

I-95 HOV/HOT Lanes Project

Exhibit C

Technical Requirements

Attachment 1.5a

Standards and Specifications

The standards, special provisions and reference guides applicable for the Construction Period shall be the version of those documents as noted herein below or those in effect as of August 15, 2011, including all supplements, errata, revisions and interims. Following the Work period, all subsequent design and construction must meet the standards current at the time the Work is performed. Groupings of standards are for ease of reference only and certain reference documents have been included. It is the responsibility of the Concessionaire to ensure that all relevant standards and specifications have been applied.

The Concessionaire must verify and use the latest version of the documents listed herein. The Concessionaire shall meet or exceed the minimum design standards and criteria.

Standards and Specifications

General

1. AASHTO Guide Specifications for Highway Construction, 9th Edition
2. VDOT Materials Approved Lists August 2011
3. VDOT Construction Manual (2005, revised July 2008)
4. VDOT Post Construction Manual (Revised & Reissued May 2011)
5. VDOT Construction Inspection Manual (April 2008)
6. VDOT's Minimum Requirements for Quality Assurance & Quality Control on Design-Build & Public-Private Transportation Act Projects August 2008
7. VDOT Traffic Engineering Design Manual (2006)
8. VDOT Right of Way Manual of Instructions, Third Edition – January 1, 2011
9. VDOT Utility Manual of Instructions – Utility Relocation Policies and Procedures, Tenth Edition (1/1/2011)
10. VDOT Land Use Permit Regulations Guidance Manual (3/17/2010)
11. VDOT Land Use Permit Regulations 24 VAC 30-151 (3/17/2010)
12. VDOT Policy Manual for Public Participation in Transportation Projects (Revised August 29, 2011)
13. VDOT Instructional & Information Memorandums (IIM) – All Divisions (Revised March 2011)
14. VDOT Traffic Engineering Division Memoranda, as of March 10, 2011
15. VDOT Road and Bridge Standards, Vol. 1 and Vol. 2 (2008), including all revisions
16. VDOT Road and Bridge Specifications (2007), including the Revisions to the Road and Bridge Specifications
17. VDOT Virginia Work Area Protection Manual (2011)
18. 2010 ADA Standards for Accessible Design

EXECUTION VERSION – JULY 31, 2012

19. Access Board's Notice of Availability of Draft Public Rights-of-Way Accessibility Guidelines, dated November 23, 2005
20. Americans with Disabilities Act (ADA) and Architectural Barriers Act (ABA) Accessibility Guidelines for Buildings and Facilities dated July 23, 2004 and amended August 5, 2005
21. VDOT Policy for Integrating Bicycle and Pedestrian Accommodations, adopted March 18, 2004 by the CTB
22. Transportation Research Board Highway Capacity Manual (2010)
23. VDOT Manual of Instruction for Material Division (Revised 2009) to include all associated memorandum
24. VDOT CADD Manual (Version 2009)
25. Revisions to VDOT CADD Manual
26. VDOT State Noise Abatement Policy (July 13, 2011)
27. ISO 9001 Quality Management Systems 2008
28. AASHTO Guide for Park-and-Ride Facilities, 2nd Edition
29. Virginia Uniform Statewide Building Code (2009)
30. Uniform Relocation Assistance and Real Property Act of 1970, as amended
31. 1950 Code of Virginia, Titles 25.1 and 33.1, as amended

Roadway Design

1. VDOT State Bicycling Policy Plan (2010)
2. VDOT Road Design Manual (all revisions as of January 2011)
3. AASHTO A Policy on Geometric Design of Highways and Streets (2004)
4. AASHTO Roadside Design Guide, Third Edition, 2006 (updated chapter 6)
5. AASHTO: A Policy on Design Standards Interstate System, Jan 2005
6. AASHTO – Guide for High-Occupancy Vehicle (HOV) Facilities, 3rd Edition
7. AASHTO Guide for the Development of Bicycle Facilities, 3rd Edition
8. AASHTO Guide for the Planning, Design, and Operation of Pedestrian Facilities, July 2004

Geotechnical and Pavement Design

1. VDOT Soil Design Parameters for Sound Barrier Walls, Retaining Walls and Non-Critical Slopes – April 14, 2011
2. VDOT Guidelines for 1993 AASHTO Pavement Design, Revised – May 2003
3. VDOT Requirements for Geotechnical Investigation, Geotechnical Design and Minimum Pavement Sections for I-95/395 HOV/HOT Lanes – July 18, 2011

EXECUTION VERSION – JULY 31, 2012

4. AASHTO Guide for Design of Pavement Structures (Rigid Pavement and Flexible Pavement) (1993 Edition)
5. AASHTO “Manual on Subsurface Investigations” (1988)
6. VDOT Pavement Design Guide for Subdivision and Secondary Roads, 2009
7. VDOT Manual of Instruction for Material Division
8. VDOT Manual of Structure and Bridge Division, Volume V – Part 11 Geotechnical Manual for Structures
9. FHWA 23CFR626 - Part 626 Pavement Policy
10. Development and Implementation of Pavement Condition Indices for the Virginia Department of Transportation: Phase I – Flexible Pavements – September 2002

Structures

1. VDOT Manual of Structure and Bridge Division, Vol. V Series
2. VDOT Procedures for Inventory and Inspection of Traffic Control Device Structures, 2006
3. AASHTO Guide Specification for LRFD Seismic Bridge Design, 1st Edition, 2009 with 2010 Interim Revisions
4. AASHTO LRFD Bridge Design Specifications, Customary U.S. Units, 5th Edition, 2010 with 2010 Interim Revisions; and VDOT Modifications (VDOT IIM-S&B-80)
5. AASHTO Standard Specifications for the Design of Highway Bridges, 16th Edition, 1996 with 1997 and 1998 Interim Revisions; and VDOT Modifications
6. AASHTO Construction Handbook for Bridge Temporary Works, 1st Edition, 1995 with 2008 Interim Revisions
7. AASHTO Guide Design Specifications for Bridge Temporary Works, 1st Edition, 1995 with 2008 Interim Revisions
8. AASHTO Manual for Bridge Evaluation, 2nd Edition, 2011
9. AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaries, and Traffic Signals, 1994 Edition
10. AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaries, and Traffic Signals, 4th Edition, 2001 (to be used for the design of anchor bolts and dynamic message sign supports only)
11. AASHTO Guide Specifications for Structural Design of Sound Barriers, 1989 with 1992 and 2002 Interim Revisions
12. “Guidelines for Deck Testing of Existing Structures to be Widened”, File No. 1-03.15 (1 thru 5), Volume IV, Manuals of the Structure and Bridge Division, VDOT
13. “Repair/Rehabilitation, Deck Investigations”, IPPM-35(03), Design Section, Internal Policy/Procedure Memorandum, Structure and Bridge Division, Salem District, VDOT

EXECUTION VERSION – JULY 31, 2012

14. VDOT Guide Manual for Causes and Repair of Cracks in Bridge Decks – September 25, 2009
15. FHWA Guidelines for the Installation, Inspection, Maintenance and Repair of Structural Supports for Highway Signs, Luminaires, and Traffic Signals (March 2005), FHWA NHI 05-036
16. Recording and Coding Guide for the Structure Inventory and Appraisal of the Nation's Bridges, December 1995, Report No. FHWA-PD-96-001
17. FHWA 23CFR625 - Part 625 Design Standards for Highways
18. FHWA 23CFR650 - Part 650 Bridges, Structures, and Hydraulics
19. Virginia Department of Transportation Stage I - Plan Review Check List – August 2011 Draft
20. Virginia Department of Transportation Stage I - Sheet Requirement Check List – October 20, 2003 Draft
21. Virginia Department of Transportation Structure and Bridge Division Stage I - Report Template – January 7, 2004 Draft
22. Stage II - Plan Review Check List – July 1, 2011 Draft
23. AASHTO LRFD Guide Specifications for Pedestrian Bridges, 2nd Edition
24. AASHTO LRFD Bridge Construction Specifications, 3rd Edition, 2010 Interim Revisions, Single User Digital Publication
25. VDOT Element Data Collection Manual, 2007
26. VDOT Memorandum – Asbestos Containing Materials on Bridges – October 23, 2009
27. VDOT Guidelines for Steel Box Girders, Draft – June 25, 2003
28. VDOT Guidelines for Steel Box Pier Caps, Draft – June 25, 2003
29. VDOT Proposed Pier Protection Detail

Drainage

1. VDOT 2002 Drainage Manual (including current Errata Sheets) and revisions (Revised 4/2010)
2. VDOT Hydraulic Design Advisories as of February 20, 2009
3. Virginia Stormwater Management Handbook, Volume I & Volume II, (First Edition – 1999), Virginia Department of Conservation and Recreation
4. Virginia Erosion and Sediment Control Handbook (Third Edition – 1992), Department of Conservation and Recreation
5. FHWA Hydraulic Design Series Number 5 (HDS-5), Hydraulic Design of Highway Culverts, 2005

EXECUTION VERSION – JULY 31, 2012

6. FHWA Hydraulic Design Series Number 6 (HDS-6), River Engineering for Highway Encroachments, 2001
7. FHWA Hydraulic Engineering Circular Number 9 (HEC-9), Debris Control Structures – Evaluation and Counter Measures, 2005
8. FHWA Hydraulic Engineering Circular Number 15 (HEC-15), Design of Roadside Channels with Flexible linings, Third Edition, 2005
9. FHWA Hydraulic Engineering Circular Number 14 (HEC-14), Hydraulic Design of Energy Dissipaters for Culverts and Channels, 2006
10. FHWA Hydraulic Engineering Circular Number 17 (HEC-17), The Design of Encroachments on Flood Plains Using Risk Analysis, 1981
11. FHWA Hydraulic Engineering Circular Number 18 (HEC-18), Evaluating Scour at Bridges, 2001
12. FHWA Hydraulic Engineering Circular Number 20 (HEC-20) Stream Stability at Highways, 2001
13. FHWA Hydraulic Engineering Circular Number 21 (HEC-21), Design of Bridge Deck Drainage Systems, 1993
14. FHWA Hydraulic Engineering Circular Number 22 (HEC-22), Urban Drainage Design Manual, 2001
15. FHWA Hydraulic Engineering Circular Number 23 (HEC-23), Bridge Scour and Stream Instability Countermeasures – Experience, Selection and Design, 2001
16. FHWA Culvert Inspection Manual, 1986
17. US Army COE, Hydrologic Modeling System (HEC HMS)
18. Virginia, Erosion and Sediment Control Law and Regulations, FY 2009
19. FEMA National Flood Insurance Program Regulations
20. US Army COE, River Analysis System (HEC RAS), Version 4.1
21. The Virginia SWM Law dated 2004 (as listed in the Code of Virginia)
22. The Virginia SWM Regulations dated 2005 (as listed in the Virginia Administrative Code)

Traffic Control Devices and Lighting

1. USDOT FHWA Standard Highway Signs
2. Manual of Uniform Traffic Control Devices (MUTCD), 2009 and Virginia Supplement to MUTCD, 2011
3. AASHTO Roadway Lighting Design Guide (2005)
4. ANSI/IESNA RP-8-00 Roadway Lighting
5. National Fire Protection Association NEC Standards, 2008

Miscellaneous

1. VDOT Survey Manual 2010 Edition
2. VDOT Guardrail Installation Training Manual (GRIT), Revised October 2010

ITS

1. Institute of Electrical and Electronics Engineer (IEEE) 802.3 Local and Metropolitan Area Networks
2. National Electric Manufacturers Association (NEMA) TS-4 Hardware Standards for Dynamic Message Signs (DMS) with NTCIP Requirements
3. IEEE 1512-2006 - IEEE Standard for Common Incident Management Message Sets for Use by Emergency Management Centers, IEEE 1512.1-2006 – IEEE Standard for Common Traffic Incident Management Message Sets for Use by Emergency Management Centers
4. National Transportation Communications for ITS Protocol (NTCIP)
5. VDOT Northern Region Operations ITS Architecture
6. Capital Beltway I-495 HOT Lanes Program TMS to the VDOT NRO PSTOC ATMS External Interface Control Document (ICD), Version: 1.4 (Draft) – March 28, 2011

Special Provisions

General

1. Virginia Department of Transportation Special Provision for Elastic Inclusion – June 24, 2003a
2. Virginia Department of Transportation Special Provision for Quality Assurance/Quality Control (QA/QC) for the Construction of Deep Foundation Systems for Design-Build and PPTA Contracts – November 10, 2009
3. Virginia Department of Transportation Guide Special Provision for Drilled Shafts – August 29, 2008
4. Virginia Department of Transportation Special Provision for Lightweight Aggregate – May 16, 2011
5. Virginia Department of Transportation Project Specific Special Provision for Soldier Pile Retaining Walls – June 6, 2011
6. Virginia Department of Transportation Special Provision for Sound Barrier Walls Project 0095-96A-107, P101, UPC 70849 (Northern Project) – April 21, 2011
7. Virginia Department of Transportation Special Provision for Hydraulic Cement Concrete Operations for Massive Construction – March 3, 2010
8. Virginia Department of Transportation Special Provision for Asbestos Removal for Road Construction Demolition Projects – March 18, 2009

EXECUTION VERSION – JULY 31, 2012

9. Virginia Department of Transportation Special Provision for Construction Noise Control – June 28, 2007
10. Virginia Department of Transportation Special Provision for Density Control of Embankments and Backfill, Revised – November 26, 2006
11. Northern Region Special Provisions for Traffic Signal Installation, Revised – May 4, 2011
12. Virginia Department of Transportation Special Provision for Design-Build Tracking (DBT) Numbers – February 8, 2008
13. Virginia Department of Transportation Special Provision for Reflection Cracking Retardant Material (English Units) – March 22, 2010
14. Virginia Department of Transportation Special Provision for Sealing Cracks in Asphalt Concrete Pavement or Hydraulic Cement Concrete Pavements (Prior to Overlay) – August 1, 2010
15. Virginia Department of Transportation Special Provision for Undersealing Portland Cement Concrete Pavement – January 3, 1995
16. Virginia Department of Transportation Special Provision for Corrosion Resistant Reinforcing Steel – November 19, 2009
17. Virginia Department of Transportation Special Provision for Gravity Filled Polymer Crack Sealing – Reissued July 2008
18. Virginia Department of Transportation Special Provision for Sealing Expansion Joints – Reissued July 2008
19. Virginia Department of Transportation Special Provision for Filling and Sealing Pattern Cracks in Concrete Decks and Overlays – May 17, 2010
20. Virginia Department of Transportation Special Provision for Tooth Expansion Joint – January 14, 2008
21. Virginia Department of Transportation Special Provision for Epoxy Concrete Overlay – May 31, 2001
22. Virginia Department of Transportation Project Specific Special Provision for Vibro Concrete Columns – June 24, 2011
23. Virginia Department of Transportation Project-Specific Special Provision for Shotcrete and Permanent Concrete Facing – June 6, 2011
24. Virginia Department of Transportation Project-Specific Special Provision for Secant Pile or Tangent Pile (Drilled Shaft) Walls – June 8, 2011
25. Virginia Department of Transportation Project-Specific Special Provision for Permanent Soil Nails – June 7, 2011
26. Virginia Department of Transportation Project-Specific Special Provision for Low Density Cementitious Fill – June 24, 2011
27. Virginia Department of Transportation Special Provision for Densified Aggregate Piers for Foundation Reinforcement – June 24, 2011

EXECUTION VERSION – JULY 31, 2012

28. Virginia Department of Transportation Project-Specific Special Provision for Densified Cement-Treated/Grouted Aggregate Piers for Foundation Reinforcement – June 10, 2011
29. Virginia Department of Transportation Project-Specific Special Provisions for Reinforced Earth Walls With Low Density Cementitious Fill (LDCF) – June 24, 2011
30. Virginia Department of Transportation Special Provision for CCTV Video Equipment and CCTV General Requirements – August 1, 2011
31. Virginia Department of Transportation Special Provision for Load and Resistance Factor Design (LRFD) – December 29, 2008
32. Virginia Department of Transportation Special Provision for Dynamic Pile Testing for Friction Piles for LRFD for Design-Build and PPTA Contracts – December 10, 2009
33. Virginia Department of Transportation Special Provision for Dynamic Pile Testing for End Bearing Piles for LRFD for Design-Build and PPTA Contracts – December 10, 2009
34. Virginia Department of Transportation Special Provision for Wave Equation Analysis for LRFD for Design-Build and PPTA Contracts – December 10, 2009
35. Special Provisions for VDOT Intelligent Transportation Systems (ITS) – Conduit – August 1, 2011
36. Special Provisions for VDOT Intelligent Transportation Systems (ITS) – Junction Boxes – August 1, 2011
37. Special Provisions for VDOT Intelligent Transportation Systems (ITS) – Fiber Optic Cable and Interconnect – August 1, 2011
38. Virginia Department of Transportation Special Provision for Sawing and Sealing Joints in Asphalt Overlays Over Jointed Concrete Pavements – October 31, 2008a

100

1. Virginia Department of Transportation Special Provision for Use of Domestic Material – February 26, 2009 (S102CF1)
2. Virginia Department of Transportation Special Provision for Section 1051.10 Construction Stakes, Lines and Grades – July 9, 2002 (S105A0B)

300

1. Virginia Department of Transportation Special Provision for Flowable Backfill – March 11, 2010

500

1. Virginia Department of Transportation Special Provision for Removal or Connection of Asbestos Cement Pipe – November 7, 2005 (S500A1B)
2. Virginia Department of Transportation Special Provision Copied Notes c504b0b – Section 504 – Sidewalks, Steps, and Handrailings – January 12, 2005

700

1. S704E01 – TYPE B, CLASS VI PAVEMENT LINE MARKING – November 21, 2008

Reference Documents

1. FHWA Geotechnical Engineering Circular No. 2 - Earth Retaining Systems, FHWA-SA-96-038, 1996
2. FHWA Geotechnical Engineering Circular No. 4 - Ground Anchors and Anchored Systems, FHWA-IF-99-015, 1999
3. FHWA Geotechnical Engineering Circular No. 7 - Soil Nail Walls, FHWA-IF-03-017, 2003
4. FHWA Permanent Ground Anchors, Volume 1, Final Report, FHWA-DP-90-068, 1991
5. FHWA Permanent Ground Anchors, Volume 2, Field Demonstration Project Summaries, FHWA-DP-90-068, 1991
6. FHWA Geotechnical Engineering Circular No. 6, Shallow Foundations, September 2002, FHWA-SA-02-054
7. FHWA Manual of Subsurface Investigations, May 2002, FHWA NHI-01-031
8. FHWA Design and Construction of Mechanically Stabilized Earth Walls and Reinforced Soil Slopes Volumes I & II, November 2009, FHWA-NHI-10-024
9. FHWA Drilled Shafts Construction Procedures and LRFD Design Methods, May 2010, FHWA NHI-10-016
10. FHWA Manual for Design & Construction of Soil Nail Walls, FHWA-SA-96-069R, 1999
11. FHWA Soil Nailing Field Inspectors Manual-Soil Nail Walls, FHWA-SA-93-068, 1993
12. FHWA The Osterberg Cell for Load Testing Drilled Shafts And Driven Piles, FHWA-SA-94-035, 1994
13. Load and Resistance Factor Design (LRFD) For Highway Bridge Superstructures (April 2007), FHWA-NHI-08-048
14. Load and Resistance Factor Design (LRFD) for Highway Bridge Substructures (April 2007), FHWA-NHI-08-036
15. Load and Resistance Factor Design (LRFD) For Highway Bridge Superstructures - Examples (April 2007), FHWA-NHI-08-049
16. LFRD for Highway Bridge Substructures and Earth Retaining Structures (Jan 2007), FHWA-NHI-05-095

EXECUTION VERSION – JULY 31, 2012

17. Ground Improvements Reference Manual Volume I, FHWA-NHI-06-019
18. Ground Improvements Reference Manual Volume II, FHWA-NHI-06-020
19. Earth Retaining Structures (RM), FHWA-NHI-07-071
20. Micropile Design and Construction Reference Manual (December 2005), FHWA-NHI-05-039
21. Mechanically Stabilized Earth Walls And Reinforced Soil Slopes - Design And Construction Guidelines (March 2001), FHWA-NHI-00-043
22. VDOT Clearance Chart (08-18-03)
23. VDOT Conductor Cable and Conduit Sizes (08-18-03)
24. VDOT Preliminary Sub Example
25. VDOT Rest in Walk pedestrian phasing (01-13-05)
26. VDOT Right Turn overlap phasing (01-13-05)
27. VDOT Right-of-way Diagrams (01-13-05)
28. VDOT Side street split phasing (01-13-05)
29. VDOT Signal Control Justification (08-18-03)
30. VDOT Signal Plan Update (01-13-05)
31. VDOT NOVA Signal Symbols (08-18-03)
32. VDOT Signal Timing Submission Process (08-18-03)
33. VDOT Span Wire Design Notes (08-18-03)
34. VDOT Telespar Sign Supports (01-13-05)
35. VDOT NOVA Timing Template-170 format (01-3-05)
36. VDOT Design Notes (08-18-03)
37. VDOT Traffic Calming Guide for Local Residential Streets, 2002 (Revised July, 2008)
38. VDOT Detector Placement (01-13-05)
39. VDOT Double Left-turn Lane Diagram (08-18-03)
40. VDOT General Guidelines for Signal Design (08-18-03)
41. VDOT Left Turn Phasing Guide (08-18-03)
42. VDOT Light Emitting Diode Module (08-18-03)
43. VDOT Mast Arm Signage (08-18-03)
44. VDOT Mast Arm Design Notes (0-8-18-03)
45. VDOT Mast Arm Traffic Signal Pole Guide (08-18-03)
46. American Water Works Association Standards

EXECUTION VERSION – JULY 31, 2012

47. FHWA Hydraulic Design Series No. 1, Hydraulics of Bridge Waterways, 1978
48. FHWA Hydraulic Design Series No. 2, Highway Hydrology, 2002
49. FHWA Hydraulic Design Series No. 3, Design Charts for Open Channel Flow, 1961
50. FHWA Hydraulic Design Series No. 4, Introduction of Highway Hydraulics, 2008
51. FHWA Hydraulic Design Series No. 5, Hydraulic Design of Highway Culverts 2005
52. FHWA Hydraulic Engineering Circular No. 11, Design of Riprap Revetment, 1989
53. USDA, NRCS, Urban Hydrology for Small Watersheds, TR-55, June 1986
54. FHWA - A Guide for HOT Lane Development, March 2003
55. ITE TMDD - Traffic Management Data Dictionary and Message Sets for External TMC Communication (TMDD and MS/ETMCC)
56. VDOT DBE Program, March 15, 2007
57. Virginia Department of Transportation CII/SSI Policy Guide For Employees, Vendors, Contractor or other Persons Accessing VDOT's CII/SSI – March, 2006 (Interim Revision November, 2009)
58. DMS Upgrade and Expansion Program *Concept of Operations*, February 25, 2008
59. VDOT NRO Vehicle Detector Master Plan, June 13, 2008
60. VDOT NRO CCTV Master Plan, May 2008
61. VDOT NRO CCTV Concept of Operations, May 2008
62. VDOT NRO Vehicle Detector Concept of Operations, May 14, 2008
63. FHWA 23 CFR PART 940—Intelligent Transportation System Architecture and Standards – January 8, 2001
64. VDOT ITS Projects – Systems Engineering and Architecture Compliance (Rule 940) Checklist
65. Virginia Megaprojects Program Lane Closure Policy and Procedures, April 23, 2012