workweek unless such laborer or mechanic receives compensation at a rate not less than one and one-half times the basic rate of pay for all hours worked in excess of forty hours in such workweek.

B. Violation; liability for unpaid wages; liquidated damages

In the event of any violation of the clause set forth in paragraph A of this Section the Contractor and any subcontractor responsible therefor shall be liable for the unpaid wages. In addition, such Contractor and subcontractor shall be liable to the United States for liquidated damages. Such liquidated damages shall be computed with respect to each individual laborer or mechanic, including watchmen and guards, employed in violation of the clause set forth in paragraph A of this Section, in the sum of $10 for each calendar day on which such individual was required or permitted to work in excess of the standard workweek of forty hours without payment of the overtime wages required by the clause set forth in paragraph A of this Section.

C. Withholding for unpaid wages and liquidated damages

The Authority shall upon its own action or upon written request of an authorized representative of the Department of Labor withhold or cause to be withheld, from any moneys payable on account of work performed by the Contractor or subcontractor under any such contract or any other Federal contract with the same prime contractor, or any other federally-assisted contract subject to the Contract Work Hours and Safety Standards Act, which is held by the same prime contractor, such sums as may be determined to be necessary to satisfy any liabilities of such contractor or subcontractor for unpaid wages and liquidated damages as provided in the clause set forth in paragraph B of this Section.

D. Subcontracts

The Contractor or subcontractor shall insert in any subcontracts the clauses set forth in paragraphs A through D of this Section and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for compliance by any subcontractor or lower tier subcontractor with the clauses set forth in paragraphs A through D of this Section.

12. VETERANS EMPLOYMENT

Contractors working on a capital project funded using such assistance agrees to give a hiring preference, to the extent practicable, to veterans (as defined in 5 U.S.C. 2108) who have the requisite skills and abilities to perform the construction work required under the contract. This subsection shall not be understood, construed or enforced in any manner that would require an employer to give a preference to any veteran over any equally qualified applicant who is a member of any racial or ethnic minority, female, an individual with a disability, or a former employee. The Contractor shall ensure that its hiring practices reflect the requirements of this section and shall, upon request, provide to the Authority personnel data which reflects compliance with the terms contained herein.

13. SEISMIC SAFETY (IF APPLICABLE)

If this is a contract for the construction of new buildings or additions to existing buildings, the Contractor agrees that any new building or addition to an existing building will be constructed in accordance with standards for Seismic Safety required in Department of Transportation Seismic Safety Regulations 49 CFR Part 41 and will certify compliance to the extent required by the regulation. The Contractor also agrees to ensure that all work performed under this Contract including work performed by a subcontractor is in compliance with the standards required by the Seismic Safety Regulations and the certification of compliance. The completed certification of compliance is to be submitted to the Port Authority's project manager. The seismic safety standards applicable to this Contract are contained in Section 2312 ICBO Uniform Building Code (UBC), as modified by the Appendix to Title 27, Chapter 1 (Volume 7), of the Administrative Code and Charter of the City of New York at RS 9-6 Earthquake Loads.

14. ENERGY CONSERVATION

The Contractor agrees to comply with the mandatory energy efficiency standards and policies within the applicable State energy conservation plans issued in compliance with the Energy Policy and Conservation Act, 42 U.S.C. §6321 et seq and the National Environmental Policy Act, 42 U.S.C. §4321 et seq. Accordingly, the Contractor agrees that the construction of any new building, or any addition, alteration or renovation of any existing building which materially increases the heating or cooling requirements for the building will comply with mandatory standards and policies relating to energy efficiency which are contained in 42 USC §6321 et seq., Article 11 of the New York State Energy Law and in Parts 7810 to7815 of Title 9, Subtitle BB of the New York Codes, Rules and Regulations. The Contractor also agrees to ensure that all work performed under this Contract including work performed by a Subcontractor is in compliance with the requirements of this Section.

15. CLEAN WATER REQUIREMENTS – CONTRACTS EXCEEDING $100,000

A. The Contractor agrees to comply with all applicable standards, orders or regulations issued pursuant to the Federal Water Pollution Control Act, as amended, 33 USC §1251 et seq.

B. The Contractor agrees to report each violation to the Authority and understands and agrees that the Authority will, in turn, report each violation as required to assure notification to FTA and the appropriate EPA Regional Office.

C. The Contractor also agrees to include the requirements of this Article in all subcontracts exceeding $100,000 issued pursuant to this Contract.

16. CLEAN AIR REQUIREMENTS – CONTRACTS EXCEEDING $100,000

A. The Contractor agrees to comply with all applicable standards, orders or regulations issued pursuant to the Clean Air Act, as amended, 42 USC §7401 et seq. The Contractor agrees to report each violation to the Authority and understands and agrees that the Authority will, in turn, report each violation as required to assure notification to FTA and the appropriate EPA Regional Office.

B. The Contractor also agrees to include the requirements of this Clause in all subcontracts exceeding $100,000 issued pursuant to this Contract.

17. FLY AMERICA

The Contractor agrees to comply with 49 U.S.C. 40118 (the "Fly America" Act) in accordance with the General Services Administration's regulations at 41 CFR Part 301-10, which provide that subrecipients of Federal funds and their contractors are required to use U.S. Flag air carriers for U.S Government-financed international air travel and transportation of their personal effects or property, to the extent such service is available, unless travel by foreign air carrier is a matter of necessity, as defined by the Fly America Act. The Contractor shall submit, if a foreign air carrier was used, an appropriate certification or memorandum adequately explaining why service by a U.S. flag air carrier was not available or why it was necessary to use a foreign air carrier and shall, in any event, provide a certificate of compliance with the Fly America requirements. The Contractor agrees to include the requirements of this section in all subcontracts that may involve international air transportation.

18. CONTRACTS INVOLVING FEDERAL PRIVACY ACT REQUIREMENTS

The following requirements apply to the Contractor and its employees that administer any system of records on behalf of the Federal Government under any contract:

A. The Contractor agrees to comply with, and assures the compliance of its employees with, the information restrictions and other applicable requirements of the Privacy Act of 1974, 5 U.S.C. § 552a. Among other things, the Contractor agrees to obtain the express consent of the Federal Government before the Contractor or its employees operate a system of records on behalf of the Federal Government. The Contractor understands that the requirements of the Privacy Act, including the civil and criminal penalties for violation of that Act, apply to those individuals involved, and that failure to comply with the terms of the Privacy Act may result in termination of the underlying contract.

B. The Contractor also agrees to include these requirements in each subcontract to administer any system of records on behalf of the Federal Government financed in whole or in part with Federal assistance provided by FTA.

19. PREFERENCE FOR RECYCLED PRODUCTS

The Contractor agrees to comply with all the requirements of Section 6002 of the Resource Conservation and Recovery Act (RCRA), as amended (42 U.S.C. 6962), including but not limited to the regulatory provisions of 40 CFR Part 247, and Executive Order 12873, as they apply to the procurement of the items designated in Subpart B of 40 CFR Part 247. The Contractor also agrees to include the requirements of this Clause in all subcontracts exceeding $10,000 for items designated by the Environmental Protection Agency (EPA) and issued pursuant to this Contract.

20. PROGRAM FRAUD AND FALSE OR FRAUDULENT STATEMENTS OR RELATED ACTS

A. The Contractor acknowledges that the provisions of the Program Fraud Civil Remedies Act of 1986, as amended, 31 U.S.C. § 3801 *et seq.* and U.S. DOT regulations, "Program Fraud Civil Remedies," 49 CFR Part 31, apply to its actions pertaining to this Project. The Contractor certifies or affirms the truthfulness and accuracy of any statement it has made, it makes, it may make, or causes to be made, pertaining to the contract or project. In addition to other penalties that may be applicable, the Contractor further acknowledges that if it makes, or causes to be made, a false, fictitious, or fraudulent claim, statement, submission, or certification, the Federal Government reserves the right to impose the

penalties of the Program Fraud Civil Remedies Act of 1986 on the Contractor to the extent the Federal Government deems appropriate.

B. The Contractor also acknowledges that if it makes, or causes to be made, a false, fictitious, or fraudulent claim, statement, submission, or certification to the Federal Government under this Contract, financed in whole or in part with Federal assistance, the Federal Government reserves the right to impose the penalties of 18 U.S.C. § 1001 and 49 U.S.C. § 5307(n)(1) on the Contractor, to the extent the Federal Government deems appropriate.

C. The Contractor agrees to include the above two clauses in each subcontract related to this Contract. It is further agreed that the clauses shall not be modified, except to identify the subcontractor who will be subject to the provisions.

21. TRANSIT EMPLOYEE PROTECTIVE REQUIREMENTS

To the extent that transit operations are involved, the Contractor agrees to carry out the transit operations work on the underlying contract in compliance with terms and conditions determined by the U.S. Secretary of Labor to be fair and equitable to protect the interests of employees employed under this Contract and to meet the employee protective requirements of 49 U.S.C. A 5333(b), and U.S. DOL guidelines at 29 C.F.R. Part 215, and any amendments thereto. These terms and conditions are identified in the letter of certification from the U.S. DOL to FTA applicable to the FTA Recipient's project from which Federal assistance is provided to support work on the underlying contract. The Contractor agrees to carry out that work in compliance with the conditions stated in that U.S. DOL letter. The requirements of this subsection (1), however, do not apply to any contract financed with Federal assistance provided by FTA either for projects for elderly individuals and individuals with disabilities authorized by 49 U.S.C. § 5310(a)(2), or for projects for nonurbanized areas authorized by 49 U.S.C. § 5311. Alternate provisions for those projects are set forth in subsections (b) and (c) of this clause.

22. ADA ACCESS REQUIREMENTS

Facilities to be used in public transportation service must comply with 42 U.S.C. Sections 12101 *et seq*. and DOT regulations, "Transportation Services for Individuals with Disabilities (ADA)," 49 CFR Part 37; and Joint ATBCB/DOT regulations, "Americans with Disabilities (ADA) Accessibility Specifications for Transportation Vehicles," 36 CFR Part 1192 and 49 CFR Part 38.

23. BUY AMERICA

The contractor agrees to comply with 49 U.S.C. 5323(j) and 49 C.F.R. Part 661, which provide that Federal funds may not be obligated unless steel, iron, and manufactured products used in FTA-funded projects are produced in the United States, unless a waiver has been granted by FTA or the product is subject to a general waiver. General waivers are listed in 49 C.F.R. 661.7, and include final assembly in the United States. Separate requirements for rolling stock are set out at 49 U.S.C. 5323(j)(2)(C) and 49 C.F.R. 661.11. Rolling stock must be assembled in the United States and have a 60 percent domestic content.

The Contractor also agrees to include the requirements of this Clause in all subcontracts exceeding $100,000 issued pursuant to this Contract.

FTA REQUIREMENTS

CERTIFICATION REGARDING LOBBYING PURSUANT TO 31 U.S.C. 1352

The undersigned

_____

(name of authorized officer)

certifies, to the best of my knowledge and belief, that:

- No Federal appropriated funds have been paid or will be paid, by or on behalf of the undersigned, to any person for influencing or attempting to influence an officer or employee of an agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any Federal contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement.

- If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this Federal contract, grant, loan, or cooperative agreement, the undersigned shall complete and submit Standard Form LLL, "Disclosure of Lobbying, Activities" in accordance with its instructions.

- The undersigned shall require that the language of this certification be included in the award documents for all subawards at all tiers (including subcontracts, subgrants, and contracts under grants, loans, and cooperative agreements) and that all subrecipients shall certify and disclose accordingly.

This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by, 31, U.S. C. § 1352 (as amended by the Lobbying Disclosure Act of 1995). Any person who fails to file the required certification shall be subject to a civil penalty of not less than $10,000 and not more than $100,000 for each such failure.

Note: Pursuant to 31 U.S.C § 1352(c)(I)-(2)(A), any person who makes a prohibited expenditure or fails to file or amend a required certification or disclosure form shall be subject to a civil penalty of not less than $10,000 and not more than $100,000 for each such expenditure or failure.

The Contractor certifies or affirms the truthfulness and accuracy of each statement of its certification and disclosure, if any. In addition, the Contractor understands and agrees that the provisions of 31 U.S.C. § 3801, et seq., apply to this certification and disclosure, if any.

Executed this day _____ of _____, 201__

By: _____

Signature of Authorized Official

_____

Official Name and Title of Authorized Official

FTA REQUIREMENTS

STANDARD FORM LLL - DISCLOSURE OF LOBBYING ACTIVITIES

Complete this form to disclose lobbying activities pursuant to 31 U.S.C. 1352

1. Type of Federal Action:	**2. Status of Federal Action:**	**3. Report Type:**
____ a. contract	____ a. bid/offer/application	____ a. initial filing
____ b. grant	____ b. initial award	____ b. material change
____ c. cooperative agreement	____ c. post award	
____ d. loan		**For material change only:**
____ e. loan guarantee		Year _____ quarter _____
____ f. loan insurance		Date of last report_____

4. Name and Address of Reporting Entity:	**5. If Reporting Entity in No. 4 is Subawardee,** Enter Name and Address of Prime:
____ Prime ____ Subawardee Tier_____, if Known: **Congressional District,** *if known***:**	**Congressional District,** *if known***:**
6. Federal Department/Agency:	**7. Federal Program Name/Description:** CFDA Number, *if applicable*: _____
8. Federal Action Number, *if known:*	**9. Award Amount**, *if known:* **$**
10. a. Name and Address of Lobbying Registrant *(if individual, last name, first name, MI):*	**b. Individuals Performing Services** *(including address if different from No. 10a)* *(last name, first name, MI):*
11. Information requested through this form is authorized by title 31 U.S.C. section 1352. This disclosure of lobbying activities is a material representation of fact upon which reliance was placed by the tier above when this transaction was made or entered into. This disclosure is required pursuant to 31 U.S.C. 1352. This information will be reported to the Congress semi-annually and will be available for public inspection. Any person who fails to file the required disclosure shall be subject to a civil penalty of not less than $10,000 and not more than $100,000 for each such failure.	**Signature:** _____ **Print Name:** _____ **Title:** _____ **Telephone No.:** _____ **Date:** _____
Federal Use Only	**Authorized for Local Reproduction** **Standard Form - LLL (Rev. 7-97)**

INSTRUCTIONS FOR COMPLETION OF SF-LLL, DISCLOSURE OF LOBBYING ACTIVITIES

This disclosure form shall be completed by the reporting entity, whether subawardee or prime Federal recipient, at the initiation or receipt of a covered Federal action, or a material change to a previous filing, pursuant to title 31 U.S.C. Section 1352. The filing of a form is required for each payment or agreement to make payment to any lobbying entity for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with a covered Federal action. Complete all items that apply for both the initial filing and material change report. Refer to the implementing guidance published by the Office of Management and Budget for additional information.

1. Identify the type of covered Federal action for which lobbying activity is and/or has been secured to influence the outcome of a covered Federal action.
2. Identify the status of the covered Federal action.
3. Identify the appropriate classification of this report. If this is a followup report caused by a material change to the information previously reported, enter the year and quarter in which the change occurred. Enter the date of the last previously submitted report by this reporting entity for this covered Federal action.
4. Enter the full name, address, city, State and zip code of the reporting entity. Include Congressional District, if known. Check the appropriate classification of the reporting entity that designates if it is, or expects to be, a prime or subaward recipient. Identify the tier of the subawardee, e.g., the first subawardee of the prime is the 1st tier. Subawards include but are not limited to subcontracts, subgrants and contract awards under grants.
5. If the organization filing the report in item 4 checks "Subawardee," then enter the full name, address, city, State and zip code of the prime Federal recipient. Include Congressional District, if known.
6. Enter the name of the federal agency making the award or loan commitment. Include at least one organizational level below agency name, if known. For example, Department of Transportation, United States Coast Guard.
7. Enter the Federal program name or description for the covered Federal action (item 1). If known, enter the full Catalog of Federal Domestic Assistance (CFDA) number for grants, cooperative agreements, loans, and loan commitments.
8. Enter the most appropriate Federal identifying number available for the Federal action identified in item 1 (e.g., Request for Proposal (RFP) number; Invitations for Bid (IFB) number; grant announcement number; the contract, grant, or loan award number; the application/proposal control number assigned by the Federal agency). Included prefixes, e.g., "RFP-DE-90-001."
9. For a covered Federal action where there has been an award or loan commitment by the Federal agency, enter the Federal amount of the award/loan commitment for the prime entity identified in item 4 or 5.
10. (a) Enter the full name, address, city, State and zip code of the lobbying registrant under the Lobbying Disclosure Act of 1995 engaged by the reporting entity identified in item 4 to influence the covered Federal action.

    (b) Enter the full names of the individual(s) performing services, and include full address if different from 10(a). Enter Last Name, First Name, and Middle Initial (MI).
11. The certifying official shall sign and date the form, print his/her name, title, and telephone number.

According to the Paperwork Reduction Act, as amended, no persons are required to respond to a collection of information unless it displays a valid OMB control Number. The valid OMB control number for this information collection is OMB No. 0348-0046. Public reporting burden for this collection of information is estimated to average 10 minutes per response, including time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding the burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to the Office of Management and Budget, Paperwork Reduction Project (0348-0046), Washington, DC 20503

CERTIFICATION REGARDING DEBARMENT, SUSPENSION, INELIGIBILITY AND VOLUNTARY EXCLUSION - LOWER TIER COVERED TRANSACTIONS

1. The prospective lower tier participant,

_____, certifies by submission of this bid or proposal, that neither it nor its principals are presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from participation in this transaction by any Federal department or agency.

2. Where the prospective lower tier participant is unable to certify to any of the statements in this certification, such prospective participant shall attach an explanation to this proposal.

3. The prospective lower tier participant shall provide immediate written notice to the Authority (and the Contractor, if applicable) if at any time the prospective lower tier participant learns that its certification was erroneous when submitted or has become erroneous by reason of changed circumstances.

Executed this day _____ of _____, 201_____.

_____

BY SIGNATURE OF AUTHORIZED OFFICIAL

_____

NAME AND TITLE OF AUTHORIZED OFFICIAL

INSTRUCTIONS FOR COMPLETION OF CERTIFICATION REGARDING DEBARMENT, SUSPENSION, INELIGIBILITY AND VOLUNTARY EXCLUSION -LOWER TIER COVERED TRANSACTIONS

1. By signing and submitting this Proposal, the prospective lower tier participant is providing the signed certification set out on the previous page.

2. This certification is a material representation of fact upon which reliance was placed when this transaction was entered into. If it is later determined that the prospective lower tier participant knowingly rendered an erroneous certification, in addition to other remedies available to the Federal Government, the Authority may pursue available remedies, including suspension and/or debarment.

3. The prospective lower tier participant shall provide immediate written notice to the Authority if at any time the prospective lower tier participant learns that its certification was erroneous when submitted or has become erroneous by reason of changed circumstances.

4. The terms "covered transaction," "debarred," "suspended," "ineligible," "lower tier covered transaction," "participant," "persons," "lower tier covered transaction," "principal," "proposal," and "voluntarily excluded," as used in this clause, have the meanings set out in the Definitions and Coverage sections of rules implementing Executive Order 12549 [49 CFR Part 29]. The Proposer may contact the Procurement Representative for assistance in obtaining a copy of those regulations.

5. The prospective lower tier participant agrees by submitting this proposal that, should the proposed covered transaction be entered into, it shall not knowingly enter into any lower tier covered transaction with a person who is debarred, suspended, declared ineligible, or voluntarily excluded from participation in this covered transaction, unless authorized in writing by the Authority.

6. The prospective lower tier participant further agrees by submitting this proposal that it will include the "Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion - Lower Tier Covered Transaction," without modification, in all lower tier covered transactions and in all solicitations for lower tier covered transactions.

7. A participant in a covered transaction may rely upon a certification of a prospective participant in a lower tier covered transaction that it is not debarred, suspended, ineligible, or voluntarily excluded from the covered transaction, unless it knows that the certification is erroneous. A participant may decide the method and frequency by which it determines the eligibility of its principals. Each participant may, but is not required to, check the Nonprocurement List issued by U.S. General Service Administration.

8. Nothing contained in the foregoing shall be construed to require establishment of system of records in order to render in good faith the certification required by this clause. The knowledge and information of a participant is not required to exceed that which is normally possessed by a prudent person in the ordinary course of business dealings.

9. Except for transactions authorized under sub-paragraph 5 of these instructions, if a participant in a covered transaction knowingly enters into a lower tier covered transaction with a person who is suspended, debarred, ineligible, or voluntarily excluded from participation in this transaction, in addition to all remedies available to the Federal Government, the Authority may pursue available remedies including suspension and/or debarment.

END OF FTA CONTRACT PROVISIONS

STANDARD CONTRACT TERMS AND CONDITIONS

STANDARD CONTRACT TERMS AND CONDITIONS

PART I GENERAL DEFINITIONS

To avoid undue repetition, the following terms, as used in this Agreement, shall be construed as follows:

Authority or Port Authority - shall mean the Port Authority of New York and New Jersey.

PATH – shall mean the Port Authority Trans-Hudson Corporation.

Contract, Document or Agreement - shall mean the writings setting forth the scope, terms, conditions and Specifications for the procurement of Goods and/or Services, as defined hereunder and shall include, but not be limited to: Invitation for Bid (IFB), Request for Quotation (RFQ), Request for Proposal (RFP), Purchase Order (PO), Cover Sheet, executed Signature Sheet, AND PRICING SHEETS with Contract prices inserted," "STANDARD CONTRACT TERMS AND CONDITIONS," and, if included, attachments, endorsements, schedules, exhibits, or drawings, the Authority's acceptance and any written addenda issued over the name of the Authority's Manager, Purchasing Services Division.

Days or Calendar Days - shall mean consecutive calendar days, Saturdays, Sundays, and holidays, included.

Week - unless otherwise specified, shall mean seven (7) consecutive calendar days, Saturdays, Sundays, and holidays.

Month – unless otherwise specified, shall mean a calendar month.

Director/General Manager – shall mean the Director/General Manager of PATH which operates the facility of PATH at which the services hereunder are to be performed, for the time being, or his/her successor in duties for the purpose of this Contract, or one of his/her authorized representatives for the purpose of this Contract.

Superintendent/Manager – shall mean the Superintendent/Manager of the PATH Division responsible for operating the said Facility for the time being, or his/her successor in duties for the purpose of this Contract, or his/her duly authorized representative for the purpose of this Contract.

No person shall be deemed a representative of the Director/General Manager or Superintendent/Manager except to the extent specifically authorized in an express written notice to the Contractor signed by the Director/General Manager or Superintendent/Manager as the case may be. Further, no person shall be deemed a successor in duties of the Director/General Manager unless the Contractor is so notified in writing signed by the Authority's, Assistant Director, Commodities & Services Division, Procurement Department. No person shall be deemed a successor in duties of the Superintendent/Manager unless the Contractor is so notified in a writing signed by the Director/General Manager.

Site of the Work - or words of similar import shall mean the Facility and all buildings and properties associated therewith as described in this Contract.

Small Business Enterprise (SBE) - The criteria for a Small Business Enterprise are:

- The principal place of business must be located in New York or New Jersey;
- The firm must have been in business for at least three years with activity;
- Average gross income limitations by industry as established by the Port Authority.

Subcontractor - shall mean anyone who performs work (other than or in addition to the furnishing of materials, plant or equipment) in connection with the services to be provided hereunder, directly or indirectly for or on behalf of the Contractor (and whether or not in privity of contract with the Contractor), but shall not include any person who furnished merely his own personal labor or his own personal services. "Subcontractor", however, shall exclude the Contractor or any subsidiary or parent of the Contractor or any person, firm or corporation which has a substantial interest in the Contractor or in which the Contractor or the parent or the subsidiary of the Contractor, or an officer or principal of the Contractor or of the parent of the subsidiary of the Contractor has a substantial interest, provided, however, that for the purpose of the clause hereof entitled "Assignments and Subcontracts" the exclusion in this paragraph shall not apply to anyone but the Contractor itself.

Women-Owned Business Enterprise (WBE) - shall mean a business enterprise which is at least 51% owned by one or more women, or, in the case of a publicly held corporation, at least 51% of the stock of which is owned by one or more women and whose management and daily business operations are controlled by one or more women who are citizens or permanent or resident aliens.

Work - shall mean all services, equipment and materials (including materials and equipment, if any, furnished by the Authority) and other facilities and all other things necessary or proper for, or incidental to the services to be performed or goods to be furnished in connection with the service to be provided hereunder.

PART II GENERAL PROVISIONS

1. Facility Rules and Regulations of PATH

a. The Contractor shall observe and obey (and compel its officers, employees, guests, invitees, and those doing business with it, to observe and obey) the facility Rules and Regulations of PATH now in effect, and such further reasonable Rules and Regulations which may from time to time during the term of this Agreement be promulgated by PATH for reasons of safety, health, preservation of property or maintenance of a good and orderly appearance and efficient operation of the Facility. PATH agrees that, except in case of emergency, it shall give notice to the Contractor of every Rule and Regulation hereafter adopted by it at least five days before the Contractor shall be required to comply therewith.

b. A copy of the facility Rules and Regulations of PATH shall be available for review by the Contractor at the Office of the Director/General Manager of PATH.

2. Contractor Not An Agent

This Agreement does not constitute the Contractor the agent or representative of PATH or the Port Authority, for any purpose whatsoever except as may be specifically provided in this Agreement. It is hereby specifically acknowledged and understood that the Contractor, in performing its services hereunder, is and shall be at all times an independent Contractor and the officers, agents and employees of the Contractor shall not be or be deemed to be agents, servants or employees of PATH or the Port Authority.

3. Contractor's Warranties

The Contractor represents and warrants:

a. That it is financially solvent, that it is experienced in and competent to perform the requirements of this Contract, that the facts stated or shown in any papers submitted or referred to in connection with the solicitation are true, and, if the Contractor be a corporation, that it is authorized to perform this Contract;

b. That it has carefully examined and analyzed the provisions and requirements of this Contract, and that from its own investigations it has satisfied itself as to the nature of all things needed for the performance of this Contract, the general and local conditions and all other matters which in any way affect this Contract or its performance, and that the time available to it for such examination, analysis, inspection and investigation was adequate;

c. That the Contract is feasible of performance in accordance with all its provisions and requirements and that it can and will perform it in strict accordance with such provisions and requirements;

d. That no Director, officer, agent or employee of PATH is personally interested directly or indirectly in this Contract or the compensation to be paid hereunder and that no Commissioner, officer, agent or employee of the Port Authority is personally interested directly or indirectly in this Contract or the compensation to be paid hereunder;

e. That, except only for those representations, statements or promises expressly contained in this Contract, no representation, statement or promise, oral or in writing, of any kind whatsoever by the Port Authority, PATH, their Directors, Commissioners, officers, agents, employees or consultants has

induced the Contractor to enter into this Contract or has been relied upon by the Contractor, including any with reference to: (1) the meaning, correctness, suitability, or completeness of any provisions or requirements of this Contract; (2) the nature, quantity, quality or size of the materials, equipment, labor and other facilities needed for the performance of this Contract; (3) the general or local conditions which may in any way affect this Contract or its performance; (4) the price of the Contract; or (5) any other matters, whether similar to or different from those referred to in (1) through (4) immediately above, affecting or having any connection with this Contract, the bidding thereon, any discussions thereof, the performance thereof or those employed therein or connected or concerned therewith.

Moreover, the Contractor accepts the conditions at the Site of the Work as they may eventually be found to exist and warrants and represents that it can and will perform the Contract under such conditions and that all materials, equipment, labor and other facilities required because of any unforeseen conditions (physical or otherwise) shall be wholly at its own cost and expense, anything in this Contract to the contrary notwithstanding.

Nothing in the Specifications or any other part of the Contract is intended as or shall constitute a representation by PATH as to the feasibility of performance of this Contract or any part thereof.

The Contractor further represents and warrants that it was given ample opportunity and time and by means of this paragraph was requested by the Port Authority and PATH to review thoroughly all documents forming this Contract prior to opening of Bids on this Contract in order that it might request inclusion in this Contract of any statement, representation, promise or provision which it desired or on which it wished to place reliance; that it did so review said documents, that either every such statement, representation, promise or provision has been included in this Contract or else, if omitted, that it expressly relinquishes the benefit of any such omitted statement, representation, promise or provision and is willing to perform this Contract without claiming reliance thereon or making any other claim on account of such omission.

The Contractor further recognizes that the provisions of this numbered clause (though not only such provisions) are essential to PATH's consent to enter into this Contract and that without such provisions, PATH would not have entered into this Contract.

4. Personal Non-Liability

Neither the Directors of PATH, the Commissioners of the Port Authority nor any of them, nor any officer, agent or employee of PATH or the Port Authority, shall be charged personally by the Contractor with any liability, or held personally liable to the Contractor under any term or provision of this Agreement, or because of its execution or attempted execution, or because of any breach, or attempted or alleged breach, thereof.

5. Non-Discrimination Requirements

The Contractor shall take all necessary and reasonable steps to ensure non-discrimination in the performance and administration of all aspects of this Contract.

A. Contractor hereby agrees that no person on the ground of race, color, national origin, creed/religion, sex, age or handicap/disability shall be excluded from participation in, denied the benefits of, or be otherwise subjected to discrimination in the furnishing of goods or services or in the selection and retention of subcontractors and/or vendors under this Contract. Contractor shall also ascertain and comply with all applicable federal, state and local laws, ordinances, rules, regulations, and orders that pertain to equal employment opportunity, affirmative action, and non-discrimination in employment.

B. Contractor agrees that these "Non-Discrimination Requirements" are a binding part of this Contract. Without limiting the generality of any other term or provision of this Contract, in the event the Authority, or a state or federal agency finds that the Contractor or any of its subcontractors or vendors has not complied with these "Non-Discrimination Requirements", the Authority may cancel, terminate or suspend this Contract in accordance with Section 14 of these Standard Terms and Conditions entitled "Default, Revocation, or Suspension of Contract."

C. Contractor agrees to cooperate fully with the Authority's investigation of allegations of discrimination. Cooperation includes, but is not limited to, allowing the Authority to question employees during the investigation of allegations of discrimination, and complying with directives that the Authority or the State or Federal government deem essential to ensure compliance with these "Non-Discrimination Requirements."

6. Rights and Remedies of PATH

PATH shall have the following rights in the event the Contractor is deemed guilty of a breach of any term whatsoever of this Contract:

a. The right to take over and complete the Work or any part thereof as agent for and at the expense of the Contractor, either directly or through others.

b. The right to cancel this Contract as to any or all of the Work yet to be performed.

c. The right to specific performance, an injunction or any appropriate equitable remedy.

d. The right to money damages.

For the purpose of this Contract, breach shall include but not be limited to the following, whether or not the time has yet arrived for performance of an obligation under this Contract: a statement by the Contractor to any representative of PATH indicating that the Contractor cannot or will not perform any one or more of its obligations under this Contract; any act or omission of the Contractor or any other occurrence which makes it improbable at the time that it will be able to perform any one or more of its obligations under this Contract; any suspension of or failure to proceed with any part of the Work by the Contractor which makes it improbable at the time that it will be able to perform any one or more of its obligations under this Contract.

The enumeration in this numbered clause or elsewhere in this Contract of specific rights and remedies of PATH shall not be deemed to limit any other rights or remedies which PATH would have in the absence of such enumeration; and no exercise by PATH of any right or remedy shall operate as a waiver of any other of its rights or remedies not inconsistent therewith or to estop it from exercising such other rights or remedies.

7. Rights and Remedies of the Contractor

Inasmuch as the Contractor can be adequately compensated by money damages for any breach of this Contract which may be committed by PATH, the Contractor expressly agrees that no default, act or omission of PATH shall constitute a material breach of this Contract, entitling the Contractor to cancel or rescind this Contract or to suspend or abandon performance.

8. Submission To Jurisdiction

The Contractor hereby irrevocably submits itself to the jurisdiction of the Courts of the State of New York and New Jersey, in regard to any controversy arising out of, connected with, or in any way concerning this Contract.

The Contractor agrees that the service of process on the Contractor in relation to such jurisdiction may be made, at the option of PATH, either by registered or certified mail addressed to it at the address of the Contractor indicated on the signature sheet, or by actual personal delivery to the Contractor, if the Contractor is an individual, to any partner if the Contractor be a partnership or to any officer, director or managing or general agent if the Contractor be a corporation.

Such service shall be deemed to be sufficient when jurisdiction would not lie because of the lack of basis to serve process in the manner otherwise provided by law. In any case, however, process may be served as stated above whether or not it might otherwise have been served in a different manner.

9. Harmony

a. The Contractor shall not employ any persons or use any labor, or use or have any equipment, or permit any condition to exist which shall or may cause or be conducive to any labor complaints, troubles, disputes or controversies at the Facility which interfere or are likely to interfere with the operation of PATH or with the operations of lessees, licensees or other users of the Facility or with the operations of the Contractor under this Contract.

The Contractor shall immediately give notice to the Port Authority (to be followed by written notices and reports) of any and all impending or existing labor complaints, troubles, disputes or controversies and the progress thereof. The Contractor shall use its best efforts to resolve any such complaint, trouble, dispute or controversy. If any type of strike, boycott, picketing, work stoppage, slowdown or other labor activity is directed against the Contractor at the Facility or against any operations of the Contractor under this Contract, whether or not caused by the employees of the Contractor, and if any of the foregoing, in the opinion of PATH, results or is likely to result in any curtailment or diminution of the services to be performed hereunder or to interfere with or affect the operations of PATH, or to interfere with or affect the operations of lessees, licensees, or other users of the Facility or in the event of any other cessation or stoppage of operations by the Contractor hereunder for any reason whatsoever, PATH shall have the right at any time during the continuance thereof to suspend the operations of the Contractor under this Contract, and during the period of the suspension the Contractor shall not perform its services hereunder and the Port Authority shall have the right during said period to itself or by any third person or persons selected by it to perform said services of the Contractor using the equipment which is used by the Contractor in its operations hereunder as PATH deems necessary and without cost to PATH. During such time of suspension, the Contractor shall not be entitled to any compensation. Any flat fees, including management fees, shall be prorated. Prior to the exercise of such right by PATH, it shall give the Contractor notice thereof, which notice may be oral. No exercise by PATH of the rights granted to it in the above subparagraph shall be or be deemed to be a waiver of any rights of termination or revocation contained in this Contract or a waiver of any rights or remedies which may be available to PATH under this Contract or otherwise.

b. During the time that the Contractor is performing the Contract, other persons may be engaged in other operations on or about the worksite including Facility operations, pedestrian, bus and vehicular traffic and other Contractors performing at the worksite, all of which shall remain uninterrupted.

The Contractor shall so plan and conduct its operations as to work in harmony with others engaged at the site and not to delay, endanger or interfere with the operation of others (whether or not specifically mentioned above), all to the best interests of PATH and the public as may be directed by PATH.

10. Claims of Third Persons

The Contractor undertakes to pay all claims lawfully made against it by subcontractors, suppliers and workers, and all claims lawfully made against it by other third persons arising out of or in connection with or because of the performance of this Contract and to cause all subcontractors to pay all such claims lawfully made against them.

11. No Third Party Rights

Nothing contained in this Contract is intended for the benefit of third persons, except to the extent that the Contract specifically provides otherwise by use of the words "benefit" or "direct right of action."

12. Provisions of Law Deemed Inserted

Each and every provision of law and clause required by law to be inserted in this Contract shall be deemed to be inserted herein and the Contract shall be read and enforced as though it were included therein, and if through mistake or otherwise any such provision is not inserted, or is not correctly inserted, then upon the

application of either party, the Contract shall forthwith be physically amended to make such insertion.

13. Costs Assumed By The Contractor

It is expressly understood and agreed that all costs of the Contractor of whatever kind or nature and whether imposed directly upon the Contractor under the terms and provisions hereof or in any other manner whatsoever because of the requirements of the operation of the service or otherwise under this Agreement shall be borne by the Contractor or without compensation or reimbursement from PATH, except as specifically set forth in this Agreement. The entire and complete cost and expense of the Contractor's services and operations hereunder shall be borne solely by the Contractor and under no circumstances shall PATH be liable to any third party (including the Contractor's employees) for any such costs and expenses incurred by the Contractor and under no circumstances shall PATH be liable to the Contractor for the same, except as specifically set forth in this Section.

14. Default, Revocation or Suspension of Contract

a. If one or more of the following events shall occur:

1. If fire or other cause shall destroy all or a substantial part of the Facility.
2. If any governmental agency shall condemn or take a temporary or permanent interest in all or a substantial part of the Facility, or all of a part of PATH's interest herein;

then upon the occurrence of such event or at any time thereafter during the continuance thereof, PATH shall have the right on twenty-four (24) hours written notice to the Contractor to revoke this Contract, such revocation to be effective upon the date and time specified in such notice.

In such event this Contract shall cease and expire on the effective date of revocation as if said date were the date of the expiration of this Contract. Such revocation shall not, however, relieve the Contractor of any liabilities or obligations hereunder which shall have accrued on or prior to the effective date of revocation.

b. If one or more of the following events shall occur:

1. The Contractor shall become insolvent, or shall take the benefit of any present or future insolvency statute, or shall make a general assignment for the benefit of creditors, or file a voluntary petition in bankruptcy or a petition or answer seeking an arrangement or its reorganization or the readjustment of its indebtedness under the federal bankruptcy laws or under any other law or statute of the United States or of any State thereof, or consent to the appointment of a receiver, trustee, or liquidator of all or substantially all its property; or
2. By order or decree of a court the Contractor shall be adjudged bankrupt or an order shall be made approving a petition filed by any of the creditors, or, if the Contractor is a corporation, by any of the stockholders of the Contractor, seeking its reorganization or the readjustment of its indebtedness under the federal bankruptcy laws or under any law or statute of the United States or of any State thereof; or
3. A petition under any part of the federal bankruptcy laws or an action under any present or future insolvency law or statute shall be filed against the Contractor and shall not be dismissed within thirty (30) days after the filing thereof; or
4. The interest of the Contractor under this Contract shall be transferred to, passed to or devolve upon, by operation of law or otherwise, any other person, firm or corporation, or
5. The Contractor, if a corporation, shall, without the prior written approval of the Port Authority, become a surviving or merged corporation in a merger, a constituent corporation in a consolidation, or a corporation in dissolution; or
6. If the Contractor is a partnership, and the said partnership shall be dissolved as the result of any act or omission of its copartners or any of them, or by operation of law or the order or

decree of any court having jurisdiction, or for any other reason whatsoever; or

7. By or pursuant to, or under authority of any legislative act, resolution or rule, or any order or decree of any court or governmental board, agency or officer having jurisdiction, a receiver, trustee, or liquidator shall take possession or control of all or substantially all of the property of the Contractor and such possession or control of all or substantially all of the property of the Contractor and shall continue in effect for a period of fifteen (15) days;

then upon the occurrence of any such event or at any time thereafter during the continuance thereof, the PATH shall have the right upon five (5) days notice to the Contractor to terminate this Contract and the rights of the Contractor hereunder; termination to be effective upon the date and time specified in such notice as if said date were the date of the expiration of this Contract. Termination shall not relieve the Contractor of any liabilities or obligations hereunder which have accrued on or prior to the effective date of termination.

c. If any of the following shall occur:

1. The Contractor shall cease, abandon any part of the service, desert, stop or discontinue its services in the premises for any reason whatsoever and regardless of the fault of the Contractor; or

2. The Contractor shall fail to keep, perform and observe each and every other promise, covenant and agreement set forth in this Contract on its part to be kept, performed or observed, within five (5) days after receipt of notice of default thereunder from PATH or the Port Authority on behalf of PATH (except where fulfillment of its obligations requires activity over a greater period of time, and the Contractor shall have commenced to perform whatever may be required for fulfillment within five (5) days after receipt of notice and continues such performance without interruption except for causes beyond its control);

then upon the occurrence of any such event or during the continuance thereof, PATH shall have the right on twenty four (24) hours notice to the Contractor to terminate this Contract and the rights of the Contractor hereunder, termination to be effective upon the date and time specified in such notice. Termination shall not relieve the Contractor of any liabilities which shall have accrued on or prior to the effective date of termination.

d. If any of the events enumerated in this Section shall occur prior to commencement date of this Contract PATH upon the occurrence of any such event or any time thereafter during the continuance thereof by twenty-four (24) hours notice may terminate or suspend this Contract and the rights of the Contractor hereunder, such termination or suspension to be effective upon the date specified in such notice.

e. No payment by PATH of any monies to the Contractor for any period or periods after default of any of the terms, covenants or conditions hereof to be performed, kept and observed by the Contractor and no act or thing done or omitted to be done by PATH shall be deemed to be a waiver of the right of PATH to terminate this Contract or of any other right or remedies to which PATH may be entitled because of any breach thereof. No waiver by PATH of any default on the part of the Contractor in the performance of any of the terms, covenants and conditions hereof to be performed, kept or observed by the Contractor shall be or be construed to be a waiver by PATH of any other subsequent default in the performance of any of the said terms, covenants and conditions.

f. In addition to all other rights of revocation or termination hereunder and notwithstanding any other provision of this Contract PATH may terminate this Contract and the rights of the Contractor hereunder without cause at any time upon five (5) days written notice to the Contractor and in such event this Contract shall cease and expire on the date set forth in the notice of termination as fully and completely as though such dates were the original expiration date hereof and if such effective date of termination is other than the last day of the month, the amount of the compensation due to the Contractor from PATH shall be prorated when applicable on a daily basis. Such cancellation shall be without prejudice to the rights and obligations of the parties arising out of portions already

performed but no allowance shall be made for anticipated profits.

g. Any right of termination contained in this paragraph, shall be in addition to and not in lieu of any and all rights and remedies that PATH shall have at law or in equity consequent upon the Contractor's breach of this Contract and shall be without prejudice to any and all such other rights and remedies. It is hereby specifically agreed and understood that the exercise by the Port Authority of any right of termination set forth in this paragraph shall not be or be deemed to be an exercise by the Port Authority of an election of remedies so as to preclude PATH from any right to money damages it may have for the period prior to the effective date of termination to the original expiration date of the Contract, and this provision shall be deemed to survive the termination of this Contract as aforesaid.

h. If (1) the Contractor fails to perform any of its obligations under this Contract or any other agreement between PATH or the Port Authority and the Contractor (including its obligation to PATH or the Port Authority to pay any claim lawfully made against it by any supplier, subcontractor or worker or other person which arises out of or in connection with the performance of this Contract or any other agreement with PATH or the Port Authority) or (2) any claim (just or unjust) which arises out of or in connection with this Contract or any other agreement between PATH or the Port Authority and the Contractor is made against the Port Authority or PATH or (3) any subcontractor under this Contract or any other agreement between PATH or the Port Authority and the Contractor fails to pay any claims lawfully made against it by any supplier, subcontractor, worker or other third person which arises out of or in connection with this Contract or any other agreement between PATH or the Port Authority and the Contractor or if in the opinion of PATH or the Port Authority any of the aforesaid contingencies is likely to arise, then the Port Authority or PATH, as applicable, shall have the right, in its discretion, to withhold out of any payment (final or otherwise) such sums as PATH may deem ample to protect it against delay or loss or to assure the payment of just claims of third persons, and to apply such sums in such manner as PATH may deem proper to secure such protection or satisfy such claims. All sums so applied shall be deducted from the Contractor's compensation. Omission by PATH to withhold out of any payment, final or otherwise, a sum for any of the above contingencies, even though such contingency has occurred at the time of such payment, shall not be deemed to indicate that PATH does not intend to exercise its right with respect to such contingency. Neither the above provisions for rights of PATH to withhold and apply monies nor any exercise or attempted exercise of, or omission to exercise, such rights by PATH shall create any obligation of any kind to such supplier, subcontractors, worker or other third persons. If, however, the payment of any amount due the Contractor shall be improperly delayed, PATH shall pay the Contractor interest thereon at the rate of 6% per annum for the period of the delay, it being agreed that such interest shall be in lieu of and in liquidation of any damages to the Contractor because of such delay.

i. If PATH has paid any sum or has incurred any obligation or expense which the Contractor has agreed to pay or reimburse PATH, or if PATH is required or elects to pay any sum or sums or incurs any obligations or expense by reason of the failure, neglect or refusal of the Contractor to perform or fulfill any one or more of the conditions, covenants, or agreements contained in this Contract, or as a result of an act of omission of the Contractor contrary to the said conditions, covenants and agreements, the Contractor shall pay to PATH the sum or sums so paid or expense so incurred, including all interests, costs and damages, promptly upon the receipt of PATH’s statement therefore. PATH may, however, in its discretion, elect to deduct said sum or sums from any payment payable by it to the Contractor.

j. If PATH pays any installment to the Contractor without reducing said installment as provided in this Contract, it may reduce any succeeding installment by the proper amount, or it may bill the Contractor for the amount by which the installment paid should have been reduced and the Contractor shall pay to PATH any such amount promptly upon receipt of PATH's statement therefore.

k. PATH shall also have the rights set forth above in the event the Contractor shall become insolvent or bankrupt or if his affairs are placed in the hands of a receiver, trustee or assignee for the benefit of creditors.

15. Sales or Compensating Use Taxes

Purchases of services and tangible personal property by PATH in the States of New York and New Jersey are generally exempt from state and local sales and compensating use taxes, and from most federal excises (Taxes). Therefore, PATH's purchase of the Contractor's services under this Contract is exempt from Taxes. Accordingly, the Contractor must not include Taxes in the price charged to PATH for the Contractor's services under this Contract**.** The Contractor certifies that there are no such taxes included in the prices for this Contract. The Contractor shall retain a copy of this Contract to substantiate the exempt sale.

The compensation set forth in this Agreement is the complete compensation to the Contractor, and PATH will not separately reimburse the Contractor for any taxes unless specifically set forth in this Agreement.

16. No Estoppel or Waiver

PATH shall not be precluded or estopped by any payment, final or otherwise, issued or made under this Contract, from showing at any time the true amount and character of the services performed, or from showing that any such payment is incorrect or was improperly issued or made; and PATH shall not be precluded or estopped, notwithstanding any such payment, from recovering from the Contractor any damages which it may sustain by reason of any failure on its part to comply strictly with this Contract, and any moneys which may be paid to it or for its account in excess of those to which it is lawfully entitled.

No cancellation, rescission or annulment hereof, in whole or as to any part of the services to be provided hereunder, or because of any breach hereof, shall be deemed a waiver of any money damages to which PATH may be entitled because of such breach. Moreover, no waiver by the Authority of any breach of this Contract shall be deemed to be a waiver of any other or any subsequent breach.

17. Records and Reports

The Contractor shall set up, keep and maintain (and shall cause its subcontractors to set up, keep and maintain) in accordance with generally accepted accounting practice during the term of this Agreement and any extensions thereof and for three years after the expiration, termination or revocation thereof, records, payroll records and books of account (including, but not limited to, records of original entry and daily forms, payroll runs, cancelled checks, time records, union agreements, contracts with health, pension and other third party benefit providers) recording all transactions of the Contractor(and its subcontractors), at, through or in any way connected with or related to the operations of the Contractor (and its subcontractors) hereunder, including but not limited to all matters relating to the charges payable to the Contractor hereunder, all wages and supplemental benefits paid or provided to or for its employees (and its subcontractors' employees) and such additional information as PATH may from time to time and at any time require, and also including, if appropriate, recording the actual number of hours of service provided under the Contract, and keeping separate records thereof which records and books of account shall be kept at all times within the Port District. The Contractor shall permit (and cause its subcontractors to permit) in ordinary business hours during the term of this Agreement including any extensions thereof and for three years thereafter the examination and audit by the officers, employees and representatives of PATH of such records and books of account and also any records and books of account of any company which is owned or controlled by the Contractor, or which owns or controls the Contractor if said company performs services similar to those performed by the Contractor anywhere in the Port District. However, if within the aforesaid three year period PATH has notified the Contractor in writing of a pending claim by PATH under or in connection with this Contract to which any of the aforesaid records and documents of the Contractor or of its subcontractors relate either directly or indirectly, then the period of such right of access shall be extended

to the expiration of six years from the date of final payment with respect to the records and documents involved.

Upon request of the Port Authority, the Contractor shall furnish or provide access to the federal Form I-9 (Employment Eligibility Verification) for each individual performing work under this Contract. This includes citizens and noncitizens.

The Contractor (and its subcontractors) shall, at its own expense, install, maintain and use such equipment and devices for recording the labor hours of the service as shall be appropriate to its business and necessary or desirable to keep accurate records of the same and as the general manager or the Facility Superintendent/Manager may from time to time require, and the Contractor (and its subcontractors) shall at all reasonable times allow inspection by the agents and employees of PATH of all such equipment or devices.

a. The Contractor hereby further agrees to furnish to PATH from time to time such written reports in connection with its operations hereunder as PATH may deem necessary or desirable. The format of all forms, schedules and reports furnished by the Contractor to PATH shall be subject to the continuing approval of PATH.

b. No provision in this Contract giving PATH a right of access to records and documents is intended to impair or affect any right of access to records and documents which they would have in the absence of such provision. Additional record keeping may be required under other sections of this Contract.

18. General Obligations

a. Except where expressly required or permitted herein to be oral, all notices, requests, consents and approvals required to be given to or by either party shall be in writing and all such notices, requests, consents and approvals shall be personally delivered to the other party during regular business hours or forwarded to such party by United States certified mail, return receipt requested, addressed to the other party at its address hereinbefore or hereafter provided. Until further notice the Contractor hereby designates the address shown on the bottom of the Contractors Signature Sheet as their address to which such notices, requests, consents, or approvals may be forwarded. All notices, requests, consents, or approvals of the Contractor shall be forwarded to the Superintendent/Manager at the Facility.

b. The Contractor shall comply with the provisions of all present and future federal, state and municipal laws, rules, regulations, requirements, ordinances, orders and directions which pertain to its operations under this Contract and which affect the Contract or the performance thereof and those engaged therein as if the said Contract were being performed for a private corporation, except where stricter requirements are contained in the Contract in which case the Contract shall control. The Contractor shall procure for itself all licenses, certificates, permits or other authorization from all governmental authorities, if any, having jurisdiction over the Contractor's operations hereunder which may be necessary for the Contractor's operations. The Contractor's obligation to comply with governmental requirements are not to be construed as a submission by PATH or the Port Authority to the application to itself of such requirements.

c. The Contractor shall pay all taxes, license, certification, permit and examination fees and excises which may be assessed on its property or operations hereunder or income therefrom, and shall make all applications, reports and returns required in connection therewith.

d. The Contractor shall, in conducting its operations hereunder, take all necessary precautions to protect the general environment and to prevent environmental pollution, contamination, damage to property and personal injury. In the event the Contractor encounters material reasonably believed to be asbestos, polychlorinated biphenyl (PCB) or any other hazardous material, in conducting its operations hereunder, the Contractor shall immediately stop Work in the area affected and report the condition in writing to the Superintendent/Manager. Work in the affected area shall not thereafter be resumed by the Contractor except upon the issuance of a written order to that effect from the

Superintendent/Manager.

e. The Contractor shall promptly observe, comply with and execute the provisions of any and all present and future rules and regulations, requirements, standard orders and directions of the American Insurance Association, the Insurance Services Office, National Fire Protection Association, and any other body or organization exercising similar functions which may pertain or apply to the Contractor's operations hereunder.

The Contractor shall not do or permit to be done any act which:

1. will invalidate or be in conflict with any fire insurance policies covering the Facility or any part thereof or upon the contents of any building thereon; or
2. will increase the rate of any fire insurance, extended coverage or rental insurance on the Facility or any part thereof or upon the contents of any building thereon; or
3. in the opinion of PATH will constitute a hazardous condition, so as to increase the risk normally attendant upon the operations contemplated by this Contract; or
4. may cause or produce in the premises, or upon the Facility any unusual, noxious or objectionable smoke, gases, vapors, odors; or
5. may interfere with the effectiveness or accessibility of the drainage and sewerage system, fire protection system, sprinkler system, alarm system, fire hydrants and hoses, if any, installed or located or to be installed or located in or on the Facility; or
6. shall constitute a nuisance in or on the Facility or which may result in the creation, commission or maintenance of a nuisance in or on the Facility.

f. If by reason of the Contractor's failure to comply with the provisions of this Section and provided PATH has given the Contractor five (5) days written notice of its failure and the Contractor shall not have cured said failure within said five (5) days, any fire insurance, extended coverage or rental insurance rate on the Facility or any part thereof or upon the contents of any building thereon shall at any time be higher than it otherwise would be, then the Contractor shall on demand pay PATH that part of all fire insurance, extended coverage or rental insurance premiums paid or payable by PATH which shall have been charged because of such violations by the Contractor.

g. The Contractor shall conduct its operations hereunder so as not to endanger, unreasonably interfere with, or delay the operations or activities of any tenants or occupants on the premises or the Facility and, moreover, shall use the same degree of care in performance on the premises as would be required by law of PATH and shall conduct operations hereunder in a courteous, efficient and safe manner.

h. The Contractor shall provide such equipment and medical facilities as may be necessary to supply first aid service in case of accidents to its personnel who may be injured in the furnishing of service hereunder. The Contractor shall maintain standing arrangements for the removal and hospital treatment of any of its personnel who may be injured.

19. Assignments and Subcontracting

a. The Contractor shall not sell, transfer, mortgage, pledge, subcontract or assign this Contract or any part thereof or any of the rights granted hereunder or any moneys due or to become due to it hereunder or enter into any contract requiring or permitting the doing of anything hereunder by an independent Contractor, without the prior written approval of PATH, and any such sale, transfer, mortgage, pledge, subcontract, assignment or contract without such prior written approval shall be void as to PATH.

b. All subcontractors who provide permanent personnel to the Contractor for work under this Contract shall be given written notice to comply with all requirements of the Contract. The Contractor shall be responsible and liable for the performance and acts of each subcontractor.

c. All persons to whom the Contractor sublets services shall be deemed to be its agents and no subletting

or approval thereof shall be deemed to release this Contractor from its obligations under this Contract or to impose any obligations on PATH to such subcontractor or to give the subcontractor any rights against PATH.

20. Indemnification and Risks Assumed By The Contractor

To the extent permitted by law, the Contractor shall indemnify and hold harmless PATH, the Port Authority, their Directors, Commissioners, officers, representatives and employees from and against all claims and demands, just or unjust, of third persons (including Contractor's employees, employees, officers, and agents of PATH and the Port Authority) arising out of or in any way connected or alleged to arise out of or alleged to be in any way connected with the Contract and all other services and activities of the Contractor under this Contract and for all expenses incurred by it and by them in the defense, settlement or satisfaction thereof, including without limitation thereto, claims and demands for death, for personal injury or for property damage, direct or consequential, whether they arise from the acts or omissions of the Contractor, of PATH, of the Port Authority, third persons (including Contractor's employees, employees, officers, and agents of PATH and the Port Authority), or from the acts of God or the public enemy, or otherwise, including claims and demands of any local jurisdiction against the Port Authority in connection with this Contract.

The Contractor assumes the following risks, whether such risks arise from acts or omissions (negligent or not) of the Contractor, PATH, the Port Authority, or third persons (including Contractor's employees, employees, officers, and agents of PATH and the Port Authority) or from any other cause, excepting only risks occasioned solely by affirmative willful acts of PATH or the Port Authority, as applicable, done subsequent to the opening of proposals on this Contract, and shall to the extent permitted by law indemnify PATH and the Port Authority for all loss or damage incurred in connection with such risks:

a. The risk of any and all loss or damage to PATH or Port Authority property, equipment (including but not limited to automotive and/or mobile equipment), materials and possessions, on or off the premises, the loss or damage of which shall arise out of the Contractor's operations hereunder. The Contractor shall if so directed by PATH, repair, replace or rebuild to the satisfaction of PATH or the Port Authority, as applicable, any and all parts of the premises or the Facility which may be damaged or destroyed by the acts or omissions of the Contractor, its officers, agents, or employees and if the Contractor shall fail so to repair, replace, or rebuild with due diligence PATH or the Port Authority, as applicable, may, at its option, perform any of the foregoing work and the Contractor shall pay to PATH or the Port Authority as applicable the cost thereof.

b. The risk of any and all loss or damage of the Contractor's property, equipment (including but not limited to automotive and/or mobile equipment) materials and possessions on the Facility.

c. The risk of claim, whether made against the Contractor, the Port Authority or PATH, for any and all loss or damages occurring to any property, equipment (including but not limited to automotive and/or mobile equipment), materials and possessions of the Contractor's agents, employees, materialmen and others performing work hereunder.

d. The risk of claims for injuries, damage or loss of any kind just or unjust of third persons arising or alleged to arise out of the performance of work hereunder, whether such claims are made against the Contractor, the Port Authority or PATH.

If so directed, the Contractor shall at its own expense defend any suit based upon any such claim or demand, even if such suit, claim or demand is groundless, false or fraudulent, and in handling such shall not, without obtaining express advance permission from the General Counsel of the Port Authority, raise any defense involving in any way the jurisdiction of the tribunal over the person of the Port Authority or PATH, the immunity of the Port Authority or PATH, their Directors, Commissioners, officers, agents or employees, the governmental nature of the Port Authority or PATH or the provision of any statutes respecting suits against PATH or the Port Authority.

Neither the requirements of PATH under this Contract, nor of PATH of the methods of performance

hereunder nor the failure of PATH to call attention to improper or inadequate methods or to require a change in the method of performance hereunder nor the failure of PATH to direct the Contractor to take any particular precaution or other action or to refrain from doing any particular thing shall relieve the Contractor of its liability for injuries to persons or damage to property or environmental impairment arising out of its operations.

21. Approval of Methods

Neither the approval of PATH of the methods of furnishing services hereunder nor the failure of PATH to call attention to improper or inadequate methods or to require a change in the method of furnishing services hereunder, nor the failure of PATH to direct the Contractor to take any particular precautions or to refrain from doing any particular thing shall relieve the Contractor of its liability for injuries to persons or damage to property or environmental impairment arising out of its operations.

22. Safety and Cleanliness

a. The Contractor shall, in the furnishing of services hereunder, exercise every precaution to prevent injury to person or damage to property or environmental impairment and avoid inconvenience to the occupants of or any visitors to the Facility. The Contractor shall, without limiting the generality hereof, place such personnel, erect such barricades and railings, give such warnings, display such lights, signals or signs, place such cones and exercise precautions as may be necessary, proper or desirable.

b. The Contractor shall in case of unsafe floor conditions due to construction, wetness, spillage, sickness and all other types of hazardous conditions proceed to rope off the unsafe area and place appropriate warnings signs to prevent accidents from occurring. The Contractor shall clean said area to the satisfaction of the Superintendent/Manager.

c. The Contractor shall at all times maintain in a clean and orderly condition and appearance any and all facilities provided by PATH for the Contractor's operations, and all fixtures, sink closets, equipment, and other personal property of PATH which are located in said facilities.

23. Accident Reports

The Contractor shall promptly report in writing to the Manager of the Facility and to the Deputy Chief, Litigation Management of the Port Authority all accidents whatsoever arising out of or in connection with its operations hereunder and which result in death or injury to persons or damage to property, setting forth such details thereof as PATH may desire. In addition, if death or serious injury or serious damage is caused, such accidents shall be immediately reported by telephone to the aforesaid representatives of PATH (or the Port Authority, as applicable).

24. Trash Removal

The Contractor shall remove daily from the Facility by means provided by the Contractor all garbage, debris and other waste material (solid or liquid) arising out of or in connection with its operations hereunder, and any such garbage, debris and other waste material not immediately removed shall be temporarily stored in a clear and sanitary condition, approved by the Superintendent/Manager and shall be kept covered except when filling or emptying them. The Contractor shall exercise care in removing such garbage, debris and other waste materials from the Facility. The manner of such storage and removal shall always be subject in all respects to the continual approval of PATH. No equipment or facilities of PATH shall be used in such removal unless with its prior consent in writing. No such garbage, debris or other waste materials shall be or be permitted to be thrown, discharged or disposed into or upon the waters at or bounding the Facility.

25. Lost and Found Property

The Contractor shall instruct its personnel that all items of personal property found by the Contractor's employees at the Site must be turned in to PATH and a receipt will be issued therefor.

26. Property of the Contractor

a. All property of the Contractor at the Site by virtue of this Contract shall be removed on or before the expiration or sooner termination or revocation of this Contract.

b. If the Contractor shall fail to remove its property upon the expiration, termination or revocation of this Contract PATH may, at its option, dispose of such property as waste or as agent for the Contractor and at the risk and expense of the Contractor, remove such property to a public warehouse, or may retain the same in its own possession, and in either event after the expiration of thirty (30) days may sell the same in accordance with any method deemed appropriate; the proceeds of any such sale shall be applied first, to the expenses of sale and second, to any sums owed by the Contractor to PATH; any balance remaining shall be paid to the Contractor. Any excess of the total cost of removal, storage and sale and other costs incurred by PATH as a result of such failure of performance by the Contractor over the proceeds of sale shall be paid by the Contractor to PATH upon demand.

27. Modification of Contract

This Contract may not be changed except in writing signed by PATH and the Contractor. The Contractor agrees that no representation or warranties shall be binding upon PATH unless expressed in writing in this Contract.

28. Invalid Clauses

If any provision of this Contract shall be such as to destroy its mutuality or to render it invalid or illegal, then, if it shall not appear to have been so material that without it the Contract would not have been made by the parties, it shall not be deemed to form part thereof but the balance of the Contract shall remain in full force and effect.

29. Approval of Materials, Supplies and Equipment

Only Port Authority/PATH approved materials, supplies, and equipment are to be used by the Contractor in performing the Work hereunder. Inclusion of chemical containing materials or supplies on the Port Authority/ PATH Approved Products List – Environmental Protection Supplies constitutes approval. The list may be revised from time to time and at any time by the Port Authority/PATH and it shall be incumbent upon the Contractor to obtain the most current list from the Superintendent/Manager of the Facility.

At anytime during the Solicitation, pre-performance or performance periods, the Contractor may propose the use of an alternate product or products to those on the Approved Products List – Environmental Protection Supplies, which product(s) shall be subject to review and approval by the Port Authority. Any alternate product so approved by the Port Authority/PATH may be used by the Contractor in performing the Services hereunder. Until such approval is given, only products on the Approved Products List – Environmental Protection Supplies may be used.

30. Intellectual Property

The right to use all patented materials, appliances, processes of manufacture or types of construction, trade and service marks, copyrights and trade secrets, collectively hereinafter referred to as "Intellectual Property Rights", in the performance of the work, shall be obtained by the Contractor without separate or additional compensation. Where the services under this Agreement require the Contractor to provide materials, equipment or software for the use of PATH/the Port Authority or its employees or agents, PATH/the Port Authority shall be provided with the Intellectual Property Rights required for such use without further compensation than is provided for under this Agreement.

The Contractor shall indemnify PATH and the Port Authority against and save it harmless from all loss and expense incurred as a result of any claims in the nature of Intellectual Property Rights infringement arising out of the Contractor's or PATH or the Port Authority's use, in accordance with the above immediately

preceding paragraph, of any Intellectual Property. The Contractor, if requested, shall conduct all negotiations with respect to and defend such claims. If the Contractor, the Port Authority or PATH, its employees or agents be enjoined either temporarily or permanently from the use of any subject matter as to which the Contractor is to indemnify PATH, or the Port Authority as applicable, against infringement, then PATH, or the Port Authority as applicable, may, without limiting any other rights it may have, require the Contractor to supply temporary or permanent replacement facilities approved by the Superintendent/Manager, and if the Contractor fails to do so the Contractor shall, at its expense, remove all such enjoined facilities and refund the cost thereof to PATH or the Port Authority, as applicable, or take such steps as may be necessary to insure compliance by the Contractor, and PATH (or the Port Authority, as applicable) with said injunction, to the satisfaction of PATH or the Port Authority as applicable.

In addition, the Contractor shall promptly and fully inform the Director/General Manager in writing of any intellectual property rights disputes, whether existing or potential, of which it has knowledge, relating to any idea, design, method, material, equipment or any other matter related to the subject matter of this Agreement or coming to its attention in connection with this Agreement.

31. Contract Records and Documents – Passwords and Codes

When the performance of the contract services requires the Contractor to produce, compile or maintain records, data, drawings, or documents of any kind, regardless of the media utilized, then all such records, drawings, data and documents which are produced, prepared or compiled in connection with this contract, shall become the property of PATH (or the Port Authority as applicable), and PATH (or the Port Authority as applicable) shall have the right to use or permit the use of them and any ideas or methods represented by them for any purpose and at any time without other compensation than that specifically provided herein.

When in the performance of the contract services the Contractor utilizes passwords or codes for any purpose, at any time during or after the performance of such services, upon written request by PATH (or the Port Authority as applicable), the Contractor shall make available to the designated PATH (or the Port Authority as applicable) representative all such passwords and codes.

32. Designated Secure Areas

Services under the Contract may be required in designated secure areas, as the same may be designated by the Superintendant/Manager from time to time ("Secure Areas"). The Port Authority shall require the observance of certain security procedures with respect to Secure Areas, which may include the escort to, at, and/or from said high security areas by security personnel designated by the Contractor or any subcontractor's personnel required to work therein. All personnel that require access to designated secure areas who are not under positive escort by an authorized individual will be required to undergo background screening and personal identity verification.

Forty-eight (48) hours prior to the proposed performance of any work in a Secure Area, the Contractor shall notify the Superintendant/Manager. The Contractor shall conform to the procedures as may be established by the Superintendant/Manager from time to time and at any time for access to Secure Areas and the escorting of personnel hereunder. Prior to the start of work, the Contractor shall request a description from the Superintendant/Manager of the Secure Areas which will be in effect on the commencement date. The description of Secure Areas may be changed from time to time and at any time by the Superintendant/Manager during the term of the Contract.

33. Notification of Security Requirements

PATH has the responsibility of ensuring safe, reliable and secure transportation facilities, systems, and projects to maintain the well-being and economic competitiveness of the region. Therefore, PATH reserves the right to deny access to certain documents, sensitive security construction sites and facilities (including rental spaces) to any person that declines to abide by Port Authority or PATH security procedures and protocols, any person with a criminal record with respect to certain crimes or who may otherwise poses a threat to the construction site or facility security. The Authority and PATH reserve the right to impose

multiple layers of security requirements on the Contractor, its staff and subcontractors and their staffs depending upon the level of security required, or may make any amendments with respect to such requirements as determined by the Authority and/or PATH.

These security requirements may include but are not limited to the following:

- Execution of Port Authority Approved Non-disclosure Agreements

  At the direction of the Port Authority, the Contractor shall be required to have its principals, staff and/or subcontractor(s) and their staff, execute Port Authority approved non-disclosure agreements.

- Contractor/ Subcontractor identity checks and background screening

  PATH and the Port Authority's designated background screening provider may require inspection of not less than two forms of valid/current government issued identification (at least one having an official photograph) to verify staff's name and residence; screening federal, state, and/or local criminal justice agency information databases and files; screening of any terrorist identification files; access identification to include some form of biometric security methodology such as fingerprint, facial or iris scanning, or the like.

  The Contractor may be required to have its staff, and any subcontractor's staff, material-men, visitors or others over whom the Contractor/subcontractor has control, authorize the Authority or its designee to perform background checks, and a personal identity verification check. Such authorization shall be in a form acceptable to the Authority and/or PATH. The Contractor and subcontractors may also be required to use an organization designated by the Authority and/or PATH to perform the background checks.

  As of January 29, 2007, the Secure Worker Access Consortium (S.W.A.C.) is the only Port Authority approved provider to be used to conduct background screening and personal identity verification, except as otherwise required by federal law and/or regulation (such as the Transportation Worker Identification Credential for personnel performing in secure areas at Maritime facilities). Information about S.W.A.C., instructions, corporate enrollment, online applications, and location of processing centers can be found at http://www.secureworker.com, or S.W.A.C. may be contacted directly at (877) 522-7922 for more information and the latest pricing. The cost for said background checks for staff that pass and are granted a credential shall be reimbursable to the Contractor (and its subcontractors) as an out-of-pocket expense as provided herein. Staff that are rejected for a credential for any reason are not reimbursable.

- Issuance of Photo Identification Credential

  No person will be permitted on or about a Port Authority or PATH construction site or facility (including rental spaces) without a facility-specific photo identification credential approved by the Authority and/or PATH. If the authority requires facility-specific identification credential for the Contractor's and the subcontractor's staff, the Authority and/or PATH will supply such identification at no cost to the Contractor or its subcontractors. Such facility-specific identification credential shall remain the property of the Authority and/or PATH and shall be returned to the Authority and/or PATH at the completion or upon request prior to completion of the individual's assignment at the specific facility. It is the responsibility of the appropriate Contractor or subcontractor to immediately report to the Authority and/or PATH the loss of any staff member's individual facility-specific identification credential. The Contractor or subcontractor shall be billed for the cost of the replacement identification credential. Contractor's and subcontractor's staff shall display Identification badges in a conspicuous and clearly visible manner, when entering, working or leaving an Authority or PATH construction site or facility.

  Employees may be required to produce not less than two forms of valid/current government issued identification having an official photograph and an original, unlaminated social security card for identify and SSN verification. Where applicable, for sensitive security construction sites or facilities, successful completion of the application, screening and identify verification for all employees of the Contractor and subcontractors shall be completed prior to being provided a S.W.A.C. ID Photo Identification credential.

- Access control, inspection, and monitoring by security guards

  The Authority may provide for Authority and/or PATH construction site or facility (including rental spaces) access control, inspection and monitoring by Port Authority Police, Authority or PATH retained contractor security guards. However, this provision shall not relieve the Contractor of its responsibility to secure its equipment and work and that of its subconsultant/subcontractor's and service suppliers at the Authority or PATH construction site or facility (including rental spaces). In addition, the Contractor, subcontractor or service provider is not permitted to take photographs, digital images, electronic copying and/or electronic transmission or video recordings or make sketches on any other medium at the Authority or PATH construction sites or facilities (including rental spaces), except when necessary to perform the Work under this Contract, without prior written permission from the Authority or PATH. Upon request, any photograph, digital images, video recording or sketches made of the Authority construction site or facility shall be submitted to the Authority to determine compliance with this paragraph, which submission shall be conclusive and binding on the submitting entity.

- Compliance with the Port Authority Information Security Handbook

  The Contract may require access to Port Authority or PATH information considered Protected Information ("PI") as defined in the Port Authority Information Security Handbook ("Handbook"), dated October, 2008, corrected as of November 14, 2013, and as may be further amended. The Handbook and its requirements are hereby incorporated into this agreement and will govern the possession, distribution and use of PI if at any point during the lifecycle of the project or solicitation it becomes necessary for the Contractor to have access to PI. Protecting sensitive information requires the application of uniform safeguarding measures to prevent unauthorized disclosure and to control any authorized disclosure of this information within the Port Authority or when released by the Port Authority to outside entities. The following is an outline of some of the procedures, obligations and directives contained in the Handbook:

  (1) require that the Contractor and subcontractors, when appropriate, sign Non-Disclosure Agreements (NDAs), or an Acknowledgment of an existing NDA, provided by the Authority as a condition of being granted access to Protected Information categorized and protected as per the Handbook;

  (2) require that individuals needing access to PI be required to undergo a background check, pursuant to the process and requirements noted in § 3.2 of the Information Security Handbook.

  (3) require Contractors and commercial enterprises to attend training to ensure security awareness regarding Port Authority and PATH information;

  (4) specific guidelines and requirements for the handling of PI to ensure that the storage and protection of PI;

  (5) restrictions on the transfer, shipping, and mailing of PI;

  (6) prohibitions on the publication, posting, modifying, copying, reproducing, republishing, uploading, transmitting, or distributing PI on websites or web pages. This may also include restricting persons, who either have not passed a pre-screening background check, or who have not been granted access to PI, from viewing such information;

  (7) require that PI be destroyed using certain methods, measures or technology pursuant to the requirements set forth in the Handbook;

  (8) require the Contractor to mandate that each of its subcontractors maintain the same levels of security required of the Contractor under any Port Authority or PATH awarded contract.

  (9) prohibit the publication, exchange or dissemination of PI developed from the project or contained in reports, except between Contractors and subcontractors, without prior approval of the Port Authority;

  (10) require that PI only be reproduced or copied pursuant to the requirements set forth in the Handbook.

- Audits for Compliance with Security Requirements

The Port Authority and/or PATH may conduct random or scheduled examinations of business practices under this section entitled "NOTIFICATION OF SECURITY REQUIREMENTS" and the Handbook in order to assess the extent of compliance with security requirements, Protected Information procedures, protocols and practices, which may include, but not be limited to, verification of background check status, confirmation of completion of specified training, and/or a site visit to view material storage locations and protocols.

34. Construction In Progress

The Contractor recognizes that construction may be in progress at the Facility and may continue throughout the term of this Contract. Notwithstanding, the Contractor shall at all times during the term hereof maintain the same standards of performance and cleanliness as prevails in non-affected areas as required by the standards hereunder.

35. Permit-Required Confined Space Work

Prior to commencement of any work, the Contractor shall request and obtain from PATH a description of all spaces at the facility which are permit-required confined spaces requiring issuance of an OSHA permit.

Prior to the commencement of any work in a permit-required confined space at a Port Authority facility requiring issuance of an OSHA permit, the Contractor shall contact the Superintendent/Manager to obtain a PATH Contractor Permit-Required Confined Space Notification form. The notification form must be filled out and submitted prior to commencing permit-required confined space work. All confined space work shall be performed in accordance with all applicable OSHA requirements. The Contractor shall provide its employees with a copy of its own company permit and shall furnish PATH with a copy of the permit upon completion of the work. The Contractor must supply all equipment required for working in a confined space.

36. Signs

Except with the prior written approval of PATH, the Contractor shall not erect, maintain or display any signs or posters or any advertising on or about the Facility.

37. Vending Machines, Food Preparation

The Contractor shall not install, maintain or operate on the Facility, or on any other PATH property, any vending machines without the prior written approval of the Port Authority. No foods or beverages shall be prepared or consumed at the Facility by any of the Contractor's employees except in areas as may be specifically designated by PATH for such purpose.

38. Confidential Information/Non-Publication

a. As used herein, confidential information shall mean all information disclosed to the Contractor or the personnel provided by the Contractor hereunder which relates to the Authority's and/or PATH's past, present, and future research, development and business activities including, but not limited to, software and documentation licensed to the Authority or proprietary to the Authority and/or PATH and all associated software, source code procedures and documentation. Confidential information shall also mean any other tangible or intangible information or materials including but not limited to computer identification numbers, access codes, passwords, and reports obtained and/or used during the performance of the Contractor's Services under this Contract.

b. Confidential information shall also mean and include collectively, as per *The Port Authority of New York & New Jersey Information Security Handbook (October 15, 2008, corrected as of November 14, 2013),*

Protected Information, Confidential Proprietary Information, Confidential Privileged Information and information that is labeled, marked or otherwise identified by or on behalf of the Authority so as to reasonably connote that such information is confidential, privileged, sensitive or proprietary in nature. Confidential Information shall also include all work product that contains or is derived from any of the foregoing, whether in whole or in part, regardless of whether prepared by the Authority or a third-party or when the Authority receives such information from others and agrees to treat such information as Confidential.

c. The Contractor shall hold all such confidential information in trust and confidence for the Authority, and agrees that the Contractor and the personnel provided by the Contractor hereunder shall not, during or after the termination or expiration of this Contract, disclose to any person, firm or corporation, nor use for its own business or benefit, any information obtained by it under or in connection with the supplying of services contemplated by this Contract. The Contractor and the personnel provided by the Contractor hereunder shall not violate in any manner any patent, copyright, trade secret or other proprietary right of the Authority or third persons in connection with their services hereunder, either before or-after termination or expiration of this Contract. The Contractor and the personnel provided by the Contractor hereunder shall not willfully or otherwise perform any dishonest or fraudulent acts, breach any security procedures, or damage or destroy any hardware, software or documentation, proprietary or otherwise, in connection with their services hereunder. The Contractor shall promptly and fully inform the Director/General Manager in writing of any patent, copyright, trade secret or other intellectual property rights or disputes, whether existing or potential, of which the Contractor has knowledge, relating to any idea, design, method, material, equipment or other matter related to this Contract or coming to the Contractor's attention in connection with this Contract.

d. The Contractor shall not issue nor permit to be issued any press release, advertisement, or literature of any kind, which refers to PATH (or the Port Authority as applicable) or to the fact that goods have been, are being or will be provided to it and/or that services have been, are being or will be performed for it in connection with this Agreement, unless the vendor first obtains the written approval of PATH (or the Port Authority as applicable). Such approval may be withheld if for any reason PATH believes that the publication of such information would be harmful to the public interest or is in any way undesirable

39. Time is of the Essence

Time is of the essence in the Contractor's performance of this Contract inasmuch as the Work to be performed will affect the operation of public facilities.

40. Holidays

The following holidays will be observed at the Site:

New Year's Day	Labor Day
Martin Luther King Jr. Day	Columbus Day
Presidents' Day	Election Day
Memorial Day	Veterans Day
Independence Day	Thanksgiving Day
	Christmas Day

This list is subject to periodic revision and the Contractor shall be responsible for obtaining all updated lists from the office of the Superintendent/Manager. If any such holiday falls on a Sunday then the next day shall be considered the holiday and/or if any such holiday falls on a Saturday then the preceding day shall be considered the holiday.

41. Personnel Standards

In addition to any specific personnel requirements that may be required under the clause entitled "Personnel Requirements" in the Specifications, the Contractor (and any Subcontractor) shall furnish competent and adequately trained personnel to perform the Work hereunder. If, in the opinion of the Superintendent/Manager, any employee so assigned is performing their functions unsatisfactorily, they shall be replaced by the Contractor within twenty-four (24) hours following the Contractor's receipt of the Superintendent/Manager's request for such replacement.

All Contractor's employees performing Work hereunder shall have the ability to communicate in the English language to the extent necessary to comprehend directions given by either the Contractor's supervisory staff or by the Superintendent/Manager's staff. Any employee operating a motor vehicle must have a valid driver's license.

The Contractor shall verify that employees working under this Contract in the United States are legally present in the United States and authorized to work by means of the federally required I-9 program

42. General Uniform Requirements for Contractor's Personnel

In addition to any specific uniform requirements that may be required by the Specifications, uniforms must be worn at all times during which the Services are being performed hereunder. The Contractor agrees that his/her employees will present a neat, clean and orderly appearance at all times. Uniforms shall include the Contractor's identification badge with picture ID bearing the employee's name. All uniforms, colors, types and styles shall be subject to the prior approval of the Superintendent/Manager. The Contractor will also be responsible for ensuring that its employees are wearing shoes appropriate for the tasks performed. The Superintendent/Manager shall have the right to require removal of any employee who shall fail to wear the proper uniform and shoes, and the exercise of this right shall not limit the obligation of the Contractor to perform the Services or to furnish any required number of employees at a specific location at the Site as specified.

43. Labor, Equipment and Materials Supplied by the Contractor

The Contractor shall, at all times during the performance of this Contract, furnish all necessary labor, supervision, equipment and materials necessary for the prompt and efficient performance of the Work, whether such materials and equipment are actually employed in the furnishing of the Work or whether incidental thereto.

All materials used by the Contractor in furnishing Work hereunder shall be of such quality as to accomplish the purposes of this Contract and the Services to be furnished hereunder in such manner so as not to damage any part of the Site.

PATH by its officers, employees and representatives shall have the right at all times to examine the supplies, materials and equipment used by the Contractor, to observe the operations of the Contractor, its agents, servants and employees and to do any act or thing which PATH may be obligated or have the right to do under this Contract or otherwise.

All equipment, materials and supplies used in the performance of this Contract required hereunder shall be used in accordance with their manufacturer's instructions.

Materials and supplies to be provided by the Contractor hereunder shall comply with OSHA and all applicable regulations.

44. Contractor's Vehicles – Parking - Licenses

At the discretion of the Superintendent/Manager, PATH may permit the Contractor during the effective period of this Contract to park vehicle(s) used by it in its operations hereunder in such location as may from time to time or at any time be designated by the Superintendent/Manager. The Contractor shall comply with

such existing rules, regulations and procedures as are now in force and such reasonable future rules, regulations and procedures as may hereafter be adopted by PATH for the safety and convenience of persons who park automotive vehicles in any parking area at the Site or for the safety and proper persons who park automotive vehicles in any parking area at the Site or for the safety and proper identification of such vehicles, and the Contractor shall also comply with any and all directions pertaining to such parking which may be given from time to time and at any time by the Superintendent/Manager. Any vehicle used by the Contractor hereunder shall be marked or placarded, identifying it as the Contractor's vehicle.

45. Superintendent/Manager's Authority

In the performance of the Work hereunder, the Contractor shall conform to all orders, directions and requirements of the Superintendent/Manager and shall perform the Work hereunder to the satisfaction of the Superintendent/Manager at such times and places, by such methods and in such manner and sequence as he/she may require, and the Contract shall at all stages be subject to his/her inspection. The Superintendent/Manager shall determine the amount, quality, acceptability and fitness of all parts of the Work and shall interpret the Specifications and any orders for Extra Work. The Contractor shall employ no equipment, materials, methods or staff or personnel to which the Superintendent/Manager objects. Upon request, the Superintendent/Manager shall confirm in writing any oral order, direction, requirement or determination.

The Superintendent/Manager shall have the authority to decide all questions in connection with the Services to be performed hereunder. The exercise by the Superintendent/Manager of the powers and authorities vested in him/her by this section shall be binding and final upon PATH and the Contractor.

PART III CONTRACTOR'S INTEGRITY PROVISIONS

1. Certification of No Investigation (criminal or civil anti-trust), Indictment, Conviction, Debarment, Suspension, Disqualification and Disclosure of Other Information

By bidding on this Contract, each Bidder and each person signing on behalf of any Bidder certifies, and in the case of a joint bid each party thereto certifies as to its own organization, that the Bidder and each parent and/or affiliate of the Bidder has not

a. been indicted or convicted in any jurisdiction;

b. been suspended, debarred, found not responsible or otherwise disqualified from entering into any contract with any governmental agency or been denied a government contract for failure to meet standards related to the integrity of the Bidder;

c. had a contract terminated by any governmental agency for breach of contract or for any cause based in whole or in part on an indictment or conviction;

d. ever used a name, trade name or abbreviated name, or an Employer Identification Number different from those inserted in the Bid;

e. had any business or professional license suspended or revoked or, within the five years prior to bid opening, had any sanction imposed in excess of fifty thousand dollars ($50,000) as a result of any judicial or administrative proceeding with respect to any license held or with respect to any violation of a federal, state or local environmental law, rule or regulation;

f. had any sanction imposed as a result of a judicial or administrative proceeding related to fraud, extortion, bribery, bid rigging, embezzlement, misrepresentation or anti-trust regardless of the dollar amount of the sanctions or the date of their imposition; and

g. been, and is not currently, the subject of a criminal investigation by any federal, state or local prosecuting or investigative agency and/or a civil anti-trust investigation by any federal, state or local prosecuting or investigative agency, including an inspector general of a governmental agency or public authority.

2. Non-Collusive Bidding, and Code of Ethics Certification, Certification of No Solicitation Based On Commission, Percentage, Brokerage, Contingent or Other Fees

By bidding on this Contract, each Bidder and each person signing on behalf of any Bidder certifies, and in the case of a joint bid, each party thereto certifies as to its own organization, that

a. the prices in its bid have been arrived at independently without collusion, consultation, communication or agreement for the purpose of restricting competition, as to any matter relating to such prices with any other bidder or with any competitor;

b. the prices quoted in its bid have not been and will not be knowingly disclosed directly or indirectly by the Bidder prior to the official opening of such bid to any other bidder or to any competitor;

c. no attempt has been made and none will be made by the Bidder to induce any other person, partnership or corporation to submit or not to submit a bid for the purpose of restricting competition;

d. this organization has not made any offers or agreements or taken any other action with respect to any Authority employee or former employee or immediate family member of either which would constitute a breach of ethical standards under the Code of Ethics dated March 11, 2014, or as may be revised, (a copy of which is available upon request) nor does this organization have any knowledge of any act on the part of an Authority employee or former Authority employee relating either directly or indirectly to this organization which constitutes a breach of the ethical standards set forth in said Code;

e. no person or selling agency other than a bona fide employee or bona fide established commercial or selling agency maintained by the Bidder for the purpose of securing business, has been employed or retained by the Bidder to solicit or secure this Contract on the understanding that a commission, percentage, brokerage, contingent, or other fee would be paid to such person or selling agency; and

f. the Bidder has not offered, promised or given, demanded or accepted, any undue advantage, directly or indirectly, to or from a public official or employee, political candidate, party or party official, or any private sector employee (including a person who directs or works for a private sector enterprise in any capacity), in order to obtain, retain, or direct business or to secure any other improper advantage in connection with this Contract.

g. no person or organization has been retained, employed or designated on behalf of the Bidder to impact any Port Authority determination with respect to (i) the solicitation, evaluation or award of this Contract, or (ii) the preparation of specifications or request for submissions in connection with this Contract.

The foregoing certifications in this Part III, Sections 1 and 2, shall be deemed to have been made by the Bidder as follows:

* if the Bidder is a corporation, such certification shall be deemed to have been made not only with respect to the Bidder itself, but also with respect to each parent, affiliate, director, and officer of the Bidder, as well as, to the best of the certifier's knowledge and belief, each stockholder of the Bidder with an ownership interest in excess of 10%;

* if the Bidder is a partnership, such certification shall be deemed to have been made not only with respect to the Bidder itself, but also with respect to each partner.

Moreover, the foregoing certifications, if made by a corporate Bidder, shall be deemed to have been authorized by the Board of Directors of the Bidder, and such authorization shall be deemed to include the signing and submission of the bid and the inclusion therein of such certification as the act and deed of the

corporation.

In any case where the Bidder cannot make the foregoing certifications, the Bidder shall so state and shall furnish with the signed bid a signed statement which sets forth in detail the reasons therefor. If the Bidder is uncertain as to whether it can make the foregoing certifications, it shall so indicate in a signed statement furnished with its bid, setting forth in such statement the reasons for its uncertainty. With respect to the foregoing certification in paragraph "2g", if the Bidder cannot make the certification, it shall provide, in writing, with the signed bid: (i) a list of the name(s), address(es), telephone number(s), and place(s) of principal employment of each such individual or organization; and (ii) a statement as to whether such individual or organization has a "financial interest" in this Contract, as described in the Procurement Disclosure policy of the Authority (a copy of which is available upon request to the Chief Procurement Officer of the Procurement Department of the Authority). Such disclosure is to be updated, as necessary, up to the time of award of this Contract. As a result of such disclosure, the Port Authority shall take appropriate action up to and including a finding of non-responsibility.

Failure to make the required disclosures shall lead to administrative actions up to and including a finding of non-responsiveness or non-responsibility.

Notwithstanding that the Bidder may be able to make the foregoing certifications at the time the bid is submitted, the Bidder shall immediately notify the Authority in writing during the period of irrevocability of bids and the term of the Contract, if Bidder is awarded the Contract, of any change of circumstances which might under this clause make it unable to make the foregoing certifications, might render any portion of the certifications previously made invalid, or require disclosure. The foregoing certifications or signed statement shall be deemed to have been made by the Bidder with full knowledge that they would become a part of the records of the Authority and that the Authority will rely on their truth and accuracy in awarding and continuing this Contract. In the event that the Authority should determine at any time prior or subsequent to the award of this Contract that the Bidder has falsely certified as to any material item in the foregoing certifications, has failed to immediately notify the Port Authority of any change in circumstances which might make it unable to make the foregoing certifications, might render any portion of the certifications previously made invalid, or require disclosure, or has willfully or fraudulently furnished a signed statement which is false in any material respect, or has not fully and accurately represented any circumstance with respect to any item in the foregoing certifications required to be disclosed, the Authority may determine that the Bidder is not a responsible Bidder with respect to its bid on the Contract or with respect to future bids on Authority contracts and may exercise such other remedies as are provided to it by the Contract with respect to these matters. In addition, Bidders are advised that knowingly providing a false certification or statement pursuant hereto may be the basis for prosecution for offering a false instrument for filing (see e.g. New York Penal Law, Section 175.30 et seq.). Bidders are also advised that the inability to make such certification will not in and of itself disqualify a Bidder, and that in each instance the Authority will evaluate the reasons therefor provided by the Bidder. Under certain circumstances the Bidder may be required as a condition of Contract award to enter into a Monitoring Agreement under which it will be required to take certain specified actions, including compensating an independent Monitor to be selected by the Port Authority, said Monitor to be charged with, among other things, auditing the actions of the Bidder to determine whether its business practices and relationships indicate a level of integrity sufficient to permit it to continue business with the Port Authority.

3. Bidder Eligibility for Award of Contracts - Determination by an Agency of the State of New York or New Jersey Concerning Eligibility to Receive Public Contracts

Bidders are advised that the Authority has adopted a policy to the effect that in awarding its contracts it will honor any determination by an agency of the State of New York or New Jersey that a Bidder is not eligible to bid on or be awarded public contracts because the Bidder has been determined to have engaged in illegal or dishonest conduct or to have violated prevailing rate of wage legislation.

The policy permits a Bidder whose ineligibility has been so determined by an agency of the State of New York or New Jersey to submit a bid on a Port Authority contract and then to establish that it is eligible to be awarded a contract on which it has bid because (i) the state agency determination relied upon does not apply to the Bidder, or (ii) the state agency determination relied upon was made without affording the Bidder the notice and hearing

to which the Bidder was entitled by the requirements of due process of law, or (iii) the state agency determination was clearly erroneous or (iv) the state determination relied upon was not based on a finding of conduct demonstrating a lack of integrity or violation of a prevailing rate of wage law.

The full text of the resolution adopting the policy may be found in the Minutes of the Authority's Board of Commissioners meeting of September 9, 1993.

4. Contractor Responsibility, Suspension of Work and Termination

During the term of this Contract, the Contractor shall at all times during the Contract term remain responsible. The Contractor agrees, if requested by the Port Authority to present evidence of its continuing legal authority to do business in the States of New Jersey or New York, integrity, experience, ability, prior performance, and organizational and financial capacity.

The Port Authority, in its sole discretion, reserves the right to suspend any or all activities under this Contract, at any time, when it discovers information that calls into question the responsibility of the Contractor. In the event of such suspension, the Contractor will be given written notice outlining the particulars of such suspension. Upon issuance of such notice, the Contractor must comply with the terms of the suspension order. Contract activity may resume at such time as the Port Authority issues a written notice authorizing a resumption of performance under the Contract.

Upon written notice to the Contractor, and an opportunity to be heard with appropriate Port Authority officials or staff, the Contract may be terminated by Port Authority at the Contractor's expense where the Contractor is determined by the Port Authority to be non-responsible. In such event, the Port Authority or its designee may complete the contractual requirements in any manner he or she may deem advisable and pursue available legal or equitable remedies for breach, including recovery of costs from Contractor associated with such termination.

5. No Gifts, Gratuities, Offers of Employment, Etc.

At all times, the Contractor shall not offer, give or agree to give anything of value either to a Port Authority employee, agent, job shopper, consultant, construction manager or other person or firm representing the Port Authority, or to a member of the immediate family (i.e., a spouse, child, parent, brother or sister) of any of the foregoing, in connection with the performance by such employee, agent, job shopper, consultant, construction manager or other person or firm representing the Port Authority of duties involving transactions with the Contractor on behalf of the Port Authority, whether or not such duties are related to this Contract or any other Port Authority contract or matter. Any such conduct shall be deemed a material breach of this Contract.

As used herein "anything of value" shall include but not be limited to any (a) favors, such as meals, entertainment, transportation (other than that contemplated by the Contract or any other Port Authority contract), etc. which might tend to obligate the Port Authority employee to the Contractor, and (b) gift, gratuity, money, goods, equipment, services, lodging, discounts not available to the general public, offers or promises of employment, loans or the cancellation thereof, preferential treatment or business opportunity. Such term shall not include compensation contemplated by this Contract or any other Port Authority contract. Where used herein, the term "Port Authority" shall be deemed to include all subsidiaries of the Port Authority.

The Contractor shall insure that no gratuities of any kind or nature whatsoever shall be solicited or accepted by it and by its personnel for any reason whatsoever from the passengers, tenants, customers or other persons using the Facility and shall so instruct its personnel.

In the event that the Contractor becomes aware of the occurrence of any conduct that is prohibited by this section entitled “No Gifts, Gratuities, Offers of Employment, Etc.”, it shall report such occurrence to the Port Authority’s Office of Inspector General within three (3) business days of obtaining such knowledge. (See “http://www.panynj.gov/inspector-general” for information about to report information to the Office of Inspector General). Failing to report such conduct shall be grounds for a finding of non-responsibility.

In addition, during the term of this Contract, the Contractor shall not make an offer of employment or use confidential information in a manner proscribed by the Code of Ethics and Financial Disclosure dated March 11, 2014, or as may be revised (a copy of which is available upon request to the Office of the Secretary of the

Port Authority).

The Contractor shall include the provisions of this clause in each subcontract entered into under this Contract.

6. Conflict of Interest

During the term of this Contract, the Contractor shall not participate in any way in the preparation, negotiation or award of any contract (other than a contract for its own services to the Authority) to which it is contemplated the Port Authority may become a party, or participate in any way in the review or resolution of a claim in connection with such a contract if the Contractor has a substantial financial interest in the contractor or potential contractor of the Port Authority or if the Contractor has an arrangement for future employment or for any other business relationship with said contractor or potential contractor, nor shall the Contractor at any time take any other action which might be viewed as or give the appearance of conflict of interest on its part. If the possibility of such an arrangement for future employment or for another business arrangement has been or is the subject of a previous or current discussion, or if the Contractor has reason to believe such an arrangement may be the subject of future discussion, or if the Contractor has any financial interest, substantial or not, in a contractor or potential contractor of the Authority, and the Contractor's participation in the preparation, negotiation or award of any contract with such a contractor or the review or resolution of a claim in connection with such a contract is contemplated or if the Contractor has reason to believe that any other situation exists which might be viewed as or give the appearance of a conflict of interest, the Contractor shall immediately inform the Chief Procurement Officer in writing of such situation giving the full details thereof. Unless the Contractor receives the specific written approval of the Chief Procurement Officer, the Contractor shall not take the contemplated action which might be viewed as or give the appearance of a conflict of interest. The Chief Procurement Officer may require the Contractor to submit a mitigation plan addressing and mitigating any disclosed or undisclosed conflict, which is subject to the approval of the Chief Procurement Officer and shall become a requirement, as though fully set forth in this Contract. In the event the Chief Procurement Officer shall determine that the performance by the Contractor of a portion of its Services under this Agreement is precluded by the provisions of this numbered paragraph, or a portion of the Contractor's said Services is determined by the Chief Procurement Officer to be no longer appropriate because of such preclusion, then the Chief Procurement Officer shall have full authority on behalf of both parties to order that such portion of the Contractor's Services not be performed by the Contractor, reserving the right, however, to have the Services performed by others and any lump sum compensation payable hereunder which is applicable to the deleted work shall be equitably adjusted by the parties. The Contractor's execution of this document shall constitute a representation by the Contractor that at the time of such execution the Contractor knows of no circumstances, present or anticipated, which come within the provisions of this paragraph or which might otherwise be viewed as or give the appearance of a conflict of interest on the Contractor's part. The Contractor acknowledges that the Authority may preclude it from involvement in certain disposition/privatization initiatives or transactions that result from the findings of its evaluations hereunder or from participation in any contract, which results, directly or indirectly, from the Services provided by the Contractor hereunder. The Port Authority's determination regarding any questions of conflict of interest shall be final.

7. Definitions

As used in this section, the following terms shall mean:

Affiliate - Two or more firms are affiliates if a parent owns more than fifty percent of the voting stock of each of the firms, or a common shareholder or group of shareholders owns more than fifty percent of the voting stock of each of the firms, or if the firms have a common proprietor or general partner.

Agency or Governmental Agency - Any federal, state, city or other local agency, including departments, offices, public authorities and corporations, boards of education and higher education, public development corporations, local development corporations and others.

Investigation - Any inquiries made by any federal, state or local criminal prosecuting and/or law enforcement agency and any inquiries concerning civil anti-trust investigations made by any federal,

state or local governmental agency. Except for inquiries concerning civil anti-trust investigations, the term does not include inquiries made by any civil government agency concerning compliance with any regulation, the nature of which does not carry criminal penalties, nor does it include any background investigations for employment, or Federal, State, and local inquiries into tax returns.

Officer - Any individual who serves as chief executive officer, chief financial officer, or chief operating officer of the Bidder by whatever titles known.

Parent - An individual, partnership, joint venture or corporation which owns more than 50% of the voting stock of the Bidder.

If the solicitation is a Request for Proposal:

Bid - shall mean Proposal;
Bidder - shall mean Proposer;
Bidding - shall mean submitting a Proposal.

In a Contract resulting from the taking of bids:

Bid - shall mean bid;
Bidder - shall mean Bidder; except and until the Contract has been awarded, then it shall mean Contractor
Bidding - shall mean executing this Contract.

In a Contract resulting from the taking of Proposals:

Bid - shall mean Proposal;
Bidder - shall mean Proposer;
Bidding - shall mean executing this Contract.

BUY AMERICA CERTIFICATION (ROLLING STOCK)

A bidder or offeror must submit to the FTA recipient the Buy America certification (below) with all bids or offers on FTA-funded contracts, except those subject to a general waiver. Bids or offers that are not accompanied by a completed Buy America certification must be rejected as nonresponsive. This requirement does not apply to lower tier subcontractors.

CERTIFICATION REQUIREMENT FOR PROCUREMENT OF BUSES, OTHER ROLLING STOCK AND ASSOCIATED EQUIPMENT (ROLLING STOCK)

Certificate of Compliance with 49 U.S.C. 5323(j)(2)(C).

The bidder or offeror hereby certifies that it will comply with the requirements of 49 U.S.C. 5323(j)(2)(C) and the regulations at 49 C.F.R. Part 661.11.

Date _____

Signature _____

Company Name _____

Title _____

Certificate of Non-Compliance with 49 U.S.C. 5323(j)(2)(C)

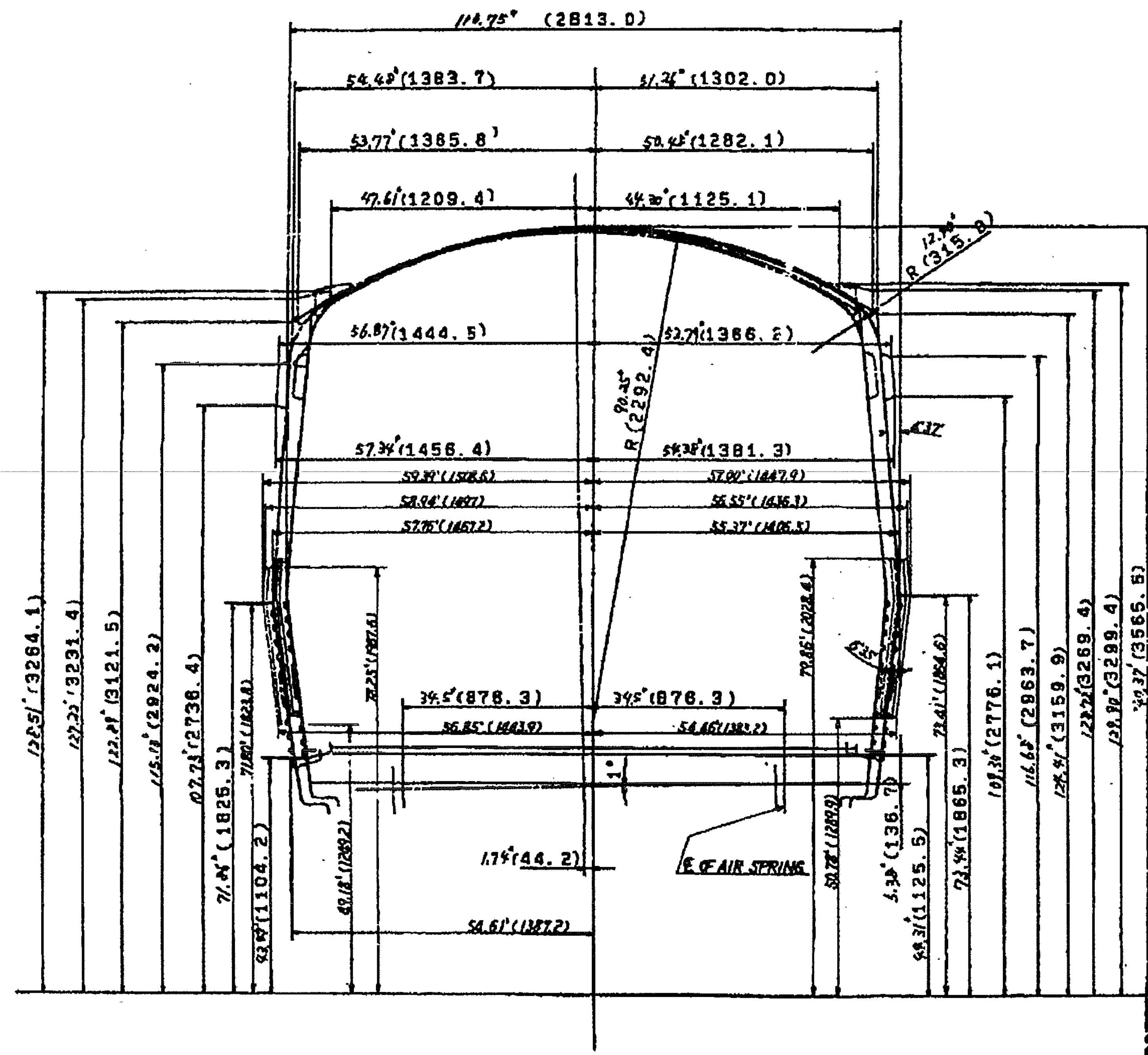
The bidder or offeror hereby certifies that it cannot comply with the requirements of 49 U.S.C. 5323(j)(2)(C) and 49 C.F.R. 661.11, but may qualify for an exception pursuant to 49 U.S.C. 5323(j)(2)(A), 5323(j)(2)(B), or 5323(j)(2)(D), and 49 C.F.R. 661.7.

Date _____

Signature _____

Company Name _____

Title _____



NOTES:

1. THIS DRAWING IS REQUESTED AS PER PATH SPECIFICATION 2.2.S.3 AND PA-NT-1255.
2. KINEMATIC ENVELOPE OF CARBODY IS DRAWN UNDER FOLLOWING CONDITIONS.
   PLEASE NOTE THAT FOLLOWING CONDITIONS ARE SAME AS PAN-J-1108, 1133 (APPROVED BY PA-NT-0516).

   (a) LATERAL DEFLECTION BETWEEN AXLE AND TRUCK FRAME: 0.24" (6.1mm)

   (b) LATERAL DEFLECTION BETWEEN TRUCK FRAME AND CARBODY: 1.5" (38.1mm)

   (c) ROLLING ANGLE: 1°
3. ALL DIMENSIONS ARE INDICATED BY INCHES AND MILLI-METERS.

AS BUILT DRAWING
REVIEWED AND CONFIRMED BY LTK

Reviewer *R L Vlick* Date 7/19/88

c	'88.5.10	ADDED DIMENSIONS OF LOCATION FOR SIDE GRAB HANDLES
b	'87.7.15	ADDED SHEET (2) PER PANT 1687
a	'86-11-28	ADDED AMERICAN UNIT AND NOTE 3

KAWASAKI HEAVY INDUSTRIES, LTD.
ROLLING STOCK DIVISION

CARBODY KINEMATIC ENVELOPE (1/2)

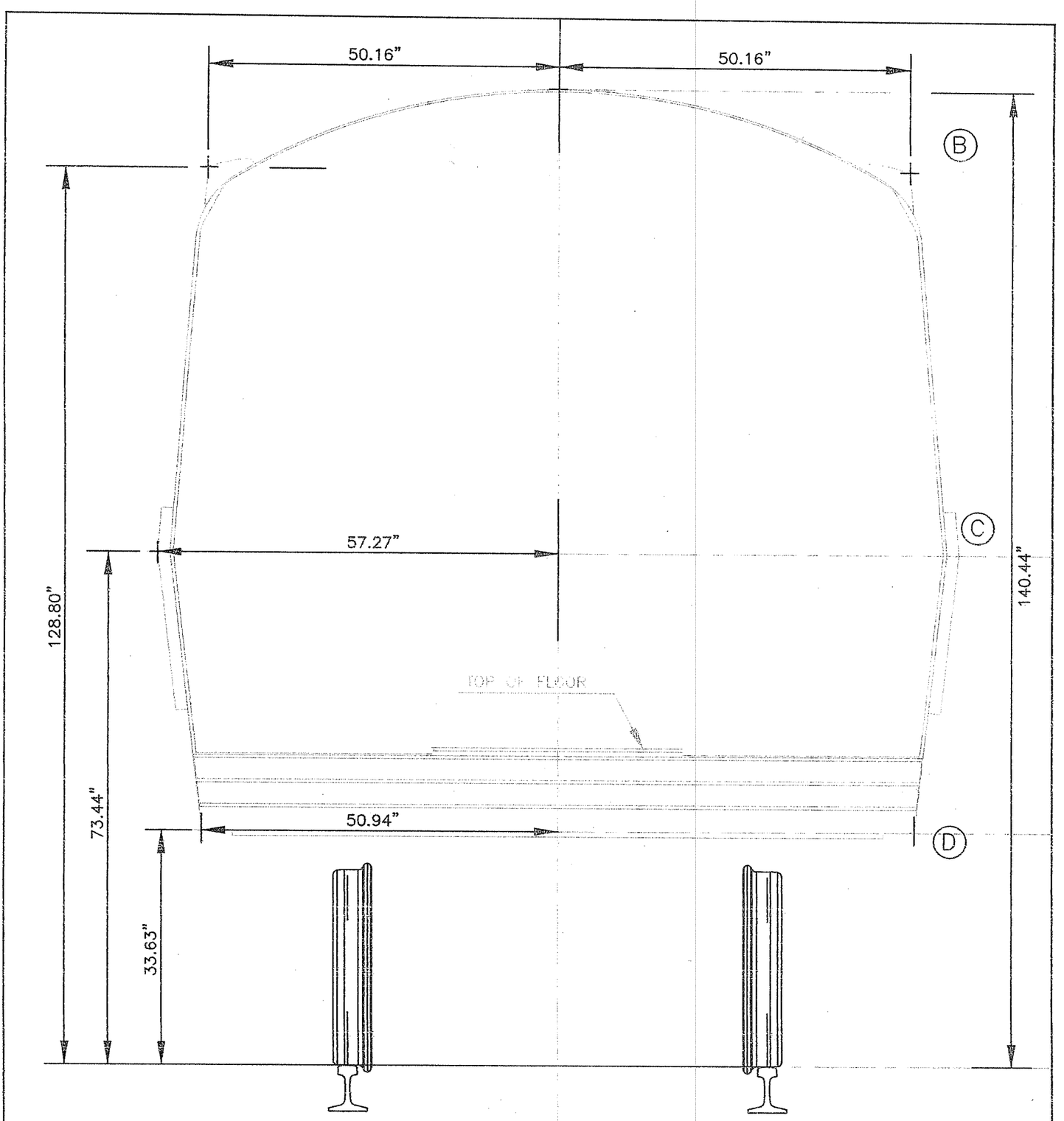
1/15

2P395305 - 1041 - C

CONTRACT PAT 120.007 PA-4 CARS

412-0 50

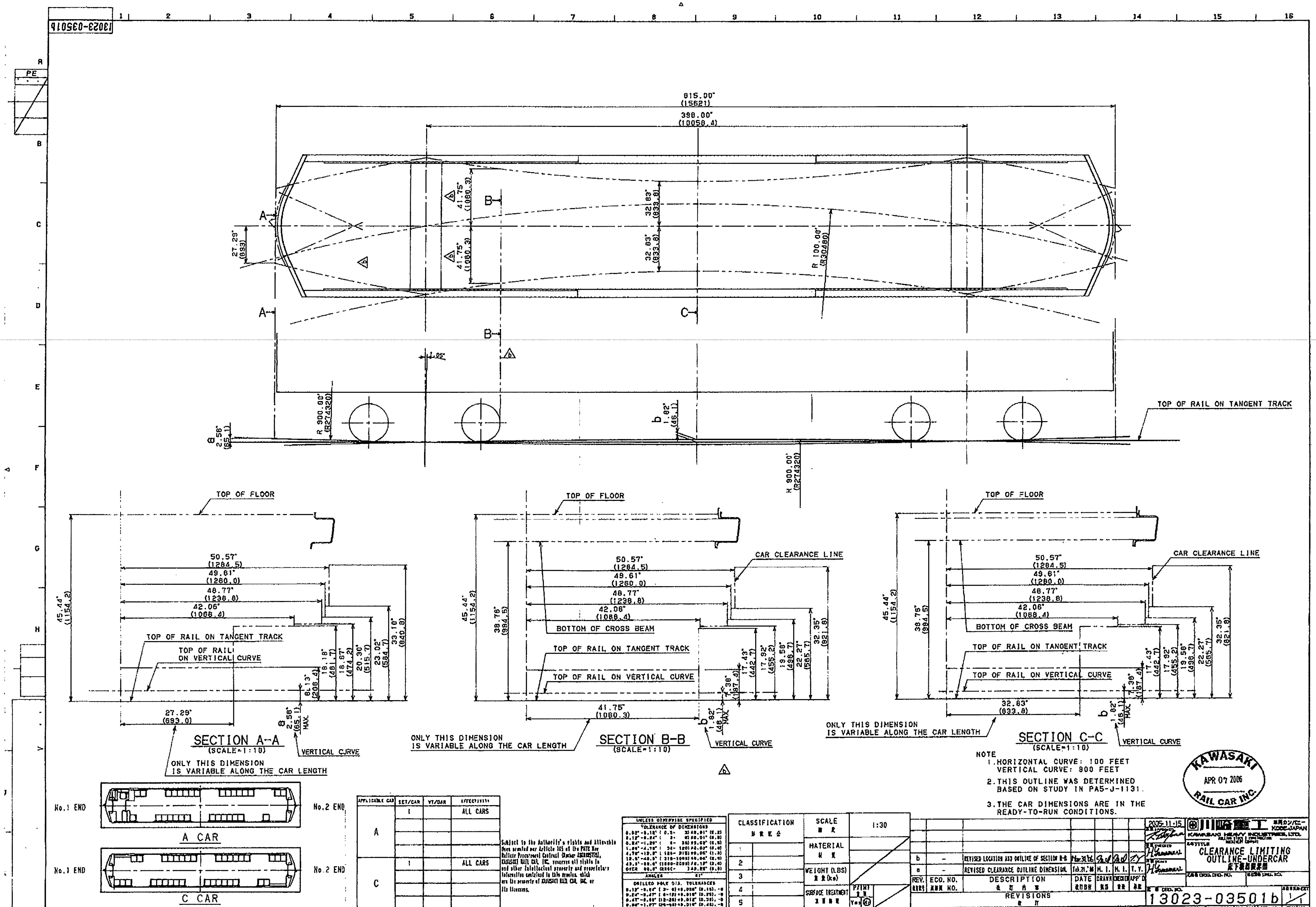
ATTACHMENT 1-1



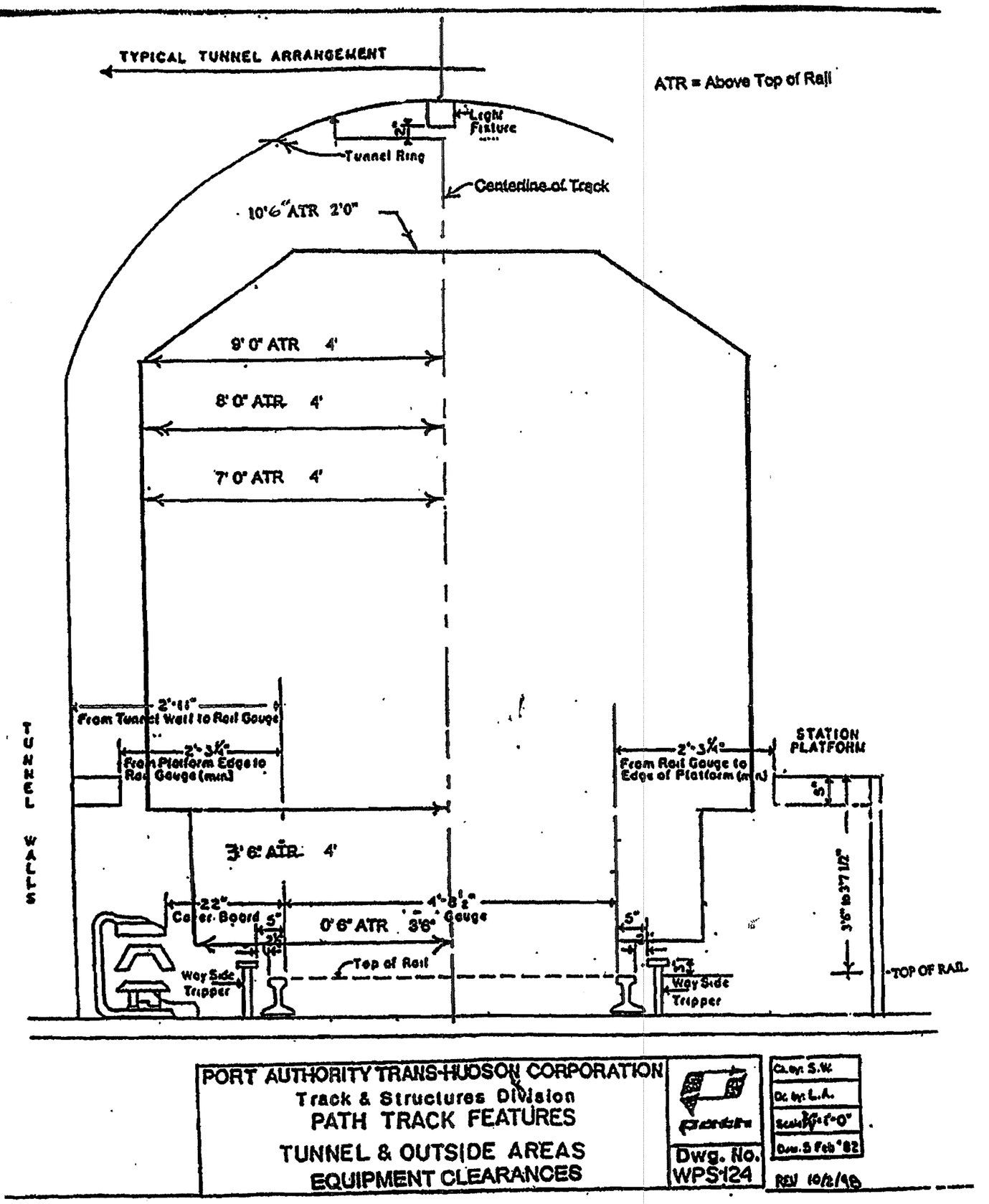
STATIC ENVELOPE
FRA CLASS 3 = 1.75"

		Discipline	Date	of
Designed by Drawn by Checked by			Contract Number PID Number	Worksheet Number Drawing Number

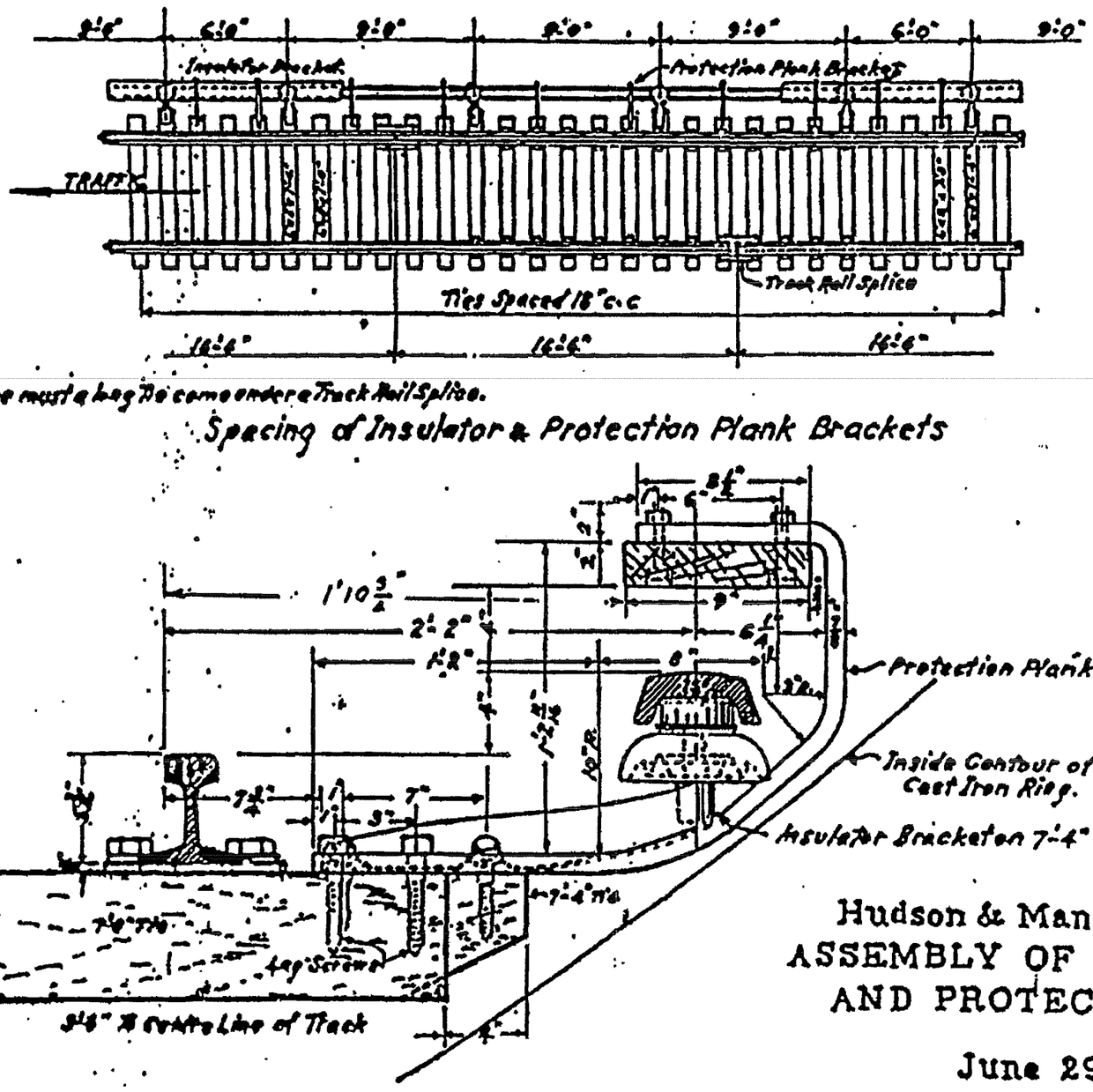
ATTACHMENT 1-2



ATTACHMENT 2



ATTACHMENT 4



NOTE:
Innocere must not be allowed to become under Track Rail Splice.

Spacing of Insulator & Protection Plank Brackets

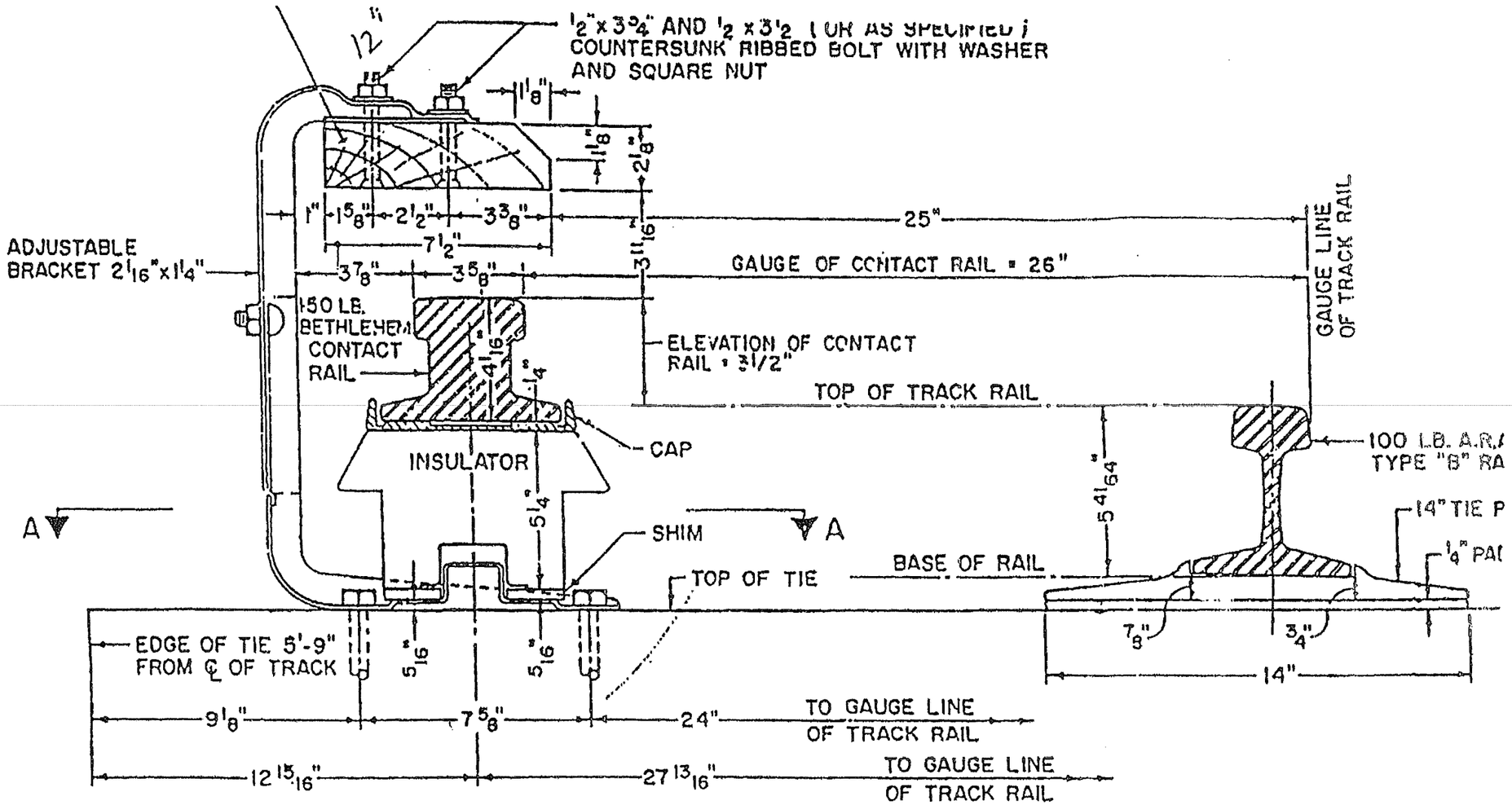
Hudson & Manhattan R. R. Co.

ASSEMBLY OF CONTACT RAIL AND PROTECTION BOARD.

June 29, 1911.

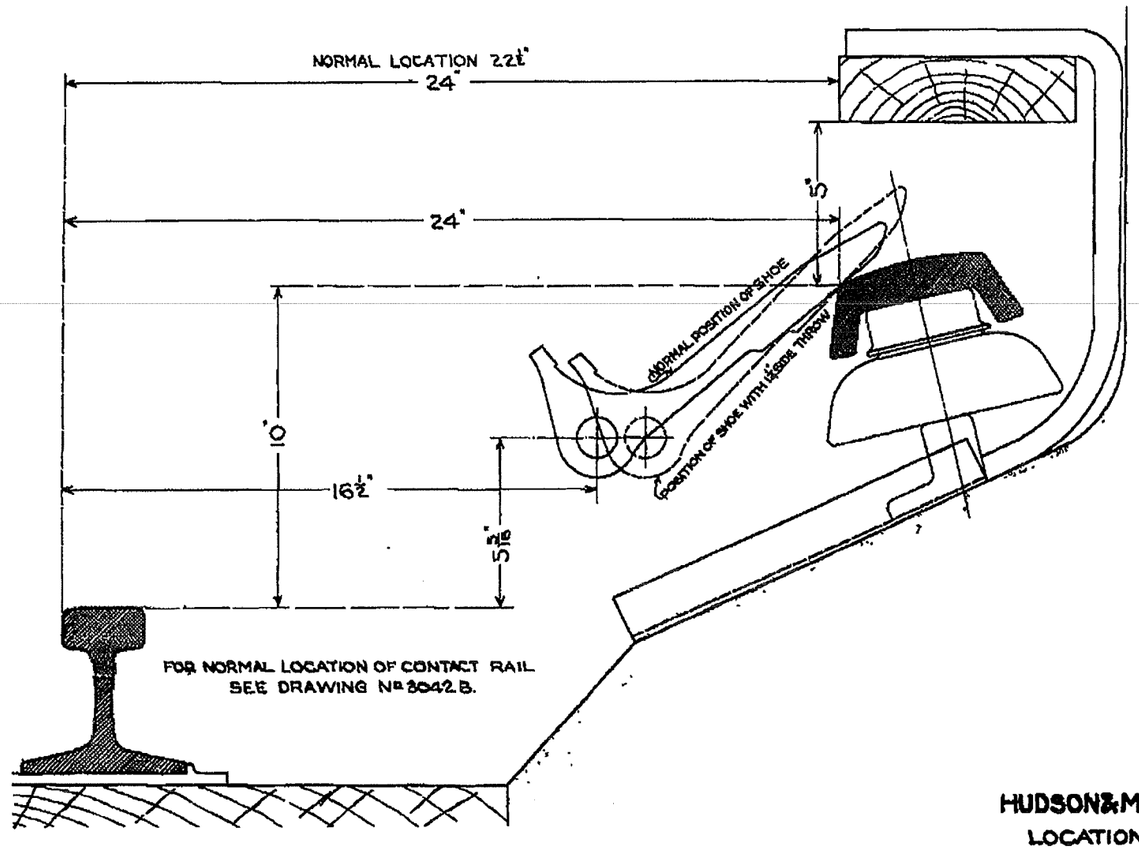
FILE NO. 5. SERIAL NO. SK. 30428.

ATTACHMENT 5



CONTACT RAIL ASSEMBLY

ATTACHMENT 6



HUDSON & MANHATTAN R.R.CO.

LOCATION OF CONTACT RAIL

IN HIGHEST POSITION ABOVE TRACK RAIL

TUNNEL-E-UNDER RIVER BET. STA. 1194+86.9 & 1191+42.5

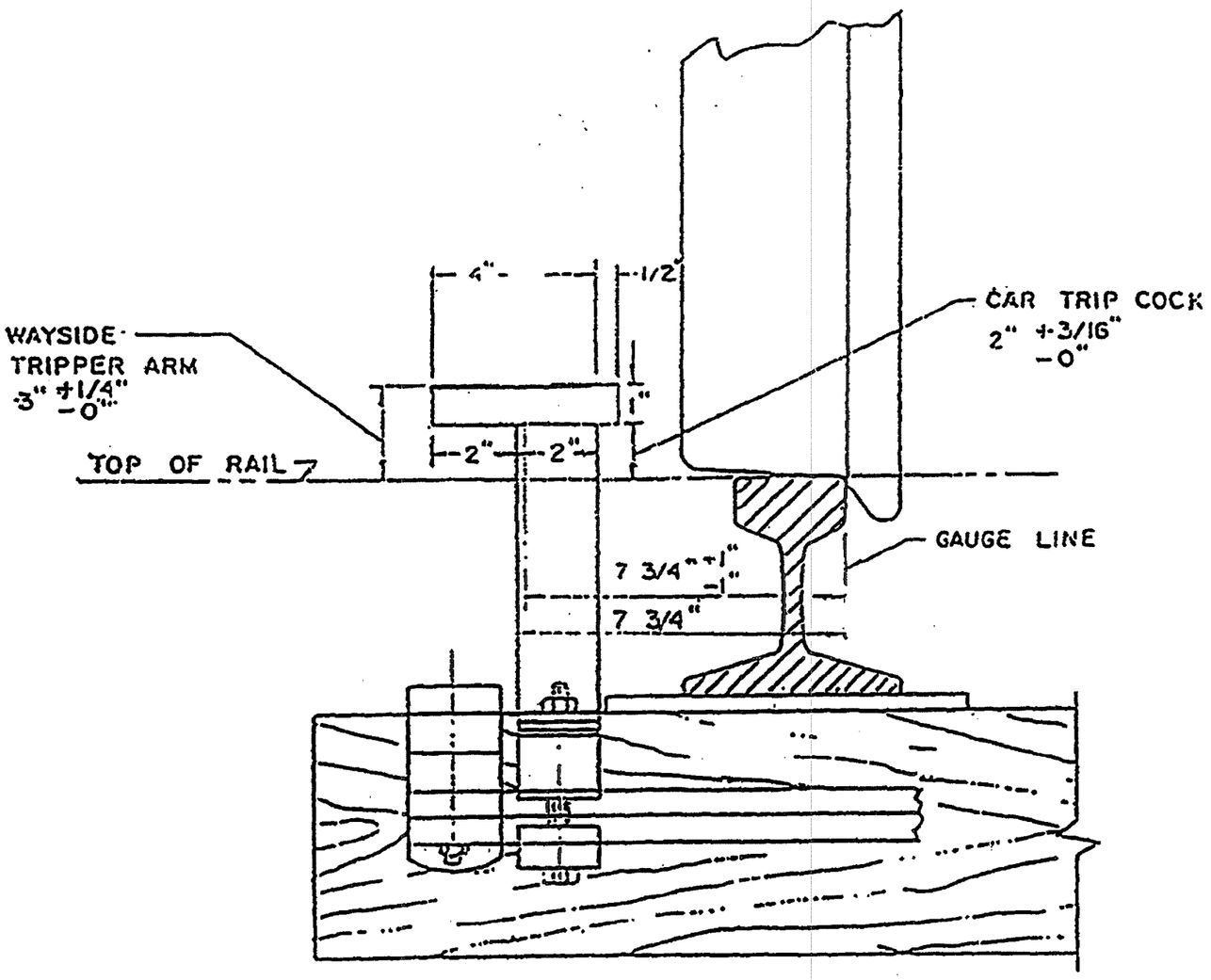
SCALE-HALF SIZE. SEPT. 30, 1913.

ATTACHMENT 7

NOTE:- TRACED FROM ELECL. DEPT'S SHEET No C-141, JULY 28, 1910.

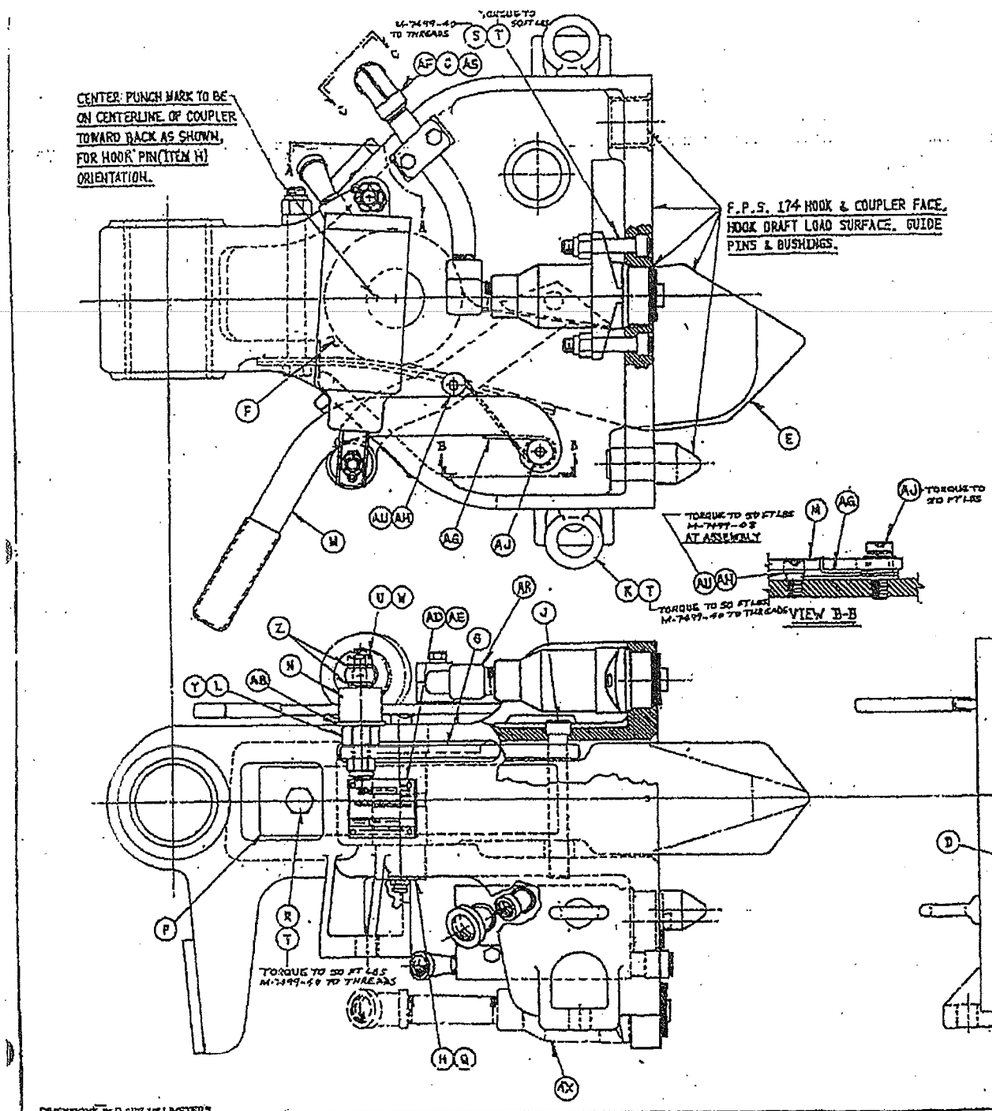
DRAWN BY E. DEPT. 2275
TRACED " WITPG.
CHECKED "
CORRECT

FILE No. 93 SERIAL No. 4486



ATTACHMENT 8

REVISIONS	PORT AUTHORITY TRANS-HUDSON CORP. (PATH)	
	AUTOMATIC TRAIN STOP TRIPPER ARM	
DATE: 1-20-93	DWG. NO. SK.-CL 001 SHEET 1 OF 2	

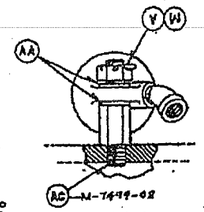


NOTE:

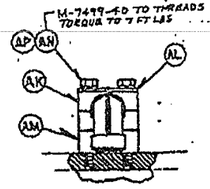
1- F.P.S. 174 SLIDING WEARING SURFACES OF CAM (IT. G), HOOK (IT. E), SPRING (IT. P), CYLINDRICAL SURFACE OF HOOK PIN (IT.-H-) & CYLINDER-BEARINGS (IT. F).

2- TOUCH UP WITH M-7745-00 (BLACK ENAMEL).

3- M-7499-18 APPLIED TO ALL NPT (TAPERED PIPE THREADS) PNEUMATIC CONNECTIONS.



VIEW A-A



VIEW C-C

LIST OF MATERIAL

ITEM	PART NO.	MATERIAL	DESCRIPTION
1 A	57773-3001	STL.	COUPLER HEAD SUB-ASS'Y
1 B	59421-3001	——	UPPER TAPPET VALVE ASS'Y
1 C	10-4110	STL.	1/2" ELBOW -90°
1 D	59424-3001	——	BRAKE TAPPET VALVE ASS'Y
1 E	58643-3001	——	HOOK
1 F	53880-3007	——	UNCOUPLING CYLINDER ASS'Y
1 G	57761-1001	C.S.	UNCOUPLING CAM
1 H	57534-1001	STL.	HOOK PIN
1 J	57936-1001	STL.	CAM PIN
2 K	57128-5024	STL.	EYE BOLT 1/2"
1 L	57780-1002	STL.	FRONT STUD
1 M	57777-3001	——	UNCOUPLING LEVER ASS'Y
1 N	57780-4003	STL.	ROLLER
2 P	8481-4001	SPSTL	HOOK SPRING
1 Q	11-4316	STL.	GREASE FITTING
2 R	3-4870	SSTL.	BOLT 1/2"X 6-1/2"
4 S	56210-4712	STL.	SOC.HD CAP SCR.1/2"X2-1/2"
7 T	3-4049	SSTL.	1/2" STOPNUT
1 U	2-4759	STL.	1/2" SLOTTED NUT
1 V	2-4810	STL.	5/8" SLOTTED NUT
2 W	3-4343	STL.	1/8" COTTER PIN X 1-1/4"
~~1 X~~	~~3-4344~~	~~STL.~~	~~3/8" COTTER PIN X 1-1/2"~~
1 Y	3-4053	SSTL.	5/8" STOPNUT
2 Z	3-4607	STL.	1/2" WASHER
2 AA	3-4618	STL.	5/8" WASHER X 1-1/16" D.
1 AB	3-4623	STL.	3/4" WASHER X 1-3/4" D.
1 AC	57780-4001	STL.	REAR STUD
1 AD	59042-4001	ALUM.	NAMEPLATE
~~1 AE~~	~~57113-4001~~	~~STL.~~	~~GREENAIL STUD~~
1 AF	57538-4001	STL.	1/2" PIPE NIPPLE
1 AG	57787-4001	SSTL.	LEVER SPRING
1 AH	57780-4007	STL.	SPACER
1 AJ	24-4434	STL.	SOC. HD. SHOULDER SCR. 1/2"
1 AK	57537-4001	PLAS.	PIPE CLAMP
1 AL	57537-4002	STL.	CLAMP COVER
1 AM	57780-4006	STL.	3/8" SPACER
2 AN	1-4572	SST	1/4" BOLT X 2-3/4
2 AP	19779-4025	STL.	1/4" LOCKWASHER
1 AQ			
1 AR	10-4107	STL.	3/4 x 1/2-90° STREET ELBOW
1 AS	3-4071	PLAS.	CAPLUG-1/2 NPT
AT			
1 AU	56210-4701	STL.	SOC.HD CAP SCR. 1/2"X1"
2 AV	56210-4713	STL.	SOC HD CAP SCR. 1/2"X1-3/4"
2 AW	19779-4044	SSTL.	1/2" LOCKWASHER
1 AX	59421-3002	——	LOWER TAPPET ASSY.

57

WABCO Knorr Division

57726

THIS DRAWING CONTAINS PROPRIETARY INFORMATION OF WABCO, PTD AND SHALL NOT BE REPRODUCED OR TRANSMITTED TO OTHERS IN WHOLE OR IN PART WITHOUT PRIOR CONSENT OF THIS COMPANY.

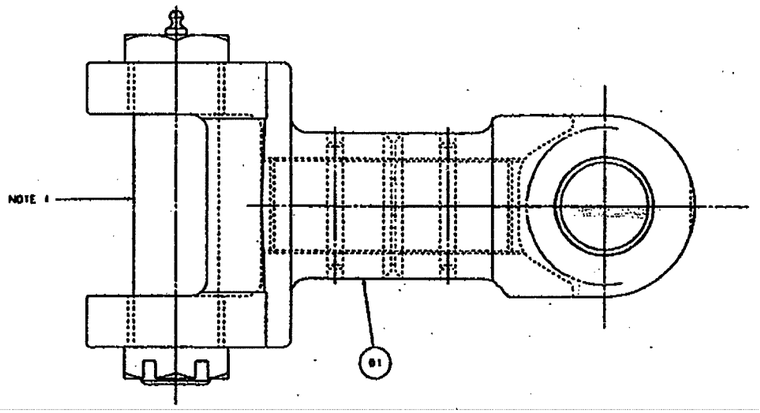
3004			
3003			
3002			
3001			

DIMENSIONS IN [ ] ARE MILLIMETERS

COUPLER HEAD ASSEMBLY

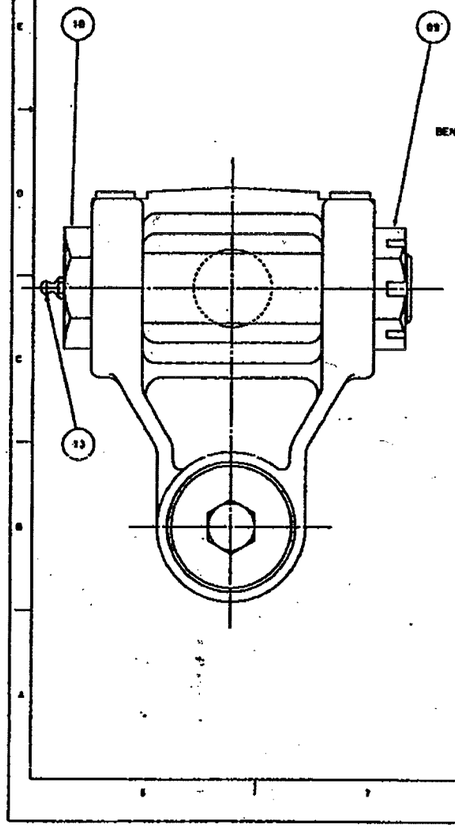
57719

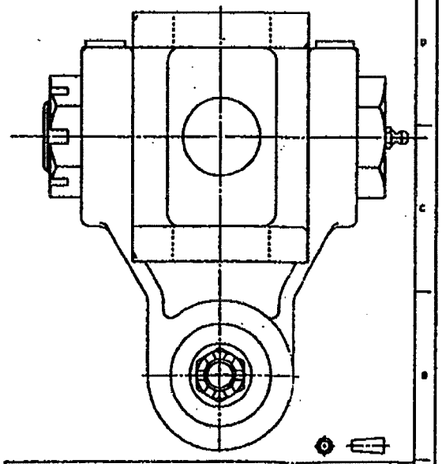
ATTACHMENT 9



NOTES: UNLESS OTHERWISE SPECIFIED

1. DRAWING ITEM NUMBERS CORRESPOND TO SEQUENCE NUMBERS ON COMPUTER GENERATED BILL OF MATERIAL FOR PART NUMBER(S) 0698750
2. INSTALL ALL FOUR (4) FLATWASHERS, ITEM 04, DURING ASSEMBLY PROCESS.
3. TOUCH UP TO M-7745-00.
4. APPLY M-7641-03 TO SURFACE. DO NOT PAINT.
5. APPLY M-7499-48(ANTI-SIEZE COMPOUND)





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M- 2765-00
M- 7641-03

UNSPECIFIED TOLERANCES

DAC 020930
CTR 020930

YOKE-DRAFT GEAR ASSEMBLY

E 0698750 0A

ATTACHMENT 10