TRANSPORTATION DISTRICT COMMISSION

OF HAMPTON ROADS

INVITATION FOR BID

FOR

PROVISION OF LRV LOCKED AXLE DOLLY TRUCK SET

IFB #09 – 50378

ISSUE DATE: February 23, 2009

1. All Procurement instructions are included herein. LRV Locked Axle Dolly truck set procured under the resulting contract will be governed by the Scope of Work and Special and General Provisions included herein.

2. Please submit your bids be received by HRT no later than 2:00 p.m. local time on Friday, March 20, 2009 addressed as follows:

   Hampton Roads Transit (Attn: Charles Bashay)
   To be Opened by Sr. Contracting Officer Only
   Solicitation IFB #09-50378
   1500 Monticello Avenue
   Norfolk, VA 23510

Charles A. Bashay

Charles Bashay
Senior Procurement Officer
FI-910

Hampton Roads Transit
3400 Victoria Boulevard, Hampton, Virginia 23661
Phone: 757-222-6000 ~ Southside Fax: 757-222-6103
Peninsula Fax: 757-222-6195 ~ www.hrtransit.org

Invitation for Bid #09-50378

Thank you for your interest in public transit projects in Hampton Roads. Attached are the solicitation documents and information necessary to participate in the competition.

Below is a brief synopsis of the acquisition.

Description of work:	Provision of one (1) LRV Locked Axle Dolly Truck Set
Solicitation type:	Invitation for Bid
Contract type:	Firm-fixed price
Basis of award:	Low bid
Anticipated award date:	April 24, 2009
Performance period:	Deliver August 27, 2009
Pre-proposal conference:	None
Bid Opening:	Bids are due March 20, 2009, 2 p.m. Bid opening will be held at 1500 Monticello, Norfolk, VA.

NOTE: Communication regarding this acquisition with others at HRT, other than the Contracting Officer, is improper and could cause cancellation and resolicitation.

For a listing of the documents to be returned to us as part of your bid offer, see Preparation of Bids, paragraph 4, Solicitation Instructions. This transmittal letter does not become part of any resulting contract. We look forward to hearing from you.

Charles A. Bashay
Charles Bashay
Senior Procurement Officer

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SOLICITATION, OFFER AND AWARD

CONTRACT NO.	SOLICITATION NO.	DATE ISSUED	ADDRESS OFFER TO
09-50378	[X] SEALED BIDDING [ ] NEGOTIATED	Feb 23, 2009	Hampton Roads Transit 3400 Victoria Boulevard Hampton, Virginia 23661

The terms "bidder" and "offeror" are used interchangeably depending on the type of solicitation.

SOLICITATION INFORMATION

Sealed offer in **1 Original and (See Bid Proposal Instructions) 3 copies** for furnishing the supplies or services in the Schedule will be received at the Commission until **2:00 P.M. local time, March 20, 2009**

All offers are subject to the following:
1. Solicitation Instructions, Schedule, Special, and General Provisions, included herein.
2. Solicitation amendments.
3. Such other provisions, representations, certifications, specifications, and documents as are attached or incorporated herein by reference.

SCHEDULE (To be completed by Offeror)

ITEM NO.	SUPPLIES/SERVICES	QUANTITY	UNIT	UNIT PRICE	BID AMOUNT
1.	LRV Locked Axle Dolly Truck Set	1			

OFFEROR (To be completed by Offeror)

Name
Address
Phone
Fax
Email

Name and Title of Person Authorized to Sign Offer (Print or Type)

Signature Offer Date

This is a binding offer subject to the terms and conditions contained herein and represents the bidder's full compliance and intent to stay in compliance with the certifications and assurances herein.

AWARD (To be completed by Contracting Officer)

ACCEPTANCE AND AWARD ARE HEREBY MADE FOR THE FOLLOWING ITEM(S):

ITEM NO.	QUANTITY	UNIT	UNIT PRICE	BID AMOUNT

The total amount of this award is $_____.

Name of Contracting Officer and Organization Signature Award Date

ACKNOWLEDGEMENT OF AMENDMENTS

Solicitation No: 09-50378 Title: LRV Locked Axle Dolly Truck Set

The undersigned, as part of submission of an offer for the above solicitation, hereby acknowledges receipt of the following amendments and certifies that the offer has been prepared in accordance with their provisions:

AMENDMENT NO.	DATE	TITLE/SUBJECT

ACKNOWLEDGED BY: _____
(SIGNATURE)

SIGNER'S NAME: _____ TITLE: _____

FIRM NAME: _____ DATE: _____

SCHEDULE AND OTHER INFORMATION

1. SCHEDULE

Bids shall include all work necessary to perform services as indicated in the Scope of Work and other documents herein.

Period of Performance: Delivery no later than August 27, 2009

2. ADMINISTRATION INFORMATION

Invitation for Bid Number: # 09-50378

Contracting Officer: Charles Bashay, 757-222-6008; fax 757-222-6062

Project Manager: Michael J. Perez

Billing and Payment Address: HRT, Accounts Payable, 3400 Victoria Blvd, Hampton, VA 23661

Commission Funding and Accounting Code: TBD

3. LOCKED AXLE DOLLY TRUCK SET DELIVERY ADDRESS: Locked Axle Dolly truck set shall be delivered to the address identified below:

Hampton Roads Transit
Attn: Pierre Marcellus (Storeroom Manager)
509 East 18th Street
Norfolk, VA 23504

Hampton Roads Transit
LRV Locked Axle Dolly Truck Set

1.0 Scope Of Work

This Specification outlines the requirements to furnish and deliver one truck set of locked axle dollies for operation in Hampton Roads Transit's (HRT) Light Rail Transit system, complete as specified herein.

2.0 Technical Data

2.1 General:

The Locked Axle Dollies shall be designed to operate in the HRT's Light Rail Transit System. They shall have the capability to negotiate the entire system, including mainline, yard, and "special" track-work, while transporting HRT's low floor Siemens S-70 Light Rail Vehicle (LRV). Special track-work includes, but may not be limited to:

- Switches
- Crossovers
- Turnouts
- Super-Elevations
- Frogs, both flange- and tread-bearing
- Road Crossings
- And track equipped with strap-guard

2.2 Locked Axle Dolly Characteristics:

2.2.1 The design shall permit disassembly of the dollies into components that weigh no more than 90 lbs, unless otherwise approved by HRT.

2.2.2 Movements of the LRV relative to the dollies shall be restricted except as required to prevent binding and to insure safe and reliable operations.

2.2.3 The dollies shall withstand, without sustaining damage, all forces resulting from the weight of the LRV, dynamic shocks and vibrations, and the thrust-loads generated during rescue operations, including towing.

2.2.4 Dollies shall be capable of being installed beneath either a motor truck or a non-motored truck.

2.2.5 All metal surfaces shall be properly prepared and painted with a minimum of two (2) coats of primer and two (2) coats of hardened polyurethane enamel. The dollies shall be painted "safety-yellow".

2.3 LRV Physical Characteristics:

HRT's LRV is Model S-70 as manufactured by Siemens Transportation Systems. The vehicle is comprised of three (3) carbody sections, two (2) sections having dual axle bogie assemblies and one (1) section having four (4) independent stub axles. The vehicle is 28.528 meters long.

2.3.1 Weights (AW0):

- Nominal Weight of a LRV 45,200 kg.
- Nominal axle load 7,900 kg.
- Estimated side to side imbalance at AW0 114 kg.

2.3.2 Clearance:

- Truck clearance, above the top of rail 80 mm.
- The aluminum journal boxes limit the space available outboard of the wheels and cannot be used as a load-bearing interface for the dollies.

2.4 Track Geometry:

2.4.1 Axle dollies shall be designed to function safely within HRT's track geometry as specified in the attached Manual of Design Criteria.

2.4.2 Bidder shall identify, at the time of bid, the maximum dimensional deviations from HRT's track design criteria permissible, while still maintaining safe operation of the axle dollies.

2.5 Wheel and Truck Geometry:

2.5.1 Wheel Profile:

The wheel profile shall be in accordance with the attached drawing, number RN02.185 or as recommended by the dolly manufacturer.

2.5.2 Wheel Face Gauge (back-to-back):

1360 mm

2.5.3 Wheel Diameter:

New = 660-mm
Worn = 580-mm

2.5.4 Truck Wheelbase:

Motor Truck Wheelbase 1900-mm
Center Truck Wheelbase 1800-mm

3.0 Design Requirements

3.1 Proposed axle dollies shall be of a service proven design having successfully operated in the U.S. transit environment.

4.0 Manuals & Drawings

4.1 Contractor shall provide "As-Built" contract drawings upon delivery of the complete dollies. Drawings shall include, but not be limited to the following:

- All Mechanical and Structural information
- All Dimensions
- Parts lists for all replaceable components

Drawings shall show fastener torque values (where applicable).

4.2 Contractor shall provide operating and instruction manuals covering the dollies. Manuals shall be in sufficient detail to describe proper operation, maintenance and repair procedures, warnings and other safety information.

4.3 Manuals and drawings shall be submitted in the English Language with English dimensional measurements (metric measurements may be included in parentheses). Two (2) copies of each "As-Built" manual, drawing, and schematic shall be submitted to HRT upon delivery of the dollies. One (1) set of the manuals, drawings, and schematics shall be provided in bound paper form, the other set shall be provided on CD ROM.

4.4 Manuals provided on CD shall be formatted in Microsoft Word, version 6.0 or higher, Adobe PDF of HTML complete with a detailed index and appropriate document linking. Drawings provided on CD shall use CADD in DGN, DWG, or DFX format. Photographs or image files shall be supplied in BMP, GIF, JPG, or TIF format.

5.0 Training

5.1 Contractor shall furnish on-site training to instruct HRT's personnel on the proper operation and maintenance of the specified equipment. Training shall be for one

(1) days, approximately eight (8) hours, and shall be held at a location to be determined in Norfolk, Virginia. Training shall be hands-on demonstration of installing the dollies beneath a motor truck and a center truck on a Siemens S-70 on both imbedded and ballasted track, demonstrating all features of the various pieces of equipment and their functions. Contractor shall be responsible for the presence of an authorized factory representative to assist in the training. Schedule and number of persons will be determined by HRT.

6.0 Contractor Qualifications

To be eligible for award, Bidder shall meet the following requirements:

6.1 Contractor shall have been in the business of providing equipment, services, adjustments, and repair services on equipment covered by these specifications for a minimum of three (3) years.

6.2 Bidder shall provide, at the time of bid, at least three U.S. references for which similar or identical dollies having been provided as stated within this specification. Bidder shall list the company name, address, telephone number and contact person for each reference. HRT may contact any or all references regarding the quality of product, timeliness of work, and general overall services provided by the Bidders firm. HRT will decide if the reference provided a "favorable" rating. If a rating other than "favorable" is obtained, HRT may elect to reject the bid at its sole discretion, and HRT's decision shall be final.

6.3 Bidder shall provide, with the proposal, sufficient design documentation certifying proposed equipment will perform the intended function Failure to provide information as required will result in the rejection of the proposal.

7.0 Warranty

7.1 All equipment shall be warranted against defects in materials and workmanship for a period of two (2) years, commencing on the date HRT accepts the equipment as operable and complete.

7.2 Contractor shall provide repair service to cover warranty repairs within 48 hours notice by HRT. Warranty repairs will not be chargeable to HRT, and shall include all parts, materials, labor, travel, shipping and other expenses needed to restore the dollies to a fully functioning and properly operating.

7.3 This warranty is in addition to any rights provided under the Uniform Commercial Code or any other remedy provided by law.

8.0 Delivery

8.1 Contractor shall deliver complete set of locked axle dolly equipment within 120 calendar days of "Notice to Proceed". Each set shall contain the appropriate dolly equipment to properly fit and move one (1) LRV as specified herein.

8.2 Delivery shall be in the quantity as indicated on the proposal. All equipment shall be F.O.B. delivered to the following location:

Hampton Roads Transit
Attention: Mr. Pierre Marcellus
509 E 18th Street
Norfolk, VA 23510

8.3 All shipping containers shall be clearly labeled "Locked Axle Dolly", and be accompanied with the corresponding shipping contents list.

9.0 Attachments

9.1 The following attachments are included and shall become a part of this specification:

- RN02.185.– Wheel profile
- REF.0009 Manual of Design Criteria Report (pages *i–ix* and A1–B16)

10.0 Payment

10.1 Contractor will be paid in "lump sum" upon completion and acceptance of the operating equipment and all deliverables by HRT's Project Manager in accordance with the proposal pricing indicated. Contractor will be paid when all criteria; including manuals and drawings have been provided under this contract and accepted by HRT.

SOLICITATION INSTRUCTIONS

1. Definitions

a. The term "solicitation" means this "Invitation for Bid"(IFB).

b. The term "offer" means "sealed bid", the term "offeror"means "bidder".

2. Cautions to Offerors

a. Offerors are expected to examine the drawings, specifications, Schedule, and all instructions. Failure to do so will be at the offeror's risk. Notwithstanding the provision of statements of work, drawings, technical specifications, or other data by the Commission, the contractor shall have the responsibility of supplying all services, materials, and details required to perform the work even though such details may not be specifically mentioned. Any request, condition, exception, reservation, understanding, or other deviation by Contractor not separately stated as required by solicitation instructions shall be invalid and shall not be binding on the Commission.

b. Time, as stated herein, is calendar days.

c. Unit price for each unit offered shall be shown and such price shall include all labor and material required to provide the identified item unless otherwise specified. In case of a discrepancy between a unit price and extended price, the unit price will be presumed to be correct, subject, however, to correction to the same extent and in the same manner as any other mistake.

d. Offers for supplies or services other than those specified will not be considered unless authorized by the solicitation.

3. Communications with the Commission

All communication in regard to any aspect of this solicitation shall be with the Contracting Officer, not with any members of the Commission, or its employees and consultants, in regard to any aspect of this solicitation. Violation of this provision may result in the rejection of a proposal or cancellation of the solicitation. In the latter event, the offending party will not be permitted to participate in any resolicitation as a prime or as a subcontractor.

Any explanation desired by an offeror regarding the meaning or interpretation of the solicitation drawings, specifications, etc., shall be requested in writing. Oral explanations or instructions given before the award of the contract shall not be binding. Material information and/or changes concerning a solicitation will be furnished promptly to all prospective bidders as an amendment of the solicitation.

4. Preparation of Bids

Bids shall be submitted in a sealed envelope, identified on the outside of the package

with the name of the bidding firm, the number and title of the solicitation. The bid submittal shall include the following:

a. Completed and executed Solicitation, Offer and Award form
b. Completed and executed Acknowledgement of Amendments form
c. Completed and executed Representations and Certifications
d. Completed and executed Price Schedule
e. All other documents required by the Specification to be submitted with the bid

5. Responsiveness and Responsibility

A responsive bid is one that complies with all material requirements of the solicitation, and which provides an offer which may be accepted by the Commission with discussions or clarifications. A responsive bid cannot contain any exceptions to the terms of the solicitation, whether technical or contractual. If a bidder desires modifications to the solicitation, they must be requested in writing not less than five (5) working days before the date scheduled for opening of bids.

A responsible bidder is one who is fully capable of fully performing the contract and who possesses the technical, financial, and personnel resources to do so. A responsibility evaluation will also consider the reputation and industry standing of the firm, including its performance on previous or current projects for the Commission or others.

6. Basis of Award

This is a sealed bid procurement. Award will be made to the responsive bid from a responsible bidder which offers to perform the work required for the lowest price. The price of the work, except for modifications to the scope and specification during the performance of the contract, is fixed at the time of the bid opening.

7. Submission of Bids

Sealed Bids shall be enclosed in sealed envelopes and addressed as specified below. Electronic offers will not be considered; however, offers may be modified or withdrawn by written or electronic notice, provided such notice is received prior to the hour and date specified for receipt.

Bids must be received by HRT no later than 2:00 p.m. local time on March 20, 2009.

Hampton Roads Transit (Attn: Charles Bashay)
To be Opened by Contracting Officer Only
Solicitation IFB #09-50378
1500 Monticello Avenue
Norfolk, VA 23510

Note: The U.S. Postal Service does not deliver to the Norfolk address; however, commercial express delivery services do.

8. Late Submissions, Modifications, and Withdrawals of Offers

(a) Bidders are responsible for submitting bids, and any modifications or withdrawals, so as to reach the HRT office designated in the IFB by the time specified herein. If no time is specified in the IFB, the time for receipt is 2:00 p.m., local time, on the date that bids are due.

(b) (1) Any bid, modification, or withdrawal received at the designated HRT office after the exact time specified for receipt of bids is "late" and will not be considered unless it is received before award is made, the Contracting Officer determines that accepting the late bid would not unduly delay the acquisition; and-

(i) If it was transmitted through an electronic commerce method authorized by the IFB, it was received at the initial point of entry to HRT infrastructure not later than 5:00 p.m. one working day prior to the date specified for receipt of bids; or

(ii) There is acceptable evidence to establish that it was received at the designated HRT office and was under HRT's control prior to the time set for receipt of bids.

(2) However, a late modification of an otherwise successful bid that makes its terms more favorable to HRT will be considered at any time it is received and may be accepted.

(c) Acceptable evidence to establish the time of receipt at HRT installation includes the date/time stamp of the installation on the bid wrapper, other documentary evidence of receipt maintained by HRT or a commercial delivery service which delivers the bid, or oral testimony or statements of HRT personnel..

(d) If an emergency or unanticipated event interrupts normal HRT process so that the bids cannot be received at the designated HRT office by the exact time specified in the IFB and either the nature of the emergency or urgent HRT requirements preclude amendment of the IFB, the time specified for receipt of bids will be deemed to be extended to the same time of day specified in the solicitation on the first work day on which the normal Government processes resume.

(e) Bids may be withdrawn by written notice received at any time before the exact time set for receipt of bids. If the IFB authorized facsimile bids, bids may be withdrawn via facsimile received at any time before the exact time set for receipt of bids. A bid may be withdrawn in person by a bidder or its authorized representative if, before the exact time set for receipt of bids, the identity of the person requesting withdrawal is established and the person signs a receipt for the bid.

9. Minimum Proposal Acceptance Period:
Commission requires a minimum acceptance period of 90 calendar days to make award.

10. Not Used

11. Not Used

12. Notice of Protest Policy

Commission policy and procedure for the administrative resolution of protests is set forth in Chapter 13 of the Procurement Procedures Manual (PPM). The PPM contains strict rules for filing a timely protest, for responding to a notice that a protest has been filed, and other procedural matters. The contracting officer can furnish a copy of Chapter 13 upon request. The commission has, in Chapter 13, defined matters which may be protested, the form of protest, and the time limits for submitting protests during different stages of the procurement process. Federal Transit Administration (FTA) Circular 4220.1 E addresses protests of solicitations utilizing Federal funds. FTA will only review protests regarding the alleged failure of the grantee to have a written protest procedure or failure to follow such procedure, or protests alleging a violation of Federal law or regulation. FTA will not consider a protest until the protestor has exhausted its local administrative remedies.

13. Not Used

14. Pre-Award Information

The Contracting Officer may conduct a pre-award survey to determine if the offeror eligible for award is responsible both financially and technically and has the capability to perform the work.

15. Restriction on Disclosure and Use of Data

The Commission is subject to the Virginia Freedom of Information Act (Code of Virginia, 2.2-3700 et seq.). to the extent permitted by that Act, the commission shall provide all reasonable precautions to ensure that information properly identified by an offeror as proprietary is held confidential within the review process. Bidders shall attach to each page containing any proprietary data of any proposal or modification thereof the following legend:

> This page contains data which is proprietary to the offeror or confidential business information not subject to disclosure under the Virginia Public Records Act, the Commission's policies, or the terms of this solicitation. It is therefore not to be disclosed inside or outside the Commission, be duplicated, or used in whole or in part, for any purpose other than to evaluate this offer; provided that, if a contract is entered into on the basis of this offer, the Commission shall have the right to duplicate, use, and disclose this data as part of the contract document or as required for performance of the contract.

Identification of such proprietary information must be specific. Any general identification of the document as a whole, or of pages which patently do not contain proprietary information, shall render the entire document non-confidential.

In a sealed bid, the contents of the bid itself, including pricing and other documentation required at the time of bid submittal are open to the public. Information requested after bid opening may be considered confidential.

16. Pre-Bid Conference.

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Not Applicable.

REPRESENTATIONS AND CERTIFICATIONS

REPRESENTATIONS (Check or complete all applicable boxes or blocks)

The offeror, _____, represents each of the following.

1. TYPE OF BUSINESS ORGANIZATION

It operates as [__] an individual, [__] a partnership, [__] a nonprofit organization, or [__] a corporation, incorporated under the laws of the State of _____.

2. DISADVANTAGED BUSINESS ENTERPRISE

It is [__], [__] is not, a disadvantaged business enterprise.

Woman-owned	[____]
Black American	[____]
Hispanic American	[____]
Native American	[____]
Asian-Pacific Americans	[____]
Asian-Indian Americans	[____]
Other minority per Section 8 (a)	[____]

"Disadvantaged Business Enterprise" means a small business concern (as defined by 49 CFR Part 23.62 as amended) (1) which is at least 51% owned by one or more socially and economically disadvantaged individuals, or in the case of any publicly owned business, at least 51% of the stock is owned by one or more socially and economically disadvantaged individuals; and (2) whose management and daily business operations are controlled by one or more socially and economically disadvantaged individuals who own it.

"Socially and Economically Disadvantaged Individuals" means those individuals who are citizens of the United States (or lawfully admitted permanent residents) who are Women, Black Americans, Hispanic Americans, Native Americans, Asian-Pacific Americans, or Asian-Indian Americans and any other minorities or individuals found to be disadvantaged by the Small Business Administration pursuant to Section 8(a) of the Small Business Act.

3. AFFILIATION AND IDENTIFYING DATA

Each offeror shall complete (a),(b) if applicable, (c) and (d) below:

a. It [__] is, [__] is not owned or controlled by a parent company. For this purpose, a parent company is defined as one which either owns or controls the activities and basic business policies of the proposer. To own another company means the parent company must own at least a majority, i.e., more than 50 percent, of the voting rights in that company.

To control another company, such ownership is not required; if another company is able to formulate, determine or veto basic business policy decisions of the proposer, such other company is considered the parent of the proposer. This control may be exercised through the use of dominant minority voting rights, use of proxy voting, contractual arrangements or otherwise.

b. If the offeror is owned or controlled by a parent company, it shall insert in the space below the name and main office address of the parent company:

Name of Parent Company

Main Office Address (including ZIP Code)

c. If the offeror has no parent company, it shall provide in the applicable space below its own Employer's Identification Number (E.I. No.), i.e., Federal Social Security Identification Number used on Federal Tax Returns or, if it has a parent company, the E.I. No. of its parent company.

Offeror's E.I. Number: _____ or,

Parent Company's E.I. Number: _____

d. With respect to the Data Universal Numbering Systems (DUNS), the following applies.

1) The offeror shall insert the DUNS number applicable to the offeror's address entered on the Solicitation, Offer & Award Form:

DUNS Number _____

2) If a DUNS number has not been established for the address indicated in paragraph (d) 1) of this provision, the Authority will arrange for the assignment of this number after award of a contract and will notify the Contractor accordingly.

4. REPRESENTATIONS – NONDISCRIMINATION

a. It [__] has, [__] has not, participated in a previous contract or subcontract subject to either the Equal Opportunity Clause of this solicitation, or the clause originally contained in Section 310 of Executive Order Number 10925, or the clause contained in Section 201 of Executive Order Number 11114;

b. It [__] has, [__] has not, filed all required compliance reports; and

c. Representations indicating submittal of required compliance reports signed by proposed subcontractors will be obtained prior to subcontract awards.

d. The above representation need not be submitted in connection with contracts or subcontracts which are exempt from the clause.

5. AFFIRMATIVE ACTION COMPLIANCE

a. It has a workforce of _____ employees.

b. It [__] has developed and has on file, [___] has not developed and does not have on file, at each establishment, affirmative action programs required by the rules and regulations of the Secretary of Labor (41 CFR Parts 60-1 and 60-2), or

c. It [__] has not previously had contracts subject to the written affirmative action program requirements of the rules and regulations of the Secretary of Labor.

CERTIFICATIONS (Check or complete all applicable blocks)

By signing and dating this offer, each offeror certifies each of the following.

6. DEBARRED OR INELIGIBLE CONTRACTORS

a. The offeror certifies, by submission of this bid or proposal, that neither it nor its principals (as defined at 49 C.F.R. Paragraph 29.105) is presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from participation in this transaction by any Federal department or agency.

b. When the offeror is unable to certify to the statements in this certification, such offeror shall attach an explanation to this proposal.

c. By signing and submitting this bid or proposal, the prospective offeror is providing the signed certification set out below. The certification in this clause 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 offeror knowingly rendered an erroneous certification, in addition to other remedies available to the Federal Government, Commission may pursue available remedies, including suspension and/or debarment.

d. The prospective offeror shall provide immediate written notice to Commission if at any time a prospective subcontractor (at any tier) learns that its certification was erroneous when submitted or has become erroneous by reason of changed circumstances.

e. The terms covered transaction, debarred, suspended, ineligible, Alower tier covered transaction, participant, person, 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]. You may contact the Commission Contracting Officer for assistance in obtaining a copy of those regulations.

f. The offeror agrees by submitting this proposal that, should the contract be entered into, it shall not knowingly enter into any subcontract (at any tier) with a firm which is debarred suspended, declared in eligible, or voluntarily excluded, unless authorized in writing by the Contracting Officer.

g. The offeror further agrees by submitting this proposal that it will include this clause without modification, in all subcontracts and solicitations for subcontracts.

h. A prime contractor may rely upon a certification of a subcontractor that it is not debarred, suspended, ineligible, or voluntarily excluded for the contracting, unless it knows that the certification is erroneous. A prime contractor may decide the method and frequency by

which it determines the eligibility of its principals. Each prime contractor may, but is not required to, check the Nonprocurement List issued by U.S. General Service Administration.

i. 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.

j. Except for transactions authorized herein, if a prime contractor under a Commission contract knowingly enters into a subcontract (at any tier) with a firm which is suspended, debarred, ineligible, or voluntarily excluded from contracting, in addition to all remedies available to the Federal Government, Commission may pursue available remedies including suspension and/or debarment.

7. CLEAN AIR AND WATER [Applicable if the offer exceeds $100,000, or the Contracting Officer believes that orders under an indefinite contract in any year will exceed $100,000 or a facility to be used has been the subject of a conviction under the Clear Air Act (42 U.S.C. 7413(c)(1) or the Water Act (33 U.S.C. 1319(c)) and is listed by the Environmental Protection Agency(EPA) as a violating facility, and the acquisition is not otherwise exempt.]

a. Any facility to be utilized in the performance of this proposed contract [___] is, or [___] is not listed on the EPA list of Violating Facilities;

b. It will immediately notify the Contracting Officer, before award, of the receipt of any communications from the Administrator, or a designee of the EPA, indicating that any facility which it proposes to use for the performance of the contract is under consideration to be listed on the EPA List of Violating Facilities; and

c. It will include a certification substantially the same as this certification, including this paragraph (c), in every non-exempt subcontract.

8. CERTIFICATION OF NONSEGREGATED FACILITIES

a. It does not and will not maintain or provide for its employees any segregated facilities at any of its establishments, and that it does not and will not permit its employees to perform their services at any location under its control, where segregated facilities are maintained.

b. The bidder agrees that a breach of this certification is a violation of the Equal Opportunity Clause in the contract.

c. As used in this certification, the term "segregated facilities" means any waiting rooms, work areas, rest rooms and wash rooms, restaurants and other eating areas, time clocks, locker rooms and other storage or dressing areas, parking lots, drinking fountains, recreation or entertainment areas, transportation, and housing facilities provided for employees which are segregated by explicit directive or are in fact segregated on the basis of race, color, religion or national origin, because of habit, local custom or otherwise.

d. It further agrees that (except where it has obtained identical certifications from proposed subcontractors for specific time periods) it will:

(1) Obtain identical certifications from proposed subcontractors before the award of subcontracts under which the subcontractor will be subject to the Equal Opportunity clause;

(2) Retain such certifications in its files; and

(3) Forward the following notice to such subcontractors (except if the proposed subcontractors have submitted identical certifications for specific time periods):

Notice to Prospective Subcontractors of Requirements
for Certifications of Nonsegregated Facilities

A Certification of Nonsegregated Facilities must be submitted prior to award of a subcontract exceeding $10,000 which is not exempt from the provisions of the Equal Opportunity clause. The certification may be submitted either for such subcontract or for all subcontracts during a period (i.e., quarterly, semiannually or annually).

9. COVENANT AGAINST GRATUITIES

Neither it nor any of its employees, representatives or agents have offered or given gratuities (in the form of entertainment, gifts or otherwise) to any director, officer or employee of the Authority with the view toward securing favorable treatment in the awarding, amending, or the making of any determination with respect to the performing of the contract.

10. LOBBYING

31 U.S.C. 1352, 49 CFR Part 19, 49 CFR Part 20
(Applicable to Construction/Architectural and Engineering/Acquisition of Rolling Stock/Professional Service Contract/Operational Service Contract/Turnkey contracts.)

Mandatory Clause/Language
- Clause and specific language therein are mandated by 49 CFR Part 19, Appendix A.

Modifications have been made to the Clause pursuant to Section 10 of the Lobbying Disclosure Act of 1995, P.L. 104-65 [to be codified at 2 U.S.C. § 1601, *et seq.*]

- Lobbying Certification and Disclosure of Lobbying Activities for third party contractors are mandated by 31 U.S.C. 1352(b)(5), as amended by Section 10 of the Lobbying Disclosure Act of 1995, and DOT implementing regulation, "New Restrictions on Lobbying," at 49 CFR § 20.110(d)

- Language in Lobbying Certification is mandated by 49 CFR Part 19, Appendix A, Section 7, which provides that contractors file the certification required by 49 CFR Part 20, Appendix A.

Modifications have been made to the Lobbying Certification pursuant to Section 10 of the Lobbying Disclosure Act of 1995.

- Use of "Disclosure of Lobbying Activities," Standard Form-LLL set forth in Appendix B of 49 CFR Part 20, as amended by "Government wide Guidance For New Restrictions on Lobbying," 61 Fed. Reg. 1413 (1/19/96) is mandated by 49 CFR Part 20, Appendix A.

Byrd Anti-Lobbying Amendment, 31 U.S.C. 1352, as amended by the Lobbying Disclosure Act of 1995, P.L. 104-65 [to be codified at 2 U.S.C. § 1601, et seq.] - Contractors who apply or bid for an award of $100,000 or more shall file the certification required by 49 CFR part 20, "New Restrictions on Lobbying." Each tier certifies to the tier above that it will not and has not used Federal appropriated funds to pay any person or organization for influencing or attempting to influence an officer or employee of any agency, a member of Congress, officer or employee of Congress, or an employee of a member of Congress in connection with obtaining any Federal contract, grant or any other award covered by 31 U.S.C. 1352. Each tier shall also disclose the name of any registrant under the Lobbying Disclosure Act of 1995 who has made lobbying contacts on its behalf with non-Federal funds with respect to that Federal contract, grant or award covered by 31 U.S.C. 1352. Such disclosures are forwarded from tier to tier up to the recipient.

APPENDIX A, 49 CFR PART 20--CERTIFICATION REGARDING LOBBYING

Certification for Contracts, Grants, Loans, and Cooperative Agreements

(To be submitted with each bid or offer exceeding $100,000)

The undersigned [Contractor] certifies, to the best of his or her knowledge and belief, that:

(1) 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.

(2) If any funds other than Federal appropriated funds have been paid or will be paid to any person for making lobbying contacts to 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 Form to Report Lobbying," in accordance with its instructions [as amended by "Government wide Guidance for New Restrictions on Lobbying," 61 Fed. Reg. 1413 (1/19/96). Note: Language in paragraph (2) herein has been modified in accordance with Section 10 of the Lobbying Disclosure Act of 1995 (P.L. 104-65, to be codified at 2 U.S.C. 1601, *et seq* .)]

(3) 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)(1)-(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. A 3801, *et seq., apply* to this certification and disclosure, if any.

_____ Signature of Contractor's Authorized Official

_____ Name and Title of Contractor's Authorized Official

_____ Date

11. CERTIFICATE OF CURRENT COST OR PRICING DATA

This is to certify that, to the best of my knowledge and belief, the cost or pricing submitted, either actually or by specific identification in writing, to the Contracting Officer or to the Contracting Officer's representative are accurate, complete, and current as of the date of contract award. This certification shall also apply to any contract modifications.

By submission of a bid or offer, bidder certifies that throughout performance of the resulting contract and any modifications and extensions, all costs and pricing are in accordance with federal cost principles as shown in OMB Circular A-87. This Part controls the determination of allowable costs and reasonable profit.

12. BUY AMERICA CERTIFICATION (Applicable over $100,000)

The contractor agrees to comply with 49 U.S.C. 5323(j) and 49 CFR 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 CFR 661.7, and include final assembly in the United States for 15 passenger vans and 15 passenger wagons produced by Chrysler Corporation, microcomputer equipment, software, and small purchases (currently less than $100,000) made with capital, operating, or planning funds. Separate requirements for rolling stock are set out at 5323(j)(2)(C) and 49 CFR 661.11. Rolling stock not subject to a general waiver must be manufactured in the United States and have a 60 percent domestic content.

A bidder or offeror must submit to the FTA recipient the appropriate Buy America certification (below) with all bids 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 steel, iron, or manufactured products.

Certificate of Compliance with 49 U.S.C. 5323(j)(1)

The bidder or offeror hereby certifies that it will meet the requirements of 49 U.S.C. 5323(j)(1) and the applicable regulations in 49 CFR Part 661.

Date _____

Signature _____

Company Name _____

Title _____

Certificate of Non-Compliance with 49 U.S.C. 5323(j)(1)

The bidder or offeror hereby certifies that it cannot comply with the requirements of 49 U.S.C. 5323(j)(1), but it may qualify for an exception pursuant to 49 U.S.C. 5323(j)(2)(B) or (j)(2)(D) and the regulations in 49 CFR 661.7.

Date _____

Signature _____

Company Name _____

Title _____

Certification requirement for procurement of buses, other rolling stock and associated equipment.

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 CFR Part 661.

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), but may qualify for an exception pursuant to 49 U.S.C. 5323(j)(2)(B) or (j)(2)(D) and the regulations in 49 CFR 661.7.

Date _____

Signature _____

Company Name _____

Title _____

PRE-AWARD EVALUATION DATA

The below information is *confidential* and will not be divulged to any unauthorized personnel.

Submission of a bid or proposal for the supplies and/or services prescribed herein certifies to the accuracy of all information.

Project Name: _____

1. Company Name: _____

2. Date Organized: _____ State Incorporated: _____

3. Type of Firm: [__] Individual [__] Partnership [__] Corporation [__] Joint Venture

4. Dun and Bradstreet Number: _____

5. How long has your firm been in business under its present name? _____

6. Attach names of officers or partners.

7. Attach list of similar contracts held. Include customer point of contact and phone. (Disregard if this information is contained elsewhere within the proposal.)

8. Attach your financial statements (most recent fiscal year) and letters from banks regarding credit. Provide whatever documents appropriate to verify financial responsibility and capability to properly perform this contract.

9. In the last two years have you or your proposed subcontractors ever been denied award where you were low bidder/offeror? If yes, attach explanation.

10. Have you or your proposed subcontractors ever failed to complete, in the last two years, any contract on which you were the successful bidder/offeror? If yes, attach explanation.

11. What percentage of work (contract amount) do you intend performing with your own personnel? _____%.

12. Attach a list of principal subcontractors, principal items of work, and the percentage (or dollar amount) each will perform. (Disregard if this information is contained elsewhere within the proposal.)

13. Do you certify that your firm is in compliance with federal tax, labor and employment, environmental, antitrust, and consumer protection laws? If unable to so certify, explain.

SPECIAL PROVISIONS

1. TYPE OF CONTRACT

This is a firm-fixed price contract

2. DELIVERY RE-LOCATION

LRV Locked Axle Truck Set delivery to HRT shall be in accordance with paragraph **8.0 Delivery,** in the Scope of Work. However, the HRT Storeroom facility may relocate to another storage location prior to the specified delivery date. The new location shall be within five (5) miles of the delivery address in paragraph 8.0.

Vendor shall notify the Storeroom Manager, Pierre Marcellus, telephonically (757-222-6044) and in writing, thirty days before LRV Locked Axle Dolly Truck Set shipment to confirm final delivery location.

GENERAL PROVISIONS – Services

1. **DEFINITIONS**

a. The term Commission means Transportation District Commission of Hampton Roads.
b. The term Contracting Officer means the person executing this contract on behalf of the Commission, and his or her successor, and the term includes, except as otherwise provided in this contract, the authorized representative of a Contracting Officer acting within the limits of his Commission.
c. Except as otherwise provided in this contract, the term subcontracts includes purchase orders under this contract.
d. Wherever in the scope of the work the words directed, ordered, designated, prescribed, or words of like import are used, it shall be understood that the direction, requirement, order, designation, or prescription of the Contracting Officer is intended and similarly the words approved, acceptable, satisfactory, or words of like import shall mean approved by, or acceptable to, or satisfactory to the Contracting Officer, unless otherwise expressly stated.

2. CHANGES

a. The Contracting Officer may at any time, by a written order, and without notice to the sureties, make changes, within the general scope of this contract.

b. If any such change causes an increase or decrease in the cost of, or the time required for, the performance of any part of the work under this contract, whether changed or not changed by the order, the Contracting Officer shall make an equitable adjustment in the contract price, the delivery schedule, or both, and shall modify the contract.

c. The Contractor must assert its right to an adjustment under this article within 3 days from the date of receipt of the written order. However, if the Contracting Officer decides that the facts justify it, the Contracting Officer may receive and act upon a proposal submitted before final payment of the contract.

d. If the Contractor's proposal includes the cost of property made obsolete or excess by the change, the Contracting Officer shall have the right to prescribe the manner of the disposition of the property.

e. Failure to agree to any adjustment shall be a dispute under the Disputes article. However, nothing in this article shall excuse the Contractor from proceeding with the contract as changed

f. Federal Changes - Contractor shall at all times comply with all applicable FTA regulations, policies, procedures and directives, including without limitation those listed directly or by reference in the Agreement (Form FTA (9) October 2002) between the Commission and FTA, 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.

3. PAYMENT

a. Mail original and one copy of all invoices to Accounts Payable, 3400 Victoria Blvd, Hampton, VA 23661.
b. Payment will only be made after receipt of a proper invoice. A proper invoice includes the purchase order/contract number, date of invoice, dates of delivery of item/service, a description of the item/service delivered, sizes, quantities, unit prices, and extended totals, and the name of the HRT employee that placed the order. Contractor shall also provide a "Certificate of Disbursement of Payment to Subcontractors" with each application for payment. This form is provided in Appendix A.
c. For those contracts which exceed $100,000 and to which the DBE program applies (see Appendix A), the failure to perform in accordance with the program may result in partial or full suspension of payment and/or progress payments. In compliance with the DBE program, contractor shall make payment to DBE subcontractors within 10 days of receiving payment from the Commission. Any retainage held at the completion of a DBE subcontractor's work, such retainage shall be returned to the DBE within 30 days of the completion.
d. Contractor shall, within thirty days of receipt of payment from Commission, make payment to suppliers/subcontractors for work performed or notify Commission of intention and reason to withhold payment.

4. POLICIES FOR ALL TIERS

The Contractor shall ensure appropriate flow-down of applicable contract provisions to appropriate subcontracts of every tier.

5. MILESTONES/SUBMITTALS

Upon project manager request, a milestone plan may be due 10 days after award showing all phases of the contract with items such as subcontract work, materials, reports, training, etc.

6. CONDITIONS AFFECTING THE WORK

The Contractor shall be responsible for having taken steps reasonably necessary to ascertain the nature and extent of the work, and the general and local conditions which can affect the work or the cost thereof. Any failure by the Contractor to do so shall not relieve the Contractor from responsibility for successfully performing work without additional expense to the Commission. The Commission assumes no responsibility for any understanding or representations concerning conditions made by any of its officers or agents prior to the execution of this contract, unless such understanding or representations are expressly stated in the contract.

7. GENERAL INSURANCE REQUIREMENTS

a. The Contractor shall procure and maintain, at his own cost and expense, during the entire period of the performance under this contract, the following types of insurance:

(1) WORKER'S COMPENSATION: A policy complying with the requirements of the statutes of the jurisdiction(s) in which the work will be performed, and if there is any exposure to any of the Contractor or subcontractor personnel with the U. S. Longshoremen's and Harbor Workers' Act, Jones Act, Admiralty Laws or the Federal Employers' Liability Act, the Contractor will provide coverage for these requirements.

Worker's Compensation:	STATUTORY
Employer's Liability - Each Accident:	$1,000,000
Disease Policy Limits:	$1,000,000
Disease - Each Employee:	$1,000,000

(2) Not Used

(3) COMMERCIAL / COMPREHENSIVE GENERAL LIABILITY:

The Contractor and any Subcontractor shall provide a valid Certificate of Insurance listing the insurance coverage maintained. The liability insurance maintained by the Contractor and any Subcontractor shall include, at a minimum, the following coverage;

[x] Premises - Operations
[x] Contractual – This contract
[x] Independent Contractors
[x] Broad Form Property Damage / Fire Legal Liability

The minimum Limit of Liability shall be:

Bodily Injury (per person / occurrence)	$1,000,000
Property Damage (per occurrence)	$ 50,000
Or	
Combined Single Limit per Occurrence	$1,000,000

If the insurance contract has a Limit of Liability Aggregate, the minimum Aggregate level shall be $1,000,000 per policy year.

The Commission shall be included as an additional insured under the coverage for Commercial General Liability insurance with respect to all activities under this contract and shall provide a copy to the contracting officer.

b. SPECIAL PROVISIONS OF INSURANCE FURNISHED BY CONTRACTOR

(1) The Contractor shall forward to the Contracting Officer for approval a certificate, or certificates, issued by the insurer(s), of the insurance required under the foregoing provisions, including special endorsements. Such certificate(s) shall be in a form satisfactory to the Commission and shall list the various coverages and limits. Insurance companies providing the

coverage must be acceptable to Commission; rated by A.M. Best and carry at least an "A" rating. In addition to any provisions herein before required, a provision of such insurance policies shall be that the policies shall not be changed or canceled, and they will be automatically renewed upon expiration and continued in full force and effect until final acceptance by the Commission of all work covered by the contract, unless the Commission is given thirty (30) days written notice before any change or cancellation is made effective. The Contractor shall promptly furnish the Contracting Officer with a certified copy of each insurance policy upon request.

(2) All insurance shall be procured from insurance or indemnity companies acceptable to the Commission/Jurisdiction and licensed and authorized to do business in Commonwealth of Virginia. Commission/Jurisdiction approval or failure to disapprove insurance furnished by the Contractor shall not release the Contractor of full responsibility for liability for damage and accidents.

(3) If at any time the above required insurance policies should be canceled, terminated or modified so that the insurance is not in full-force and effect as required herein, the Contracting Officer may terminate this contract for Default or obtain insurance coverage equal to that required herein, the full cost of which shall be charged to the Contractor and deducted from any payments due the Contractor.

(4) Any contract of insurance or indemnification naming the Commission, the United States of America or any of its departments, agencies, administrators or authorities, as an insured, shall be endorsed to provide that the insurer will not contend in the event of any occurrence, accident, or claim that the Commission or the United States of America, et al., are not liable in tort by virtue of the fact of being governmental instrumentalities or public or quasi-public bodies.

8. CIVIL RIGHTS REQUIREMENTS

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, section 202 of the Americans with Disabilities Act of 1990, 42 U.S.C. § 12132, and Federal transit law at 49 U.S.C. § 5332, 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 and Federal transit law at 49 U.S.C. § 5332, 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 financed in whole or in part with Federal assistance provided by FTA, modified only if necessary to identify the affected parties.

d. In accordance with the Code of Virginia, the contractor agrees to not discriminate against any employee or applicant for employment because of race, religion, color, sex, or national origin, except where religion, sex or national origin is a bona fide occupational qualification reasonably necessary to the normal operation of the contractor. The contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices setting forth the provisions of this nondiscrimination clause. The contractor, in all solicitations or advertisements for employees placed by or on behalf of the contractor, will state that such contractor is an equal opportunity employer. Notices, advertisements and solicitations placed in accordance with federal law, rule or regulation shall be deemed sufficient for the purposes of meeting the requirements of this section.

9. NONDISCRIMINATION UNDER FEDERAL GRANTS

No otherwise qualified handicapped individual in the United States, as defined in Section 7(6), shall solely by reason of his handicap, be excluded from the participation in, be denied the benefits of, or be subjected to discrimination under any program or activity receiving Federal financial assistance.

10. AUTHORITY OF PROJECT MANAGER

a. The work will be conducted under the general direction of the Contracting Officer. The project manager may take the following actions:

(1) Act as the principal technical point of contact with the Contractor.
(2) Review and approve invoices and payment estimates. In those cases requiring release of final retained percentage of payment, the
PM will make his recommendations in writing to the Contracting Officer;
(3) Coordinate correspondence with the CO if its importance significantly impacts the contractual terms and obligations..
(4) Not Used
(5) Notify the Contracting Officer whenever the PM has reason to believe that the estimated cost not-to-exceed amount will be
exceeded.
(6) Prepare the Commission estimate for proposed contract modifications.
(7) Approve, in writing, the Contractor's progress schedule when required.
(8) Receive from the Contractor, monthly, if applicable, DBE status reports.
(9) Provide the Contracting Officer with a written notification after all supplies/services have been received with statement that PM is
not aware of any open issues that would preclude closeout of the contract and that the contract is ready for closeout.
(10) Initiate exercise of option(s).

b. The contractor shall adhere to the actions below only if received from the Contracting Officer.

(1) Approval of contract modification proposals and/or other unilateral actions.
(2) Issuance of written orders to stop and/or resume work.
(3) Negotiation with the Contractor for adjustment of contract price and/or time.

c. The presence or absence of the PM or his inspectors shall not relieve the Contractor from any requirements of the contract.

11. WARRANTY

a. Definitions. "Acceptance" as used in this clause, means the act of an authorized representative of the Commission by which the Commission assumes for itself or an agent of another, ownership of existing and identified supplies, or approves specific services, as partial or complete performance of the contract. "Correction" as used in this clause, means the elimination of a defect.
b. This contract shall follow the contractor's standard commercial warranty for the items purchased. However, notwithstanding that warranty or inspection and acceptance by the Commission or any provision concerning the conclusiveness thereof, the Contractor warrants that all services performed under this contract will, at time of acceptance, be free from defects in workmanship and conform to the requirements of this contract. The Contracting Officer shall give written notice of any defect or nonconformance by the Commission. This notice shall state either (1) that the Contractor shall correct or re-perform any defective or nonconforming services, or (2) that the Commission does not require corrective action or re-performance.
c. If the Contractor is required to correct or re-perform, it shall be at no cost to the Commission, and any services corrected or re-performed by the Contractor shall be subject to this clause to the

same extent as work initially performed. If the Contractor fails or refuses to correct or re-perform, the Contracting Officer may, by contract or otherwise, correct or replace with similar service and charge to the Contractor the cost occasioned to the Commission thereby, or make an equitable adjustment in the contract price.

e. If the Commission does not require correction or re-performance, the Contracting Officer shall make an equitable adjustment in the contact price.

f. In addition to any other warranties, either express or implied, provided under this contract or by law, the Contractor shall warrant and guarantee that the Information Technology provided as part of this contract is Year 2000 compliant. Year 2000 compliant means that the Information Technology accurately processes date/time data (including but not limited to, calculating, comparing, and sequencing) from, 1999 and 2000 and Leap Year calculations. The Contractor shall be liable for any and all damages, including consequential damages, arising from a breach of this warranty. No other provision of this contract shall be construed to limit the Contractor's liability for a breach of this warranty.

12. INSPECTION OF SERVICES

(a) *Definition:* "Services," as used in this clause, includes services performed, workmanship, and material furnished or utilized in the performance of services.

(b) The Contractor shall provide and maintain an inspection system acceptable to the Commission covering the services under this contract. Complete records of all inspection work performed by the Contractor shall be maintained and made available to the Commission during contract performance and for as long afterwards as the contract requires.

(c) The Commission has the right to inspect all services called for by the contract, to the extent practicable at all times and places during the term of the contract. The Commission shall perform inspections and tests in a manner that will not unduly delay the work.

(d) If any of the services do not conform with contract requirements, the Commission may require the Contractor to perform the services again in conformity with contract requirements, at no increase in contract amount. When the defects in services cannot be corrected by re-performance, the Commission may—

(1) Require the Contractor to take necessary action to ensure that future performance conforms to contract requirements; and

(2) Reduce the contract price to reflect the reduced value of the services performed.

(f) If the Contractor fails to promptly perform the services again or to take the necessary action to ensure future performance in conformity with contract requirements, the Commission may—

(1) By contract or otherwise, perform the services and charge to the Contractor any cost incurred by the Commission that is directly related to the performance of such service; or

(2) Terminate the contract for default.

13. FALSE OR FRAUDULENT STATEMENTS

(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 C.F.R. Part 31, apply to its actions pertaining to this contract. Upon execution, 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 this contract. 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 under a contract connected with a project that is financed in whole or in part with Federal assistance originally awarded by FTA under the authority of 49 U.S.C. § 5307, the 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 paragraphs in each subcontract. It is further agreed that the clauses shall not be modified, except to identify the subcontractor who will be subject to the provisions.

14. TITLE AND RISK OF LOSS

a. Unless this contract specifically provides for earlier passage of title, title to supplies covered by this contract shall pass to the Commission upon formal acceptance, regardless of when or where the Commission takes physical possession.

b. Unless this contract specifically provides otherwise, risk of loss of or damage to supplies covered by this contract shall remain with the Contractor until, and shall pass to the Commission upon:

(1) Delivery of the supplies to a carrier, if transportation is FOB origin;
(2) Acceptance by the Commission or delivery of possession of the supplies to the Commission at the destination specified in this contract, whichever is later, if transportation is FOB destination.

c. Notwithstanding b. (1) above, the risk of loss of or damage to supplies which so fail to conform to the contract as to give a right of rejection shall remain with the Contractor until cure or acceptance, at which time (1) above shall apply.

15. DELAY OF WORK

a. If the performance of all or any part of the work is delayed or interrupted by an act of the Contracting Officer in the administration of this contract, which act is not expressly or impliedly authorized by this contract, or by his failure to act within the time specified, an adjustment (excluding profit) shall be made for any increase in the cost of performance of this contract caused by such delay or interruption and the contract modified in writing accordingly. Adjustment shall be made also in the delivery or performance dates and any other contractual provision affected by such delay or interruption. However, no adjustment shall be made under this article for any delay or interruption to the extent that performance would have been delayed or interrupted by any other cause, including the fault or negligence of the Contractor; or for which an adjustment is provided or excluded under any other provision of this contract.

b. No claim under this clause shall be allowed for any costs incurred more than 20 days before the Contractor shall have notified the Contracting Officer in writing of the act or failure to act involved; and
unless the claim, in an amount stated, is asserted in writing as soon as practicable after the termination of such delay or interruption, but not later than the date of final payment under the contract.

16. STOP WORK ORDER

a. The Contracting Officer may, at any time, by written order to the Contractor, require the Contractor to stop all, or any part of the work called for by this contract for a period of 90 days after the order is delivered to the Contractor, and for any further period to which the parties may agree. Any such order shall be specifically identified as a STOP WORK ORDER issued pursuant to this article. Upon receipt of such an order, the Contractor shall forthwith comply with its terms and take all reasonable steps to minimize the incurrence of costs allocable to the work covered by the order during the period of work stoppage. Within a period of 90 days after a stop work order is delivered to the Contractor, or within any extension of that period to which the parties shall have agreed, the Contracting Officer shall either:

Cancel the stop work order, or
Terminate the work covered by such order as provided in the TERMINATION FOR CONVENIENCE article of this contract.

b. If a stop work order issued under this article is cancelled or the period of the order or any extension thereof expires, the Contractor shall resume work. An equitable adjustment shall be made in the delivery schedule or contract price, or both, and the contract modified in writing accordingly, if:
The stop work order results in an increase in the time required for, or in the Contractor's cost properly allocable to, the performance of any part of this contract, and
The Contractor asserts a claim for such adjustment within 30 days after the end of the period of work stoppage; provided that, if the Contracting Officer decides the facts justify such action, he may receive and act upon any such claim asserted at any time prior to final payment under this contract.

c. If a stop work order is not cancelled and the work covered by such order is terminated for the convenience of the Commission, the reasonable costs resulting from the stop work order shall be allowed in arriving at the termination settlement.

17. DISPUTES

a. Except as otherwise provided in this contract, any dispute concerning a question of fact arising under this contract which is not disposed of by agreement shall be decided by the Contracting Officer, who shall reduce his decision to writing and mail or otherwise furnish a copy thereof to the Contractor. The decision of the Contracting Officer shall be final and conclusive unless, within 30 days from the date of receipt of such copy, the Contractor mails or otherwise furnishes to the Contracting Officer a written appeal addressed to the Board of Commissioners. The decision of the Commissioners or its duly authorized representative for the determination of such appeals shall be final and conclusive unless determined by a court of

competent jurisdiction to have been fraudulent, or capricious, or arbitrary, or so grossly erroneous as necessarily to imply bad faith, or is not supported by substantial evidence. In connection with any appeal proceeding under this article, the Contractor shall be afforded an opportunity to be heard and to offer evidence in support of his appeal. Pending final decision of a dispute hereunder, the Contractor shall proceed diligently with the performance of the contract and in accordance with the Contracting Officer's decision.

b. This DISPUTES article does not preclude consideration of questions of law in connection with decisions provided for in paragraph a. above. Nothing in this contract, however, shall be construed as making final the decisions of the Commissioners or its representative on a question of law.

18. DEFAULT

a. The Commission may, subject to the provisions of paragraph c. below, by written notice of default to the Contractor, terminate the whole or any part of this contract in any one of the following circumstances:
If the Contractor fails to make delivery of the supplies or to perform the services within the time specified herein or any extension thereof; or
If the Contractor fails to perform any of the other provisions of this contract, or so fails to make progress as to endanger performance of this contract in accordance with its terms, and in either of these two circumstances does not cure such failure within a period of 10 days (or such longer period as the Contracting Officer may authorize in writing) after receipt of notice from the Contracting Officer specifying such failure.

b. In the event the Commission terminates this contract in whole or in part as provided in paragraph a. of this article, the Commission may procure, upon such terms and in such manner as the Contracting Officer may deem appropriate, supplies or services similar to those so terminated, and the Contractor shall be liable to the Commission for any excess costs for such similar supplies or services; provided, that the Contractor shall continue the performance of this contract to the extent not terminated under the provisions of this article.

c. Except with respect to defaults of subcontractors, the Contractor shall not be liable for any excess costs if the failure to perform the contract arises out of causes beyond the control and without the fault or negligence of the Contractor. Such causes may include, but are not restricted to, acts of God or of the public enemy, acts of the Government in its sovereign capacity or the Commission in its contractual capacity, fires, floods, epidemics, quarantine restrictions, strikes, freight embargoes, and unusually severe weather; but in every case the failure to perform must be beyond the control and without the fault or negligence of the Contractor. If the failure to perform is caused by the default of a subcontractor, and if such default arises out of causes beyond the control of both the Contractor and subcontractor, and without the fault or negligence of either of them, the Contractor shall not be liable for any excess costs for failure to perform, unless the supplies or services to be furnished by the subcontractor were obtainable from other sources in sufficient time to permit the Contractor to meet the required delivery schedule.

d. If this contract is terminated as provided in paragraph a. of this article, the Commission, in addition to any other rights provided in this article, may require the Contractor to transfer title and deliver to the Commission, in the manner and to the extent directed by the Contracting Officer, any completed supplies, and such partially completed supplies and materials, parts,

tools, dies, jigs, fixtures, plans, drawings, information, and contract rights (hereinafter called "manufacturing materials") as the Contractor has specifically produced or specifically acquired for the performance of such part of this contract as has been terminated; and the Contractor shall, upon direction of the Contracting Officer, protect and preserve property in the possession of the Contractor in which the Commission has an interest. Payment for completed supplies delivered to and accepted by the Commission shall be at the contract price. Payment for manufacturing materials delivered to and accepted by the Commission and for the protection and preservation of property shall be in an amount agreed upon by the Contractor and Contracting Officer; failure to agree to such amount shall be a dispute concerning a question of fact within the meaning of the DISPUTES article of this contract. The Commission may withhold from amounts otherwise due the Contractor for such completed supplies or manufacturing materials such sum as the Contracting Officer determines to be necessary to protect the Commission against loss because of outstanding liens or claims of former lien holders.

e. If, after notice of termination of this contract under the provisions of article, it is determined for any reason that the Contractor was not in default under the provisions of this article, or that the default was excusable under the provisions of this article, the rights and obligations of the parties shall, if the contract contains an article providing for termination for convenience of the Commission, be the same as if the notice of termination had been issued pursuant to such article. If, after notice of termination of this contract under the provisions of this article, it is determined for any reason that the Contractor was not in default under the provisions of this article, and if this contract does not contain an article providing for termination for convenience of the Commission, the contract shall be equitably adjusted to compensate for such termination and the contract modified accordingly; failure to agree to such adjustment shall be a dispute concerning a question of fact within the meaning of the DISPUTES article of this contract.

19. TERMINATION FOR CONVENIENCE

a. The performance of work under this contract may be terminated by the Commission in accordance with this article in whole, or from time to time in part, whenever the Contracting Officer shall determine that such termination is in the best interest of the Commission. As much notice as possible will be given the contractor. Any such termination shall be effected by delivery to the Contractor of a Notice of Termination specifying the extent to which performance of work under the contract is terminated, and the date upon which such termination becomes effective.

b. After receipt of a Notice of Termination, and except as otherwise directed by the Contracting Officer, the Contractor shall:

(1) Stop work under the contract on the date and to the extent specified in the Notice of Termination;
(2) Place no further orders or subcontracts for materials, services, or facilities, except as may be necessary for completion of such portion of the work under the contract which is not terminated;
(3) Terminate all orders and subcontracts to the extent that they relate to the performance of work terminated by the Notice of Termination.
(4) Assign to the Commission, in the manner, at the time, and to the extent directed by the Contracting Officer, all of the rights, title, and interests of the Contractor under the orders

and subcontracts so terminated, in which case the Commission shall have the right, in its discretion, to settle or pay any or all claims arising out of the termination of such orders and subcontracts;

(5) Settle all outstanding liabilities and all claims arising out of such termination of orders and subcontracts, with the approval or ratification of the Contracting Officer, to the extent he may require, which approval or ratification shall be final for all the purposes of this article;

(6) Transfer title to the Commission and deliver in the manner, at the times, and to the extent, if any, directed by the Contracting Officer:

(a) the fabricated or unfabricated parts, work in process, completed work, supplies, and other material produced as a part of, or acquired in connection with the performance of the work terminated by the Notice of Termination, and

(b) the completed or partially completed plans, drawings, information and other property which, if the contract had been completed, would have been required to be furnished to the Commission;

(7) Use his best efforts to sell, in the manner, at the times, to the extent, and at the price or prices directed or authorized by the Contracting Officer, any property of the type referred to in paragraph 6. above.

(8) Complete performance of such part of the work as shall not have been terminated by the Notice of Termination; and

(9) Take such action as may be necessary, or as the Contracting Officer may direct, for the protection and preservation of the property related to this contract which is in the possession of the Contractor and in which the Commission has or may acquire an interest.

c. Not Used

d. After receipt of a Notice of Termination, the Contractor shall submit to the Contracting Officer his termination claim, in the form and with certification prescribed by the Contracting Officer. Such claims shall be submitted promptly but in no event later than one year from the effective date of termination. Upon failure of the Contractor to submit his termination claim within the time allowed, the Contracting Officer may determine the amount, if any, due the Contractor by reason of the termination.

e. Not Used

f. In the event of the failure of the Contractor and the Contracting Officer to agree upon the whole amount to be paid the Contractor, the Contracting Officer shall determine, on the basis of information available to him, the amount if any, due the Contractor by reason of the termination and shall pay to the Contractor the amounts determined as follows:

(1) For completed supplies accepted by the Commission a sum equivalent to the aggregate price for such supplies computed in accordance with the prices specified in the contract.

(2) The total of:

(a) The costs incurred in the performance of the work terminated, including initial costs and preparatory expense allocable thereto, but exclusive of any costs attributable to supplies paid or to be paid for.

(b) The cost of settling and paying claims arising out of the termination of work under subcontracts or orders which are properly chargeable to the terminated portion of the contract (exclusive of amounts paid or payable on account of supplies or materials delivered or services furnished by subcontractors or vendors prior to the effective date of the Notice of Termination, which amounts shall be included in the costs payable; and

(c) A sum, as profit on (a), above, determined by the Contracting Officer to be fair and reasonable. Provided, however, that if it appears that the Contractor would have sustained a loss on the entire contract had it been completed, no profit shall be included or allowed and an appropriate adjustment shall be made reducing the amount of the settlement to reflect the indicated rate of loss; and

(3) The reasonable costs of settlement, including accounting, legal, clerical, and other expenses reasonably necessary for the preparation of settlement claims and supporting data with respect to the terminated portion of the contract and for the termination and settlement of subcontracts thereunder, together with reasonable storage, transportation, and other costs incurred in connection with the protection or disposition of property allocable to this contract.

(4) The total sum to be paid to the Contractor shall not exceed the total contract price as reduced by the amount of payments otherwise made and as further reduced by the contract price of work not terminated. There shall be excluded from the amounts payable to the Contractor the fair value, as determined by the Contracting Officer, of property which is destroyed, lost, stolen, or damaged so as to become undeliverable to the Commission, or to a buyer.

g. Costs claimed, agreed to, or determined shall be in accordance with the applicable contract cost principles and procedures in OMB Circular A-87s in effect on the date of this contract.

h. The Contractor shall have the right to appeal, under the DISPUTES article of this contract from any determination made by the Contracting Officer, except that, if the Contractor has failed to submit his claim within the time provided and has failed to request extension of such time, he shall have no such right of appeal. In any case where the Contracting Officer has made a determination of the amount due, the Commission shall pay to the Contractor the amount as determined by the Contracting Officer.

i. Not Used

j. If the termination hereunder be partial, prior to the settlement of the terminated portion of this contract, the Contractor may file with the Contracting Officer a request in writing for an equitable adjustment of the price or prices specified in the contract relating to the continued portion of the contract (the portion not terminated by the Notice of Termination), and such equitable adjustment as may be agreed upon shall be made in such price or prices.

20. FEDERAL, STATE AND LOCAL TAXES

Commission is exempt from federal, state, and local taxes.

21. CONFLICT OF INTEREST

a. Neither the Contractor nor any person or company affiliated with it shall have, during the term of this contract and any extensions thereof, any contractual or other financial relationship with the Commission, with any Commission prime Contractor, or with any subcontractor or supplier to any Commission prime Contractor other than the contractual relationship established under this contract, unless an exception is granted as described below.

b. Upon request of the Contractor and upon full disclosure and for good cause the Contracting Officer may in his sole discretion grant an exception to the requirement of a., above, when in his judgment the exception will not create a conflict between the Contractor's duties and obligations under this contract and the duties and obligations imposed on the Contractor under the contractual or other relationship for which an exception is requested.

c. If, during the performance of this contract and any extension thereof, the Contractor becomes aware of any relationship, financial interest, or other activity in which it or an affiliated person or company is involved which is not in compliance with the provisions of a., above, it shall promptly notify the Contracting Officer in writing and fully disclose all circumstances thereof. Should the Contracting Officer not grant an exception to the requirements of this Article, the Contractor shall, within ten (10) days of written notice from the Contracting Officer to do so, take all action necessary to comply with the terms of a., above.

d. If the Contractor fails to comply with the terms of this Article, the Contracting Officer, may withhold payments due under the contract until such time as the Contractor is in compliance or, should the non-compliance remain uncorrected at the expiration of ten (10) days from written notice from the Contracting Officer as provided in c., above, terminate the contract for default pursuant to the Default Article of this contract.

e. The Contractor in performing this contract shall avoid any conduct which might result in or give the appearance of creating for Directors, Officers or employees of the Commission in their relationship with the Contractor any conflicts of interest or favoritism and/or the appearance thereof and shall avoid any conduct which might result in a Director, Officer or employee failing to adhere to the Standards of Conduct adopted by the Commission's Board of Directors.

f. Any determination by the Contracting Officer under this Article shall be final and shall be considered a question of fact within the meaning of the Disputes Article of this contract.

22. OFFICIALS NOT TO BENEFIT

a. No member of or delegate to Congress, or resident commissioner, shall be admitted to any share or part of this contract, or to any benefit that may arise therefrom; but this provision shall not be construed to extend to this contract if made with a corporation for its general benefit.

b. No member, officer, or employee of the Public Body or of a local public body during his tenure or one year thereafter shall have any interest, direct or indirect, in this contract or the proceeds thereof.

23. COVENANT AGAINST CONTINGENT FEES

The Contractor warrants that no person or selling agency has been employed or retained to solicit or secure this contract upon an agreement or understanding for a commission, percentage, brokerage, or contingent fee, excepting bona fide employees or bona fide established commercial or selling agencies maintained by the Contractor for the purpose of securing business. For breach or violation of this warranty, the Commission shall have the right to annul this contract without liability or in its discretion, to deduct from the contract price or consideration, or otherwise recover, the full amount of such commission, percentage, brokerage, or contingent fee.

24. GRATUITIES

In connection with performance of work required under this contract, or any changes or modifications relative thereto, the giving of or offering to give gratuities (in the form of entertainment, gifts or otherwise) by the Contractor, or any agent, representative or other person deemed to be acting on behalf of the Contractor, or any supplier or subcontractor furnishing material to or performing work under this Contractor, or any agent, representative or other person deemed to be acting on behalf of such supplier or subcontractor, to any Director, Officer or employee of the Commission; or to any Director, Officer, employee or agent of any of the Commission's agents, consultants, representatives or other persons deemed to be acting for or on behalf of the Commission with a view toward securing a contract or securing favorable treatment with respect to the awarding or amending, or the making of any determinations with respect to the performing of such contract is expressly prohibited and Contractor agrees to abide by this prohibition.

25. ORGANIZATIONAL CONFLICT OF INTEREST

Unless specifically exempted from the conditions of this provision by the Contracting Officer, any Commission Contractor, subcontractor, subsidiary, or other entity which is legally related and which develops or drafts specifications, requirements, statements of work, invitation for bids, shall be excluded from competing for the directly ensuing procurement.

26. INDEMNIFICATION

a. If the amount of this contract is in excess of $10,000, the Contractor shall indemnify the Commission and its officers, agents, and employees against liability, including costs, for infringement of any United States letters patent arising out of the manufacture or delivery of supplies under this contract. The foregoing indemnity shall not apply unless the Contractor shall have been informed as soon as practicable by the Commission of the suite or action alleging such infringement, and shall have been given such opportunity as is afforded by applicable laws, rules, or regulations to participate in the defense thereof; and further, such indemnity shall not apply to:

1. an infringement resulting from compliance with specific written instructions of the Contracting Officer directing a change in the supplies to be delivered or in the materials or equipment to be used, or directing a manner or performance of the contract not normally used by the Contractor;

2. an infringement resulting from addition to, or change in, such supplies or components furnished which addition or change was made subsequent to delivery or performance by the Contractor; or

3. a claimed infringement which is settled without the consent of the Contractor, unless required by final decree of court of competent jurisdiction.

b. The contractor will save and keep harmless and indemnify the Commission, its officers, employees, agents and/or their successors, assigns and/or heirs against any and all liability claims arising for injury, including personal injury to or death of any person or persons, and for any loss or damage to any person or property whatsoever, occurring in connection with the negligent performance of this contract, including the acts, errors or omissions of the Contractor, any subcontractor, employee, DBE, agency or representative of the contractor or subcontractor.

27. AUDIT AND INSPECTION OF RECORDS

a. The Contractor shall maintain records, and the Contracting Officer, the U.S. Department of Transportation, and the Comptroller General of the United States or any of their duly authorized representatives shall, until the expiration of three years after final payment under this Contract, have access to and the right to examine any directly pertinent books, documents, papers and records of the Contractor, involving transactions related to this Contract, for the purpose of making audit, examination, excerpts and transcriptions.

b. The Contractor further agrees to include in all his subcontracts hereunder a provision to the effect that the subcontractor agrees that the Contracting Officer, the U.S. Department of Transportation and the Comptroller General of the United States or any of their duly authorized representatives shall, until the expiration of three years after final payment under the Contract, have access to and the right to examine any directly pertinent books, documents, papers and records of such subcontractor, involving transactions related to the subcontract, for the purpose of making audit, examination, excerpts and transcriptions.
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28. ENERGY CONSERVATION

The Contractor agrees to comply with mandatory standards and policies relating to energy efficiency which are contained in the state energy conservation plan issued in compliance with the Energy Policy and Conservation Act.

29. FEDERAL GOVERNMENT OBLIGATION

(a) The Commission and Contractor acknowledge and agree that, notwithstanding any concurrence by the Federal Government in or approval of the solicitation or award of this 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 Commission, Contractor, or any other party (whether or not a party to that contract) pertaining to any matter resulting from this contract.

(b) The Contractor agrees to include the above clause in each subcontract financed in whole or in part with Federal assistance provided by FTA. It is further agreed that the clause shall not be modified, except to identify the subcontractor who will be subject to its provisions.

30. FLY AMERICA

The Commission shall not fund the costs of international air transportation of any persons involved in or property acquired for this contract unless that air transportation is provided by U.S.-flag carriers to the extent service by these carriers is available, in accordance with the International Air Transportation Fair Competitive Practices Act of 1974, as amended, 49 U.S.C. paragraph 40118, and with U.S. General Services Administration regulations pertaining to the use of United States air carriers, 41 C.F.R. 301-3.61(b), and any later regulations at 41 C.F.R. 301-10.131 *et seq*.

31. COST OR PRICING DATA

a. The Contractor shall submit to the Contracting Officer upon request cost or pricing data under the conditions described in this Paragraph and certify that, to the best of his knowledge and belief, the cost or pricing data submitted is current, accurate, and complete. The contractor shall also certify that costs proposed hereunder are allocable, allowable, and reasonable in accordance with cost principles and practises under the OMB Circular A-87.

b. The submittal of certified cost or pricing data shall not be required if the price is based on adequate price competition, established catalog or market prices of commercial items sold in substantial quantities to the general public, or prices set by law or regulation. The Contractor agrees that the terms "adequate price competition" and "established catalog or market prices of commercial items sold in substantial quantities to the general public" shall be determined by the Contracting Officer.

c. Cost or pricing data consists of all facts existing up to the time of agreement on price which prudent buyers and sellers would reasonably expect to have a significant effect on the price negotiations for the modification. The definition of cost or pricing data embraces more than historical accounting data; it also includes, where applicable, such factors as subcontractor, supplier and vendor quotations, nonrecurring costs, changes in construction methods, unit cost trends such as those associated with labor efficiency and any management decisions which could reasonably be expected to have a significant bearing on costs. Cost or pricing data consists of all facts which can reasonably be expected to contribute to sound estimates of future costs as well as to the validity of costs already incurred. Cost or pricing data, being factual, is that type of information which can be verified. Because the certificate pertains to cost or pricing data, it does not make representations as to the accuracy of the Contractor's judgment on the estimated portion of future cost or projections. The certificate does, however, apply to the data upon which the Contractor's judgment is based.

d. If the contractor or subcontractor submits defective cost or pricing data, a reduction in contract price shall be made by that amount deemed defective.

32. FTA TERMS

The preceding provisions include, in part, certain Standard Terms and Conditions required by DOT, whether or not expressly set forth in the preceding contract provisions. All contractual provisions required by DOT, as set forth in FTA Circular 4220.1F, dated November 1, 2008, are hereby incorporated by reference. Anything to the contrary herein notwithstanding, all FTA mandated terms shall be deemed to control in the event of a conflict with other provisions contained in this Agreement. The Contractor shall not perform any act, fail to perform any act, or refuse to comply with any Commission requests which would cause the Commission to be in violation of the FTA terms and conditions.

33. Not Used

34. CLEAN AIR AND WATER

The Contractor agrees to comply with all applicable standards, orders or regulations issued pursuant to the Clean Air Act, as amended, 42 U.S.C. §§ 7401 et seq, and the Federal Water Pollution Control Act, as amended, 33 U.S.C. 1251 et seq . The Contractor agrees to report each violation to the Commission and understands and agrees that the Commission will, in turn, report each violation as required to assure notification to FTA and the appropriate EPA regional office.

The Contractor also agrees to include these requirements in each subcontract exceeding $100,000 financed in whole or in part with Federal assistance provided by FTA.

35. Not used

36. CONTRACT WORK HOURS AND SAFETY STANDARDS ACT

(1) **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.

(2) **Violation; liability for unpaid wages; liquidated damages** - In the event of any violation of the clause set forth in paragraph (1) 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 (1) 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 (1) of this section.

(3) **Withholding for unpaid wages and liquidated damages** - The Commission 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 (2) of this section.

(4) **Subcontracts** - The contractor or subcontractor shall insert in any subcontracts the clauses set forth in 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 this section.

(5) **Payrolls and basic records** - (i) 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 ofthe apprentices and trainees, and the ratios and wage rates prescribed in the applicable programs.

37. AVAILABILITY OF FUNDS FOR THE NEXT FISCAL YEAR

Funds may not be presently available for performance under this contract beyond a certain date. The Commission's obligation for performance of this contract beyond that date is contingent upon the availability of funds from which payment for contract purposes can be made. No legal liability on the part of the Commission for any payment may arise for performance under this contract until funds are made available to the Contracting Officer for performance and until the Contractor receives notice of availability, to be confirmed in writing, by the Contracting Officer. Any option exercised by the Commission which will be performed in whole or in part in a subsequent fiscal year is subject to availability of funds in the subsequent fiscal year and will be governed by the terms of this Article.

38. DRUG-FREE WORKPLACE

The contractor agrees to (i) provide a drug-free workplace for the contractor's employees; (ii) post in conspicuous places, available to employees and applicants for employment, a statement notifying employees that the unlawful manufacture, sale, distribution, dispensation, possession, or use of a controlled substance or marijuana is prohibited in the contractor's workplace and specifying the actions that will be taken against employees for violations of such prohibition; (iii) state in all solicitations or advertisements for employees placed by or on behalf of the contractor that the contractor maintains a drug-free workplace; and (iv) include such provisions in every subcontract or purchase order of over $10,000, so that the provisions will be binding upon each subcontractor or vendor

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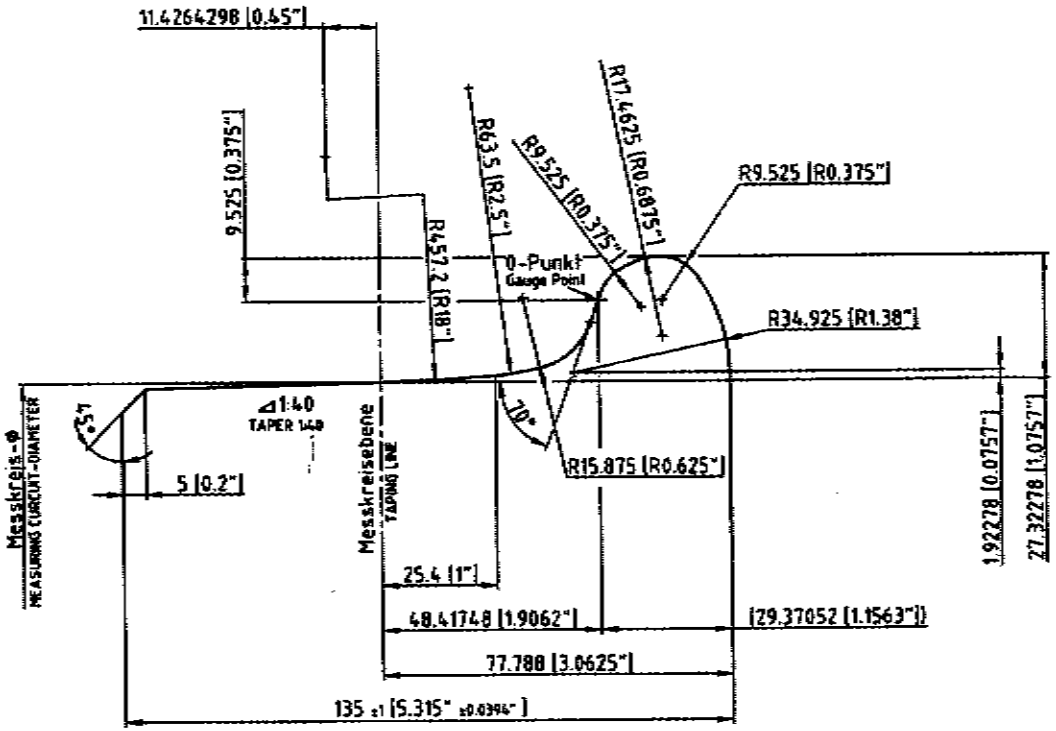

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Schutzvermerk ISO 16016 beachten

Patent :

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Maßstab 1:1

Werkstoff, Halbzeuge

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Gepr.	15-05-19	PW
Norm		
Abt.	G-TK	

Profil

Bochumer Verein

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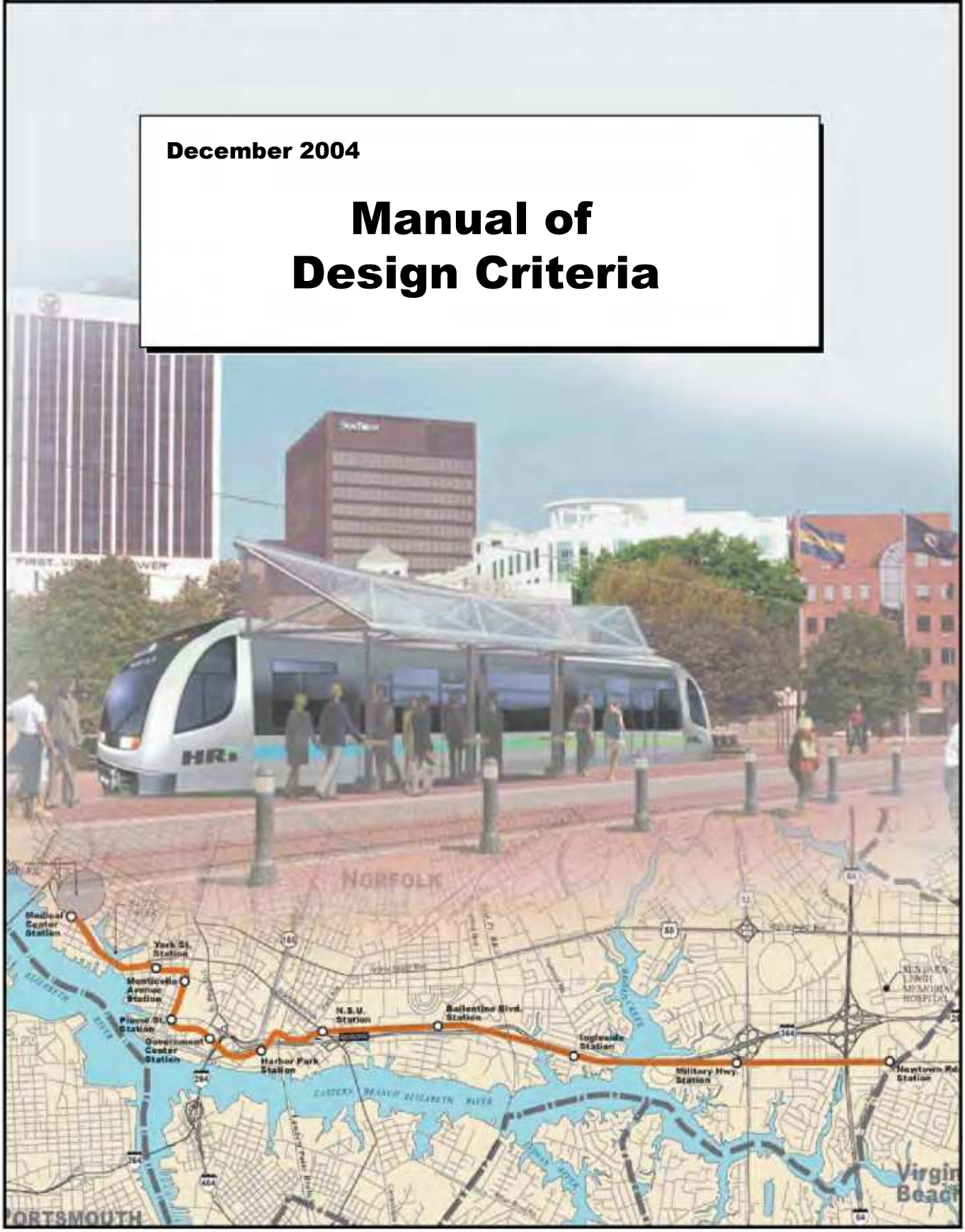
Norfolk Light Rail Transit Project
Preliminary Engineering
Final Environmental Impact Statement

December 2004

Manual of Design Criteria



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A. General

A.1 Purpose

This Draft Manual of Design Criteria establishes the standards needed to guide the preliminary design of the Hampton Roads Transit's (HRT's) Light Rail Transit corridors. Its purpose is to provide sufficient information to allow:

- the development of preliminary designs,
- estimates of capital, operating and maintenance costs, and
- determination of the potential impacts of operations and construction on adjacent communities.

The criteria provides a uniform basis for preliminary design of the project. This dynamic document will undergo expansion and refinement during the Preliminary Engineering and Final Design phases of corridor development. Such changes will be documented, and the copies of the Criteria will be controlled to keep current copies available for all design consultants.

A.2 System-wide Goals

The basic goal of the LRT system is to provide the citizens of the Hampton Roads Region with the benefits of improved public transportation in a cost-effective, environmentally sensitive, and socially responsible manner. To this end the following system-wide policies concerning proven hardware, design life, and service integration shall be adhered to.

A.2.1 Proven Hardware

The design of the LRT shall incorporate proven subsystem hardware and design concepts. All of the major subsystems, such as vehicles, signaling, and traction power equipment, shall be procured from established manufacturers, have a documented operating history of previous and current usage, and be available off the shelf, so far as practical. The same requirements shall apply to spare parts. Waiver of these requirements shall be considered only where the alternative subsystem offers substantial technical and cost advantages, is in an advanced state of development and testing, and has accumulated substantial test data under simulated-revenue conditions.

A.2.2 Design Life

Major fixed system equipment (substation gear, shop machinery, etc.) and light rail vehicles shall be designed for continued operation over a minimum period of 30 years before complete replacement becomes necessary, assuming that approved maintenance policies are followed.

The rail system's fixed facilities (structures and buildings) shall be designed for continued operation over a minimum period of 50 years, before complete refurbishment and renovations are necessary as a result of wear and tear and obsolescence.

A.2.3 Service Integration

The rail system shall be designed as an integral part of the overall regional transportation system. Specific provisions shall be made for the efficient interchange of passengers to and from private and other public transportation modes.

A.3 Scope

The Draft Manual of Design Criteria will take precedence over all other standards referenced herein except those fixed by legislation.

Specific attention should be given to the Final Rule of the US Department of Transportation regarding Transportation for Individuals with Disabilities, published in the Federal Register of September 6, 1991, and to any succeeding modifications that may be issued. The applicability of that document is noted in several sections of this manual where it appears to be particularly appropriate. However, the regulations must be adhered to in all areas, whether or not mentioned here.

A.4 Procedures

Design Engineers/Architects shall prepare studies, drawings and technical specifications for each contract of the project in accordance with their design contract (if applicable) and the following HRT documents:

1) Draft Manual of Design Criteria
2) Drafting/CAD Standards
3) Capital Cost Estimating Methodology Report
4) Patronage Forecasting Methods Report
5) Quality Assurance Manual
6) Design Review Report

Deviations may be made within the framework of the Design Criteria to meet the requirements of a particular problem. However, any deviation, discrepancy, or unusual solution must be approved by the HRT Director of Engineering & Construction before it can be included in the design. It is the responsibility of the Designer to identify, explain and justify any deviation from the established criteria and to secure the necessary approvals from HRT.

A.5 Definitions

A.5.1 HRT or HRTDC

Hampton Roads Transit District Commission (or Hampton Roads Transit) provides transit service that is safe, dependable, convenient and easy to use in the Hampton Roads Region of Virginia.

A.5.2 Contracting Officer

An individual appointed by HRT to administer a given contract between HRT and other parties.

A.5.3 Design Consultants

Consultants retained by HRT to perform and coordinate the various tasks involved with the design of an LRT project.

A.5.4 Project Manager

A HRT staff person responsible for planning design and construction of an LRT project.

A.5.5 Subconsultant

Any firm(s) to which the prime Design Consultant has subcontracted, with HRT's approval, a portion or phase of their scope of work.

A.5.6 Design Engineer

An individual or organization performing LRT project design. This includes HRT, consultants, subconsultants, and others.

A.5.7 Contractor

Refers to the procurement, installation, or construction contractors actually under contract for the construction and implementation of a LRT project.

A.6 Design Codes and Manuals

In addition to this Draft Manual of Design Criteria, the Design Engineer must comply with all other applicable engineering codes and standards and life-safety codes and standard, of the various federal state and local jurisdictions.

If codes and/or manuals are specified herein for the design of an element of the HRT LRT system, than the most recent edition(s) shall be used. Responsibility for the design remains with the Design Engineer in accordance with the terms and conditions of their contract with HRT. Where the codes and/or standards conflict with each other, the Design Engineer shall alert HRT and recommend a solution. The Design Engineer shall also determine which codes and standards have priority.

Specific Codes and standards include, but are not limited to, the following:

- Standard Specifications for Highway Bridges, AASHTO.
- LRFD Bridge Design Specifications, AASHTO.
- Guide Specifications for Design and Construction of Segmental Concrete Bridges, AASHTO.
- Guide Specifications for Structural Design of Sound Barriers, AASHTO.
- Structural Design Guidelines, VDOT.
- Detailing Manual VDOT.
- Standard Specifications for Road and Bridge Construction, VDOT.
- AREMA Manual for Railway Engineering hereinafter referred to as the AREMA Manual.
- International Conference of Building Officials (ICBO) *Uniform Building Code* (UBC).
- Roadside Design Guide; AASHTO.
- Highway Capacity Manual, ITE.
- Manual on Uniform Traffic Control Devices (MUTCD).
- AREMA Signal Manual

- VDOT requirements for Grade Crossings
- TCRP Report 57, Track Design Handbook for Light Rail Transit, Transportation Research Board, National Research Council.
- Flexibility in Highway Design, FHWA.
- American Society of Testing Materials; ASTM.
- American Concrete Institute; ACI.
- American Institute of Steel Construction; AISC.
- National Electrical Code; NEC.
- National Electrical Safety Code; NESC.
- Federal Transit Administration; FTA.
- Americans with Disabilities Act; ADA.
- Federal Railway Administration; FRA.
- Federal Highway Administration; FHWA.
- TCRP Report 57: The Track Design Handbook for Light Rail Transit.
- American National Standards Institute; ANSI.
- National Fire Protection Association; NFPA.
- Army Corps of Engineers; ACDE.
- Utility companies, ditch companies, and other local entities may be applicable.
- Federal Code of Regulations Title 49, Transportation Shall Apply to Height Operations, Part 213 – Track Safety Standards and Part 236 – Rules, Standards and Instructions, Signal System
- DOT, 49 CFR Part 37 "Transportation for Individuals with Disabilities
- Virginia Public Utilties Commission (VPUC) – General Orders
- Occupational Safety and Health Administration (OSHA) – 29FR Part 196
- VDOT Drainage Manual
- VDOT Road and Bridge Standards
- City of Norfolk Stormwater Design Criteria Manual
- City of Norfolk Standard Details
- Virginia Erosion and Sediment Control Handbook

A.7 Climatic Conditions Criteria for Systems Design

This information will need to be developed by the Systems designer and based upon local climatic data and history.

A.8 Acronyms and Abbreviations

The following acronyms and abbreviations appear in this document. They are defined as follows:

AAR	Association of American Railroads
AASHTO	American Association of State Highways and Transportation Office
ABS	Automatic Block Signals
AC	Alternating Current
ACI	American Concrete Institute
ADA	Americans with Disabilities Act
AFC	Automatic Fare Collection
AFI	Air Filter Institute
AFO	Audio Frequency Overlay
AISC	American Institute of Steel Construction
AISI	American Iron and Steel Institute
AMCA	Air Moving and Conditioning Association, Inc.
ANSI	American National Standard Institute
APTA	American Public Transit Association
AREMA	American Railway Engineering and Maintenance Association
ARI	Air Conditioning and Refrigeration Institute
ASA	Acoustical Society of America
ASCII	American Standard Code for Information Interchange
ASHRAE	American Society of Heating, Refrigeration and Air Conditioning Engineers
ASIC	Application Specific Integrated Circuit
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
ATA	Air Transportation Association of America

AT&T	American Telephone and Telegraph Company
ATO	Automatic Train Operation
ATP	Automatic Train Protection
ATS	Automatic Train Stop
AW0	Maximum empty vehicle operating weight
AW1	Load, corresponding to a LRV with all seats occupied, which shall be used to determine off-peak period service frequency
AW2	Load that shall be used to determine service frequency during the AM and PM peak periods
AW3	Load that shall be used to determine service frequency for the peak 15 minute period
AW4	Load that shall be used to determine the Structural Design requirements for the LRV
AWG	American Wire Gauge
AWS	American Welding Society
BLS	Bureau of Labor Statistics
C&S	Communication & Signals
CAD	Computer Aided Design
CBD	Central Business District
CCC	Central Control Center
CCH	Communication Control Head
CCIR	International Radio Consultation Committee
CCITT	Consultative Committee for International Telephone and Telegraphs
CCTV	Closed Circuit Television
CDA	Copper Development Association
CFR	Code of Federal Regulations
CIL	Certifiable Items List
CMOs	Complementary Metal Oxide Semiconductor
CPM	Critical Path Method

CRB	Columbia River Basalt
CRT	Cathode-Ray Tube
CTS	Cable Transmission System
CWR	Continuously Welded Rail
DB	Dry Bulb
DBE	Disadvantaged Business Enterprise
DC	Direct Current
DF	Direct Fixation
DIN	Deutsche Industrie Norm (German Industrial Standard)
DOGAMI	Department of Geology and Mineral Industries
DOT	Department of Transportation
DWG	Drawing
ECS	Environmental Control System
ECU	Electronic Control Unit
EIA	Electronic Industries Association
EMC	Electromagnetic Compatibility
EMI	Electromagnetic Interference
EPABX	Electronic Private Automatic Branch Exchange
EPP	Emergency Preparedness Plan
FAA	Federal Aviation Administration
FACP	Fire Alarm Control Panel
FCC	Federal Communications Commission
FDB	Fahrenheit Dry Bulb
FEA	Finite Elements Analysis
FEIS	Final Environmental Impact Statement
FHWA	Federal Highway Administration
FMP	Fire Management Plan

FRA	Federal Railroad Administration
FTA	Federal Transit Administration
FWB	Fahrenheit Wet Bulb
GSA	General Services Administration
GTE	General Telephone Company
HPCU	Hydraulic Pressure Control Unit
HSCB	High Speed Circuit Breaker
HVAC	Heating, Ventilating, and Air Conditioning
ICEA	Insulated Cable Engineers Association
IEC	International Electro-technical Committee
IEEE	Institute of Electrical and Electronic Engineers
IES	Illuminating Engineering Society
ISO	International Organization for Standards
JEDEC	Joint Electronic Device Engineering Council
JlC	Joint Industrial Council
LAHT	Low Alloy High Tensile Strength (Steel)
LED	Light Emitting Diode
LOS	Level of Service
LPA	Locally Preferred Alternative
LRT	Light Rail Transit
LRV	Light Rail Vehicle
LVPS	Low Voltage Power Supply
MB	Maximum Brake
MCE	Maximum Credible Earthquake
MDBF	Mean Distance Between Failure
MIL	Military Specification
MIS	Management Information System

MOS	Minimum Operating System, Minimum Operable Segment
MOV	Metal Oxide Varistor
MOW	Maintenance-of-Way
MSB	Maximum Service Brake
MSS	Manufacturers' Standardization Society of the Valve and Fitting Industry
MTTR	Mean Time to Repair
NBS	National Bureau of Standards
NEC	National Electrical Code
NEMA	National Electrical Manufacturer's Association
NESC	National Electrical Safety Code
NETA	National Electrical Testings Association
NFL	No Field Lubrication
NFPA	National Fire Protection Association
NTP	Notice to Proceed
OCC	Operations Control Center
OCS	Overhead Catenary System
OSHA	Occupational Safety and Health Administration
OSI	Open System Interconnect
PA	Public Announcement
PABX	Private Automatic Branch Exchange
PE	Preliminary Engineering
PIV	Peak Inverse Voltage
PHA	Preliminary Hazard Analysis
PM	Project Manager
PSCO	Public Service Company of Colorado
QA	Quality Assurance
QC	Quality Control

R/W	Right-of-Way
RMS	Root Mean Square
ROW	Right-of-way
RTU	Remote Terminal Unit
SAE	Society of Automotive Engineers
SCADA	Supervisory Control and Data Acquisition
SCAT	Simple Catenary Auto Tensioned
SCFT	Single Catenary Fixed Termination
SES	Subway Environment Simulation
SIC	Standard Industrial Code, U.S. Department of Labor
SMACNA	Sheet Metal and Air Conditioning Contractor's national Association
SSP	System Safety Program
SWFT	Single Wire Fixed Termination
t	Time
TES	Traction Electrification System
TIG	Tungsten Inert Gas
TIR	Total Indicated Runout
TOR	Top of rail
TPS	Traction power substation
TVM	Ticket Vending Machine
TWC	Train to Wayside Communication
UBC	Uniform Building Code
UFC	Uniform Fire Code
UL	Underwriters' Laboratories, Inc.
UPS	Uninterruptible Power System
USASI	United States of America Standards Institute
USDOT	United States Department of Transportation

v	Velocity
VDOT	Virginia Department of Transportation
VPI	Vacuum Pressure Impregnation
VSWR	Voltage Standing Wave Ratio
WB	Wet Bulb
WBE	Women's Business Enterprise

Units of Measure:

A	Ampere
Amp	Ampere
Btu	British Thermal Unit
Cfs	cubic feet per second
dB	Decibel
dBA	Decibel on the 'A' weighted scale
FC	Footcandles
ft	Foot
ft/min	Foot per Minute
ft^3/min	Cubic Feet per Minute (CFM)
ft^3/sec	Cubic Feet per Second (CFS)
g	Acceleration due to Gravity (32.2 ft/S^2 = 9.81 m/s^2)
gpm	Gallons per minute
h	Hour
Hz	Hertz
in	Inch
J	Joule
kg	Kilogram
kHz	Kilohertz
km	Kilometer

km/h	Kilometer per hour
kWh	Kilowatt hour
l	Liter
lb	Pound
lbf	Pound force
m	Meter
MHz	Megahertz
mi	Mile
mph	Miles per hour
mphps	Miles per hour per second
min	Minute
mm	Millimeter
mV	Millivolt
µV	Microvolt
N	Newton
oz	Ounce
pcf	Pound per cubic foot
plf	Pound per linear foot
psf	Pound per square foot
psi	Pound force per square inch
s	Second
sec	Second
sq ft	Square Feet
V	Volt
Vac	Volt alternating current
Vdc	Volt direct current
^{O}C	Degree Celsius

^{O}F	Degree Fahrenheit
‘	Foot
“	Inch

B. Track Geometry and Clearances

This chapter establishes the basic track geometry and clearance criteria to be used in the preliminary design of LRT corridors. It includes criteria for the preliminary design of light rail transit system alignments and also establishes the minimum dimensions required to insure proper clearances between the transit vehicles or transit structures and the obstructions involved.

Except for the requirements established in these criterias and the HRT drafting standards, all geometry and clearances shall follow the AREMA Manual for Railway Engineering and Portfolio of Track Work Plans, "The Track Design Handbook for Light Rail Transit" TCRP Report 57 sponsored by the Federal Transit Administration and the APTA Guidelines for Design of Rapid Transit Facilities modified as necessary to reflect the physical requirements and operating characteristics of Hampton Roads Transit (HRT) Light Rail Corridor.

B.1 Track Geometry

B.1.1 General

The criteria set forth in this section for the preliminary design of LRT track geometry have been established to allow the provision of comfortable, economical, and efficient transportation for passengers while maintaining adequate factors of safety with respect to overall operation, maintenance, and vehicle stability. They have been developed by utilizing accepted engineering practices and the experiences of currently operating light rail transit, and railroad systems.

The section includes criteria for the preliminary design of horizontal and vertical track alignments, alignments through areas of special trackwork, and horizontal and vertical clearance requirements.

B.1.2 Horizontal Alignment

The alignment of mainline horizontal tracks shall be composed of a series of tangents joined to circular curves by means of spiral transition curves. Spiral transitions shall not be used in yards and service areas. Superelevation shall be used to maximize running speeds except for in street operations.

Horizontal curvature and superelevation shall be related to design speed and the acceleration and deceleration characteristics of the design vehicle specified in Section H of this report. Where possible, the geometrics shall accommodate the maximum service operating speed range of 55 mph to 65 mph, taking into account the spacing of stations, location of curves, construction limitations, and the performance characteristics of the design vehicle. Physical constraints along various portions of the system, together with other design limitations, may preclude achievement of this service speed objective in some areas.

The LRT may include at-grade segments where vehicles would operate on a shared right-of-way with vehicular traffic within city and/or arterial streets. In these segments the track alignment shall be designed to accommodate a maximum design speed equal to the legal speed of the parallel street traffic.

Correlation between horizontal and vertical alignment shall avoid a combination of minimum radius, maximum gradient, and maximum unbalanced superelevation.

The LRT track alignment for each line section shall be stationed along the centerline of the eastbound track. Stationing along the eastbound track shall be the basic control for locating all other system facilities along the route. Separate stationing for the westbound track shall be used where tracks are neither parallel nor concentric, where widened track centers are required around curvesor where tracks are

in separate structures. The stationing along the westbound track shall be equated to the eastbound track at points where parallel alignment resumes.

B.1.2.1 Track Gauge and Construction Tolerances

Track gauge shall be a standard gauge of 4 ft 8 ½ in (1435mm). The gauge is the distance between the inner sides of the head of rails measured 5/8 in below the top of rail. The R159 and R152 girder rail gauge is measured 3/8 in (10mm) below top of rail. LRT track construction tolerances shall comply with Figure B-1.

The track gauge shall be widened by ¼ in at all locations where restraining rail is used. Although the restraining rail is primarily designed to reduce rail wear, it also inhibits lateral vehicle movement, therefore no allowance will be made in the clearance calculation for the gauge widening. The track gage in paved track using girder rail shall be established by using TCRP Report 57, "Track Design Handbook for Light Rail Transit" Gage Determination Analysis.

B.1.2.2 Tangent Alignment

Line Sections

The minimum length of tangent track between curved sections of track shall be as follows:

Condition	Tangent Length
Desirable Minimum	200 ft
Minimum	100 ft or 3 times the design speed,in mph, whichever is greater
* Absolute Minimum	45 ft

* Not to be reduced below the "Minimum" dimension without approval of HRT's Director of Engineering & Construction.

If adjacent curves in the same direction, which are in close proximity to one another, cannot be replaced by a single simple curve due to geometric constraints, a series of compound curves shall be the preferred arrangement. Broken back curves, (e.g., short tangents between curves in the same direction) shall be avoided.

Switches

The minimum length of tangent track preceding a point of switch shall be as follows:

Condition	Tangent Length
Desirable Minimum	45 ft (stock rail projection plus one rail length)
Minimum	10 ft
* Absolute Minimum	8 ft (stock rail plus ½ of the adjacent rail joint)

* Not to be exceeded without approval of HRT's Director of Engineering & Construction.

Stations

At station platforms, the horizontal alignment shall be tangent throughout the entire length of the platform. The tangent shall be extended beyond both ends of the platform as follows:

Condition	Tangent Length
Desirable Minimum	75 ft
Minimum	60 ft
* Absolute Minimum	45 ft

* Not to be reduced below the "Minimum" dimension (the outswing will affect the platform edge) without approval of HRT's Director of Engineering & Construction.

Yard Tracks

Yard tracks shall have a desirable minimum tangent length of 40 ft, with an absolute minimum of 30 ft.

For tangent alignment requirements through special trackwork areas, refer to Section D.2.2.4 of this report.

B.1.2.3 Curved Alignment

Intersections of horizontal tangents shall be connected by circular curves, which may be either simple curves or spiraled curves as required by this criteria.

Circular Curves

Circular curves shall be specified by their radius (See Figure B-3 for curve and spiral nomenclature). Degree of curvature, where required for calculation purposes, shall be defined by the arc definition of curvature as determined by the following formula:

$$D = \frac{5729.58}{R}$$

Where D = degree of curvature

R = radius of curvature, ft

The minimum radii for mainline tracks shall be as follows:

Location	Minimum Radius
At-grade ballasted:	300 ft desirable*
In-street:	100 ft desirable* 82 ft absolute *

The minimum radii for yard and service tracks shall be as follows:

Location	Minimum Radius
Yard and service tracks:	100 ft desirable* 82 ft absolute *

* Not to be reduced below the "Desirable" dimension without approval of HRT's Director of Engineering & Construction.

The maximum allowable curve radius for any given adjustment should generally be utilized.

The desirable minimum circular curve length shall be determined by the following formula:

$$L(ft) = 3V$$

Where L = minimum length of curve, in ft

V = design speed through the curve, in mph

For spiraled circular curves in areas of restricted geometry, the length in feet of the circular curve added to the sum of one half the length of both spirals shall be an acceptable method of determining compliance with the above criteria. The absolute minimum length of a superelevated circular curve shall be 45 ft.

Curves that include no actual circular curve segment (e.g., double-spiraled curves) shall be permitted only in areas of extremely restricted geometry (such as paved or embedded track in a downtown area), provided no actual superelevation (E_a) is used and prior approval of HRT's Director of Engineering & Construction has been obtained.

The design speed for a given horizontal curve shall be based on its radius, length of spiral transition, and actual and unbalanced superelevation through the curve as described in the following sections.

Superelevation

Superelevation is defined as the difference in inches the outer (high) rail is raised above the inner (low) rail. Equilibrium superelevation is the amount of superelevation that would be required so that the resultant force from the center of gravity of the light rail vehicle will be perpendicular to the plane of the two rails and halfway in between them at a given speed. Equilibrium superelevation shall be determined by the following equation:

$$E_q \text{ (inch)} = E_a + E_u = 3.96\left(\frac{V^2}{R}\right)$$

Where E_q = total amount of superelevation required for equilibrium, in inches
E_a = actual superelevation, in inches
E_u = unbalanced superelevation, in inches
V = design speed through the curve, in mph
R = radius of curvature, in ft

Desirable values of actual superelevation (E_a) shall be determined by the following formula:

$$E_a\text{(inch)} = 2.64\left(\frac{V^2}{R}\right) - 0.67$$

$$Eu = \frac{Ea}{2} + 1$$

Calculated values for actual superelevation shall be rounded to the nearest ¼-inch. For a total superelevation ($E_a + E_u$) of 1 inch or less, no actual superelevation (E_a) shall be applied. In specific cases where physical constraints limit the amount of E_a, which can be introduced, a maximum of 1-½ in of E_u shall be permitted without introduction of E_a.

Actual superelevation (E_a) shall be attained and removed linearly throughout the full length of the spiral transition curve by raising the outside rail while maintaining the inside rail at the profile grade.

Superelevation shall not be required for radii over 11,000 ft.

The maximum values for actual and unbalanced superelevation shall be as follows:

Superelevation		Maximum Value
E_a	=	4 in desirable * 6 in absolute
E_u	=	3 in desirable * 4.5 in absolute

* Not to be exceeded without approval of HRT's Director of Engineering & Construction.

Yard and secondary tracks shall not be superelevated.

Spiral Curves

Spiral transition curves shall be used in order to develop the superelevation of the track and limit lateral acceleration during the horizontal transition of the light rail vehicle as it enters the curve. Spiral transition curves shall be clothoid spirals (See Figure B-3 for curve and spiral nomenclature). Spirals shall be required on all mainline track horizontal curves with a radius less than 10,000 ft.

The desirable lengths of spiral shall be the greater of the lengths determined from the following formulae (rounded up to the nearest 10 ft), but preferably not less than 60 ft:

$$L_s(ft) = 1.10E_aV$$

$$L_s(ft) = 0.82E_uV$$

$$L_s(ft) = 31E_a$$

Where L_s = spiral length in ft
V = curve design speed in mph
E_a = actual superelevation in inches
E_u = unbalanced superelevation in inches

B.1.2.4 Reverse Curves

Reverse curves shall be avoided on mainline track, if possible. Every attempt shall be made to use standard circular curves with tangent sections as described in Section B.1.2.2. For those sections where reverse curves must be used, the following criteria may be used with prior approval from the HRT Director of Engineering & Construction.

- Reverse curves shall have spiral transition curves that meet at the point of reverse curvature, with the rate of change of superelevation constant through both of the spiral curves.
- If either of the reverse curves is less than 170 ft in radius, each spiral shall be at least 62 ft in total length. If possible, the length of spiral shall conform to the criteria in Section B.1.2.3.
- The superelevation transition through the spirals shall be accomplished by sloping both rails through the entire transition, as shown in Figure B-4.

B.1.3 Vertical Alignment

The vertical track alignment shall be composed of constant grade tangent segments connected at their intersection by parabolic curves having a constant rate of change in grade. The profile grade line in tangent track shall be along the centerline of track between the two running rails and in the plane defined by the top of the two rails. In curved track, the inside rail of the curve shall remain at the profile grade line and superelevation achieved by raising the outer rail above the inner rail.

B.1.3.1 Vertical Tangents

The minimum length of constant profile grade between vertical curves shall be as follows:

Condition	Length
Desirable Minimum	100 ft or 3 times the design speed in mph, whichever is greater
Minimum	40 ft

In areas of in-street alignments, where the need to conform to existing street profiles makes compliance with the above criteria economically unfeasible, the above requirement may be waived with prior approval of HRT's Director of Engineering & Construction.

Where a tangent between vertical curves would be shorter than 40 ft, consideration shall be given to reverse or compound vertical curves to avoid abrupt changes in vertical acceleration, which could result in both passenger discomfort and excessive vehicle suspension system wear and tear.

The profile at stations shall be on a vertical tangent that extends 40 ft beyond each end of the platform.

B.1.3.2 Vertical Grades

The following profile grade limitations shall apply:

Mainline tracks

Maximum (sustained grade unlimited length)	4.0%
Maximum (sustained grade with up to 2500 ft between PVI's of vertical curves)	6.0%
Maximum (short sustained grade with no more than 500 ft between points of vertical intersection (PVI's) of vertical curves)	7.0%
Minimum (for drainage on direct fixation track)	0.2%

Station Area

Desirable	0.0%
Maximum	2.0%

No minimum grade is specified at passenger stations provided adequate track drainage can be maintained. In downtown areas, the existing street profile may govern the profile grade within the station. In this case, the profile grade may exceed 2.0 percent, but shall be restricted to a maximum of 3.5 percent.

Yard Tracks

Desirable	0.0%
Maximum	1.0%

Yard Storage & Pocket Tracks

Desirable	0.0%
Maximum	0.2%

All tracks entering the yard shall either be level, sloped downward away from the mainline, or dished to prevent rail vehicles rolling from the yard onto the mainline. For yard secondary tracks, it is desirable to have a slight grade, maximum 1.0 percent and minimum 0.35 percent, to achieve good track drainage at the subballast level.

Through storage tracks shall have a sag in the middle of their profile to prevent rail vehicles from rolling to either end. It is desirable that the profile grade of a stub end storage track descend toward the stub end, and, if adjacent to a mainline or secondary track, be curved away from that track at its stub end. If it is necessary for the profile grade of a storage track to slope up toward the stub end, the grade shall not exceed 0.2 percent.

B.1.3.3 Vertical Curves

All changes in grade shall be connected by vertical curves. Vertical curves shall be defined by parabolic curves having a constant rate of change in grade.

Vertical Curve Lengths

The minimum length of vertical curves shall be determined as follows:

Desirable length: $LVC(ft) = 200A$

Preferred minimum length: $LVC(ft) = 100A$

Absolute minimum length:

Crest curves: $LVC(ft) = \frac{AV^2}{25}$

Sag curves: $LVC(ft) = \frac{AV^2}{45}$

Where LVC = length of vertical curve, in ft

A = $(G_2 - G_1)$ = algebraic difference in gradients connected by the vertical curve, in percent

G_1 = percent grade of approaching tangent

G_2 = percent grade of departing tangent

V = design speed, in mph

Standard vertical curves are shown in Figure B-5.

B.1.3.4 Combined Vertical and Horizontal Curves

A two-car train shall be capable of negotiating a combined (horizontal and vertical) curved section involving:

A. 82 ft radius horizontal curve and 1640 ft radius vertical curve either crest or sag.
B. 89 ft radius horizontal curve and 1150 ft radius vertical sag curve
C. 95 ft radius horizontal curve and an 820 ft radius vertical crest curve.

B.1.4 Special Trackwork

All special trackwork shall conform to and be installed in compliance with American Railway Engineering Association (AREMA) standards, modified as necessary to reflect the physical and operating characteristics of the system. For alignment requirements through special trackwork areas, refer to Section D.2.2.4 of this report. Section

B.1.5 Shared Use Tracks

If the LRT is operating on tracks shared with freight or commuter railroads, the maximum gradients, minimum horizontal and vertical curvature criteria, and the special trackwork requirements must be in accordance with FRA and the railroads requirements. The criteria used must be confirmed by the railroads operating on the track.

B.2 Clearance Requirements

B.2.1 General

This section establishes the minimum dimensions required to assure proper clearances between the light rail vehicles and transit structures or wayside obstructions involved.

For preliminary design, the following generalized lateral and track center to center clearances shall be adhered to. Where unusually restrictive or sensitive conditions warrant a more detailed calculation, the methodology presented in Sections B.2.2 through B.2.4 shall be utilized.

	Absolute Minimum	Desirable Minimum
• Standard ballasted track center to center – spacing with center overhead contact system poles	13’-0”	14'-0"
• Standard ballasted track center to center spacing without center overhead contact system poles	11’-0”	12'-0"
• Standard direct fixation track center to center spacing with center overhead contact system poles	12’-6”	13'-6"
• Standard direct fixation track center to center spacing without center overhead contact system poles	11’-4”	11'-6"
• Clearance to a retaining wall or fence with side maintenance and emergency evacuation path	7’-9 3/4”	9'-0"
• Distance between LRT track and adjacent railroad track assuming fencing between LRT track and railroad track	17'-0"	21'-0"
• Outer face of curb of adjacent traffic lane	6’-6"	8'-0"

B.2.2 Clearance Envelope

The Clearance Envelope (CE) is defined as the space occupied by the Vehicle Dynamic Envelope (VDE) plus the effects of other wayside factors (OWF) including construction and maintenance tolerances for track and various facilities, plus running clearances (RC). This relationship can be expressed as follows:

$$CE = VDE + OWF + RC$$

The Clearance Envelope represents the space into which no physical part of the system (other than the light rail vehicle) shall be placed, constructed or protrude. The Clearance Envelope shall be referenced from the centerline of track at top of rail. The following factors shall be considered in developing the Clearance Envelope.

B.2.2.1 Vehicle Dynamic Envelope

The vehicle dynamic envelope (VDE) is the extreme limit which a vehicle may reach while in motion taking into consideration lateral, vertical, and rotational car body movements that occur when operating on tangent track. The vehicle dynamic envelope can be thought of as the cross section of the vehicle for design purposes, but without construction tolerances, maintenance tolerances, and running clearances added. Figure B-2 presents the static outline and dynamic envelope of a composite vehicle that incorporates the range of critical dimensions and operational characteristics of the preliminary light rail vehicle design specified in Chapter H of this criteria.

In addition to body movements on tangent track, the effects of track curvature and superelevation must also be considered. On curved sections of track, the dynamic envelope must be adjusted for the end overhang and middle ordinate shift of the carbody and for track superelevation. Preliminary dynamic envelope values to the outside of curve (T_a) and inside of curve (T_t) for both ballasted and paved/direct fixation (DF) track are presented in Tables B-1 through B-4.

Clearances used in preliminary design shall be based on this assumed composite vehicle. When the actual dimensions and operational characteristics of the LRT vehicle become available, the dynamic outline shall be updated accordingly. Dimensions for the dynamic envelope shall include:

- Static geometry of the vehicle
- Roll angle of + 4o
- Suspension lateral travel (per side) of 1.340 in
- Wheel gauge construction tolerance (per side) of 0.031 in
- Lateral wheel wear (per side) of 0.300 in
- Radial wheel wear of 1.000 in
- Rail gauge construction tolerance (per side) of 0.125 in
- Lateral rail wear (per side) of 0.500 in
- Wheel-to-rail sideplay (per side) of 0.375 in

B.2.2.2 Other Wayside Factors

OWF is the sum of certain construction and maintenance tolerances (CMT) plus a chorded wall construction factor (CW) where applicable. This relationship can be expressed as follows:

$$OWF = CMT + CW$$

The following define the other wayside factors and are applicable to, and shall be included in, the horizontal component of the Clearance Envelope.

Construction and Maintenance Tolerances (CMT)

Construction Tolerance Along Proposed Soldier Pile and Lagging Wall	6 in
Construction Tolerance Along All Other Proposed Structures	2 in
Construction Tolerance at Poles or Signal Equipment	1.5 in

Construction and Maintenance Tolerances (CMT)

Track Construction and Maintenance Tolerance for Embedded or Direct Fixation Track	0.5 in
Track Construction and Maintenance Tolerance for Mainline, Ballasted Track	2 in
Track Construction and Maintenance Tolerance for Secondary and Yard Tracks	1 in
Allowance for Acoustical Treatment, Where Required	3 in

Chorded Wall Construction Factor (CW)

Additional Width for Chorded Construction of Walls to be Added on the Outside of Curves Only *(To be determined for Final Design)*	Not considered for preliminary design

Table B-1 Dynamic Envelope to Outside of Curve, T_a in inches (Ballasted Track)

Radius (feet)	Superelevation (in)						
	0	1	2	3	4	5	6
82	92.33	90.53	88.73	86.89	85.04	83.24	81.57
100	88.37	86.59	84.78	82.94	81.09	79.29	77.62
150	82.04	80.26	78.45	76.62	74.76	72.97	71.30
200	78.73	76.95	75.14	73.31	71.45	69.66	67.99
300	75.32	73.54	71.73	69.90	68.04	66.25	64.58
400	73.58	71.80	69.99	68.16	66.30	64.51	62.84
500	72.52	70.74	68.94	67.10	65.24	63.45	61.78
600	71.82	70.04	68.23	66.39	64.54	62.74	61.07
700	71.31	69.53	67.72	65.89	64.03	62.24	60.57
800	70.93	69.15	67.34	65.50	63.65	61.85	60.18
900	70.63	68.85	67.04	65.21	63.35	61.56	59.89
1000	70.39	68.61	66.80	64.97	63.11	61.32	59.65
2000	69.31	67.53	65.72	63.89	62.03	60.24	58.57
10000	68.44	66.66	64.85	63.02	61.16	59.37	57.70
Tangent	68.23	66.44	64.63	62.80	60.94	59.15	57.48

Table B-2. Dynamic Envelope to Inside of Curve, T_t in inches (Ballasted Track)

Radius (ft)	Superelevation (in)						
	0	1	2	3	4	5	6
82	81.85	84.33	86.80	89.26	91.71	94.16	96.60
100	79.15	81.63	84.10	86.56	89.01	91.46	93.90
150	75.08	77.56	80.03	82.49	84.95	87.40	89.84
200	73.06	75.54	78.01	80.47	82.92	85.37	87.81
300	71.04	73.52	75.99	78.45	80.91	83.36	85.80
400	70.04	72.51	74.98	77.44	79.90	82.35	84.79
500	69.43	71.91	74.38	76.84	79.30	81.74	84.19
600	69.03	71.51	73.98	76.44	78.89	81.34	83.78
700	68.74	71.22	73.69	76.15	78.61	81.05	83.50
800	68.53	71.00	73.47	75.93	78.39	80.84	83.28
900	68.36	70.84	73.30	75.77	78.22	80.67	83.11
1000	68.22	70.70	73.17	75.63	78.09	80.54	82.98
2000	67.62	70.10	72.57	75.03	77.48	79.93	82.37
10000	68.04	69.81	72.08	74.55	77.00	79.45	81.89
Tangent	68.23	70.00	71.96	74.43	76.88	79.33	81.77

Table B-3 Dynamic Envelope to Outside of Curve, T_a in inches (Paved/DF Track)

Radius (feet)	Superelevation (in)						
	0	1	2	3	4	5	6
82	91.43	89.63	87.81	85.97	84.10	82.41	80.73
100	87.48	85.68	83.86	82.02	80.15	78.46	76.78
150	81.16	79.36	77.54	75.69	73.82	72.14	70.45
200	77.84	76.05	74.23	72.38	70.51	68.82	67.14
300	74.44	72.64	70.82	68.97	67.10	65.42	63.73
400	72.70	70.90	69.08	67.23	65.36	63.68	61.99
500	71.64	69.84	68.02	66.18	64.31	62.62	60.94
600	70.93	69.13	67.31	65.47	63.60	61.91	60.23
700	70.42	68.63	66.81	64.96	63.09	61.40	59.72
800	70.04	68.24	66.42	64.58	62.71	61.02	59.34
900	69.74	67.95	66.13	64.28	62.41	60.72	59.04
1000	69.50	67.71	65.89	64.04	62.17	60.48	58.80
2000	68.42	66.63	64.81	62.96	61.09	59.40	57.72
10000	67.55	65.76	63.94	62.09	60.22	58.53	56.85
Tangent	67.34	65.54	63.72	61.87	60.00	58.32	56.83

Table B-4. Dynamic Envelope to Inside of Curve, T_t in inches (Paved/DF Track)

Radius (ft)	Superelevation (in)						
	0	1	2	3	4	5	6
82	80.61	83.09	85.56	88.03	90.49	92.94	95.38
100	77.91	80.39	82.86	85.33	87.79	90.24	92.68
150	73.84	76.32	78.80	81.26	83.72	86.17	88.62
200	71.82	74.30	76.77	79.24	81.70	84.15	86.59
300	69.80	72.28	74.76	77.22	79.68	82.13	84.58
400	68.80	71.28	73.75	76.21	78.67	81.12	83.57
500	68.19	70.67	73.14	75.61	78.07	80.52	82.97
600	67.79	70.27	72.74	75.21	77.67	80.12	82.56
700	67.50	69.98	72.45	74.92	77.38	79.83	82.28
800	67.29	69.77	72.24	74.70	77.16	79.62	82.06
900	67.12	69.60	72.07	74.54	77.00	79.45	81.89
1000	66.98	69.46	71.94	74.40	76.86	79.31	81.76
2000	66.38	68.86	71.33	73.80	76.26	78.71	81.15
10000	67.14	68.88	70.85	73.32	75.77	78.23	80.67
Tangent	67.34	69.12	70.90	73.20	75.65	78.11	80.55

B.2.2.3 Running Clearances

In addition to the Vehicle Dynamic Envelope and Other Wayside Factors, the Clearance Envelope includes an allowance for running clearance (RC) to provide clear passage for a light rail vehicle (LRV) which has moved to the extreme position within the Vehicle Dynamic Envelope.

The following define the running clearances to be included in the horizontal component of the Clearance Envelope.

Running Clearances (RC)	
Running Clearance at Overhead Contact System (OCS) Poles, Signals, Signs, and Other Non-Structural Members	2 in
Running Clearance Along Structural Members	6 in
Running Clearance for Adjacent Light Rail Vehicles	2 in

B.2.3 Special Clearance Situations

In addition to the Clearance Envelope requirements described above, there are several special clearance situations warranting further definition. These special situations include the vehicle interface at station platforms, retaining walls in both cut and fill sections, through girder bridges, and maintenance and emergency evacuation paths.

B.2.3.1 Shared Use Tracks

If the LRT is operating on tracks shared with freight or commuter railroads, the minimum horizontal clearance for structures on tangent track (including catenary poles, signal masts, etc.) is 10 ft 6 in from centerline of track to the face of the structure. In addition, if the track is curved the appropriate adjustments to the clearance envelope of the railroad's vehicles for track curvature and superelevation must be applied. The criteria used to adjust for curvature and superelevation must be confirmed by the railroads operating on the track. Additional horizontal clearance may be dictated by the railroad if oversize loads are anticipated to be run on the shared tracks.

B.2.3.2 Vehicle Interface at Station Platforms

At passenger stations, the distance from the centerline of the track to the edge of platform shall be 54.5 in. with a tolerance of plus 0.5 in and minus 0.0 in for tangent track. Curb edges for station platforms on curves are located at 54.5 in + 0.25 in per degree of curvature for inside curves and 54.5 in + 0.5 in per degree of curvature for outside curves from track centerline. Exact edge distance to be determined after vehicle selection.

Degree of curvature is defined as:

$$D = \frac{5729.28}{R(ft)}$$

B.2.3.3 Retaining Walls

Where retaining walls are used, they shall comply with the following:

Cut Sections

In those cases where a retaining wall along the LRT System is in a cut section, the preferred minimum clearance from the centerline of track to the near face of a retaining wall shall be 9 ft 0 in (See Figure C-6). Where no maintenance and emergency evacuation path is required adjacent to the retaining wall, the absolute minimum clearance from the centerline of track to the near face of a retaining wall shall be no less than that required to clear the Clearance Envelope.

Fill Sections

In retained fill sections, the top of a retaining wall shall be at the same elevation as the top of the adjacent rail (the rail nearest to the wall), and the preferred minimum distance from the centerline of track to any fencing or hand railing on top of the wall shall be a minimum of 9 ft 0 in (See Figure C-5 and C-6). Where no maintenance and emergency evacuation path is required adjacent to a curb or retaining wall without a fence or railing, the absolute minimum clearance from the centerline of track to the near face of the curb or wall shall be no less than 6 ft 6 in.

B.2.3.4 Through Girder Bridges

The lateral distance from a centerline of track to the nearest point on the girder of a through girder bridge shall be a minimum of 9 ft 0 in.

B.2.3.5 Maintenance and Emergency Evacuation Paths

A minimum clear width of 30 in (48 in desirable) shall be provided between the Clearance Envelope and any continuous obstruction alongside the track in a designated passenger emergency evacuation path. A minimum clear distance of 24 in shall be provided between the Clearance Envelope and any continuous obstruction along a path, which is used by maintenance employees in the performance of their duties.

B.2.4 Track Spacing

The minimum allowable spacing between two exclusive LRT mainline tracks, with equal superelevation and no OCS support poles between them, shall be determined from the following formula:

$$d = T_t + T_a + 2(OWF) + RC$$

Along sections where OCS poles are located between track centerlines, the minimum track spacing with equal superelevation shall be determined from the following formula:

$$d = T_t + T_a + 2(OWF + RC) + P$$

Where
- d = minimum allowable spacing between track centerlines, in inches
- T_t = dynamic half width of vehicle towards curve center, in inches (see Table B-2 and Table B-4)
- T_a = dynamic half width of vehicle away from curve center, in inches (see Table B-1 and Table B-3)
- OWF = other wayside factors, in inches
- RC = running clearance, in inches
- P = maximum allowable OCS pole diameter (including deflection) of 18.5 in

The desirable minimum track spacing to be used along tangent ballasted track with center OCS support poles shall be 14 ft 0 in. The desirable minimum track spacing to be used along tangent ballasted track without center OCS support poles shall be 12 ft 0 in. Tangent embedded and direct fixation tracks without center OCS poles shall have absolute minimum track centers of 11 ft 4 in and desirable minimum of 11 ft 6 in.

B.2.5 Vertical Clearances

Since the LRT system will draw electric traction power from an overhead contact wire system, provide the following vertical clearances from the top of the high rail along any given section of track to the soffit of any overhead structure, within the horizontal limits of the Clearance Envelope:

Location	Minimum Vertical Clearance
At Overhead Bridges	19 ft 6 in, preferred minimum
	15 ft 0 in, desired minimum
	14 ft 3 in, absolute minimum

The absolute minimum vertical clearance of 14 ft 3 in is based upon a minimum pantograph operating height of 13 ft 6 in. Vertical clearances less than the "desired minimum" may not be used without specific approval of HRT's Director of Engineering & Construction.

Transit structures over public highways shall be in accordance with American Association of State Highway and Transportation Officials Standard Specifications for Highway Bridges or as modified by the Hampton Roads Transit District Commission (HRTDC) or local jurisdiction, whichever is applicable. Vertical clearances for transit structures over local public streets and roads shall be as required by the authority having jurisdiction over the street or road.

B.2.5.1 Shared Use Tracks

If the LRT is operating on or crossing tracks shared with freight or commuter railroads, the minimum vertical clearance for structures over the tracks shall be 23 ft 6 in. The structure height shall allow installation of catenary with a minimum 22 ft 0 in contact wire height.

HRT Hampton Roads Transit

URS & PB TEAM

6161 Kempsville Circle, Suite 110
Norfolk, Virginia 23502

TRACK CONSTRUCTION AND MAINTENANCE TOLERANCES

TYPE OF TRACK	GAGE VARIATION [1, 6]	CROSS LEVEL AND SUPERELEVATION VARIATION [1, 5]	VERTICAL TRACK ALIGNMENT		HORIZONTAL TRACK ALIGNMENT	
			TOTAL DEVIATION [2]	MIDDLE ORDINATE IN 62' CHORD [3]	TOTAL DEVIATION [2, 3]	MIDDLE ORDINATE IN 62' CHORD [4]
MAIN LINE	+/- 1/8"	+/- 1/8"	+/- 1/2" OPEN +/- 1/8" EMBEDDED AND DF	+/- 1/8"	+/- 1/2"	+/- 1/8"
YARD	+/- 1/8"	+/- 1/4"	+/- 1"	+/- 1/4"	+/- 1/2"	+/- 1/8"

NOTES:

1. VARIATIONS OF GAGE, CROSSLEVEL AND SUPERELEVATION SHALL NOT EXCEED 1/8 INCH PER 31 FEET OF TRACK
2. TOTAL DEVIATION IS MEASURED BETWEEN THE THEORETICAL AND ACTUAL ALIGNMENTS AT ANY POINT IN THE TRACK. TOTAL DEVIATION IN STATION AREA = 1/4"
3. POSSIBLE FUTURE MAINTENANCE DEVIATION - MAINLINE: +/- 2" OPEN TRACK, +/- 0.5" PAVED & DF TRACK; YARD TRACK: +/- 3"
4. POSSIBLE FUTURE MAINTENANCE DEVIATION - MAINLINE: +/- 1/2" OPEN TRACK, +/- 0.5" PAVED & DF TRACK; YARD TRACK: +/- 3"
5. POSSIBLE FUTURE CROSSLEVEL MAINTENANCE DEVIATION - MAINLINE: +/- 7/8" OPEN TRACK, +/- 3/8" PAVED & DF TRACK; YARD TRACK: +/- 7/8"
6. POSSIBLE FUTURE GAGE MAINTENANCE DEVIATION - MAINLINE: +/- 1"; YARD TRACK: +/- 1"

Figure No. B-1

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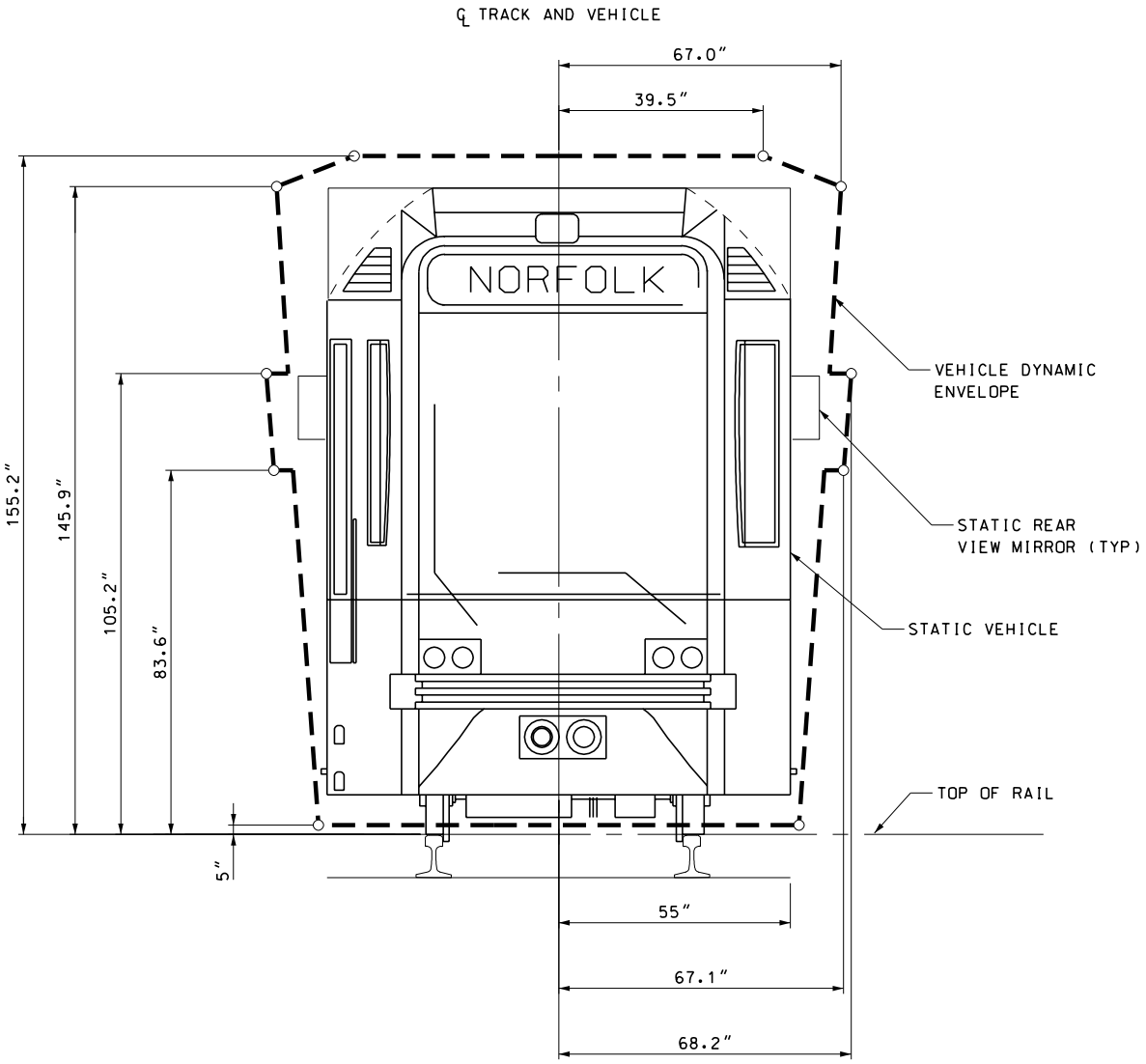
Page No.

VEHICLE OPERATING CONDITIONS

1. TANGENT, BALLASTED TRACK
2. CROSS LEVEL VARIATION OF 1 in.
3. WORN RAILS AND WHEELS
4. NOMINAL RAIL GAGE OF 4' - 8 1/2"
5. MAXIMUM ROLL ANGLE OF 4 DEGREES
6. WORST CASE VEHICLE CONSTRUCTION TOLERANCES
7. WORST CASE CARBODY AND TRUCK MOVEMENTS
8. FAILED SUSPENSION

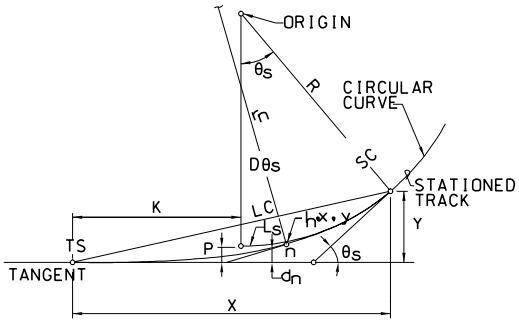


NOT TO SCALE

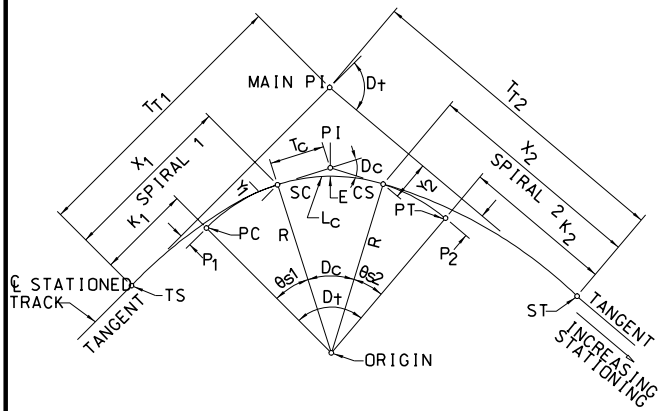
NOTES

1. ALL DIMENSIONS ARE SYMMETRICAL ABOUT THE CENTERLINE OF TRACK AND VEHICLE
2. PANTOGRAPH NOT SHOWN
3. ROUNDING OF CARBODY CORNER IGNORED TO BE CONSERVATIVE

HRT Hampton Roads Transit	URS & PB TEAM 6161 Kempsville Circle, Suite 110 Norfolk, Virginia 23502	PRELIMINARY VEHICLE DYNAMIC ENVELOPE	Figure No. B - 2	Rev. No. Page No.



SPIRAL TRANSITION CURVE (CLOTHOID)



SPIRAL – CURVE – SPIRAL (SCS) LAYOUT

CURVE FORMULAS AND ABBREVIATIONS

CS = CURVE/SPIRAL POINT
L_S = LENGTH OF SPIRAL
PC = POINT OF CURVATURE
PI = POINT OF INTERSECTION
PT = POINT OF TANGENCY
R = RADIUS OF CIRCULAR CURVE
SPI = SPIRAL POINT OF INTERSECTION
ST = SPIRAL/TANGENT POINT
TS = TANGENT/SPIRAL POINT
PS = POINT OF SWITCH
PITO = POINT OF INTERSECTION FOR TURNOUT

θ_S = SPIRAL ANGLE IN DEGREES $= \frac{L_S \, D_C}{200}$

d_S = SPIRAL ANGLE IN RADIANS $= \theta_S \cdot \frac{\pi}{180}$

D_t = OVERALL DEFLECTION ANGLE

D_C = CENTRAL ANGLE OF CIRCULAR CURVE $= D_t - (\theta_{S1} + \theta_{S2})$

$$X = L_S\left(1 - \frac{d_S^2}{10} + \frac{d_S^4}{216} - \frac{d_S^6}{9360} + \frac{d_n^8}{685440}\right)$$

$$Y = L_S\left(\frac{d_S}{3} - \frac{d_S^3}{42} + \frac{d_S^5}{1320} - \frac{d_S^7}{75600} + \frac{d_S^9}{6894720}\right)$$

(WHERE X = TANGENT DISTANCE FROM TS TO SC OR CS TO ST.
AND Y = OFFSET DISTANCE AT SC FROM TS OR AT CS FROM ST.

D_C = DEGREE OF CIRCULAR CURVE – ARC DEFINITION $= \frac{18000}{\pi \cdot R}$

E = EXTERNAL DISTANCE R = EXSEC $\frac{D_C}{2}$

$K = X - R \cdot \sin \theta_S$

L_C = LENGTH OF CIRCULAR CURVE $= \frac{D_C}{180} \cdot \pi \cdot R$

$LT = X - Y/\sin \theta_S$

$P = Y - R \cdot (1 - \cos \theta_S)$

$ST = Y/\sin \theta_S$

T_C = TANGENT LENGTH OF CIRCULAR CURVE $= R \cdot \tan \frac{D_C}{2}$

T_T = TANGENT LENGTH FROM TS TO MAIN PI $= K + (R+P) \tan \frac{D_t}{2}$

IF $\theta_{S1} \neq \theta_{S2}$:

$$T_{T1} = \frac{P_2}{\sin D_t} - \frac{P_1}{\tan D_t} + K_1 + R \cdot \tan \frac{D_t}{2}$$

$$T_{T2} = \frac{P_1}{\sin D_t} - \frac{P_2}{\tan D_t} + K_2 + R \cdot \tan \frac{D_t}{2}$$

NOTES:
1. D_C, D_t, θ_S, AND D_C ARE IN DEGREES
2. NUMERIC SUBSCRIPTS REFER TO SPIRALS 1 AND 2
3. ALL DISTANCES ARE IN FEET
4. TRANSITION SUPERELEVATION LINEARLY OVER UNLESS OTHERWISE NOTED.

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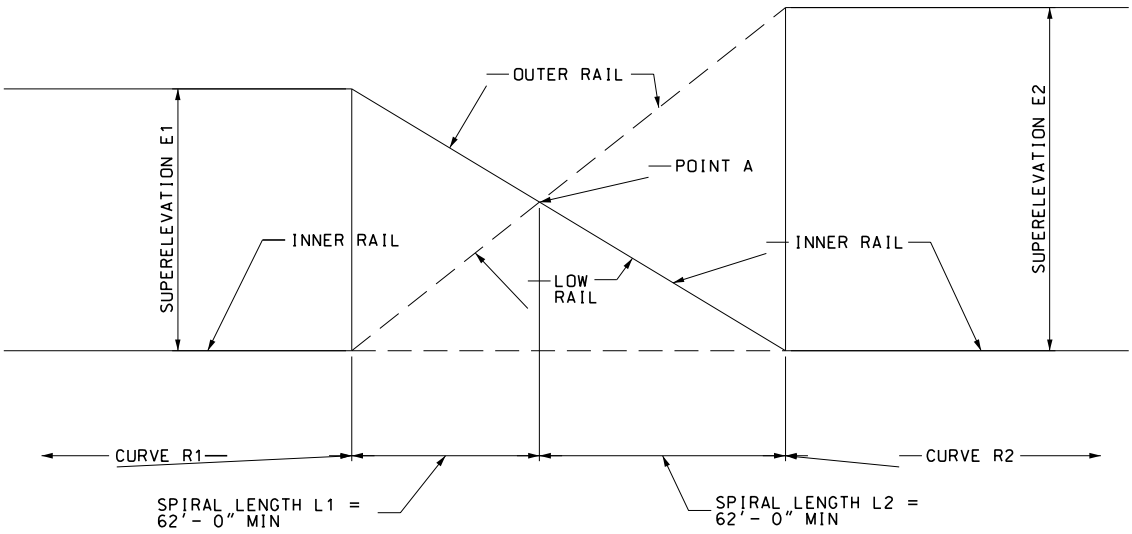
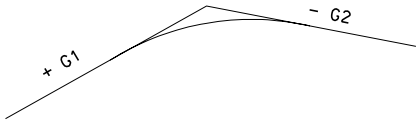
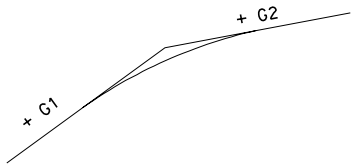


NOT TO SCALE

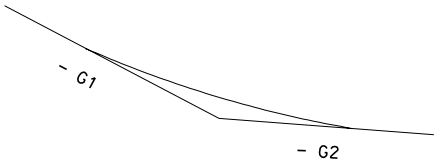
NOTE: ON SUPERELEVATED CURVE, TOP OF RAIL ELEVATIONS SHOWN ON PROFILE ARE FOR THE LOWER RAIL

HRT Hampton Roads Transit	URS & PB TEAM 100 YEARS 6161 Kempsville Circle, Suite 110 Norfolk, Virginia 23502	SUPERELEVATION TRANSITIONS FOR REVERSE CURVES	Figure No. B-4	Rev. No. Page No.



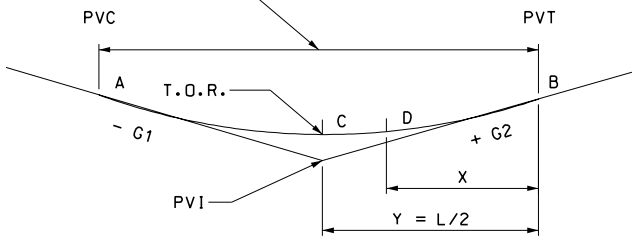


CREST TYPE VERTICAL CURVES



SAG TYPE VERTICAL CURVES

L DESIRABLE = 200(G2 - G1)



ELEV C = $\frac{2 \text{ ELEV. PVI} + \text{ELEV. A} + \text{ELEV. B}}{4}$

OFFSET AT C = DIFFERENCE BETWEEN ELEV. C AND ELEV. PVI

OFFSET AT D = OFFSET AT C * $(X/Y)^2$

T.O.R. AT D = OFFSET AT D +/- GRADIENT ELEV. AT D

STANDARD VERTICAL CURVES

HRT Hampton Roads Transit	URS & PB TEAM 100 YEARS 6161 Kempsville Circle, Suite 110 Norfolk, Virginia 23502	STANDARD VERTICAL CURVES	Figure No. B - 5	Rev. No. Page No.