



Adjacent Construction Project Manual

Office of Joint Development and Adjacent Construction

Washington Metropolitan Area Transit Authority
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Preface

The Washington Metropolitan Area Transit Authority's (WMATA) Adjacent Construction Project Manual (ACPM), known throughout this document as the Manual, is prepared in the interest and for the guidance of those who may contemplate construction activities that are adjacent to, beneath, on, or over existing WMATA property, facilities, Roadway and/or operating Rights-of-Way.

The Manual outlines the general procedures and process requirements that must be followed when working in close proximity to any WMATA facility. It also covers requirements for safety & security, WMATA operations, public communication, quality control, real estate & insurance, design, construction, monitoring, and as-built documentation.

The criteria provided herein are general and provide an overview of the design requirements for adjacent construction projects. WMATA review and acceptances are required prior to construction of the project. For those projects requiring modification or updates to existing infrastructure, delivery of new assets, or joint development, additional requirements shall apply.

It is WMATA's policy that projects be reviewed to ensure that no adverse impacts will be caused to WMATA operations, systems and facilities and to assure the safe operation of the WMATA system.

The WMATA Office of Joint Development and Adjacent Construction (JDAC) has the lead responsibility to review, accept and oversee implementation for compliance with WMATA requirements for all construction adjacent to and/or impacting WMATA interests. The Owner/Developer/Contractor (ODC) is responsible for requesting the latest published editions of all external manuals and other reference material as noted in the References section of the Manual.

This update, Revision 6 dated December, 2023, includes updated coordination and design requirements for joint development and adjacent construction projects.

OPEN LETTER TO THE OWNER/DEVELOPER/CONTRACTOR (ODC) COMMUNITY

Dear Reader,

As WMATA employs its Strategic Transformation Plan to transform one of the nation's largest mass transit systems and propel it into the next era of transportation, the Office of Joint Development and Adjacent Construction (JDAC) strives to do its part by focusing on two core missions: (1) to help facilitate the continuous development of our region, and (2) to ensure such development does not impact WMATA facilities, operations, and safety.

To successfully execute these two missions, the most recent revision of the Adjacent Construction Project Manual (ACPM) is presented here. Since its inception in 1989, the ACPM has remained an invaluable resource for the development of our region and served as an integral part of the collaboration between WMATA and the ODC community.

We trust that you, the reader, will find the ACPM resourceful and will help facilitate our collaboration to achieve our shared goal—the successful completion of the development without impact to WMATA.

Please do not hesitate to contact JDAC with questions, clarifications, requests, or any other items. At any time, feedback on the Manual may be submitted via e-mail to acpmfeedback@wmata.com.

We look forward to collaborating with you.

Sincerely,



Andy Off
Executive Vice President / Chief Infrastructure Officer

LINKS

Name	Location	Purpose
WMATA Homepage	www.wmata.com	To learn more about WMATA
JDAC Homepage	https://www.wmata.com/business/adjacent-construction/index.cfm	To learn more about the JDAC program at WMATA and access forms and supplementary material

CONTACT INFORMATION

Name	Address	Purpose
Inquiries	JDAC@wmata.com	To submit all general inquiries and introductions about your joint development or adjacent construction project
Feedback	acpmfeedback@wmata.com	To submit feedback on the Manual or the JDAC program as a whole

EMERGENCY

The early stages of each adjacent construction or joint development project shall involve the creation of a communication structure, as defined in Section 1.06. This project-specific document shall provide the ODC and their staff members with points of contact and a hierarchy of secondary contacts for appropriate purposes.

If such a document does not yet exist, or points of contact are otherwise unreachable, the ODC may use the below contact information for emergencies. If there is an immediate health, safety, or environmental threat, please dial 911.

Name	Phone #	Purpose
Mission Assurance Coordinator (MAC)	(301) 955-7150	For urgent construction-related safety concerns if your JDAC team member cannot be reached.
Metro Transit Police Department (MTPD)	(202) 962-2121	Metro Transit Police
Maintenance Operations Control Center (MOC)	(202) 962-1530	24h line for emergency issues.

ABBREVIATIONS

Acronym	Name
ACPM	Adjacent Construction Project Manual
AASHTO	American Association of State Highway and Transportation Officials
ADA	Americans with Disabilities Act
AISC	American Institute of Steel Construction
AMPP	The Association for Materials Protection and Performance
ANSI	American National Standards Institute
ATC	Automatic Train Control
BIM	Building Information Modeling
BPLN	WMATA Office of Bus Planning
CADD	Computer-Aided Drafting & Design
CCTV	Closed Circuit Television
CE	Construction Engineer
CIF	Construction Inspection Facilitator
CM	Construction Manager
CSP	Crew Support Personnel
EOR	Engineer of Record
FS	Factor of Safety
GOTRS	General Orders Track Rights System
IDW	Intrusion Detection Warning
JDAC	WMATA Office of Joint Development & Adjacent Construction
LAND	WMATA Office of Real Estate & Development
MOC	Maintenance Operation Center
NATM	New Austrian Tunneling Method
NFPA	National Fire Protection Association
ODC	Owner/Developer/Contractor
OSHA	Occupational Safety and Health Administration
PCN	Project Control Number
PEPCO	Potomac Electric Power Company
PM	Project Manager
PPV	Peak Particle Velocity
ROCC	Rail Operations Control Center
ROW	Right-of-Way
RWIC	Roadway Worker In Charge
RWPT	Roadway Worker Protection Training
SAFE	WMATA Department of Safety and Environmental Management
SDS	Safety Data Sheet
SSWP	Site Specific Work Plan
TAMC	Track Access for Maintenance and Construction
UFAS	Uniform Federal Accessibility Standards
WMATA	Washington Metropolitan Area Transit Authority
ZOI	Zone of Influence

GLOSSARY

Subject	Definition
Actual Work Area	The specific location of work on WMATA's railroad within the protected work area that has boundaries established by reflective rubber mats.
Adjacent Construction	Any project that involves work on, over, under, within, or approximate to WMATA facilities and property. Any project by others constructed within WMATA-owned or controlled real property, Zone of Influence, or rights-of-way pursuant to an easement, lease, license, or permit granted by WMATA. Joint Development projects are also considered as adjacent construction.
Automobile Liability Insurance	A commercial auto insurance policy covering the use of all owned, non-owned, hired, rented, or leased vehicles bearing valid license plates appropriate for the circumstances for which the vehicles are being used.
Builder's Risk Insurance	An insurance policy covering all risk of physical damage to property under construction.
Chainmarker	WMATA's wayside signage displaying distance along the operating roadway.
Commercial General Liability Insurance (CGL)	An insurance policy covering the liability of the Contractor for all work or operations under or in connection with this Project; and all obligations assumed by the Contractor under this Contract.
Consist	The quantity of cars coupled together to make up a rail vehicle. See also "Revenue Train"
Construction Engineer (CE)	The point of contact for project reviews and acceptances, the real estate permit application process, interface and coordination with operations and maintenance offices, and field coordination.
Construction Inspection Facilitator (CIF)	Provides construction coordination and oversight of permitted contractor work. Ensures contractor compliance with WMATA construction plans, specifications, and regulations.
Construction Sequence Plan & Staging Plan	A general plan to be prepared by the Owner/Developer/Contractor indicating the safe positioning of major construction equipment, particularly cranes, within the WMATA Zone of Influence, and/or crane positions, which operate with the boom encroaching or adjacent to WMATA Roadway, pedestrian and vehicular access areas.
Contact Rail	See "Third Rail".
Contractor's Pollution Legal Liability Insurance	An insurance policy covering the liability of the Contractor during the process of removal, storage, transport and disposal of hazardous waste and contaminated soil and or asbestos abatement. The policy should also include coverage for bodily injury, and loss of, damage to, or loss of use of property, directly or indirectly arising out of the discharge, dispersal release or escape of smoke, vapors, soot, fumes, acids, alkalis, toxic chemicals, liquids, or gas, waste materials or other irritants, contaminants or pollutants into or upon the land, the atmosphere or any water course or body of water, whether it be accidental, gradual or sudden.

Coverboard	A fiberglass cover over the contact/third rail to protect personnel from accidental contact.
Crew Support Personnel	Any qualified WMATA individual assigned the responsibility of ensuring the safety of all crew members, the security of all WMATA assets, and contractor forces or WMATA personnel comply with the Metrorail Operating Rulebook and the approved Site-Specific Work Plan while performing maintenance or construction in or around WMATA property. Crew Support Personnel are trained to set-up necessary protective equipment during times of authorized and approved access by Contractor personnel.
Crosslevel	The relationship in elevation that the two rails of a track section have in relation to each other. Where both rails' treads are of equal altitude, the track is considered as having a zero crosslevel at that point.
CTF	Carmen E. Turner Maintenance and Training Facility located at 3500 Pennsy Drive, Landover, MD 20785
Cut and Cover	A method of constructing an underground structure, mostly tunnels, by excavating from the surface, placing the structure, and then backfilling and restoring the original surface.
dBa	The magnitude of sound weighted to approximate the sensitivity of the human ear.
Design and Coordination Checklist	A detailed checklist provided in WMATA's Adjacent Construction Manual that provides Owners/Developers/Contractors, and Consultants with the rudiment phases of design and construction coordination and interface with WMATA. The list is also provided to assist Owners/Developers/Contractors, and Consultants in preparing project time schedules which are specific to WMATA impact.
Development Plan	A graphic representation which depicts the nature and character of the development proposed for a specific land area: information such as topography, location and size of proposed structures, location of streets trails, utilities, and storm drainage are generally included on a development plan.
Easement	A right to or interest in property owned by another for a specific and limited purpose. Examples: access easement, utility easement, construction easement, slope easement, aerial easement, etc. Easements may be for public or private purposes.
Encroachment	Use of an existing easement or property without proper authorization.
Engineer of Record	The professional engineer, registered in the jurisdiction of the proposed project, who develops the design criteria and concept for a particular project and discipline, and who prepares or causes to be prepared under his/her immediate personal supervision the corresponding drawings, specifications, reports, or other documents, shall be designated the engineer of record for the project and discipline.
Facility	Any WMATA-owned structure or asset, including but not limited to, existing WMATA deep foundations, retaining walls, and underground utility lines, is considered a WMATA facility.
Flagperson	WMATA personnel in charge and whose only duty is providing flagging protection to a work area.

Fouling a Track	The placement of an individual or equipment in such proximity to a track that the individual or equipment could be struck by a moving train or on-track equipment.
General Orders (WMATA)	WMATA's official document that lists all of the approved track rights requests. This information is listed by day and includes the location by track and chainmarkers, the organization's authorized track rights, and the type of power outage (supervisory or red tag) if required.
General Orders Track Rights System (GOTRS)	General Orders Track Rights System. The General Orders and Tracks Rights System is a program that is used by WMATA employees, to enter requests for track rights and power outages for coordination of all wayside work and third rail power outages.
Georeference	To define points, lines, polygons or images in a WMATA-specified coordinate system and vertical reference datum. Specific reference is made to CADD Drawings provided to WMATA showing improvements by ODC in or around WMATA facilities
Geotechnical Review	An engineering study of the geology and soils of a site which is submitted to determine the suitability of a site for development and recommends construction techniques designed to overcome development on problem soils.
Mainline	All tracks on the operating railroad, except yards and terminals.
Maintenance Operations Control (MOC)	The focal point within the ROCC for command, control, administration, and coordination of all maintenance functions for ATC, Communications, Department of Plant Maintenance and Office of Track and Structures.
Monitoring and Contingency Plan	A written plan designed and implemented by the Owner/Developer/Contractor that includes, but is not limited to, how the Owner/Developer/Contractor plans to provide surveillance of WMATA facilities potentially impacted by proposed construction. The plan must include criteria for threshold values or deformations, or movements. The plan shall also outline the contingency procedure that will be followed when strains, deformations or movements of WMATA facilities approach or exceed the specified limits. The plan will also contain detailed personnel contact information of both Contractor and WMATA personnel involved with implementing the monitoring program.
Monument	A permanent WMATA survey marker/benchmark accurately defining a point from which the surrounding WMATA structures were constructed (elevation and horizontal distances).
No-Clearance Area	An area where the minimum safe distance between a moving vehicle and fixed wayside structures or appurtenances is not sufficient to allow personnel to occupy during passage of a train.
Operational Support	Any support provided by WMATA's operational departments.
Photometric Study	A site lighting plan prepared by a registered Professional Engineer which conveys projected illumination levels, wattage levels, maintenance criteria and input values.
Piezometer or Observation Wells	A drilled casing or standpipe in the soil used to measure groundwater elevations.

Post-Construction Survey	A detailed, written, and certified follow-up technical survey and analysis of a WMATA facility or facility(s) that were potentially impacted by ongoing construction. The post-construction survey is to be performed when all work is completed, or when construction has progressed to a construction phase whereby there is no possibility of any movement/damage/impact to WMATA structures. The survey may be supported with comparison engineering or technical analysis of pre-construction photographs, track alignment survey data, and/or wayside instrumentation. Written analysis of the post-construction survey must also be submitted to WMATA for acceptance prior to the Contractor demobilizing from the site.
Pre-Construction Survey	A detailed written & certified technical survey & analysis of a WMATA facility or facility(s) that will potentially be impacted by upcoming construction. The survey may require the necessity of a track alignment survey, photographs and/or safe placement of wayside instrumentation for purposes of continued and periodic surveillance/protection of WMATA facilities. The outline of the pre-construction survey is to be developed by the Contractor and submitted to WMATA for acceptance before commencing any work within WMATA's ZOI.
Pre-Development Project Agreement	A legal agreement between WMATA and the Developer/Contractor executed at the beginning of a project which documents that the Developer/Contractor agree to read and comply with all WMATA administrative, design, operational, safety requirements set forth in the WMATA Adjacent Construction Manual. No project will be supported unless this agreement is executed.
Professional Errors and Omissions Liability Insurance	A separate insurance policy to pay on behalf of the Contractor all costs the Contractor shall become legally obligated to pay as damages due to any claim caused by any negligent act, error or omission of the Contractor or any other person for whose acts the Contractor is legally liable arising out of the performance of work under a permit.
Project Impact Statement	A statement completed by the Owner/Developer/Contractor, or Consultant which describes in detail the impact to WMATA facilities, including a delineated Zone of Influence line and locations of all impact areas, from all upcoming proposed construction. The statement is prepared by the Owner/Developer/Contractor, or Consultant seeking work in the vicinity of WMATA facilities and requires prior review of WMATA As-built documentation.
Protected Work Area	Area designated by extreme limits (chainmarker stationing) in approved SSWP within which work will be performed.
Rail Operations Control Center (ROCC)	Designated to control the movement of trains and other track equipment.
Rail Service Adjustment (RSA)	A temporary adjustment to the WMATA passenger train operating schedule in order to accommodate maintenance or construction activities on the WMATA main line during revenue service.
Railroad Protective Liability Insurance	An insurance policy issued to WMATA for bodily injury and property damage liability of the Contractor resulting from the Contractor's performance of project work within 50 feet of WMATA's Roadway. Project work within 50 feet is defined as: work performed on, adjacent to (North-South-East-West), above or beneath WMATA's owned / operating railroad property.

Red Tag	Third rail power outage where the circuit breaker is physically removed from the power circuit and a red tag is issue to implement lockout/tag-out procedures.
Revenue Operation	Time(s) which WMATA runs scheduled passenger rail service.
Revenue Train	Any train in transit service on main track, which may be used by the public.
Right of Access	The right of an abutting land owner, or its contractor(s), for entrance to or exit from a WMATA facility or structure for purposes of construction or planning.
Right-of-Way (ROW)	The land occupied by a railroad, the physical facilitates, track, tunnels, surface and elevated structures through which WMATA trains operate.
Roadway	Any location where roadway worker protection is required.
Site Specific Work Plan (SSWP)	A detailed time scaled, resource loaded work plan prepared by the Contractor that is specific to WMATA property which describes the construction and/or installation and associated schedule of work to be performed at specific locations. The plan is to outline all personnel and work to be completed during approved track access. The plan encompasses: 1) a site plan, 2) track rights acceptance information, 3) a work zone protection plan, 4) identify an assigned Contractor's on-site safety foreman, and 5) a detailed summary of work to be completed including work procedures and potential job-related hazards with protection methods. Required where requested track usage or other interface with the operating railroad, bus loop, Kiss & Ride or park & ride facilities occurs.
Surveyor of Record	The licensed professional surveyor, registered in the jurisdiction of the proposed project, who develops the criteria and concept for a particular project and discipline, and who prepares or causes to be prepared under his/her immediate personal supervision the corresponding survey results, drawings, specifications, reports, or other documents, shall be designated the surveyor of record for the project and discipline.
Technical Submission (Submittal)	A complete set of documents required for WMATA review of the anticipated or proposed construction. In submitting, the Owner/Developer/Contractor or Consultant has confirmed that all documents being provided for WMATA review meet the requirements of the WMATA Adjacent Construction Manual, Design Criteria, Specifications, or specific agreement as applicable. Content of submittals to be specific to WMATA interest. Method of submission determined by JDAC project team.
Terminal	A station and its associated turnback interlocking which is designated as terminus of a passenger Line.
Third Rail	The electrical conductor steel rail section mounted on insulators adjacent to the running rail for supplying D.C. traction power to the transit vehicles, sometimes referred to as "contact rail".
Third Rail Gap	The distance between sections of third rail where no third rail is present. These locations are usually of sufficient length to be bridged by a train and are used as a limit for either a Supervisory Third Rail Power Outage or a Red Tag Third Rail Power Outage.

Third Rail Power Outage	RED TAG OUTAGE: A procedure for removal of energy from the third rail which requires that track feeder breakers which feed a specific section of third rail be removed from their operating cubicles and specific verification and coordination procedures involving ROCC and MOC and the Red Tag holder. Under Third Rail Power Red Tag Outages work is permitted on the third rail and its connecting components. Red Tag outages are also used for work on Low Voltage AC power equipment and circuits. SUPERVISORY OUTAGE: A third rail power outage that may be implemented from ROCC for work that might result in incidental contact with the third rail. Work on, or that requires contact with the third rail requires a Third Rail Power Red Tag Outage.
Tiebreaker / Tiebreaker Station (TBS)	A source for traction power distribution by electrically connecting one Traction Power Substation to another by using the third rail and circuit breakers in the tiebreaker station. The tiebreaker station is also used in conjunction with the traction power substation to isolate power from a section of third rail.
Track Rights	Exclusive use permission for a specific section of track. Permission is requested through GOTRS, and approved by WMATA OPER, General Superintendent OCC.
Traction Power Substation (TPSS)	The facility which transforms and rectifies local utility high voltage alternating current to 750 VDC propulsion current and supplies it to nearby third rails via Track Feeder Breakers and conductors to/on the R.O.W.
Wayside	1. That portion of the ATC system which is outside of the OCCB. 2. Any area adjacent to and including the track roadway, except passenger station platforms.
WMATA Real Estate Impact	Temporary or permanent construction impact to WMATA's existing real property or easement(s).
WMATA Real Estate Permit	A legal document issued by WMATA Office of Real Estate when it has been determined that there is a potential for temporary or permanent construction impact to WMATA. Developer/Contractor(s) will be required to complete the WMATA Real Estate Permit Application to obtain legal access to WMATA property or easement(s). Certified survey exhibits, plats and/or legal descriptions of property impacted may be required.
WMATA Zone of Influence (ZOI)	Designated area adjacent or within specific distance to WMATA structures and interests, which if construction activity is performed within the Zone, has the potential to cause influence or impact to WMATA. Limits of Zones for various conditions of adjacency are depicted in Appendix C , Plates A-2A thru A-2E.
Work Train	Any vehicle designated for maintenance purposes or to transport non-public passengers. A work train is a train that is engaged in railway maintenance, repair work or support.



LN	CAR	DESTINATION	MIN
YL	8	Greenbelt	1
GR	8	Greenbelt	4
YL	8	Greenbelt	12
GR	8	Greenbelt	14
GR	8	Greenbelt	22

SECTION 1

General Procedures and Overview

Section 1 - General Procedures and Overview

This manual describes WMATA offices' review, acceptance, and operational support process for proposed projects adjacent to, on, over, or under WMATA property and facilities which may impact an existing WMATA facility or WMATA operations.

1.01 Overview

Any project which involves work on, over, under, within, or approximate to WMATA facilities and property is considered an adjacent construction project. Joint Development projects are also considered adjacent construction projects and shall comply with the requirements outlined in this manual.

- A. WMATA will review the design, plans, and specifications for adjacent construction projects to ensure that:
- 1) WMATA facilities and operations are not impacted during and after the proposed project construction.
 - 2) WMATA station capacity is not impacted by the ridership generated by these projects.
 - 3) Facilities being built for WMATA to own, operate, and maintain comply with WMATA Design Criteria, Administrative and Standard Specifications, Standard Drawings, Design Drawings, and this manual.

Each project will be assigned a unique Project Control Number (PCN). This number must be referenced in all communications with WMATA.

Construction plans will be reviewed to determine whether the proposed construction falls within WMATA's Zone of Influence (ZOI), as defined in [Section 1.04](#) of this manual, and whether the project will have an impact on WMATA's facilities or revenue operations.

It is the general policy of WMATA to review the design for the construction of projects adjacent to, on, over, or under WMATA property on a case-by-case basis.

At WMATA's discretion, the Owner/Developer/Contractor (ODC) will provide a study/report showing that any additional ridership generated by a project will not cause current WMATA station facility capabilities to be exceeded. The study must include mitigation measures if the proposed project adversely impacts WMATA. This may include, but is not limited to, required expansion of facilities such as the station entrances, elevators, escalators, fare gates, fare vending machines and station mezzanines. The costs of any new facilities or revisions to existing facilities will be borne by the ODC. These requirements will be coordinated with all involved parties.

A flowchart showing the necessary steps and time requirements for adjacent construction project start-up can be reviewed in [Section 1.02](#). These are minimum time frames which

could be extended depending on the complexity and scope of the project. ODCs are to consider timeframes when developing the project schedule.

- A.** The JDAC project team consists of all WMATA personnel assigned to support an ODC's project as needed. The team roles are defined as follows:
- 1.** Project Manager (PM): JDAC staff providing oversight of the Construction Engineer (CE) and project progress.
 - 2.** Assistant Project Manager (APM): JDAC staff providing assistance to the PM.
 - 3.** Construction Engineer (CE): The point of contact for project reviews and acceptances, the real estate permit application process, interface and coordination with operations and maintenance offices, and field coordination.
 - 4.** Construction Manager (CM): Provides field oversight of all projects and of all JDAC Construction Inspection Facilitators (CIFs) and Inspectors.
 - 5.** Construction Inspection Facilitator (CIF) and Inspectors: Provide construction coordination and oversight of ODCs. Ensures contractor compliance with WMATA construction plans, specifications, and regulations.
- B.** The ODC is to submit design and construction documents to the WMATA Office of Joint Development and Adjacent Construction (JDAC).
- 1.** The ODC shall provide sufficient drawings and details, including project plan views and cross sections, denoting the location of WMATA facilities, the extent of the WMATA ZOI, and their relationship to the proposed construction to evaluate whether the proposed construction will or will not be in WMATA's ZOI. Construction plans will not be accepted until this information is confirmed.
 - 2.** To ensure proper coordination of the project, one (1) person shall be designated by the ODC to WMATA as the authorized point of contact to represent the project (including tiered subcontractors and designers). All contact from WMATA to the project will be through the designated representative.
- C.** The ODC will be advised of WMATA review findings as follows:
- 1. No impact.** Letter of No Impact will be provided.
 - 2. Impact.** The assigned JDAC project team will initiate contact with the ODC.
- D.** The CE is the point of contact for project reviews and acceptances, real estate permits, interface and coordination with operations, communications, and

maintenance offices. The project team coordinates with WMATA staff for this work as necessary. The CIF coordinates field activities and oversight.

- E.** All project correspondence from the ODC must include the project team in addition to the PCN and the assigned Procore email address.

1.02 Project Flowchart

*The Adjacent Construction Project Flowchart may also be accessed in full resolution through the JDAC main site, as noted in [Appendix A](#).

The Adjacent Construction Project Flowchart below provides a breakdown of the project process separated by project phase. Denoted on the flowchart are action items, required submittals, common items that may apply to each project, and project milestones. Adjacent Construction projects progress in five phases:

Phase 1: Inquiries & Initialization:

- A.** The Inquiries & Initialization Phase covers the initial steps of every adjacent construction project. The ODC shall submit a project inquiry, and the project will be evaluated by a JDAC CE for impact.
- B.** If no impact is determined, JDAC involvement in the project will terminate. The ODC may continue interfacing with other WMATA departments as needed.
- C.** If impact is determined, the JDAC project team will be assigned to support the project throughout its duration. JDAC and the ODC shall hold an introductory meeting, and the ODC shall be provided with a Project Agreement to sign and return.
- D.** The ODC shall be required to pay the cost of the initial invoice prior to WMATA commencing Phase 2.

Phase 2: Design & Plan Review:

- A.** The Design & Plan Review phase covers WMATA review of project documents. In this phase, the project design & construction plans will be analyzed for impact to WMATA facilities and for appropriate impact mitigation measures. The requirement for a future maintenance agreement, as noted in Phase 6, will be determined.
- B.** The ODC shall submit all project documents to JDAC. JDAC distributes project documents to the appropriate internal review agencies for feedback.
- C.** JDAC will provide final acceptance of all project documents.

Phase 3: Pre-Construction:

- A.** The Pre-Construction phase consists of preparing the project for construction activity.
- B.** The ODC shall interface with WMATA LAND and apply for a real estate permit.
- C.** The ODC shall apply for Contractor ID badges as needed and enroll in Contractor Roadway Worker Protection.

- D.** The ODC shall develop and submit a Site-Specific Work Plan for WMATA review.
- E.** The ODC may be granted track rights only after the requirements listed in points B, C, and D above have been satisfied.
- F.** Once preparation for construction activity is complete, JDAC and the ODC shall hold a Pre-Construction Meeting.

Phase 4: Construction:

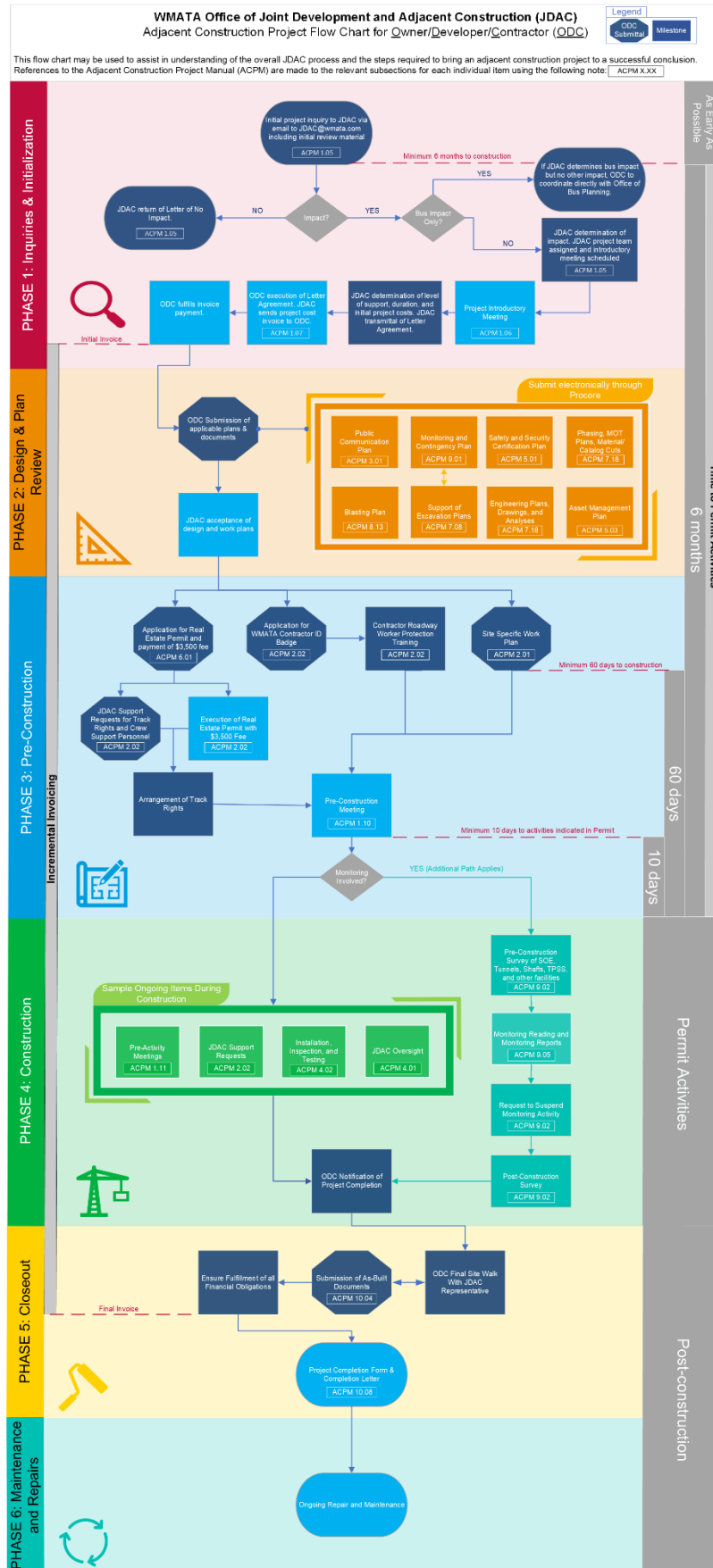
- A.** The Construction phase covers all project activity while construction is underway. Ongoing submittals may include monitoring reports, testing and installation reports, and JDAC support requests.
- B.** The ODC shall be responsible for holding pre-activity meetings and performing installation & testing as specified in the project documents.
- C.** JDAC reserves the right to monitor construction activity on-site for impact to WMATA.

Phase 5: Closeout:

- A.** The Closeout phase represents final items needed prior to completing a JDAC project. In this phase, the ODC shall complete any final site walk and punch list developed, submit final as-built documentation, and fulfill all financial obligations prior to signing a project completion form.

Phase 6: Maintenance and Repairs

- A.** If the project will require recurrent maintenance or repairs after closeout, the ODC shall be responsible for notifying JDAC of such requirements, entering a maintenance agreement, and funding WMATA support accordingly.



1.03 Reference Chart

JDAC oversees hundreds of projects each year, each with their own unique constraints, challenges, and considerations. The entire contents of this manual will not apply uniformly to each project.

The chart located on the following page is to serve as a non-comprehensive reference guide and navigational companion for any ODC looking to perform work that will impact WMATA.

This chart may be used to determine, at a glance, which requirements may apply to which project types and where to find the relevant information within this manual.

Project Phase & Consideration:	Inspection & Maintenance	Field Verification & Borings	Bus Impacts / No Other Impact	Bridge Inspection & Painting	Under WMATA	Over WMATA	Within WMATA	Adjacent to WMATA	Modifications to WMATA	WMATA Equipment & Systems	New WMATA Facilities	Joint Development	Refer to Sections:
1. Inquiries & Initialization													
Impact evaluation inquiry	x	x	x	x	x	x	x	x	x	x	x	x	1
Impact determination	x	x	x	x	x	x	x	x	x	x	x	x	1
Project & PCN establishment	x	x		x	x	x	x	x	x	x	x	x	1
2. Design & Plan Review													
Civil Drawings & Details					x	x	x	x	x		x	x	7
Mechanical Drawings & Details					x	x	x	x	x	x	x	x	7
Tunneling / Boring Schedule					x			x				x	8
Structural Check / Analysis					x	x	x	x	x		x	x	7
Phasing Plan	x			x	x	x	x	x	x		x	x	7
Support of Excavation Design							x	x	x		x	x	7
Construction Sequence Plan	x	x		x	x	x	x	x	x	x	x	x	2
Construction Protection Plan	x			x		x	x	x	x		x	x	8
Maintenance of Traffic	x	x	x	x		x	x	x	x		x	x	2
Monitoring & Contingency Plan					x	x	x	x	x		x	x	9
Blasting Plan					x	x	x	x			x	x	8
Public Communication Plan	x	x	x	x	x	x	x	x	x	x	x	x	3
Safety & Security Certification Plan	x	x		x	x	x	x	x	x	x	x	x	5
3. Pre-Construction													
Real Estate Entry Permit	x	x		x	x	x	x	x	x	x	x	x	6
Insurance Policies	x	x		x	x	x	x	x	x	x	x	x	6
Contractor Badging & Background	x	x		x	x	x	x		x	x	x	x	2
Roadway Worker Protection	x	x		x			x		x	x	x	x	2
JDAC Support Requests	x	x		x	x	x	x	x	x	x	x	x	2
Site Specific Work Plan					x	x	x	x	x	x	x	x	2
4. Construction													
Equipment Verification	x			x	x	x	x	x				x	8
Construction Permits					x	x	x	x				x	1
Geotechnical Investigations		x			x	x	x	x			x	x	7
Pre-Construction Survey					x	x	x	x	x	x	x	x	9
JDAC Oversight	x	x		x	x	x	x	x	x	x	x	x	2
Asset Management Data & Documents									x	x	x		5
Monitoring Reports					x	x	x	x	x		x	x	9
5. Closeout													
Post-Construction Survey					x	x	x	x	x	x	x	x	9
Closeout Letter					x	x	x	x	x	x	x	x	10
As-Built Documentation Package					x	x	x	x	x	x	x	x	10
6. Maintenance and Repairs													
Maintenance and Repair Agreement	Establish a long-term maintenance and repair funding structure.												1

1.04 Zone of Influence

- A.** The Zone of Influence (ZOI) is defined as a designated area adjacent or within specific distance approximate to WMATA structures and interests, which if construction activity is performed within the Zone, may cause influence or impact to WMATA. The ZOI is a critical tool in determining which projects may or may not have impact to WMATA facilities. Impact to WMATA facilities is ultimately determined at the sole discretion of WMATA.
- B.** The four following criteria shall be considered in determining WMATA ZOI. If any one of the four criteria applies, or as designated by additional or prior agreement, the proposed adjacent construction or excavation is considered to be within WMATA ZOI.
1. If the proposed excavation is within 25 feet (horizontal / plan dimension) of a WMATA facility. If the proposed auguring of soldier piles and bearing piles are within 25 feet of WMATA facilities. Other activities within 25 feet horizontally of WMATA facilities may be considered to be within the Zone of Influence at the sole discretion of WMATA.
 2. An envelope starting at a point two feet below the lowest point of the underground structure or excavation continuing upward at a 45-degree angle from the horizontal at the vertical projection of the outside limits of the WMATA structure.
 3. An envelope starting at a point two feet below the lowest point of WMATA structure continuing upwards at 45-degree angle from the horizontal line, up to the horizontal projection of the outside limits of the adjacent structure or excavation, projected at grade level. The 45-degree influence line defining WMATA ZOI envelope should extend until it intersects existing ground line as depicted on Plate A-2A.
 4. If the proposed rock blasting operation is within 100 feet of WMATA facilities.
- C.** Plate Diagrams A-2A, A-2B, A-2C, A-2D, and A2-E in [Appendix C](#) represent the Zone of Influence line under five common instances.

1.05 Inquiries & Impact Evaluation

- A.** The ODC is responsible for initiating contact with JDAC. All initial inquiries shall be sent via e-mail to JDAC@wmata.com.
- B.** To obtain electronic files of WMATA's as-built records, the ODC must submit a completed Document Request Form (DRF) / Non-Disclosure Agreement (NDA), found in [Appendix A](#). Upon WMATA acceptance of the request, JDAC will provide PDFs of the requested records to the ODC, if available.

- C.** ODC shall field verify, document, and engineer their proposed project relative to existing WMATA facilities and utilities in accordance with the applicable sections of this manual.
- D.** The ODC shall prepare a documentation package for submittal to JDAC showing the locations of WMATA facilities in relation to the ODC's proposed construction, and a statement describing expected impacts due to construction.
- E.** If uncertainty exists on the possible impacts a project may have on the WMATA facilities and before making a formal application for a review of a construction project adjacent to WMATA facilities, the ODC must contact JDAC for assessment of the project impact.
- F.** For projects with no expected WMATA impact:
 - 1.** JDAC shall return a Letter of No Impact to the ODC.
 - 2.** Further coordination with WMATA's Office of Bus Planning may be required by the ODC after receipt of JDAC's Letter of No Impact if project's only impact is to Metrobus.
- G.** For projects with expected WMATA impact:
 - 1.** The assigned JDAC project team will initiate contact with the ODC.

1.06 Introductory Meeting

- A.** JDAC and the ODC shall, after JDAC has determined impact, hold a joint introductory meeting outlining the responsibilities and expectations of both parties and the JDAC process for the project.
- B.** The JDAC project team and appropriate representatives from the ODC's organization shall attend the introductory meeting.
- C.** The introductory meeting shall cover topics including, but not limited to:
 - 1.** Introductions between ODC staff and JDAC project personnel.
 - 2.** Delineation of project scope.
 - 3.** Outline of JDAC project lifecycle and coordination requirements.
 - 4.** Creation of a communication structure, which shall define points of contact between the ODC and WMATA, a hierarchy of positions on both project teams, secondary and emergency points of contact, and submittal methods.
 - 5.** Outline of project agreement, including process for funding and invoicing.

6. Introduction to the Typical WMATA Design & Coordination Checklist ([Appendix A](#))
7. Introduction to applicable early action items including the Safety and Security Certification Program ([Section 5.01](#)), document configuration requirements ([Section 5.02](#)), asset management requirements ([Section 5.03](#)), the Public Participation Program ([Section 3.01](#)), and necessary coordination with the WMATA Office of Bus Planning ([Section 3.04](#)).
8. Expected testing, certification, and training requirements for the contractor.
9. WMATA Real Estate considerations.

1.07 Project Agreement

- A. JDAC shall, at a point after hosting an introductory meeting, draft and issue a project agreement to be accepted by the ODC. A project agreement may typically be issued in the form of a Letter Agreement, a Joint Development Agreement, a Maintenance Agreement, and other types may be issued as needed.
- B. The project agreement shall provide a summary statement of project impacts, a brief description of the responsibilities of both parties, a breakdown of assigned JDAC project roles, and a delineation of estimated WMATA costs.
- C. The project agreement shall provide a summary statement of project impacts, a brief description of the responsibilities of both parties, a breakdown of assigned JDAC project roles, and a delineation of estimated WMATA costs.
- D. The project agreement shall be considered executed once the agreement is signed and returned to JDAC.

1.08 Costs

The services of WMATA's staff are invoiced to the project to provide necessary support to the project and ensure that WMATA's interests are protected. Costs, as determined by WMATA, are based on the estimated level of support required by the project, and construction schedule duration of the project.

- A. WMATA will require payment of an initial invoice of the estimated cost to coordinate and process project submittals, access requests, reviews and other support required by this manual and WMATA. WMATA will assess additional costs as necessary. The initial invoice includes, but is not limited to, the following:
 1. Administrative and coordination costs

2. Engineering review costs
 3. Field support costs (e.g., crew support personnel, track rights, construction oversight)
 4. Customer communications support (e.g., review of customer outreach material and plans)
- B.** JDAC will separately invoice costs not included in the initial payment. These costs may be one-time payments associated with project activities or incrementally invoice support costs which will be assessed while the project remains active. These costs include:
1. Support costs associated with WMATA support of ODC's activities where access is required into the operating WMATA rail system, or where other WMATA facilities are impacted, will be invoiced incrementally while project remains active.
 2. Costs for service adjustments and modified service such as shutdowns, single tracking, bus route modifications and detours, or bus bridging will be additional and determined on the acceptance of the Site-Specific Work Plan (SSWP) requirements.
 3. Lost revenue (e.g., lost parking revenue)
 4. Modification, repair, purchase, and installation of any facilities as a result of the project.
- C.** WMATA may separately invoice costs associated with internal WMATA departments other than JDAC.
1. Costs for easement, right of entry, or acquisition of WMATA property interests will be invoiced separately from WMATA's Office of Real Estate and Development (LAND). All Real Estate Permit applications require an application fee of \$3,500.
 2. Metrobus service impacts shall be invoiced separately by WMATA's Office of Bus Planning, as detailed in [Section 3.04](#).
- D.** WMATA internal departments may use third-party support, such as consultant staff services, inspections, and testing. Costs associated with third-party support shall be borne by the ODC.
- E.** When a Maintenance Agreement is required, the ODC shall be responsible for funding WMATA support during the Maintenance and Repairs phase of the ODC's project.

1.09 Submittals and Documents Required for WMATA Review

- A.** Submittals are to be submitted to the CE electronically through WMATA's electronic data management system (EDMS), Procore, or through an alternative EDMS at the sole discretion of WMATA. The submittals shall include a cover sheet such as a transmittal. The ODC shall provide multiple hard copies (generally not less than (3) of each submission—exact quantity to be determined on a project-by-project basis) for WMATA review when requested.
- B.** All email correspondence between the JDAC project team and the ODC shall also be sent to the project-specific Procore address.
- C.** The below table represents a list of submittals that may be required, delineated by project phase. Specific details pertaining to each submittal are listed in their respective section as denoted by the table. The table is non-comprehensive and should be used as an overview of likely project submittals and navigational aide. The ODC is responsible for reviewing the contents of this manual and complying with all project requirements.

Table 1-1: Submittals and Documents Required for WMATA Review

Category	Submittal	Section Location
PHASE 1: Inquiries & Initialization	Initial inquiry	1.05
	Executed project agreement	1.07
	Initial lump payment	1.08
PHASE 2: Design & Plan Review	Project impact statement	7.01
	Project design drawings and calculations	7.01
	Project construction drawings and plans	8.01
	Monitoring and Contingency Plan	9.01
	Safety and Security Certification Plan	5.01
	Customer Communication & Outreach Plan	3.02
PHASE 3: Pre- Construction	Real Estate Permit Application	6.02
	Appropriate insurance policies	6.04
	Contractor badging & ID forms	2.02
	Track rights and support requests	2.02
	Site-specific work plan	2.01
	Copies of permits & certificates of utility severance	4.03
PHASE 4: Construction	Progress reports as available	4.01
	Inspection and testing reports	4.02, 4.03
	Pre and post construction survey data, monitoring reports, and movement detection reports	9.01
PHASE 5: Closeout	Final inspection reports	8.01
	Installation certifications	10.06
	As-built documentation	10.04
	Project completion form	10.08
	Project closeout letter	10.08
PHASE 6: Maintenance and Repairs	Executed maintenance agreement	1.02

1.10 Review Procedures & Impact Analysis

- A.** Design work will be reviewed based upon the assumption that the design will meet all applicable codes adopted in the jurisdiction as well as the current WMATA Design Criteria, Design Drawings, Standard Drawings, Administrative and Technical Specifications as well as the ACPM.

- B.** Permits, where required by the local jurisdiction, utility agencies and railroads shall be the responsibility of the ODC. Copies of these permits must be provided to the CE.
- C.** WMATA submittal reviews are conducted for each individual project item. Incomplete submissions will delay the review process and may be returned. The ODC is responsible to ensure that submissions comply with WMATA's requirements.

 - 1.** The ODC shall allow no less than 30 business days for review of the initial submission.
 - 2.** The ODC shall allow no less than 30 business days for each successive review.
- D.** The ODC is responsible for determining the extent and the manner of impact to WMATA facilities during impact analysis of a JDAC project.

 - 1.** The ODC shall prepare and submit a Project Impact Statement. This statement describes, in detail, the impact to WMATA facilities, including a delineated Zone of Influence line and locations of all impact areas, from all upcoming proposed construction.
 - 2.** Appropriate supporting documentation, as detailed throughout this manual and including items such as design and construction drawings, shall be submitted to WMATA in support of the Project Impact Statement. JDAC shall distribute project documents to appropriate WMATA internal departments for review and feedback. The extent of impact to WMATA shall be determined by project-specific characteristics.
 - 3.** Based on the expected impact, WMATA shall determine the appropriate protective and mitigative measures, monitoring requirements, and other necessary actions.
- E.** All comments and responses on submittals shall be documented in accordance with JDAC's requirements conveyed in the project introductory meeting.
- F.** WMATA's acceptance of the ODC project documents will remain in effect for a 120-day period (four calendar months) or as previously agreed to by WMATA. If the project goes dormant or does not advance to the next phase the ODC will be required to provide WMATA with written certification that the previously accepted submittals are still valid.
- G.** Construction documents accepted by WMATA and changed by the ODC must be resubmitted for acceptance.

1.11 Pre-Construction Meeting

- A.** The ODC shall request and conduct a pre-construction meeting with WMATA's Construction Inspection Facilitator (CIF) prior to scheduling any work in WMATA's ZOI (work adjacent to, under, over, or on WMATA property, or which could potentially endanger, impact, or impair WMATA's revenue operations or facilities). A pre-construction meeting request must be made to the individual identified in the Real Estate Permit and must be received a minimum of ten (10) work days prior to commencement of any work.
- B.** The Pre-Construction Meeting shall be held after the following requirements have been met:

 - 1.** Real Estate Permit has been executed by LAND.
 - 2.** Project roles including the CIF have been assigned and are available to support the project.
 - 3.** Impact Analysis has been completed, and any appropriate changes or cautionary measures as recommended by WMATA review departments have been implemented, or measures that will be required during construction have been properly identified and prepared.
 - 4.** Qualified personnel and qualified third-party subcontractors that are necessary to perform independent tests, inspections, and certification have been identified and are available to support the project's needs.
 - 5.** Additional training and clearances that may be required of WMATA personnel in order to access sites and properly support the project have been identified and obtained, or a plan to obtain said clearance before access may be necessary has been created.
 - 6.** All appropriate ODC representatives, JDAC representatives, and additional parties are included in the pre-construction meeting and an agenda listing the topics to be covered has been created and distributed.

1.12 Construction Management

- A.** The ODC shall conduct pre-activity meetings in coordination with the CIF prior to commencing work on any major construction activity that may have impact to WMATA. An agenda detailing the work activities and the work plan that were accepted shall be distributed prior to the pre-activity meeting.
- B.** The ODC shall, in coordination with the CIF, ensure testing and inspection procedures are properly followed, and tests and inspections are performed by the appropriate qualified individuals, for all project elements of WMATA concern. Testing and inspection procedures are detailed in [Section 4](#) of this manual.

- C.** The ODC shall actively monitor appropriate elements of WMATA facilities, as accepted by WMATA in the ODC-developed Monitoring and Contingency Plan, throughout the duration of construction activity, as defined in [Section 9](#) of this manual.

 - 1.** Monitoring of the temporary support of excavation structure for adjacent construction shall be required for excavations within WMATA's ZOI.
 - 2.** Monitoring of the inside of WMATA tunnels and structures will be required when the adjacent construction will change the loads on or could cause movement of the WMATA structure or tunnel. Crew support personnel shall be required for survey parties entering WMATA facilities in accordance with WMATA operating regulations.
 - 3.** Monitoring of compliance with accepted construction staging plans effecting WMATA operations shall be required.
- D.** All WMATA personnel, including the CIF, shall have the ability to stop work in the event of unsafe conditions. The ODC shall review and conform with all WMATA safety regulations as defined in [Section 2](#).
- E.** WMATA reserves the right to stop all adjacent construction work if the policies and procedures described herein are not properly followed, or if impact is shown to WMATA facilities without proper mitigation measures taken.
- F.** WMATA reserves the right to place the JDAC CIF or other WMATA personnel on the site, at the ODC's cost, to observe the effects of the project's construction on WMATA facilities.

1.13 Project Closeout

- A.** The ODC must advise WMATA in writing when project construction impacting WMATA is complete and ensure all WMATA punch list items have been completed.
- B.** In accordance with WMATA's real estate permits, as-built documentation is a project requirement where permanent modifications are being made on, above, below, or to WMATA property. WMATA requires as-built documentation to be submitted as electronic documents in the format specified by the CADD standards provided by the assigned JDAC project team. For more details, see [Section 10 Closeout](#).
- C.** All financial obligations must be met before completion of project closeout.

SECTION 2 – Safety, Access, and Compliance



Section 2 - Safety, Access, & Compliance

The prevention of accidents while completing any joint development or adjacent construction project is of primary importance to everyone connected to WMATA. WMATA is an organization totally committed to the all-encompassing goal of safety in construction and operations. It is WMATA's responsibility to the public to assure them of an organization which is not only innovative but also effectively implementing the highest safety standards.

Each ODC should review the WMATA Construction Safety and Environmental Manual and the Metrorail Operating Rulebook prior to beginning any work on or adjacent WMATA. Each manual is available upon request from the project CE. As applicable, the ODC shall be required to attend WMATA safety trainings, including Safety and Security CIL training for any project that includes facilities for WMATA to own, operate, or maintain.

2.01 Site Specific Work Plan

- A.** A complete Site-Specific Work Plan (SSWP) shall be submitted for all work activities on or adjacent to WMATA property that have potential to impact WMATA facilities, or at the sole discretion of JDAC.
- B.** The warrant for and specific contents of the SSWP shall be determined by JDAC and introduced at the Introductory Meeting. SSWP contents shall vary based on detail indicated by project parameters. In general, SSWPs shall contain:
 - 1.** Performance of construction and maintenance activities that require track access or impact critical systems. Critical systems include, but are not limited to, power/electrical, communications, track, and passenger interfaces.
 - 2.** Descriptions of how each activity affects impacted systems, and the type and location of impacted systems.
 - 3.** Descriptions of the project scope of work, schedule, cut-in requirements, equipment used, plans for returning the impacted systems to existing operational capacity, and extent of system modifications.
 - 4.** Provide indication of impact to fire/life safety systems so WMATA can arrange appropriate oversight during impact.
 - 5.** Identification of potential problems, including schedule overruns, for close monitoring and contingency measures if problems are faced.
 - 6.** Description of safety measures to be taken.

- C. The SSWP must be submitted a minimum of 60 days prior to desired start of work date. No track access will be permitted without approved access and an accepted SSWP.
- D. The draft SSWP shall be submitted to WMATA for review. Review and acceptance of the SSWP shall be obtained solely from JDAC. If necessary, JDAC shall return comments on the SSWP to the ODC, from appropriate review departments, for changes before final acceptance.
- E. The SSWP shall be accompanied with all necessary Job Hazard Analyses and Activity Hazard Analyses as indicated by the WMATA Construction Safety and Environmental Manual, the Metrorail Operating Rulebook, and applicable Occupational Safety and Health Administration (OSHA) requirements including a fall protection plan when applicable.
- F. An example of a generic SSWP template can be found in [Appendix B](#). Samples may be provided by the CE.

2.02 Access to WMATA Roadway and Facilities

Depending on the nature and extent of impact a project may have on the WMATA system, access to the Roadway/Wayside (tracks) and non-Wayside facilities may be necessary. The WMATA Roadway is defined as any area a rail vehicle may travel, whether at-grade, through tunnels, or on aerial structures. To obtain access to the WMATA Roadway, the below policies must be followed. This access will assist in completing pre and post construction inspections, installation and removal of monitoring equipment, and surveying locations of existing installations.

- A. The WMATA Operating Week is defined as the seven-day period beginning on Saturday morning at 0001 hours (12:01 AM).
- B. WMATA revenue hours are defined as the period in which the WMATA Roadway is in operation and WMATA services are open to customers.
 - 1. All work, including mobilization and demobilization, within the WMATA Roadway, must be performed during non-revenue hours or as accepted in advance.
 - 2. WMATA does not guarantee that the ODC will be able to work within the scheduled non-revenue hours.
 - 3. Revenue hours are subject to change without notification. Accurate revenue hours for requested dates may be obtained from the WMATA website and confirmed by the JDAC project team.
 - 4. With WMATA acceptance, the ODC may request a Rail Service Adjustment (RSA)—a temporary adjustment to the passenger train operating schedule

in order to accommodate maintenance or construction activities on the main line during revenue service—for projects requiring extensive track work.

5. An RSA may be requested in the form of a late-service start, and early-service halt, or a full-service shutdown. WMATA requires financial compensation for lost revenue time if an RSA is requested and approved.
 6. Any RSA must be communicated to the public in compliance with WMATA policies and as detailed in the Customer Communication and Outreach Plan as described in [Section 3.02](#).
- C. WMATA Contractor ID Badges are required of all personnel accessing any WMATA property and/or facilities. The JDAC project team will assist the ODC in obtaining contractor ID badges and notify personnel of steps requiring ODC action.
1. A criminal background screening certification is required of all applicants. Any background check older than one (1) year will be considered invalid and a new background check will be required.
 2. The OneBadge Request and Renewal form will be required with applicant's name, personal information, and dates of work.
 3. Contractor ID badges are valid until end of contract.
 4. Contractor ID badges must be picked up in-person by the applicant at MTPD's Office of Badging and Identification at WMATA's L'Enfant Plaza Headquarters, 300 7th Street, SW, Washington, DC 20024, or WMATA's New Carrollton office at 4100 Garden City Drive, Hyattsville, Maryland 20785. Applicants must appear with a valid government-issued ID (driver's license, passport, etc.) and a copy of the Contingent Hire Complete e-mail provided by the JDAC project team.
 5. Contractor ID badges must be always displayed on-person when working on WMATA property.
- D. All contractors and other personnel who access the Roadway must be trained and qualified in Contractor Roadway Worker Protection (CRWP) before entering the WMATA Roadway. The appropriate level of training is determined by the individual's duties.
1. Training is provided by WMATA Department of Safety (SAFE) at no cost to the ODC. Scheduling should be coordinated through the assigned CE or CIF.
 2. The ODC will be charged if the employee fails to attend the scheduled training class.

3. Proficiency in Contractor Roadway Worker Protection shall be signified by a sticker on the Contractor ID.
 4. If a designated crew is unable to complete the CRWP training, it is the ODC's responsibility to provide a crew with the capability.
- E. A completed and accepted Site-Specific Work Plan (SSWP) is required.
- F. Operational support requests, indicating the desired dates for entry into WMATA facilities, must be submitted to the WMATA CIF and CE on a JDAC Support Request Form (JSR) at least thirty (30) days prior to the beginning of the WMATA Operating Week of the requested date(s) for submittal into WMATA's General Orders Track Rights System (GOTRS). The thirty (30) day advance notification is necessary to allow WMATA sufficient notice to schedule personnel and/or support equipment, and to adjust WMATA operations and maintenance to accommodate the developer's/contractor's request wherever possible.
1. JDAC Support Request forms shall not be submitted until the ODC has obtained acceptance of a monitoring plan, accepted SSWP, and a fully executed real estate permit from the WMATA Office of Real Estate and Development (LAND).
 2. Any work performed within the Roadway will require a third-rail power outage.
 3. A separate JSR is required for each activity (event).
- G. For any operational support, a JDAC Daily Support Tracking Form must be completed. See [Appendix A](#). The completed form must be signed and emailed to the CIF and CE by the next business day.
- H. An executed real estate permit and insurances are required to work on WMATA property or perform work which may impact WMATA interests. Reference [Section 6](#) and [Appendix D](#) for WMATA real estate permit and insurance requirements.
- I. All ODC personnel performing work where confined space entry is required must comply with OSHA and WMATA safety regulations regarding confined spaces.
1. The WMATA Department of Safety (SAFE) maintains confined space entry procedures that may be distributed to the ODC by the JDAC project team upon request.
 2. WMATA requires certifications for in-person confined space entry training prior to entering confined spaces within WMATA property.

2.03 WMATA Operational Considerations

- A.** ODC personnel are bound by WMATA's safety rules and procedures while on or within WMATA's Roadway and air space.
- B.** The ODC is required to submit a detailed construction sequence and equipment staging plan for all work that will impact WMATA interests. This plan shall include necessary Maintenance of Traffic plans or similar plans required by local agencies. The ODC shall maintain both vehicular and pedestrian traffic, and existing streets and sidewalks within and adjacent to the project site at all times during the duration of the project.
- C.** Construction Safety, Fire Signage and Traffic Control Devices on WMATA property (for pedestrian and/or vehicular traffic):
 - 1.** The ODC shall maintain traffic and erect and maintain traffic control devices, as required by accepted plans.
 - 2.** Construction safety signage and markers are to be included as part of the construction sequence and staging plans submitted to WMATA for review and acceptance. Safety signage and markers must comply with the Public Communications and Outreach Plan as outlined in [Section 3](#).
 - 3.** Construction safety signage and markers are to be fabricated in accordance with the codes and regulations of the local jurisdictional authorities where the project is proposed.
 - 4.** ODC shall install and maintain any temporary safety signage and/or markers placed on WMATA property during construction.
 - 5.** Access shall be maintained to fire hydrants, standpipes, or Siamese connections and fire alarm boxes. Free access must be given to each fire hydrant, standpipe, or Siamese connection, and fire alarm boxes as accepted by local jurisdictional fire departments and WMATA whenever work is being carried on. Obstructions shall not be piled at any time or placed within 10 feet of any fire hydrant, standpipe, Siamese connection, or fire alarm box. The position and location of hydrants, standpipes, Siamese connections, and fire alarm boxes must be indicated by suitable signage and lights that are readily seen and accessible in both day and night when materials are placed in the vicinity of fire equipment (as accepted by the local Fire Marshal in the jurisdiction of the proposed project).

6. The ODC shall erect and maintain signs, fences, barricades, lighting, pedestrian bridges, and overhead protection and provide flaggers and oversight of the protection of public travel, protection of the work site, and protection of adjoining WMATA property and adjoining public places.
 7. The ODC, in compliance with OSHA standards on WMATA property, shall barricade all work area(s) or close excavations and openings in floors, walls and other parts of structures while openings are not protected full time. Barricades shall be substantial in character, neat in appearance, constructed of accepted materials and of accepted size. See also, [Section 8](#) for Construction Protection.
 8. ODCs are to take accepted positive measures on WMATA property to prevent unauthorized entry into the construction site of the work and storage areas. Protective devices shall be in accordance with codes and regulations of jurisdictional agencies.
- D. WMATA's fire escape routes shall not be obstructed. Metrorail Emergency Response Maps will be used to determine if the proposed development and the related construction activities will have a potential impact to existing WMATA emergency routes and local fire department access route(s). Copies of emergency response maps may be provided at the discretion of the JDAC project team.
- E. Flammable liquids shall not be stored over, under, or within 25 feet horizontally of any WMATA facility. If installation by the project is required within 25 to 100 feet horizontally of the structure, protective encasement of the tanks will be required. Existing underground tanks located within 100 feet horizontally of WMATA facilities and scheduled to be abandoned shall be removed and properly disposed. New underground tanks shall be designed to meet current applicable codes.
- F. Projects that require working over or adjacent to public WMATA facilities shall develop their construction procedures and sequences of work to meet the following minimum requirements:
1. Construction operations on or directly adjacent WMATA facilities must be planned, scheduled, and carried out in a way that will afford WMATA customers (and the general public) a clean, safe and orderly access to and from the facility during revenue hours.
 2. Construction activities that involve swinging a crane and suspended loads over pedestrian areas, WMATA station entrances and escalators, Roadway, and WMATA passenger areas shall not be performed during revenue hours. All cranes that swing over WMATA property shall be

equipped with GPS controllers, and tower cranes shall additionally be equipped with trolley stops.

SECTION 3

Public Notification and Customer Impact



Section 3 - Public Communications and Customer Impact

3.01 Public Participation Plan

- A.** All projects or initiatives that impact WMATA customers in any form must comply with the rules and regulations outlined in the WMATA Public Participation Plan, available publicly on the WMATA website. This plan was introduced by WMATA with four goals:
- 1.** To actively facilitate the involvement of all communities that may be affected in the public participation process.
 - 2.** To work jointly with the community throughout the planning and project development process.
 - 3.** To proactively link public feedback to outcomes in order to build trust.
 - 4.** To ensure established guidelines from the Public Participation Plan are followed throughout WMATA.
- B.** Compliance with WMATA's Public Participation Plan requires advance notice of customer impact, meaningful communication to customers, and accessible language and visual communication methods in standard, recognizable formats.
- C.** Projects are deemed obligated for participation in WMATA's Public Participation Plan on a case-by-case basis. Generally, projects that meet one or more of the below criteria may require a Customer Communications Plan:
- 1.** Projects that generate high levels of construction noise near WMATA customer areas.
 - 2.** Projects that create impacts to customer parking, such as lot or garage entrance and exit closures, reservations of public parking spaces for construction activity, or full parking lot or garage closures.
 - 3.** Projects that involve pedestrian and vehicular detours, such as lane closures, sidewalk closures, station entrance closures, or elevator and escalator closures.
 - 4.** Projects involving impacts to bus service, such as bus stop closures, bus loop closures, or bus detours.
 - 5.** Projects involving impacts to rail service, such as reduced or extended hours of operation, frequency adjustments, or other Rail Service Adjustments (RSAs).

3.02 Customer Communications and Outreach Plan

- A.** In compliance with the Public Participation Plan ([Section 3.01](#)), the ODC shall develop, submit to WMATA for acceptance, and execute a Customer Communications & Outreach Plan.
- B.** In order to provide ample time to communicate construction impacts to the public, WMATA requires public communication efforts to commence as early as possible and for the Customer Communications and Outreach Plan to be submitted for review no less than ninety (90) days before the projected date of first impact. WMATA and the ODC shall host a communications kickoff meeting to review and accept the draft Customer Communications and Outreach Plan. Subsequent coordination meetings shall be scheduled as needed to review materials, collaborate on communication efforts, and update WMATA on communication activity.
- C.** The Customer Communication and Outreach Plan must include:
 - 1.** A written narrative of the expected impacts to WMATA customers throughout the project duration, including stated objectives of the communication plan.
 - 2.** A projected timeline or schedule tailored to customer impacts, showing start dates and end dates of impact activities.
 - 3.** Methodology of public outreach. Depending on the project scope, the public outreach warranted may consist of construction signs, neighborhood flyers, banners, in-person outreach, advertisement, or a webpage with project updates. When construction signage is indicated, the ODC shall develop and submit a sign plan denoting sign locations, dates, sign type, and inventory.
- D.** WMATA must accept the Customer Communications and Outreach Plan, including outreach strategies and designs, before the ODC may begin implementation.
- E.** All content must be professionally translated, by a certified translator, into Spanish, in compliance with the WMATA Language Assistance Plan. Additional languages may be required based on the demographics of the area impacted. Demographic information and language compliance information by stations and bus line is published in WMATA's Public Participation Plan.
- F.** Individual communication items must be accepted by WMATA's communications department. Communication materials may come in the form of banners, A-frame signage, posted signage, variable message signs, or brochures and handouts.

When indicated, different communication material shall be created to inform customers of construction patterns both before and during impact.

- G.** WMATA maintains standards for public communication material regarding construction impact. Examples and templates of accepted signage, banners, and flyers may be found in [Appendix B](#). All public communication material shall include the following:
- 1.** Logo of the ODC's organization and a point of contact for public communication.
 - 2.** Effective start and end dates. Signage and other communication material shall be updated in the event of project schedule changes or delays.
 - 3.** Visual aid to assist in understanding. This includes, but is not limited to, yellow and black hashing around borders, iconography where indicated, rail maps with station names where impacts are occurring, and others. WMATA maintains standard symbols and iconography that shall be used through the development of public communication material.
 - 4.** Site area map, when applicable. Site area map shall include a legend, routes for pedestrian detours, ADA-accessible detours, and a north arrow to orient the reader.
- H.** Public communication material is required to be posted on and around the project site on timelines based on the level of expected impact to WMATA customers.
- 1.** For large customer impacts, including parking lot closures, partial lot closures, bus loop closures, station entrance closures, or elevator and escalator impacts, accepted customer communication material must be posted 30 days prior to the beginning of work.
 - 2.** For medium-grade customer impacts, including parking entrance and exit closures, lane closures, sidewalk closures and pedestrian detours, or bus stop relocation, accepted customer communication material must be posted 14 days prior to the beginning of work.
 - 3.** For low-grade customer impacts, such as individual parking space reservations or ADA parking space closures, accepted customer communication material must be posted 10 days prior to the beginning of work.
- I.** The ODC shall be responsible for all costs associated with the Public Participation Plan, including signage development.

- J. WMATA may supplement the Customer Communications & Outreach Plan with additional effort, including press releases, updates to the WMATA website, and station announcements.
- K. To assist with the ODC's role in the WMATA public participation plan, a communications checklist for adjacent construction projects may be provided to by the JDAC project team upon request.

3.03 Americans with Disabilities Act Considerations

- A. WMATA's ADA requirements comply with the rules and regulations found in 49 C.F.R Part 37 Transportation Services for Individuals with Disabilities, promulgated by the US Department of Transportation, and the ADA standards for Transportation Facilities, the Final FTA ADA Circular C 4710.1 (11/4/2015), and WMATA standards.
- B. Additionally, the Accessibility Standard for non-federally funded and non-transportation projects are the 2010 ADA Standards, issued by the Justice Department, and the 2006 ADA Accessibility Guidelines.
- C. All permanent and temporary facilities intended for use by WMATA customers shall be ADA compliant and subject to review by WMATA's Office of ADA Policy and Planning. Connecting paths to WMATA stations, as well as management of traffic plans, must also be reviewed and accepted by WMATA's Office of ADA Policy and Planning.
- D. Parking structures and parking lots that are designed for the use of Metro customers must also comply with WMATA's more stringent standards and must be accepted by WMATA's Office of ADA Policy and Planning.
- E. Any area that affects or impacts the usability of the station or WMATA facility must be reviewed by WMATA's Office of ADA Policy and Planning.

3.04 Impacts to Metrobus Services

- A. For any project that will affect a Metrobus stop or a Metrobus route, permanently or temporarily, the ODC shall provide mitigation measures. JDAC shall initiate contact with the WMATA Office of Bus Planning (BPLN), and coordination between the ODC, JDAC, and BPLN shall remain ongoing throughout the project lifecycle. For projects where JDAC evaluates no impact to WMATA facilities, Metrobus impact mitigation may still be required. JDAC shall provide introductions and a point of contact, and the ODC shall coordinate with BPLN without further JDAC involvement.
- B. Costs associated with Metrobus impacts and mitigation shall be determined separately through BPLN analysis and invoiced separately from JDAC operational costs. BPLN and the ODC shall enter a separate project agreement, denoting Metrobus route impacts. The ODC shall be responsible for costs

associated with Metrobus rerouting, temporary facilities, public notification of Metrobus changes, and any other disruptions to the Metrobus system.

- C.** Projects that impact Metrobus operation, Metrobus services, and Metrobus customers, but not WMATA facilities, shall still be obligated to provide customer communication as described in WMATA's Public Participation Plan and the requirements noted within [Sections 3.01](#) and [3.02](#) of this manual.
- D.** Mitigation of Metrobus operational impacts:
- 1.** The ODC shall submit a plan view of the project area showing the street layout and active Metrobus routes and stops in the vicinity of the project. All routes affected by construction setup shall be provided with detours as accepted by WMATA.
 - 2.** All Metrobus detours, schedule changes, and other operational impacts shall require public communication efforts as denoted in the Public Participation Plan and in [Sections 3.01](#) and [3.02](#) of this manual.
 - 3.** The maintenance of traffic plan shall include viable Metrobus detours for each phase of construction.
 - 4.** Turning radii analyses shall be performed for all curves introduced in each phase of the maintenance of traffic to ensure WMATA buses are able to maneuver safely through introduced detours. The ODC shall ensure turning radii is performed for properly-sized buses according to the route. WMATA standard bus dimensions can be found in [Appendix E](#).
 - 5.** Turning radii analyses for all bus sizes shall be performed and submitted for any permanent changes in roadway alignment.
- E.** Mitigation of WMATA bus infrastructure impacts:
- 1.** Disruption to Metrobus stops, or pedestrian access to Metrobus stops, will require setup of temporary bus facilities. Design of all temporary Metrobus facilities must be submitted to WMATA for review and acceptance. WMATA BPLN may provide temporary bus facility design examples that may be used.
 - 2.** Temporary Metrobus stops shall include a pedestrian-accessible and ADA-compliant access route, a WMATA and ADA-compliant bus boarding and alighting area, and accessible bus passenger shelters. Temporary landing areas shall be made slip-resistant.

3. If temporary facilities cannot match the ambient lighting conditions of the permanent facilities disrupted, temporary lighting must be provided by the ODC to both bus stops and accessible routes.
4. When major facilities such as bus loops or transfer stations are impacted by construction, temporary replacement facilities shall be constructed. Depending on the duration and nature of impact, WMATA may require the construction of temporary loops and stations, including, but not limited to, the pouring of concrete curbs and laying asphalt. Temporary bus facilities must provide amenities to WMATA customers equal to those of the permanent facilities impacted.
5. All newly constructed temporary or permanent bus facilities will undergo a WMATA-run test to ensure viability of facilities no less than two (2) weeks prior to the opening of the facility for customer use.

WMATA staff and bus operators shall test, using WMATA buses, for bus movement ability, identify locations for buses to park during layover, ensure buses do not block travel paths of other buses, and identify risks and restrictions related specifically to the new facility.

WMATA staff shall measure curb heights, wheelchair ramp deployment angles, and minimum clearances between fixed objects to ensure compliance.

Jurisdictional partner transit agencies that have existing agreements in place to use WMATA bus facilities shall test all new temporary or permanent facilities for viability.

6. After conclusion of construction activities, all temporary facilities shall be demolished, and the site returned to pre-construction conditions as documented in the pre-construction survey.

SECTION 4 – Quality Assurance and Quality Control



Section 4 - Quality Assurance and Quality Control**4.01 WMATA Project Management and Progress Tracking**

- A.** WMATA tracks construction activity and project progress through JDAC field oversight and through ODC progress reporting. Any method in which the ODC remotely monitors construction progress shall be shared with WMATA.
- B.** Construction cameras are highly recommended. When construction cameras are used to remotely monitor construction progress, WMATA shall require access to the video feed to monitor construction progress, adherence to the accepted construction documents, and impact to WMATA facilities. WMATA may grant power to construction cameras from WMATA facilities, when access is granted, at the discretion of WMATA.
- C.** Progress photos of construction, including aerial imagery, shall be submitted to WMATA for review of construction progress and impact to WMATA. Construction progress photos shall be kept on-file for documentation of conditions prior to any potential construction impact. WMATA shall review photographs and video of existing conditions taken prior to groundbreaking periodically to analyze for impact to WMATA structures.
- D.** WMATA shall request access to ongoing, continuously recorded monitoring data, when available by the monitoring equipment used.
- E.** WMATA requires ongoing coordination to ensure WMATA maintains awareness of project progress and is able to adequately maintain construction support.
 - 1.** The ODC shall maintain access for all WMATA project team personnel to all construction sites located at or adjacent to WMATA property. For construction sites located within WMATA property, access shall be maintained for all qualified WMATA personnel for planned maintenance and other purposes.
 - 2.** WMATA requires the ODC to submit an overall lifecycle project schedule. This lifecycle project schedule shall note the dates of WMATA submittals and shall be used for WMATA to properly allocate resources and ensure the project remains supported. The overall lifecycle project schedule should be maintained regularly and updates sent to the CE on a monthly basis.
 - 3.** WMATA requires the ODC to submit three-week look-ahead construction schedules, updated and returned to WMATA weekly. Activities with impact to WMATA shall be highlighted.

4.02 Inspection and Testing

- A.** WMATA requires the ODC to hire an independent, third-party inspection & testing contractor, when indicated by WMATA standard specifications, to perform inspection and tests of work that is of interest and has potential to impact WMATA, including any work performed within the Zone of Influence and any work being done for WMATA to own, operate, or maintain. Use of third-party contractors are subject to the acceptance of WMATA.
- B.** Components of an adjacent construction or joint development project that may require independent testing include, but are not limited to, the following:
- 1.** Weld testing of all steel members and Support of Excavation (SOE) welds, including cross struts and walers shall be required. WMATA requires weld testing to be non-destructive. All weld tests shall comply with the WMATA standard specification for structural steel, provided by the JDAC project team.

Provided that welding has been performed before pre-loading is performed, and pre-loading record documentation in compliance with WMATA specifications has been received by WMATA, weld testing may be waived with WMATA acceptance.
 - 2.** SOE components, including struts, rackers, tiebacks, and bracing, shall be tested and documented by a third-party inspection & testing agency as listed in the Support of Excavation WMATA standard specification. All loading records and test reports shall be signed and sealed by a registered Professional Engineer, licensed to practice in the jurisdiction where the work is being performed.
 - 3.** Grounding and bonding shall be tested after installation.
 - 4.** The ODC shall perform watertight testing of new installations.
 - 5.** Airflow through vent shafts, plenums, and ductwork must be tested to establish a baseline of operation pre-construction. Post-construction testing shall be conducted to ensure equivalent operation is sustained.
- C.** WMATA procedures for testing of construction activities are defined in the WMATA standard specifications. The latest version of WMATA specifications for individual tests and inspections shall be provided to the ODC by the JDAC project team upon request. It is the ODC's responsibility to comply with all WMATA standard specifications.

4.03 Certifications

- A.** Certain construction activities and certain tests and inspections shall only be performed by appropriate qualified personnel and witnessed by WMATA or third-party inspectors as necessary. Copies of all in-date licenses and certifications held by qualified personnel shall be submitted to WMATA for documentation and record. ODC shall ensure all submitted licenses and certifications comply with stated requirements.
- B.** Construction activities that require qualified personnel or qualified firms and documentation of their respective licenses and certifications are listed below. Additional requirements may apply as identified by the JDAC project team.
- 1.** A testing and balancing contractor, certified by the National Environmental Balancing Bureau (NEBB), shall be employed to perform testing and balancing of mechanical ventilation systems.
 - 2.** A qualified communications engineer shall be employed to perform design, installation, testing, and inspection of new CCTV, fire alarm, network switches, and other network infrastructure. The qualified installation contractor or inspector shall have a minimum of five (5) years' experience in the following areas:
 - i. NFPA 70 (NEC) for all low voltage (24V, AC/DC, PoE, etc.) communication equipment, conductors, and raceways.
 - ii. NFPA 72 (NEC) for all low voltage (24V, AC/DC) communication equipment, conductors, and raceways.
 - iii. Building Industries Consulting Services International (BICSI) telecommunication standard for all communications equipment, cabling, and raceways (racks, cable trays, etc.). At least 30% of the copper installation and termination crew must be BICSI certified. At least 10% of the optical fiber installation termination must have network cabling systems certified by the manufacturer.
 - iv. Should fiber or IT network installation activity be required, the communications engineer shall possess an in-date Registered Communications Distribution Engineer (RCDD) certification and experience applying Open Systems Interconnection (OSI) codes.
 - v. ANSI/TIA/EIA industry standards for testing of communication cables including Cat6, fiber optics, and low voltage conductors.
 - vi. Preparing and maintaining a plan for the quality of engineering inspections and documentation of activities to provide as-builts reflecting the actual installation.

vii. Drafting as-builts in CADD meeting WMATA's BIM standards.

3. Certified Survey Technicians shall be employed to perform installation of monitoring equipment and monitoring or survey readings.

- C. WMATA general requirements for qualified individuals and certifications are defined in the WMATA standard specifications. The latest version of WMATA specifications for individual tests and inspections shall be provided to the ODC by the JDAC project team upon request. It is the ODC's responsibility to comply with all WMATA standard specifications.

4.04 WMATA Involvement

- A. WMATA requires the ODC to identify and coordinate with WMATA-designated inspections, tests, installation, and other construction activities that have a direct and controlled impact to WMATA, regardless of if such activities were covered in pre-activity meetings as defined in [Section 1.12](#). A WMATA representative shall be required to perform or be witness to the performance of any such tests.

These activities include those listed below, and additional requirements may apply as indicated by WMATA or by the WMATA standard specifications provided by the JDAC project team.

1. Testing activities performed on WMATA mechanical systems, including ventilation.
2. At the discretion of WMATA, activities that have a direct, controlled impact to WMATA facilities shall require the presence of a WMATA representative.

- B. The ODC shall notify WMATA of all access requirements associated with adjacent construction sites including clearances, training, PPE requirements, and certifications early enough for WMATA personnel to satisfy access requirements before site access is needed.

WMATA personnel, including the JDAC project team, project management staff, and internal WMATA qualified personnel, shall satisfy access requirements prior to the beginning of construction, or a plan to have personnel satisfy the requirements prior to the date of indicated work shall be in place before construction shall commence.

4.05 Reporting

- A.** Inspection reports shall be submitted to WMATA for review after inspection for documentation.
- B.** Installation reports shall be submitted to WMATA. Installation reports shall be reviewed for compliance with WMATA standard specifications.
- C.** The ODC shall maintain a comprehensive log used for tracking of for non-conformance items and deficiencies in construction. This log shall be regularly maintained and shared with the JDAC project team. Non-conformance items and construction deficiencies shall be accompanied by active mitigation measures to ensure no impact is imposed upon WMATA facilities.
- D.** All project issues pertaining to quality, non-conformance, or construction deficiency shall be reported to the CIF and CE.

WMATA reserves the right to halt construction activity on, above, under, or adjacent to WMATA facilities if appropriate mitigative measures are not taken by the ODC to address deficiencies in construction or if ongoing construction activities shall cause undue impact to WMATA.

SECTION 5 – Early Action Items



Section 5 - Early Action Items

5.01 Safety and Security Certification Program Plan

- A.** System safety and security play important roles in achieving and maintaining the Washington Metropolitan Area Transit Authority mission to provide exceptional service in a safe and secure operating environment. WMATA has implemented a Safety and Security Certification Program to help in the achievement of this mission.
- B.** The goal of safety and security certification is to ensure that WMATA rail extensions, new and rehabilitated facilities and vehicles, and new and rehabilitated Metrobus facilities and equipment are operationally safe and secure for customers, employees, and the general public. To this end, the Safety and Security Certification Program verifies, through a formal process, that safety and security requirements are incorporated into design, construction, installation, procurement, and testing activities, training programs, and operations and maintenance procedures.
- C.** Safety and Security Certification is a ten-step, systematic approach to hazard, threat, and vulnerability management throughout the entire project lifecycle.

 - 1.** Step 1: Identify Certifiable Elements. Based on the project scope of work, major components of a project in Systems, Facilities and Equipment, Testing, and Operations that will undergo hazard analysis and threat and vulnerability assessment will be identified and cataloged in the certifiable item list. A preliminary hazard analysis shall be performed on each certifiable item.
 - 2.** Step 2: Safety and Security Design Criteria. Review of safety standards, codes, and material to provide guidance to the project.
 - 3.** Step 3: Design Criteria Conformance Checklists. Checklists provide verification of compliance with safety and security requirements. Checklist items are verified against project plans, drawings, and specifications.
 - 4.** Step 4: Construction Specification Conformance. All facilities and systems shall be verified for compliance with safety requirements and that hazard and risk mitigation has been implemented.
 - 5.** Step 5: Identify Additional Safety and Security Test Requirements. Tests required to verify functionality of systems and implementation of hazard mitigation will be identified.

6. Step 6: Monitor Testing and Validation. Personnel will monitor contract required tests and document results.
 7. Step 7: Monitor Integrated Testing and Validation. Personnel will verify the systems and equipment are properly interfacing.
 8. Step 8: Manage Open Items. Remaining open items, consisting of exceptions, restrictions, or instances where a certifiable item does not meet designated requirements, shall be tracked and mitigation will be developed.
 9. Step 9: Verify Operational Readiness. Personnel shall verify that plans, rules, procedures, and manuals are prepared, operational and emergency training has been completed, and hazards have been eliminated or adequately controlled.
 10. Step 10: Issue Final Safety and Security Certification. After verification that all requirements have been met, a Safety and Security Certification shall be issued.
- D. ODCs will be required to participate in the program for those projects identified as requiring certification. The Safety and Security Certification Program Plan is available upon request. Obligation for participation in the program shall be determined by WMATA and is based upon project characteristics. If obligated, participation in the plan is begun as early as possible in the project lifecycle, through coordination between the ODC, WMATA, and the WMATA Department of Safety. Additional safety certification requirements may be deemed required by WMATA throughout the project lifecycle.

5.02 Document Configuration and As-Built Requirements

- A. WMATA requires as-built documentation of all adjacent and reimbursable projects. As-built documentation requirements differ on a project-by-project basis. Document configuration requirements shall be introduced to the ODC by the JDAC project team early in the project lifecycle.
- B. As-built documentation and as-built records must comply with the latest WMATA Computer-Aided Drafting & Design and Building Information Modeling (CADD/BIM) standards provided by the JDAC project team. CADD/BIM standards may require the use of specific software or the maintenance of models throughout the project lifecycle to be turned over to WMATA upon project completion.
- C. During construction, the ODC shall maintain a record set of contract drawings annotated to illustrate changes incorporated as work progresses. Drawings, plans,

and calculations accepted by WMATA and revised by the ODC must be resubmitted for acceptance.

- D.** As-built records will be required for new facilities, structures, utilities, property rights related to WMATA structures and property resulting from the adjacent construction or joint development project. As-built drawings will include record of impacts within the WMATA ZOI. As-built drawings shall also be required of adjacent work causing impact to WMATA facilities. As-built documentation is not required of adjacent projects that show no ongoing impact to WMATA facilities.

All projects impacting assets that WMATA owns, operates, or maintains correspond to Document Configuration-assigned M or M-D numbers. When project delivery involves new or modification to existing facilities for WMATA to own, operate, and maintain, detailed as-built documentation corresponding with the assigned project M-number shall be required.

- E.** Project as-built drawings must use WMATA's as-built drawings for the base layer, when applicable.
- F.** The as-built documentation shall include, but is not limited to, the following items:
- 1.** Depths of various elements of foundations in relation to survey data.
 - 2.** Horizontal and vertical locations of underground electrical and utility facilities.
 - 3.** Field changes of dimensions and details.
 - 4.** Changes accomplished by change orders.
 - 5.** Construction left in place, such as temporary support systems, and concrete left outside neat lines of permanent structures, including notes defining types and locations of items.
 - 6.** Any necessary Operations and Maintenance Manuals if WMATA is to maintain such facilities and equipment constructed by others.
- G.** Drafting shall be performed by skilled drafters using CADD software and shall match original contract drawings in line weights, symbols and lettering style and size.

5.03 Asset Management

- A.** An asset is defined as pieces of physical equipment and infrastructure that make up WMATA's transit system. Any item that WMATA considers a tangible entity or system of entities requires a preventive maintenance schedule, regular inspection, regular calibration, and inventory management or tracking.
- B.** WMATA employs a comprehensive asset management system consisting of systematic processes for operation, maintenance, and improvement of physical assets, focusing both on engineering and economic analyses. The ODC must strictly adhere to WMATA asset management practices for any asset provided for WMATA to own, operate, and maintain, and for any WMATA-owned asset replaced or modified.
- C.** If asset management is required by the scope of the ODC's project, the ODC, along with the JDAC and the WMATA asset management teams will hold a kickoff meeting outlining the extent of requirements.
 - 1.** The asset management identification and onboarding process is outlined in WMATA SOP TAMO-PRO-P02-00 and may be provided to the ODC by the JDAC project team upon request.
 - 2.** When applicable, the asset management process shall commence as early as possible in the project lifecycle to allow adequate time for review, inventory, and tracking.
- D.** If applicable, the ODC must provide WMATA with a comprehensive bill of materials for asset management review using a template provided by the JDAC project team. WMATA Asset Management will individually review all materials and determine the extent of WMATA assets.
- E.** The WMATA asset management team will, in coordination with JDAC, provide project-specific requirements and outline asset turnover procedures on a project-by-project basis.

SECTION 6
Real Estate
And
Insurance
Requirements

Section 6 - Real Estate and Insurance Requirements

6.01 Real Estate General Requirements

- A.** Clearly depict impact to WMATA real property or easements on design plans submitted for WMATA review.
- B.** Real estate transactions with WMATA are handled directly by the Office of Real Estate and Development (LAND). The Office of Joint Development and Adjacent Construction (JDAC), for purposes of ODC's work, coordinates all design plans, engineering disciplines and real estate permit(s) for temporary or permanent real estate rights, leases, etc., and submits its review to the Office of Real Estate and Development for action.
- C.** WMATA may grant permits, easements, licenses, or other rights, on a case-by-case and first-come, first-served basis in response to third party requests to use or occupy WMATA property. WMATA determines if the proposed use will not adversely impact WMATA operations or existing or planned WMATA facilities.
- D.** JDAC reviews requests to use WMATA property (either temporary or permanent use) to determine the compatibility with existing or planned WMATA facilities. Review of requests will be coordinated by JDAC with operating departments before the design review phase is complete.
- E.** WMATA Real Estate is responsible for determining the appropriate property interest to accommodate the requested use, for determining the fair market value for the real estate interest and coordinates the preparation of the appropriate document with the WMATA Office of General Counsel.
- F.** A completed WMATA real estate permit application is required prior to any access or start of any work on or near to WMATA property. Impact is considered to include any property interest (including areas of tieback installations) and access by the ODC. WMATA requires payment of fair market value for any property interest used or conveyed and requires payment of WMATA's costs associated with review of requests for permits, easements, licenses and other rights. Reference also [Section 6.02](#), point F for requirements for permanent impact to WMATA property. A real estate permit application and supportive documentation are required for:
 - 1.** Property screening whereby temporary access on WMATA property is required.
 - 2.** Providing operational support for structural monitoring of WMATA facilities.

3. Temporary access by construction personnel, equipment, or devices for surveying and monitoring.
 4. Temporary support of excavation system on WMATA property (whether to be left in place or removed at the end of the project). If left in place, an easement with fair market value payment may be required.
 5. Installation of overhead protective structures that impact WMATA property.
 6. Placement of siltation devices and/or construction clearing and grading zones.
 7. New installations on WMATA property.
 8. New underground utilities within WMATA property.
 9. New permanent installations over WMATA facilities that encroach into WMATA air space and upper limits of surface and aerial easements.
 10. Encroachments into WMATA underground easements from underpinning structures or soil anchoring systems (such as tiebacks).
 11. Storm drainage runoff directed onto WMATA property from new construction (only to be allowed within WMATA's specifications).
 12. Encroachment onto any WMATA property including surface easements such as slope easements or access easements.
 13. Modification(s) to existing WMATA right-of-way fencing at surface levels.
- G.** The ODC shall consider and determine WMATA property use needs prior to planning and coordination of project design and construction on and adjacent to WMATA facilities/structures. WMATA design guidelines highlighted under Sections [7](#), [8](#), and [9](#) of this manual may require structural monitoring of WMATA facilities, structures, etc. should construction impact WMATA's ZOI. Such impact and structural monitoring requirements typically necessitate a WMATA real estate permit for purposes of gaining access onto WMATA property to design, survey, install, implement, and execute monitoring programs.
- H.** Requests for new installations on WMATA property that will require WMATA to incur maintenance, security or other costs will normally be denied, unless the requesting party agrees to pay such costs and demonstrates the financial capability to pay such costs.

6.02 Procedures and Application Process

- A.** When the engineering design review phase has been completed by WMATA, and plans are accepted or conditionally accepted, the ODC is required to complete and submit the necessary real estate permit application and supporting documentation and pay the permit fee electronically. The ODC to provide the assigned CE a draft of the permit application for initial review prior to submission.
- B.** The completed real estate permit application must be submitted simultaneously to WMATA's Offices of Joint Development and Adjacent Construction and Real Estate and Development. The permit application shall be provided to the ODC by the JDAC project team upon request.
- C.** WMATA will review all incoming requests on a first-come, first-served basis. Requests for use of real property will be coordinated with WMATA Real Estate.
- D.** Real Estate, upon receipt of JDAC certification of the permit application will:
 - 1.** Determine the required property interest.
 - 2.** Establish the value of the property interest.
 - 3.** Prepare and coordinate the requisite legal documents.
 - 4.** Obtain WMATA Board of Directors and Federal Transit Administration acceptance when required.
 - 5.** Coordinate with the WMATA Office of Risk Management (RISK) to review and accept insurance policies and certificates of insurance in advance of delivery of the executed permit or conveyance document to applicant/ODC.
 - 6.** Issue, approve and sign the permit, easement, license, requisite legal documents, etc.
 - 7.** Arrange to collect required compensation, in addition to the permit fee, if applicable.
- E.** Real estate requests that will permanently impact WMATA real property or easements (whether exclusive or non-exclusive easements) will generally require supportive documentation for property acquisition and conveyance. Reference [Appendix D](#) for detailed WMATA criteria for property surveys and submission documentation. Plan submissions for real property use shall include, at a minimum:

1. A certified plat of survey (or exhibit), prepared, signed, and sealed by a licensed surveyor, suitable for recordation which clearly illustrates property interrelation and location to WMATA's property and facilities. Certified plats shall identify the property being impacted and include all necessary units of measure for WMATA's real estate appraisal (e.g., proposed total areas, easement lengths, easement widths, upper and lower easement limits, basis or bearings, horizontal and vertical reference datums, etc.)
 2. Certified legal property description(s) of property or easements with metes and bounds description, basis of bearings, and horizontal and vertical reference datums, signed and sealed documentation by a licensed Land Surveyor practicing in the jurisdiction of the proposed project.
 3. Deed Book and Page Number of property or parcel identified on the plat and legal descriptions.
 4. Confirmation that survey is closed and tied to WMATA's existing control (limit of right-of-way to the property lines).
 5. Delineation of specific maintenance responsibilities and future access to such permanent at-grade or underground structures.
- F.** NOTE: Conveyances governed by the WMATA Board Regulation Concerning the Use by Others of WMATA Property, Joint Development Agreements and leases/permits which are specifically entered into for purpose of generating revenue for WMATA will be handled in accordance with the procedures established for those actions.

6.03 Real Estate Responsibility

- A.** Documentation of impact to WMATA real property: the ODC shall plan, document, develop and coordinate real estate interests with WMATA.
- B.** The ODC shall coordinate permit requests with WMATA. It is preferred and less expensive for the ODC to coordinate all impact to WMATA's real property from joint and/or adjacent construction development in one (1) real estate permit application under one (1) applicant. This process requires advance planning and coordination on the part of the Owner/Developer/Contractor prior to interface with WMATA.

6.04 Indemnification and General Insurance Requirements and Procedures

- A.** The ODC will be responsible for complying with all applicable indemnification and insurance requirements for work activities impacting WMATA.
- B.** WMATA's indemnification and insurance requirements for joint development and adjacent construction are referenced in [Appendix D](#) of this manual. Any on-site work which could cause or with potential to cause impact to WMATA facilities or operations may not begin without proper insurances in place. Work will be suspended in the event insurance is not maintained current by the ODC. WMATA is to be named as an additional insured on all insurance relative to joint and adjacent construction work with the exception of workers' compensation and professional liability insurance.
- C.** Certificates of insurance and associated forms from the ODC are reviewed and processed by the WMATA Office of Risk Management (RISK) during permitting phases (along with the Office of Real Estate and Development).
- D.** Copies of applicable certificates of insurance and associated forms shall be forwarded to WMATA as soon as the ODC is informed of the requisite insurance coverages for the project.
- E.** Contact may be made directly with the WMATA Office of Risk Management via e-mail, with the JDAC project team copied, for any specific insurance issues, requirements, or questions while working on, over, below, or adjacent to WMATA facilities.

6.05 Insurance Responsibility

- A.** The ODC shall keep certificates of insurance and associated forms current with WMATA during the full duration of each project.
- B.** All policies shall include a special cancellation provision which reads "The Authority is interested in the maintenance of this insurance, and it is agreed that this insurance will not be cancelled, materially changed or not renewed without at least thirty (30) days prior written notice to the Authority". Notice is by Certified Mail, Return Receipt Requested; hand delivery; a nationally recognized overnight courier service for next business day delivery; or any telecommunications device capable of creating a written record of such notice and its receipt. Addressed to: Program Manager, Office of Real Estate and Development, Washington Metropolitan Area Transit Authority, 300 Seventh Street, SW, Washington, DC 20024.

- C.** At least two (2) weeks prior to the expiration of the original policies or any renewals thereof, evidence of renewal or replacement policies of insurance, with the same terms and limits as expiring, along with the required forms, shall be delivered to WMATA.

SECTION 7 Design

Section 7 – Design

General Note: Specific designs performed by WMATA or its consultants may not necessarily be in conformance with the current WMATA Design Criteria or this manual's appendices. It is considered an Owner/Developer/Contractor (ODC) responsibility to obtain the original design computations, where available, from WMATA to completely understand the original design intent in order to accurately assess the impact of their proposed construction on WMATA structures, facilities and utilities.

Prior to commencing design, the ODC shall fully understand that noise and vibration might arise from WMATA's underground and above-ground operations which include but is not limited to bus or train movement, and therefore, it should take actions to mitigate such noise and vibrations by implementing measures during their design and construction of this project. The ODC waives for itself and all other persons or entities claiming by or through it all right to make any claims against WMATA arising from noise or vibration that might be caused by WMATA's operations and agrees to notify any subsequent purchaser or lessees of such waiver. Acceptable decibel values for transit noise and vibration may be found in the Transit Noise and Vibration Impact Assessment Manual, published by the Federal Transit Administration.

7.01 Geotechnical Criteria

- A.** Geotechnical/Structural evaluation of the adjacent construction shall be based on the WMATA Standard Specifications and the WMATA Manual of Design Criteria. WMATA facilities are considered to be affected by the adjacent construction when the proposed excavation and construction is in the WMATA Zone of Influence. Existing WMATA deep foundations, retaining walls, and underground utility lines are considered to be a part of WMATA facilities.
- B.** If the proposed construction will be located within the WMATA ZOI the WMATA Manual of Design Criteria and Standard Specifications shall be utilized for design and construction of the portion of the proposed facility within the WMATA ZOI.
- C.** When the structure adjacent to an existing WMATA structure is required to support or provide resistance to re-establish the 'Long Term' loading on WMATA's structure(s), adjacent structure(s) should be designed for loads accordingly. In the case of uncertainty, the developer must contact WMATA for clarification before design begins.
- D.** The ODC shall be responsible for providing a geotechnical/soils report for WMATA review.

7.02 Earth Pressure Criteria

- A.** The at-rest coefficient of earth pressure (K_0) is expressed as:

$$K_0 = 1 - \sin\Phi$$

- B.** The active coefficient of earth pressure (K_a) is expressed as:

$$K_a = \tan^2 \left(45^\circ - \frac{\Phi}{2} \right)$$

- C.** The passive coefficient of earth pressure (K_p) is expressed as:

$$K_p = \tan^2 \left(45^\circ + \frac{\Phi}{2} \right)$$

In these equations, the effective friction angle (Φ) should be taken from Table C-3 of this Manual's [Appendix C](#), and cohesion, c , shall be considered to be zero.

If a geotechnical report is prepared, and submitted to WMATA, based on sufficient, job-specific borings and other geotechnical investigation, other values of effective friction angle (Φ) may be used at the sole discretion of WMATA.

- D.** Plate A-4 in [Appendix C](#) presents the vertical pressure distribution to be assumed for the loads from the adjacent construction. The effect of resulting lateral loads due to the adjacent construction shall be added along with the vertical pressures on WMATA structures.

7.03 Design Pressure

- A.** Lateral Earth Pressure and Groundwater Pressure. The basic horizontal earth pressures shall be computed using the active earth pressure. The resultant or total active earth pressure shall be multiplied by a stiffness factor depending upon the required stiffness. The resulting load shall be redistributed on the Support of Excavation (SOE) in a trapezoidal pressure diagram similar to that shown in Plate A-1A or A-1B in [Appendix C](#). The stiffness factors shall be applied to both the SOE design and the bracing system. The stiffness factors shall be assigned as follows:

1. Use stiffness factor = 1.25 for a soldier pile and lagging or a sheet pile support system.
2. Use stiffness factor = 1.5 for a slurry wall, secant and tangent pile wall support system.

If the water table is above the subgrade, and if de-watering is not done, consider the effect of the lateral water pressure and modify the active earth pressure accordingly.

- B.** Depending upon the type of soil, the ordinate of the resultant trapezoidal pressure diagram in pounds per square foot shall be calculated based on the Plate A-1A. Earth Pressure (P_a) shall not be less than 25H (without stiffness factor) in any case, at least equal to 25H (for a soil with internal friction angle, Φ =38 degrees, and a stiffness factor of 1.25) and 29H (for a soil with Φ =38 degrees, and a stiffness factor of 1.5), where H = the height in feet of the excavation between the subgrade under the working slab and the surface of the ground. The bottom of a laid back slope at the top of the SOE shall not be used as the upper limit in determining the

value of H. Any other excavation support system not identified in [Section 7.04](#) shall be designed for at-rest earth pressure ($K_0\gamma sH$) and full water pressure.

Appropriate soil and rock properties listed in [Appendix C](#), Table C-3, shall be used in computing soil pressures and other analysis. Note that cohesion of soil shall not to be considered in the analysis (cohesion, $c = 0$), for all types of soils.

- C.** Ground water pressures shall be estimated based upon the existing water levels or on permissible drawdown levels, plus an allowance for seasonal variation. Where soldier beams with wood lagging are to be used, ground water may be assumed to be below the level of the interior excavation subgrade. When the shoring wall is intended to prevent all leakage of ground water the exterior water level shall be used and accounted for in the design.
- D.** The passive earth pressure available to resist the forces placed upon the temporary support structure shall be computed using the conventional expressions for passive earth pressure. Friction forces on the SOE shall be ignored. A safety factor of 1.5 shall be used when computing the theoretical passive resistance. The passive earth pressure should be reduced with consideration of slopes and berms in front of the support system.
- E.** Frictional forces shall be considered only on the embedded soldier pile length below the subgrade when balancing the vertical forces imparted to the support structure by rakers or tiebacks. Determine the allowable bearing capacity by applying a safety factor of 3.0 to the ultimate bearing capacity.
- F.** The trapezoidal shaped pressure diagram as shown in Plate A-1A is applicable only for a multi-level tieback, strut or raker support system. A triangular shaped pressure diagram, as illustrated in Plate A-1B, shall be used for the single level strut, raker, or tieback support system.
- G.** The structural support system design shall consider the effects of all loads resulting from construction equipment, construction trailers, supported utilities, stockpiled materials, cranes, concrete trucks, and non-underpinned buildings adjacent to the excavation. Minimum surcharge pressure is shown in Plate A-1A, Plate A-1B and Plate A-6A, which is based on a vertical construction surcharge of 600 pounds per square foot acting adjacent to the excavation. For more severe construction loading a special analysis shall be conducted per Plate A-6B.

Temporary construction surcharge directly over WMATA underground structures shall not exceed 300 pounds per square foot as shown in Plate A-5B.

Plates A-5A, A-6A, A-5B, and A-6B can be found in [Appendix C](#).

- H.** The stability of the base of the excavation must be evaluated for all excavation support systems. The evaluation shall consider piping due to seepage, unbalanced external forces, base stability of cohesive soils, and additional appropriate variables. An acceptable method of evaluating the stability of the base of the

excavation shall be in accordance with the procedures presented in the US Navy Design Manual 7.02, Foundations and Earth Structures.

7.04 Support of Excavation

- A. Lateral design loadings to be used for adjacent construction projects are shown in [Appendix C](#), Plate A-1A and Plate A-1B. Plate A-6A and A-6B show temporary construction loads that shall be added to the lateral earth pressures when developing the horizontal forces acting on the proposed support of excavation.
- B. The original basic design loadings used for the design of WMATA structures and tunnels are presented in [Appendix C](#), Plate Nos. A-5A, A-5B, A-7A and A-7B. These diagrams are presented to indicate the earth pressure used in the original design of the WMATA facilities. Thus, if the changed earth pressures due to the proposed excavation and construction can be maintained within the limits of the original design pressures (e.g., the short-term loading and the long term loading) at all times, the structural analysis of the existing WMATA facilities can be eliminated, with prior acceptance of WMATA.

If the tunnel or structure was originally designed using the New Austrian Tunneling Method (NATM), the ODC shall provide a structural adequacy check, based on procedure or computer program acceptable to WMATA, on WMATA structures. This requirement may be waived at WMATA's discretion.

For tunnels and other structures in rock, the ODC shall provide a structural adequacy check, based on the loading provided in this manual or based on procedure or computer program acceptable to WMATA, on WMATA structures. This requirement may be waived at WMATA's discretion.

- C. For construction proposed within the ZOI the following analyses shall be included in the submission:
 - 1. Establish diagrams illustrating the pressures used in the design, including the long term or existing pressures on the underground WMATA structures. Illustrate the variation in the existing pressures due to the different construction phases, including full excavation to subgrade and when the structure is complete. A structural evaluation will not be required if the proposed pressures or loads on WMATA structures are within the limits of WMATA's initial structural design.

If the proposed pressures or loads on WMATA's structures fall outside initial design limitations (of WMATA structures), then a structural analysis will be required to verify that the anticipated earth pressures will not cause over stressing or cracking. The analysis must be submitted for WMATA review and acceptance. WMATA, may at its sole discretion, waive such an analysis based on the amount of variation in pressures or loads acting on WMATA structures.

- 2. The design for the excavation support system shall include consideration of a deep-seated slope stability analysis of the soldier pile or sheeting wall.
- D. As necessary, or if required by WMATA, an analysis shall be provided of the existing WMATA structure, including foundation, for the anticipated loads.
- E. Provide the details of any proposed construction dewatering or groundwater drawdown planned during the adjacent construction. Settlement analysis of the existing WMATA facilities shall be performed if the foundations are founded in a subsurface strata of loose material with a thickness of more than 5 feet.
- F. If laid back slopes are used at the top of excavation support system, and if they are steeper than one vertical to one and a half horizontal, a slope stability analysis shall be provided.
- G. The design of the temporary structures shall be the responsibility of the ODC. This section presents minimum design and construction requirements to facilitate WMATA review of support of excavation submittals.
- H. Temporary structures may be designed with laid back slopes as long as the soil loads are taken as equivalent to the full height of the excavation from the subgrade under the working slab to the original street grade or surface elevation of the soil before excavation.
- I. Underpinning Protection Requirements: Plates A-3A and A-3B shown in [Appendix C](#) depict the zone in which underpinning will be required as a result of construction adjacent to WMATA structures. The same principle shall be applied to determine the effects that proposed construction may have on other WMATA facilities.
- J. If design criteria or methods given in any of the reference standards differ with a criteria or method explicitly stated in this manual, then this manual's criteria or method shall govern.
- K. The support systems acceptable to WMATA are steel soldier piles with timber lagging, steel sheet piles, slurry (diaphragm) walls, secant pile walls, and tangent pile walls secured in place with bracing members such as walers, rakers, shores, struts and ground anchors. For small utility trenching, trench boxes are acceptable. Acceptance of any other methods of support of excavation will be at the sole discretion of WMATA.
- L. Installation methods and requirements for Support of Excavation and associated components may be found in [Section 8.02](#).

7.05 Support of Excavation Methods

- A. The excavation construction sequence and its effect on the struts, corner braces or diagonal struts, rakers, walers and soldier piles shall be examined for the various stages of partial excavation, including removal stages. The condition where the soldier pile is assumed to be continuous over the brace immediately

above the excavated level may produce a condition of maximum loading in the support structure. The excavation support members shall be sized accordingly. For raker bracing system use reduced passive pressure acting on the soldier beams due to the soil sloping down from the edge of berms, for the partially excavated conditions.

When the support of excavation is closer than ten (10) feet (horizontal dimension) to the WMATA vent structures/shafts, station locations, tracks, or underground tunnel sections, WMATA may require the ODC to provide a stiff support system (e.g., slurry walls, tangent walls, or secant walls) and other means of support of excavation (such as soil grouting). The requirement may also include restricting the spacing of soldier piles to four (4) feet maximum, and restricting the spacing of supports (rakers, tiebacks, etc.) to eight (8) feet maximum. It is recommended that the ODC discuss the support of excavation within ten (10) feet (horizontal dimension) of structures with WMATA before commencing such support design.

- B.** All structural steel members in the excavation support structure should be sized using Allowable Stress Design (Working Stress Method) in the AISC Steel Construction Manual. Neither can the design axial stress be reduced nor the permissible allowable bending stress and combined stress ratio be increased for the excavation support structure. Support of Excavation design calculations must consider the effects of combined axial, torsional, and flexural loads in the structure and its elements.

Bracing members, such as struts, corner braces, cross struts, and rakers, should be designed, other than self-weight, for an additional lateral load, equal to 2% of maximum design axial load and imposed on bracing members in both lateral directions, applied to produce maximum flexure on the members.

The stability of laterally unsupported members and unsupported span lengths should be considered in the design of the supporting members. The use of pin piles or lacing may be required provided the above stress requirement is not satisfactory.

The pin pile design is presumed as 2% of maximum design axial load of abutted bracings in both horizontal and vertical directions. The lacing design load is assumed to be 2% of maximum axial load of abutted main support members.

- C.** Soldier piles generally shall be designed as simply supported beams, spanning between points of support. In analyzing intermediate stages of excavation, the soldier pile shall be assumed to be continuous across the lowest level of bracing. The embedment length of soldier piles below the design subgrade shall be analyzed for the horizontal resistance required to provide a support point below the subgrade. The maximum horizontal resistance on the soldier beams flange may be assumed to be three times the ordinary passive pressure computed for the width of the flange, or the width/diameter of pre-augured hole when filled with a minimum of 3500 psi concrete, but not to exceed the passive pressure based on the spacing of soldier piles. The minimum embedment length shall be ten (10) feet.

1. For soldier piles terminating in sound or relatively sound rock, and when subgrade is located below the top of rock, with minimum three (3) feet clearance from the excavation edge, minimum embedment in rock shall be five (5) feet.
 2. For soldier piles terminating in weathered rock, and when subgrade is located below the top of rock within ten (10) feet, minimum embedment in rock shall be three (3) feet below subgrade or three (3) feet below auger refusal. The soldier pile shall be laterally supported in an accepted manner before the start of rock excavation.
 3. For soldier piles terminating in weathered rock, and when subgrade is located at ten (10) feet or greater below the top of rock, minimum embedment in rock is five (5) feet below auger refusal. The soldier pile shall be laterally supported in an accepted manner before the start of rock excavation.
- D. The structural support system design must recognize the effects of all loads resulting from construction equipment, construction trailers, supported utilities, stockpiled materials, cranes, concrete trucks, and non-underpinned buildings adjacent to the excavation. The loading shown in Plate A-6A of [Appendix C](#) will provide the minimum surcharge loading.
- E. Soldier piles shall ordinarily be spaced from four (4) to seven (7) feet on centers. A maximum spacing of eight (8) feet on centers will be allowed where soil conditions are granular. Timber lagging shall have a minimum flexural stress of 1100 pounds per square inch and three (3) inches minimum thickness for soldier piles spaced seven (7) feet apart and for excavated depths of up to 25 feet. Timber lagging, four (4) inches thick, shall be used in excavations below 25 feet. For other pile spacing, other conditions, and types of lagging, the design details shall be submitted for acceptance. Soldier pile and lagging walls shall be analyzed in accordance with requirements presented herein.
- F. The vertical spacing of bracing tiers, including the bracing to the subgrade, shall not exceed 12 feet center to center. The maximum length of an unsupported soldier pile between the surface of the ground and the first brace shall not exceed six (6) feet. Deflections in the soldier piles shall not exceed one-half ($\frac{1}{2}$) inch. The soldier pile bearing capacity and the soldier pile deflections shall be calculated and included in the calculations.
- Cantilevered soldier piles may be used for shallow excavation provided the maximum cantilever length does not exceed seven (7) feet and the maximum deflection does not exceed one-half ($\frac{1}{2}$) inch.
- G. Wales may be designed as simply supported beams, spanning between points of support, or as continuous across points of support, depending upon fabrication and installation details. Axial load shall be considered in the design of wales as appropriate. Wale deflection shall not exceed one-quarter ($\frac{1}{4}$) inch.

- H. Struts and rakers shall be designed for axial load, torsional and flexural loads as appropriate. Struts and rakers shall be laterally braced in accordance with the requirements of the current edition of the AISC Steel Construction Manual. Strut and raker sections shall be chosen to limit deflections to the above requirements.

In addition, for support systems in which braces are installed between opposite sides of excavation (cross-lot struts), design and construct support on both sides to obtain comparable restraint and rigidity.

- I. Tiebacks shall be deformed steel bars with a minimum guaranteed ultimate tensile strength (GUTS) of 150,000 pounds per square inch or seven-wire stress relieved steel strand for pre-stressed concrete with a guaranteed ultimate tensile stress (GUTS) of 270,000 pounds per square inch. Tiebacks must be installed and tested in accordance with [Section 7.06](#).

The ODC shall ensure that the minimum clearances of tiebacks' free length and the anchored length shall be at least five (5) feet and ten (10) feet respectively from the existing WMATA facilities. Tieback construction procedures shall take every precaution to minimize ground loss. WMATA shall be notified for any changes to the tiebacks or anchors which are made to clear existing utilities (prior to construction).

- J. When using corner/diagonal bracing, and when the wales do not transfer the load to the other end, analysis shall include calculations required to determine reaction dissipation into the support of excavation wall (soldier piles, slurry walls etc.) on the sides of excavation. If corner bracing is proposed with wales connected at the corners, the corner connection of the wales must be completed after preloading the corner/diagonal bracing.

- K. Details should be provided on the shop or working drawings indicating how the tieback, strut, or raker loads are to be transmitted from the supporting member through the waler to the soldier pile. Details should include bolted and welded connections, web stiffeners and brackets, dimensions of raker heel blocks, strut lacing, pin piles, jacking lugs and other special details of construction. Illustrate connection details indicating how the forces from the corner braces would be transmitted and dissipated or balanced through the soldier piles and walers. Calculations are required for each listed item.

- L. The sequence and method of construction shall be included on the shop or working drawings. Procedures shall be included for wedging or jacking rakers, loading tiebacks and preloading struts. Details of wedging and jacking to maintain tight contact for all bracing members shall be shown.

1. Tiebacks shall be preloaded to 140% of the maximum design load and locked off at 100% of the maximum design load.
2. Struts and rakers **not** used for slurry walls, tangent or secant piles shall be preloaded to 50% of the maximum design load.

3. Struts and rakers used to support slurry walls, tangent or secant piles shall be preloaded to 100% of the maximum design load.
4. Tieback, raker, and strut loads shall be shown on the shop drawings.
5. Excavation shall not be allowed to proceed for more than two feet below the point of lateral support before the main bracing members are installed and preloaded. Earth berms are permitted when required for the installation of rakers and heel blocks. Slopes on the berms are to be no steeper than one vertical to one-and-one-half horizontal (1V:1.5H).

- M.** Bearing capacity for heel blocks shall be analyzed based on accepted methods of analysis of inclined footings, such as are described in the Reference Manuals as listed at the end of this sub-section.

A minimum safety factor of three (3) shall be applied to obtain the allowable bearing capacity. The heel block spacing and design shall consider the interaction of the heel blocks on the supporting soil. Suitable reductions in the allowable bearing capacity of the soil shall be made to account for any overlapping soil stresses.

1. Bowles, Joseph E. "Foundation Analysis and Design", Fourth Edition or Fifth Edition, Chapter 4, Bearing Capacity of Foundations, McGraw-Hill Companies, Inc., New York, N.Y.
2. United States Naval Facilities Engineering Command, Design Manual 7.02 (NAVFAC DM 7.02), 1986, Foundations and Earth Structures, USNAVFAC, Alexandria, Virginia.
3. Ralph B. Peck, Walter E. Hanson, and Thomas H. Thornburn (1974), Foundation Engineering, Second Edition, John Wiley & Sons, Inc.

- N.** Steel sheet piles used adjacent to WMATA structures shall be hot-rolled, steel sheet piles. Lateral soil pressures for sheet piles must be based on undrained conditions. For adequate stiffness Z-profile sheet piles are recommended. For sheet piles terminating at top of rock above the base of excavations, the sheet piles shall be laterally supported in an accepted manner before the start of rock excavation. Sheet pile deflections shall be calculated and included in the submissions; maximum allowable deflection of sheet piles is one-half ($\frac{1}{2}$) inch.

- O.** Slurry (diaphragm) walls consist of structural cast in place concrete walls constructed by tremie placement of concrete in a pre-excavated, slurry filled trench. Slurry wall panels excavated adjacent to WMATA structures shall have a minimum thickness of three (3) feet and maximum length of ten (10) feet. Slurry wall bearing capacity and slurry wall deflections shall be calculated and included in the submissions. For slurry walls terminating at top of rock above the base of excavations, the slurry wall shall be keyed into the rock and laterally supported in an accepted manner before the start of rock excavation. Slurry walls shall be analyzed in accordance with the requirements presented herein.

- P.** Secant or tangent pile walls consist of a line of bored piles to form a continuous wall. If the bored piles are tangent or contiguous to each other the wall is a tangent pile wall. If the bored pile elements overlap to form an interlocking wall, the wall is called a secant pile wall. Piles shall be reinforced with reinforcing bar cages or structural steel shapes. Secant or tangent pile wall bearing capacity and deflections shall be calculated and included in the submissions. For secant and tangent pile walls terminating at top of rock above the base of excavations, the pile wall shall be laterally supported in an accepted manner before the start of rock excavation. Secant and tangent pile walls shall be analyzed in accordance with the requirements presented herein.
- Q.** NATM Shafts may be used with prior acceptance from WMATA. NATM shafts are shafts constructed using the New Austrian Tunneling Method (NATM). NATM shafts can be constructed in soil and in rock.
- NATM shaft construction in soil entails excavation in lifts ranging from three (3) feet to five (5) feet in height. Each lift is supported by a lining girders, normally lattice girders, embedded in shotcrete (sprayed concrete). For all NATM shafts submit supporting design calculations; proposed excavation and support procedures; proposed groundwater control measures; shotcrete design mix and field trial information; shop drawings for lattice girders, including connection details, rock reinforcement, and welded wire fabric, including details for intermediate anchors between rock reinforcement and lattice girders; concrete mix; formwork design; and concrete placement and consolidation methods.
- R.** Structural configuration and details shall permit reasonable access and a fall protection system required for WMATA's future inspection and maintenance, consistent with the requirements of the structure in question. Fall protection design shall be in compliance with OSHA requirements.

7.06 Support Systems with Tiebacks

- A.** Install tieback system in accordance with accepted working drawings. Install anchorage in soil no closer than a plane extending upward at an angle of 45 degrees to the horizontal from outer limit of lowest depth of excavation. ODC will have to certify that the boundary survey for the proposed tieback / support systems have been tied into WMATA's control coordinates. WMATA's survey control may be located on as-built plans.
- B.** Stress tiebacks to proof loads equal to 140 percent of maximum design load and maintain proof load for 30 minutes prior to reducing to design load. Reject tiebacks which lose more than five (5) percent of proof load during 30-minute period.
- C.** Apply proof loads in increments of five (5) tons at one (1) minute intervals and provide means to measure load application within accuracy of plus-or-minus five (5) percent.

- D. After reducing tieback load to design load, encase anchors in grout maintaining design load until anchors are fixed in place.
- E. In transfer of loads from jacks to support system, use fixation method which will limit load loss to no more than five (5) percent of design load.
- F. Provide and maintain convenient access and appropriate means to accomplish these observations.
- G. Preliminary and Creep Tests On Tiebacks:
 - 1. Reapply proof loads equal to 140 percent of design load at each level of support in excavation on first installation on each side of excavation at horizontal intervals not exceeding 500 feet and wherever there is significant difference in soil in which tiebacks are installed.
 - 2. As specified for proof loading, apply proof loads in increments of five (5) tons at one (1) minute intervals. Provide means to measure load applications with an accuracy of plus-or-minus five (5) percent of design load. Maintain proof load for 24 hours prior to reducing it to design load.
 - 3. Make records of axial movement with incremental applications of load as well as amount and time of load fall-off with no pumping of jack or axial movement during the 24-hour period that proof load on tieback is maintained.
 - 4. If during the 24-hour period axial deformation of tieback system exceeds 0.02 inch or decrease in jack pressure without pumping is more than five (5) percent after correcting for temperature changes during the test period, redesign tieback system to satisfy requirements.
- H. Refer to [Section 7.06](#) for additional tieback requirements.

7.07 Underpinning

- A. Underpinning of WMATA structures is required when the WMATA structures fall within the 1:1 Zone of Influence line of the adjacent construction, see Plate A-3A and Plate A-3B in [Appendix C](#). The underpinning will be designed to meet the allowable compressive / bearing strength of the soil under the WMATA structure. The allowable bearing capacity shall be determined by applying a safety factor of three (3) to ultimate bearing capacity or use allowable bearing pressure contained in [Appendix C](#), Table C-3. Alternately, compute ultimate bearing capacity in accordance with procedures in US Naval Facilities Design Manual, NAVFAC DM7.2, Foundations and Earth Structures, Chapter 5, Deep Foundations, ignoring friction and adhesion.
- B. Location, type, and sequence of underpinning shall be clearly shown on the excavation support system drawings. When the ground conditions warrant and the WMATA structure load can be supported below the 1:1 slope influence line (Plate

A-3B in [Appendix C](#)), use rigid support of excavation or ground stabilization with flexible support of excavation, in lieu of underpinning if accepted by WMATA.

- C.** All proposed underpinning pits shall be clearly shown on the excavation drawings. The size and depth of the pits shall be indicated as well as the stratum into which the underpinning pit is to be excavated. The bearing pressure of the stratum shall be shown together with the lowest pit bearing elevation expected. Details shall be provided for load transfer between underpinning piers and existing foundations (dry packing, steel shims with non-shrinkage grout, or other accepted means).
- D.** Provide calculations in support of the drawings.
- E.** Jacked Piles and Bracket Piles may be used for underpinning with WMATA's prior acceptance.

7.08 Jacked Piles

- A.** Jacked piles may be used for underpinning WMATA structures if installed in accordance with the following criteria.
 - 1.** Approach pit and pile locations shall be shown clearly on excavation support drawings. Submit design calculations for temporary shoring of approach pits. Use hydraulic jacks capable of developing sufficient capacity to jack piles to specified load. Submit recent certified calibration data of pressure gauge and jack as a combined unit. Calibration shall be performed within 30 calendar days of start of field operations.
 - 2.** Use open-end steel pipe shells. Jack to levels/depths shown plus any additional penetration required to develop design working load of pile. Jack pile shells by distributing reactions over existing footing or structure so as to prevent over stressing or damaging the footing or the structure.
 - 3.** Furnish proposed monitoring system. During installation of jacked piles check column or wall movement under each footing. If movement exceeds 1/32 of an inch, immediately cease operations and report the situation to WMATA.
 - 4.** Submit complete procedure for jacked pile installation to WMATA for review.
- B.** Installation of Jacked Piles
 - 1.** Clean out pile shells to within one foot of pile tips. Remove obstructions by drilling or spudding, not blasting. When pile tip is below groundwater table, maintain elevation of water inside pile shell at or above elevation of groundwater table, except during inspection of pile or as otherwise accepted.

2. After cleaning and prior to filling shell with concrete, apply load equal to the percentage of design working load, shown on the drawings, unless otherwise directed, to each empty pile shell and maintain until there is no measurable settlement over a one hour period.
3. Fill the accepted steel pipe with concrete by either placing concrete continuously by accepted tremie or underwater bucket, or by placing five (5) foot seal underwater, dewater pile shell and place remainder of concrete continuously in the dry.
4. After concrete within pile has set for at least 24 hours, test pile by jacking to 150% of design working load of the pile. Maintain load until there is no measurable settlement of pile over one (1) hour period. Details and arrangement of pile shell load test and pre-loading are at the option of the ODC and subject to WMATA acceptance. Inserting steel beam on top of pile and jacking or wedging firmly against pile and foundation, and encasing it in concrete is an acceptable solution.

7.09 Bracket Piles

- A. Bracket piles shall be installed in pre-drilled holes. Pre-drilled holes shall be protected by casing or by drilling mud or slurry. Pre-drilled holes shall be backfilled with lean concrete to minimize ground loss.
- B. Provide design calculations for pile and bracket.

7.10 Civil Criteria

- A. Refer to the WMATA Manual of Design Criteria for submission of real estate plat and survey documentation. WMATA's Indemnification and Insurance Requirements in Real Estate Permits is available in [Appendix D](#).
- B. Refer to the WMATA Manual of Design Criteria for standard fencing plans, details, and specifications.
- C. Refer to the WMATA Manual of Design Criteria for at-grade standards for installation of right-of-way utility markers.
- D. WMATA's Manual of Design Criteria, Standard Design Drawings, and Specifications are available electronically upon request. Request must be made in writing to the CE who will issue the documents after the ODC has signed a non-disclosure agreement when applicable.
- E. Underground utilities on WMATA property being proposed for abandonment shall be either removed or filled with permanent flowable fill. This requirement shall be identified on all design plans.
- F. Where modifications to WMATA utilities are required by adjacent construction, submit cross sections, plan and profiles, specifications, and design calculations

concerning the utility modifications for review. Details for maintaining utility services to WMATA facilities shall be shown when WMATA utilities are impacted.

- G.** When a gas line is proposed to be installed under a WMATA track, WMATA tunnel, WMATA power feeds or other WMATA facility, the ODC shall provide the safety measures to be taken—sleeve, safety jacket, or other means—so that WMATA track, tunnel, or other facilities would be protected in the event of a gas leak or explosion.
- H.** The ODC shall provide cross sections with the existing and proposed contours and limits of grading work shown in relation to the property lines and the impact on or to WMATA facilities. Where grading changes are required on WMATA property, the dimensions and square footage of the area required for construction easements shall be provided.
- I.** Hydrologic and hydraulic calculations showing the impacts on the WMATA drainage system are required showing that the hydraulic load from storm drainage on WMATA drainage systems will not be increased by the proposed construction. The ODC shall conduct a field review to verify WMATA drainage system extents prior to designing new drainage infrastructure or modifying the existing conditions. The ODC shall submit drainage area maps and calculations as necessary to verify this analysis to WMATA for review and acceptance.
- J.** Runoff due to new proposed construction shall not be directed toward WMATA facilities regardless of installed erosion & sediment control measures.

7.11 Mechanical Criteria

- B.** Existing services to WMATA facilities, including chilled water and condenser water piping, potable and fire water, fire standpipes, drainage pump stations, discharge pipes, and storm and sanitary sewers, are not to be interrupted nor disturbed without written acceptance of WMATA. The ODC must ensure that future access to WMATA utilities is maintained and illustrated in the proposed design modifications.
- C.** Surface openings of ventilation shafts, emergency exits serving WMATA underground facilities, and ventilation system openings of surface and elevated facilities shall not be blocked or restricted. Construction dust and debris shall be prevented from entering WMATA facilities as specified in [Section 8.07](#).
- D.** Hot or foul air, fumes, smoke, steam, etc. from adjacent new or temporary facilities shall not be discharged within 25 feet of existing WMATA ventilation system intake shafts. Tunnel ventilation shafts are both intake and discharge structures.
- E.** Clear access for the fire department to the WMATA fire standpipe system shall be maintained at all times. Construction signs shall be provided to identify the location of WMATA fire standpipes. The ODC must contact WMATA's assigned CE and CIF at least forty-eight (48) hours in advance for coordination of any accepted interruption to fire standpipe water service or water service.

- F.** Modifications to existing WMATA mechanical systems and equipment, including ventilation shafts, required by new utility connections into the WMATA System, shall be permitted with acceptance by WMATA, providing:
- 1.** The ODC submit design calculations, drawings, specifications, catalog cuts and any other information necessary to fully describe the proposed modification.
 - 2.** If the ODC wishes to permanently enclose any WMATA fan, emergency exit, or exhaust/ventilation units, the enclosure must be designed with appropriate clearances and openings to accommodate the air circulation volumes equal to the design capacity of the particular shaft. The proposed construction above WMATA's ventilation units must include projected air flow calculations accounting for the specific shaft type. This information shall be submitted to WMATA for acceptance.

The calculations shall be signed and stamped by a licensed mechanical engineer practicing in the jurisdiction where the construction is proposed. A permanent emergency path shall be provided and maintained at all times between the nearest public street and the shaft to accommodate fire and rescue, WMATA emergency ingress / egress, and WMATA maintenance access. Panic hardware is to be provided on all door(s) / gate(s) servicing the proposed enclosure.
 - 3.** The ODC obtains a WMATA Real Estate Permit.
 - 4.** At WMATA's discretion, the ODC may be requested to perform the field tests necessary to verify the adequacy of the modified system and the equipment performance. Where a modification is accepted, the ODC shall be responsible for maintaining original operation capacity of the equipment and the system impacted by the modification.
 - 5.** Commissioning test plan, startup checklist, functional performance test, and final test report shall be provided when mechanical control systems required commissioning.
 - 6.** Fire suppression water flow drains shall be provided allowing for full draining and testing of system without connecting a hose. The drain shall be piped to a fire suppression stack or directly to the exterior unless accepted by the Fire Protection Engineer.
 - 7.** When mechanical systems such as ventilation shafts are realigned or modified, pre-construction and post-construction testing are required to ensure equivalent operation. Testing requires the use of a NEBB-certified testing and balancing contractor. A WMATA representative shall be present to witness testing.
- G.** Separate utility meters shall be installed when retail space is in WMATA property.

7.12 Electrical and Communication Criteria

- A.** No interference with existing WMATA ductbanks for electrical services shall be allowed for:
 - 1.** 13.8KV service from PEPCO
 - 2.** 34.5KV or 13.8KV service from Dominion
 - 3.** 480V service to Chiller Plant from PEPCO, Dominion or from WMATA Substations.
 - 4.** 480V service to lighting in Parking Lots, Kiss and Ride areas, and 120V service to Bus Shelters.
- B.** If ductbanks are affected by the adjacent construction, all information must be submitted to WMATA and associated utility company for review and acceptance.
- C.** Any network, communications, electrical, or other cable located on or within WMATA property that is decommissioned must be removed and may not be abandoned-left in place.
- D.** All conduit installations or conduit modification on or within WMATA property shall require the submittal of a conduit schedule providing a clear picture of all conduit use.
- E.** The ODC shall be responsible for the provision of network communication drawings including network drop floor plans, network riser diagrams, network cable and device schedules, and detail drawings.
- F.** Any and all power requirements are the responsibility of the ODC. Temporary and/or permanent use of WMATA power systems is prohibited unless otherwise noted.
- G.** Requests for WMATA support and for scheduled power outages must be submitted for the following non-wayside work:
 - 1.** All emergency, corrective, or modification work as reviewed, coordinated, and accepted by WMATA; and
 - 2.** Any work adjacent to energized cables and other electrical equipment. Except for emergency situations, the ODC must comply with scheduling of power outage(s) and crew support personnel request procedures.
- H.** No interference with existing WMATA ductbanks shall be allowed for:
 - 1.** Telephone lines from respective carriers.

2. WMATA train control and communications cables.

7.13 Energized Roadway / WMATA Right-of-Way Fencing

- A. WMATA maintains high standards for right-of-way fencing securing the high voltage operating railroad and other energized facilities.
- B. Modifications to WMATA fencing must meet the design standards whether modifications are temporary or permanent.
- C. Fence modifications must be reviewed, accepted, and coordinated with WMATA. The ODC must clearly delineate operating stationing where fencing is to be modified. WMATA will evaluate whether there is impact to existing Intrusion Detection Warning (IDW) Systems.
- D. The ODC shall replace or upgrade existing signage on installed or modified fencing to reflect current standards. Existing signing conditions shall be noted prior to the beginning of any work on the R.O.W. fencing. Existing signage shall be restored to new or modified fencing, or, at WMATA's discretion, new signage shall be commissioned.
- E. If the existing R.O.W. fence or emergency access gate is modified, relocated, or replaced, the ODC shall replace the facilities with WMATA's most current fencing and gate standards.
- F. When construction is adjacent to WMATA surface roadway and will impact the WMATA security fence, details shall be provided for the proposed modifications to the WMATA security fencing required to accommodate the project. The drawings shall include the details of temporary and permanent intrusions into or occupancy of WMATA's right-of-way. WMATA will require that the right-of-way is protected at all times and any modifications to current right-of-way fencing will be completed during non-revenue hours. WMATA will also require that all fencing (temporary or permanent), which protects the operating / energized roadway, will meet the standards and specifications provided in the WMATA's Manual of Design Criteria.
- G. WMATA will require additional protective design measures for modified grade separation between existing facilities and the proposed construction. Such additional design measures, at the ODC's time and expense, may include, but are not limited to:
 1. Implementation of additional IDW systems along its right-of-way fence.
 2. Increased vertical height of the right-of-way fence.
 3. Crash barrier protective devices.
 4. Additional or replacement informational or warning signage.

The WMATA IDW system on the security fence must be maintained at all times during adjacent construction. WMATA has standard design criteria for crash barrier walls. This information is available from WMATA upon request.

- H. Specific protective measures will be required for project activities which may impact the operating roadway. These measures may include protective screening and overhead protections, as well as restrictions on crane placement and movements. Requirements will be addressed on a project specific basis.
- I. A WMATA Standard Detail for fencing can be found in [Appendix E](#). The latest standard detail shall be provided to the ODC upon request.

7.14 Grounding and Bonding

- A. Grounding of WMATA fencing, personnel safety, service equipment, facilities, etc. will be as per WMATA Specifications.
- B. Bonding for stray current and cathodic protection will be as per WMATA Specifications. Refer to [Section 8.09](#).
- C. For ground connections, WMATA requires an exothermic process to be in accordance with ANSI/IEEE80-2000 (exothermic is defined as the use of powdered metals contained in a mold to form a molecular bond between materials to be connected without application of an external source of heat or power).

7.15 Lighting Standards

- A. For proposed temporary and/or permanent modifications, lighting criteria shall be as per WMATA's Manual of Design Criteria for all construction.
- B. WMATA lighting criteria were developed as an integral part of the architectural concept, with the purpose of providing comfort, safety and accessibility to patrons, as well as lighting system reliability and efficiency. Lighting design and installation must be closely coordinated with the following:
 - 1. Safety and security requirements
 - 2. ADA regulations
 - 3. CCTV systems
 - 4. Maintenance Factors
 - 5. Landscaping
- C. Temporary lighting modifications shall be maintained by the ODC.
- D. Requirements for temporary and permanent lighting modifications impacting WMATA structures and/or property will be conveyed in WMATA design reviews and through a WMATA real estate permit.

- E. Impact on any WMATA emergency lighting is to be as per WMATA's Manual of Design Criteria for all construction.

7.16 Redesign of WMATA Facilities

- A. The design for relocation or modification to existing WMATA chiller plants, drainage pumping stations, parking garages, parking lots, Kiss & Ride areas, escalator passageways, vent shafts, bus shelters, and any other facilities shall be done in accordance with the WMATA Manual of Design Criteria, Directive Drawings and Standard Specifications. To minimize interruption of WMATA operations, a construction phasing plan shall be developed and submitted for acceptance.
- B. Proposed relocation of light fixtures, if any, shall be submitted for WMATA acceptance. Temporary lighting that meets WMATA requirements shall be provided in the interim.
- C. Existing ground-grids and ground conductors from ground-grids to WMATA facilities shall not be disturbed. No digging or cutting into existing WMATA facilities (ductbanks, walls, floor, or ceiling) shall be permitted.
- D. Access to personnel and equipment hatches for underground facilities shall not be blocked. In case any structure is built over an equipment access hatch, adequate passageway shall be provided for entry of a heavy truck and clearance for the use of a crane to lower equipment from the truck into the hatch.
- E. In case any structure is built adjacent to WMATA at-grade facilities (e.g., traction power substations, tiebreaker stations, train control, communications rooms, or other at-grade facilities) passageways for heavy trucks and adequate clearance shall be provided for the use of cranes to move equipment from trucks into and out of the equipment hatches and facilities.
- F. Emergency access gates for at-grade or aerial sections of WMATA roadway shall not be blocked. Adequate passage from the gates to public streets shall be provided.
- G. As-Built documentation shall refer to [Section 5.02](#) and [Section 10.04](#).
- H. Modifications To Structures:
 - 1. Design must allow for positive drainage around WMATA structures where impact or modifications are necessary.
 - 2. Drawings and specifications illustrating the details of required changes shall be prepared by the ODC. Normally, to meet sidewalk grades, six or eight inches of the vent or shaft is removed, the existing steel is bent to accommodate the new steel and new angles are installed to hold the grate.

The grates shall be reinstalled after the concrete has set. Grates are designed for AASHTO H-25 live loading.

3. The ODC will be required to increase the top of structure elevation of the affected WMATA facility or take preventive measures as required by WMATA if the adjacent construction (including modifications to existing grade elevations) would cause a change in hydrology (e.g., ponding of water, or increase in water runoff adjacent to WMATA facilities).
 4. A photometric study (site lighting plan with projected lighting illumination levels, wattage, etc.) will be required for temporary and permanent lighting modifications ‘to’ and ‘around’ existing WMATA facilities. The plans must be reviewed and accepted prior to any field modifications beginning. The ODC and WMATA personnel must coordinate and field verify illumination levels provided on the study plans prior to placing the facility in service. ODC inspection of the temporary lighting will be regularly required to ensure that the accepted illumination levels are maintained. ODC to check illumination levels and provide a foot-candle reading report of permanent facilities to ensure designed and accepted lighting levels are met. WMATA standards for light levels at different WMATA facilities may be found in Tables 7-1 to 7-3. All foot-candle values are measured horizontally at 3 ft. above the floor or ground, and at stair and escalator treads.
- I. Details of the proposed modifications to WMATA’s facilities, roadways, parking areas, and busways shall be provided. The ODC shall include sections and details showing the interface of existing and proposed facilities.
1. The ODC shall provide design and construction documents for all projects requiring an expansion of WMATA station facilities. This may include additional or expanded entrances, additional fare gates, fare collection equipment, additional or expanded mezzanines and vertical circulation elements, and underground tunnel connections or other direct connections to the station, and other items.

Table 7-1: Underground Stations Lighting Criteria

Station Area	Average Illumination Level		Minimum Illumination Level	
	Maintained	Initial	Maintained	Initial
Platform Open to Vault Above	10 FC	18 FC	3 FC	5 FC
	Average Luminance of Vault: 10 Foot Lamberts			
Platform Under Mezzanine	10 FC	18 FC	3 FC	5 FC
Mezzanine	10 FC	18 FC	3 FC	5 FC
	Average Luminance of Vault: 10 Foot Lamberts			
Kiosk	30 FC	43 FC	15 FC	21 FC
Passageways	10 FC	18 FC	3 FC	5 FC
Stairs Landings, Escalator Compatible	10 FC	14 FC	5 FC	7 FC
Stair and Escalator Treads	10 FC	14 FC	5 FC	10 FC
Station Entrance Within 30-ft. of the Entrance or Parapet Wall	3 FC	4.3 FC	1 FC	1.4 FC
Faregates	20 FC	28 FC	10 FC	14 FC
Farecard Vendors and Smarttrip Card Dispensers	20 FC (Vertical)	28 FC	10 FC (Vertical)	14 FC

Table 7-2: Above Ground Station Lighting Criteria

Station Area	Average Illumination Level		Minimum Illumination Level	
	Maintained	Initial	Maintained	Initial
Platform – Under Canopy	10 FC	14 FC	3 FC	4 FC
Platform – Outside Canopy	10 FC	14 FC	3 FC	4 FC
Mezzanine	10 FC	14 FC	3 FC	4 FC
Platform Edge, Kiosk Passageways, Stairs, Escalators, Faregates, Farecard Vendors and Smarttrip Card Dispensers, Ancillary Spaces			See Table 7-1	

Table 7-3: Exterior Space Lighting Criteria

Station Area	Average Illumination Level		Minimum Illumination Level	
	Maintained	Initial	Maintained	Initial
Parking Lots	3 FC	4.3 FC	1 FC	1.4 FC
Pedestrian Walkways	3 FC	4.3 FC	1 FC	1.4 FC
Bus Platforms	3 FC	4.3 FC	1 FC	1.4 FC
Bus Shelters	20 FC	29 FC	10 FC	14 FC
Kiss & Ride	3 FC	4.3 FC	1 FC	1.4 FC
Parking Structures: Stairs & Vestibules Ramps and Corner	10 FC	14 FC	5 FC	7.1 FC

Parking Structures: Covered Decks	5 FC (10 FC daytime at vehicle entrance/exit area)	7.1 FC	3 FC	4.3 FC
Parking Structures: Roof Decks	3 FC	4.3 FC	1 FC	1.4 FC
Structured Bus and Kiss & Ride Areas	5 FC	7.1 FC	3 FC	4.3 FC

7.17 Direct Connections to WMATA Station / Facility

- A. Connections to WMATA structures and facilities shall be designed, built, and paid for by the ODC requesting the connection in accordance with WMATA requirements or through a Direct Connection Agreement which usually, in addition to the fees associated with WMATA staff time, will require a connection fee. In certain cases, WMATA's Office of Real Estate and Development may require documentation of such property requirements through a Maintenance and Operations Agreement.
- B. Underground passageways connecting to a WMATA facility (e.g., station, structure, passageway, etc.) must be sloped away from WMATA property in such a way as to provide positive drainage around WMATA facilities. The developer/contractor must design and install a drain system that is separate from WMATA's utilities in the event that the proposed passageway cannot be sloped away from the existing WMATA facility. The drain system design (to be reviewed and accepted by WMATA) must preclude water from entering WMATA's facilities. accepted pumps, if required, shall be sized to handle the fire sprinkler runoff, in the event of a fire.
- C. The connection shall have a stainless-steel flexible roll-down gate installed between the two passageways. The gate shall be keyed on both sides with separate locks and a concealed manual pull chain for WMATA to open the gate. Where the connection has 24-hour staffed security on the non-WMATA side of the connection, glass doors may be used in lieu of a gate. If doors are used, each door shall be lockable from both sides. Access control measures shall be designed, installed, and access granted to WMATA.

- D. When required, Closed-Circuit Television (CCTV) shall be installed at the ODC's expense and connected to the WMATA Kiosk. Power for the cameras shall be run from the CCTV to the electrical room servicing the WMATA station. The existing conduit runs and spare breaker locations can be found in the WMATA as-built drawings. It is the ODC's responsibility to have the plans for this work prepared by a licensed professional engineer with expertise in this type of work. Intrusion alarms shall be installed on the gate or door and control wires installed between the gate or door and the communications room by the developer's contractor. Final connection will be made by WMATA to the WMATA security system. CCTV shall be tested and accepted by WMATA engineers.
- E. When indicated, the direct connection's intercom, CCTV, access control, and fire alarm system shall require integration into existing systems used by the WMATA station. WMATA engineers shall provide necessary requirements on a per-project basis.
- F. Finishes on the interior of the WMATA side of the connection shall be to WMATA's standards and specifications.
- G. The power source for lighting and lights in the new passageway shall be run to the ODC's electrical facility and included in the development's emergency power panel. WMATA is not liable for any electrical loss or maintenance.
- H. Normally the direct connection tunnels are designed to be compatible with the building of which they are a part; however, in the event that a direct connection is to be maintained by WMATA, the design shall be in accordance with the WMATA Manual of Design Criteria, construction will be required to meet WMATA's standard construction specifications, and all applicable asset management procedures as described in [Section 5.03](#) shall apply.
- I. The contractor shall submit a fire-rated dust protection system design for WMATA review and acceptance. Once accepted, the contractor shall implement the dust protection system to full-functionality prior to removing the knock-out panel. Typically, a dust protection system shall consist of a stationary partition that isolates the knock-out panel from the station. The dust partition shall be constructed using only fire rated materials. All joints shall be sealed with tape. The partition shall be constructed during non-revenue hours.
- J. The contractor shall design and employ a temporary partition wall between the station and the work zone to ensure WMATA passengers cannot enter.
- K. Adjacent construction with a connecting passageway(s) to WMATA facilities shall require special features to isolate one facility from the other for fire-safety as required by the local fire code, and may include automatic fire doors and dampers,

sprinkler systems, smoke removal and ventilation systems, and detection and alarm systems. All fire alarms shall be tested and accepted by WMATA engineers.

- L. Specific operations and use agreements will typically be required when connecting with WMATA facilities.

7.18 Project Drawings, Plans, Calculations, & Submittals

- A. The ODC shall submit designs for the protection, support, and underpinning of existing WMATA structures and facilities. JDAC shall coordinate design review internally with WMATA offices. The ODC shall maintain, protect, and be responsible for the safety, stability, and integrity of all adjacent WMATA structures which may be affected by the work.
 - 1. All WMATA underground structures shall be fully re-evaluated for the effects caused by the adjacent construction using working stress methods and calculations submitted to WMATA.
 - 2. All stresses and deflections induced in the existing WMATA structures shall be calculated and provided to WMATA.
 - 3. All short-term and long-term effects of new loading on WMATA facilities due to the adjacent construction shall be analyzed and provided to WMATA.
 - 4. Soil parameters and other pertinent geotechnical criteria used in design and analysis shall be provided to WMATA.
 - 5. WMATA structures shall be analyzed for differential pressure loadings caused by dewatering the adjacent construction site.
- B. Copies of the loading records for struts, rakers, tiebacks, bracing, and the test reports on tiebacks shall be provided to WMATA. The loading records and the test reports shall be signed and sealed by a registered Professional Engineer, licensed to practice in the jurisdiction where the work is being performed.
- C. The ODC shall submit dimensioned clearances, both horizontal and vertical, between the adjacent construction project and WMATA structures, tracks, roadways, parking areas, and utilities. WMATA's easements and right-of-way must be clearly identified on all site plans. Project encroachment(s) shall be specifically identified.
- D. Where construction will impact a WMATA station entrance, parking facilities, bus facilities and the public's access to the station, the submittal shall include plans for temporary pedestrian and vehicular traffic circulation for the area around the station entrance and/or work zone. Kiss and ride or parking operations must be maintained when disrupted by the work zone. Where construction is adjacent to or above a WMATA station entrance, protection will be required over the pedestrian

areas, escalators, and elevators. Provide signed and sealed construction plans, shop drawings, or working drawings showing the phasing of adjacent construction as well as the construction details for overhead protection, pedestrian barricades, and sidewalk protection. Requests for relocation of bus stops and bus shelters shall be clearly shown on the plans. Barricades and signage necessary to direct the public through the construction zone shall be required. Lighting shall be required as part of all overhead protection structures.

- E.** Final WMATA acceptance of the Support of Excavation design shall be contingent on final WMATA acceptance of the monitoring and contingency plan.
- F.** Calculations shall be provided for all components of the support of excavation system required for adjacent construction impacting WMATA's ZOI. The calculations and the drawings shall be signed and sealed by a Professional Engineer, licensed to practice in the jurisdiction where the work is performed. The calculations submitted shall include the following:

 - 1.** A concise statement of the problem and the purpose of the calculation.
 - 2.** Input data, applicable criteria, clearly stated assumptions and justifying rationale.
 - 3.** References to articles, manuals, and source material must be furnished with the calculations.
 - 4.** References to pertinent codes and standards.
 - 5.** Sufficient sketches or drawing references for the work to be easily understood by an independent reviewer. Diagrams indicating data (such as loads and dimensions) shall be included along with adequate sketches of all details not considered standard by WMATA.
 - 6.** The source or derivation of all equations where they are introduced into the calculations.
 - 7.** Numerical calculations shall be clearly shown, orderly and legible; all in English units.
 - 8.** Results and conclusions.
- G.** The ODC shall submit a Construction Phasing Sequence and Heavy Equipment Plan indicating the position and loading of major construction equipment within the WMATA ZOI, crane positions including crane swing radii that operate near or with the potential to foul the WMATA Roadway, impact to any WMATA facility, pedestrian, and vehicular access area. Construction sequence shall also include a plan for contractor access to site and contractor parking. Parking for workers and construction vehicles on WMATA property shall require advance acceptance from WMATA and cost reimbursement for lost parking revenue and property use.

1. Construction sequence shall include details and procedures for wedging or jacking rakers, loading tiebacks and preloading struts and corner braces/struts. The details of wedging and jacking should be such as to maintain tight contact for all bracing members. Tiebacks, raker and strut loads, sizes and locations shall be shown on the design drawings.
- H. Maximum size of each sheet will depend on the projects engineering design scale. Minimum requirements for each drawing:
1. Number and title of the drawing.
 2. Date of the drawing and revision date(s).
 3. Name of project.
 4. Engineering scale.
 5. Name of ODC submitting the drawing.
 6. Clear identification of contents and location of the work to include delineation of WMATA easements relative to the adjacent work.
 7. Title and number of referenced specification sections.
 8. Signed and sealed by engineer licensed in the jurisdiction of the proposed project.
 9. Other pertinent drawing criteria / documentation:
 - i. Fabrication, erection, layout and setting drawings.
 - ii. Complete list of materials for construction on / directly adjacent to WMATA property.
 - iii. Schedules.
 - iv. Manufacturer's drawings.
 - v. Wiring and control diagrams, as applicable.
 - vi. Catalog cuts or entire catalogs.
 - vii. Descriptive literature
 - viii. Performance test data.
 - ix. Material samples (as required).
- I. When computer programs are used to perform calculations, a "User's Manual" shall accompany the calculation. The "User's Manual" shall also include a

verification section. The verification section shall describe the verification methods and how they cover all the permitted options and uses of the program.

- J.** The ODC shall allow sufficient time for WMATA review and acceptance of project documents. It is recommended that the initial submittal is made six (6) months or more prior to the expected start date of work.

SECTION 8 – Construction Requirements



Section 8 – Construction Requirements

8.01 Shop Drawings, Calculations, and Submittals

- A.** In addition to the submittal requirements noted in [Section 7.18](#), the ODC shall be required to submit all installation certifications, test reports, and verify that the design of construction protection conforms to the WMATA standards specified in this manual.
- B.** Where construction differs from the WMATA-accepted work plan or designs due to existing conditions, changes must be accepted by a registered Professional Engineer licensed to practice in the jurisdiction in which the work is being performed and all changes must be clearly marked and submitted to WMATA for review.
- C.** Prior to construction, a construction protection plan denoting the locations, type, design, and characteristics of all WMATA overhead, vertical, canopy, vent shaft, and other required protections shall be submitted for review and acceptance. The construction protection plans shall also preclude impacts on WMATA landscaping, street furniture, pylons, navigational/information signage, bus shelters, and light fixtures.
- D.** Once available, the ODC shall submit to WMATA a full project schedule denoting impact activity to WMATA facilities. The schedule shall be made in bar chart format and be revised and updated according to actual conditions. The ODC shall also submit periodically to WMATA a two-week look-ahead schedule containing pertinent activities that are expected to be performed.
- E.** The ODC shall submit all material and catalog cut information used to WMATA, including Safety Data Sheets (SDS).

8.02 Support of Excavation Installation

- A.** Piles located within 25 feet (horizontal dimension) of existing facilities shall be installed in pre-augured holes. Pre-augured holes shall be protected by either steel casing or drilling mud or slurry to keep the drilled hole open and to prevent ground loss.

Furthermore, these piles shall be embedded at least ten (10) feet into the strata below the ZOI of the WMATA structure or should be embedded at least ten (10) feet below the subgrade level as accepted by WMATA. The drilled hole around the pile shall be filled with 3500 psi concrete from pile tip to subgrade and filled with lean concrete from the subgrade to the surface of the ground. Concrete shall be placed using a tremie.

Struts and rakers used to support slurry walls and tangent or secant pile walls shall be preloaded to 100% of their maximum design load. Struts and rakers for steel soldier piles with lagging and sheet pile walls shall be preloaded to a minimum of 50% of their maximum design load (or for any other support system accepted by WMATA). When using raker bracing systems, a reduced passive resistance shall be applied for temporary berms during partial excavations.

- B.** For tieback installation, the free length and the anchored length shall be at least five (5) feet and ten (10) feet, respectively, from the existing WMATA facilities. Tieback construction procedures shall take every precaution to minimize ground loss. (See [Section 7.06](#) for other requirements of tie-back installation)
- C.** A system for monitoring the vertical and horizontal movement of the support of excavation structure shall be submitted for WMATA acceptance in accordance with the requirements listed in [Section 9](#).

8.03 Limitations on Construction

- A.** The following construction activities are not permitted within the specified limits of existing WMATA facilities:
 - 1.** Excavation under WMATA structures is prohibited, except for access for underpinning.
 - 2.** Tunneling under WMATA structures or facilities and tracks is prohibited unless prior documented acceptance from WMATA is obtained.
 - 3.** Excavation within ten (10) feet of existing WMATA facilities is prohibited (the ten (10) feet shall be measured, in plan, from the outside face of the WMATA structure, including foundation, to the crest of slope of any unsupported excavation), unless the below points i and ii. apply:
 - i.** The existing WMATA excavation support system, that was used for construction of the WMATA facility (i.e., soldier piles) can be utilized, with prior acceptance from WMATA, if the soldier piles can be located, and can be pre-loaded to the required stress level during excavation, without over stressing the WMATA structure.

The capacity of the existing soldier beams shall be based on an allowable flexural stress of 20 ksi. In addition, if the soldier beams are corroded or if there is any loss in section, allowance should be made for it. It is essential that the use of the existing WMATA excavation system shall not damage the existing waterproofing system; therefore, it is necessary to grout the area between the existing soldier piles to ensure no impact on the existing waterproofing.

Existing soldier piles shall be located by test pit or by geophysical methods supplemented by test pits and the information shall be submitted to WMATA for review.

In addition, when the support of excavation is nearer to a WMATA structure or cut-and-cover tunnel than five (5) feet laterally, or is nearer to a WMATA bored tunnel than ten (10) feet laterally, and the subgrade of the excavation is below an elevation which is five (5) feet above the bottom of the WMATA structure, then provide a rigid support of excavation system like slurry walls, tangent walls or secant walls. Reference Plate A-9 of [Appendix C](#).

As a rule, WMATA discourages the use of the existing/previous excavation support systems, and the use of the existing/previous support systems will be at the sole discretion of WMATA. When the ground conditions warrant, use of ground stabilization with flexible support of excavation, in lieu of rigid support of excavation, may be accepted by WMATA in its sole discretion.

- ii. An excavation support system, conforming to the requirements of this manual, shall be installed to protect existing WMATA facilities.
- 4. Installation of pre-augured piles within five (5) feet (horizontal dimension) of the bored tunnel liners.
- 5. Pile driving within 25 feet (horizontal dimension) of WMATA structures, and tracks.
- 6. Construction below or above ground within the WMATA track clearance area. Reference the Manual of Design Criteria for minimum clearances.
- 7. Blasting shall not occur within 100 feet of WMATA structures without prior acceptance from WMATA, and unless test blasting that generates a particle velocity-scaled distance relationship indicates that peak particle velocity (PPV) measured at the minimum separation distance between the WMATA structure and proposed blasting locations shall not exceed 2.0 inches per second. (See U.S. Army Corps of Engineers ETL 1110-1-142, Engineering and Design – Blasting Vibration Damage and Noise Prediction and Control, available from www.usace.army.mil). A blast-monitoring program and blasting plan shall be submitted to WMATA for review and acceptance to verify compliance.

Measurement of PPV in excess of the requirement stated herein shall require the suspension of blasting operations and revision of blasting procedures to reduce PPV to acceptable limits.

8. If WMATA survey monument disks or National Capital Transportation Agency (NCTA) survey monuments are encountered, the ODC shall coordinate removal and recovery with the JDAC project team.
- B. The ODC shall use hand excavation methods or a WMATA-accepted alternative in the vicinity of communication lines or WMATA, Pepco, and Dominion Virginia Power lines feeding the Metro System. It is the contractor's responsibility to contact 811 MISS-UTILITY to locate underground infrastructure before beginning excavation.
- C. If the proposed work occurs not only directly above but also in potential falling hazard areas of aerial, at-grade, open, or otherwise unprotected WMATA facilities including the Roadway, overhead protection shall be required at the discretion of WMATA.
- D. WMATA operational support will be required to monitor the Roadway for all auguring, pile driving or other work that can impact WMATA's operating system. The ODC shall make a formal request for any operational support by submitting a JDAC Support Request (JSR) form to the CIF and CE. Costs associated with the support shall be borne by the ODC. JSR submittal procedures can be found in [Section 2.02](#).
- E. The ODC shall request access rights or track rights to perform work during WMATA's non-revenue hours of operation. The ODC shall make a formal request for access and support by submitting a JDAC Support Request form to the CE. Costs associated with the request shall be borne by the ODC.
- F. The ODC shall be held financially responsible for any damage to WMATA structures, including any loss of revenue operations due to detrimental impact from the adjacent construction. This includes, but is not limited to, restoring WMATA tracks and/or structures to new construction standards due to the movements and displacements caused by the adjacent construction work, and alternate service in the event of disruption to scheduled revenue service.

8.04 WMATA R.O.W. Overhead Protection

- A. Overhead protection shall be provided whenever there is a possibility of overhead fall hazards from construction material, personnel, dunnage, or other items. Overhead protection is required on or around WMATA station entrances, WMATA bus stops, WMATA Roadway, WMATA elevators, WMATA escalators, and areas designated for public access to WMATA facilities. The overhead protection or shield structure may also serve as working platform for construction or maintenance activities. However, staging construction materials, tools, or other items on top of the platform shall be prohibited. Erection and installation of the

overhead protection or shield for these areas will be performed during WMATA's non-revenue hours as defined in [Section 2.02](#).

B. Structural design criteria:

1. The design live load for all shields shall be 150 pounds per square foot minimum. The design wind load on the temporary structures shall be 20 pounds per square foot, on both the windward and leeward sides of the structure a total of 40 pounds per square foot in any one direction. The roof of the shield shall also be designed for an uplift pressure of 25 pounds per square foot (due to wind).
2. The shield(s) must be constructed of painted, fire-retardant materials. Materials and equipment shall not be stored on the completed shield.

C. Lighting design criteria:

1. Lighting in public areas and around affected WMATA facilities must be provided under the temporary shield(s) to maintain a minimum illumination level of ten (10) foot-candles at the escalator treads or at walking surfaces. The temporary lighting is to be maintained and power source provided by the ODC during all construction phase(s). The ODC shall demonstrate in the field to WMATA that required illumination levels are being maintained throughout construction.
2. Temporary disruption in WMATA's existing electrical systems (lighting) will require temporary lighting and maintenance of the current standard illumination levels. Electrical staging plans are required for WMATA review and acceptance. WMATA's standard illumination levels are found in Tables 7-1 to 7-3, and full design criteria for facility lighting is identified in the WMATA Manual of Design Criteria which shall be provided by the JDAC project team upon request.

D. Construction barricades shall be provided around all temporary construction areas and WMATA property to prevent public access in accordance with OSHA standards.

1. Temporary barricades or fencing must be a minimum of six (6) feet in height and secured and maintained to withstand wind loads and public vandalism.
2. Temporary barricades or fencing located within WMATA property shall be free of advertisement or other public communication unless accepted by WMATA.

- 3. Use of wooden fences shall require material with a minimum of one (1) hour fire-rating.
- 4. Construction barricades and fencing shall be inspected daily.
- E. Temporary sidewalks or pedestrian ways which will be in use more than ten (10) days shall be constructed of four (4) inch thick Portland cement concrete or four (4) inches of asphaltic concrete placed and suitably finished for pedestrian traffic. Temporary sidewalks are to be a minimum width of five (5) feet wide.
- F. All modified or temporary pedestrian access paths shall be ADA compliant and conform to WMATA standards.
- G. A construction project that will require work over, under, or adjacent to WMATA at grade or aerial segments, including machinery operation, construction of scaffolding or any other potentially hazardous adjacent work, shall be done during non-revenue hours with a supervisory power outage, or as otherwise accepted by WMATA.
- H. Work may be accepted to be performed during revenue hours with conditions such as constructing a temporary protective shield to protect WMATA's operating Roadway and facilities in accordance with the above minimum design load and other requirements of this manual. The shield shall have solid sides and both sides and deck shall be designed to withstand the air pressures generated by a moving train unless otherwise noted by WMATA's Manual of Design Criteria. The shield shall be constructed or installed with a WMATA power outage in the construction area during non-revenue hours. Reference [Section 2.02](#) for WMATA power outage requirements. The design and field installation for the protective shield must be certified in writing by a registered professional engineer practicing in the jurisdiction of the project and shall be accepted by WMATA. The certification must be obtained prior to putting the shield in field use. A visual inspection is also required.

Once written certification is received, work may proceed above the shield during revenue hours. Crane(s) shall not swing over the shield during revenue hours. [Reinforcing steel may be tied, but not swung over the shield using a crane during revenue hours.]

- I. Crane operators working in areas adjacent to WMATA facilities where encroachments are possible shall possess a current National Commission for The Certification of Crane Operators certification for the type of crane being operated.
- J. Equipment used for sheeting and shoring operations shall be positioned and operated so that the equipment is precluded from overturning and falling onto or fouling WMATA Roadway. Soldier piles must not be swung over the WMATA

Roadway during revenue hours. Auguring or pile driving equipment shall be oriented parallel to the roadway and set-up in the field to prevent piles or equipment from falling or fouling WMATA Roadway.

- K.** Construction cranes shall not swing over the operating Roadway during revenue operations. Crane certification and inspection documents shall be available for review by WMATA's Department of Safety (SAFE) and the Office of Risk Management (RISK) personnel at any time.

8.05 WMATA Vertical Protection

- A.** When construction is in close proximity to the WMATA Roadway and protection is needed to avoid fouling of the Roadway, the ODC shall be responsible for the design and construction of a vertical protection scheme for all adjacent construction projects when indicated. Vertical protection shall be submitted to WMATA for review and acceptance and must meet the following requirements:
 - 1.** Shields shall be designed to withstand a 30 PSF wind load at minimum. WMATA requiresC more strength as needed based on project parameters.
 - 2.** The ODC shall apply SEI/ASCE 37-02 Design Loads on Structures During Construction for construction live load changes. Ultimate wind load requirement shall be based on the duration of construction per the standards outlined in SEI/ASCE 37-02.
 - 3.** Shields shall be constructed out of painted, fire-retardant material.
 - 4.** Shield, at the discretion of WMATA, shall be grounded.
- B.** A vertical protection plan, designed to the specific needs of each project, must be submitted for WMATA review and acceptance.

8.06 WMATA Station Canopy Protection

- A.** Where demolition or construction will take place in close proximity to a WMATA Station Canopy, proper protection for the station canopy shall be erected. Due to the varying configurations of WMATA station canopies, the ODC shall design a protection concept and submit to WMATA for review and acceptance.
- B.** The protection shall ensure WMATA station canopies are shielded from construction debris, projectiles, and dust.

- C. Station canopy protection shall not be used to stage construction material or equipment unless explicitly designed to do so and with WMATA acceptance.
- D. The ODC shall conduct pre and post-construction photographic surveys of the station canopy and be held responsible for any damage incurred on the canopy by construction activity. Survey shall be provided to WMATA.

8.07 WMATA Vent Shaft Protection

- A. Where demolition or construction will take place in close proximity to a WMATA vent shaft, the vent shaft shall be protected with a wooden structure constructed of painted, fire-retardant materials. The protection shall be designed to adequately protect each unique vent shaft, may differ from location to location, and shall conform to the requirements presented herein. All designs must be accepted by WMATA. An example of commonly used “doghouse structure” configurations for vent shaft protection is shown in [Appendix C](#), Plate L-1.
- B. When WMATA vent shafts are located in a sidewalk adjacent to the construction site and are located within the protected pedestrian walkway, the vent shafts may be covered with an expanded metal screen to provide a better walking surface when pedestrian traffic is forced by the curb and the construction fence to walk across the vent grate. The construction fence adjacent to the vent shaft shall be walled with exterior plywood for the entire length of the vent plus four feet extra at each end and laterally braced for wind loads.
- C. Expanded metal screen shall not be used to cover a grate where it will restrict the opening for an intake or an exhaust fan.
- D. The ODC shall design all vent shaft protection such that airflow from the vent remains unobstructed by construction, temporary structures, work activity, trash and debris, or the general public.
- E. All standpipes located adjacent to vent shafts shall be labeled with signage denoting “WMATA – FDC” for clear visibility by the ODC.
- F. Access from public streets to WMATA fan shafts, vent shafts, and emergency exits shall be maintained at all times.

8.08 WMATA Escalator Protection

- A. Where demolition or construction will take place over a WMATA escalator, protection must be installed. The protection design must be submitted and accepted by WMATA. Examples of escalator protection schematics that comply with WMATA regulations are shown in [Appendix C](#), Plate E-1 and E-2.
- B. An unrestricted public access path shall be provided at the upper landing of the entrance escalator way in accordance with the following:

1. Vertical clearance between the walking surface and the lowest projection of the shield shall be a minimum of seven (7) feet.
 2. A clear pedestrian runoff area extending beyond the escalator newel shall be provided, the least dimension of which shall be 20 feet.
 3. A 15-foot-wide strip (other than the sidewalk) shall be maintained on the side of the escalator for circulation when the escalator is pointed away from a street corner.
 4. A clear direct path from any WMATA emergency exit to the public street shall be maintained at all times.
- C. All WMATA escalators shall be protected from dust and debris that may enter the escalator machinery. At the sole discretion of WMATA, dust prevention measures such as polyethylene sheet coverings or other screen protection for escalators to prevent dust from entering bearings shall be required.
- D. Adequate site control measures shall be designed so that WMATA customers may not mistakenly use escalators that are under construction or otherwise undergoing maintenance.

8.09 Corrosion and Stray Current Protection

- A. The ODC must be aware that, since WMATA transit cars are powered by direct current (750 volts DC) electricity, direct current can enter the earth through unintentional leakage from WMATA's negative ground return system. The leakage or stray current may flow to and discharge from underground metallic elements (i.e., steel reinforcing, pipelines, ground systems, etc.) that are in contact with any electrolyte, including earth, in the vicinity of WMATA's facilities and systems. Because stray current may be corrosive to metal at locations where it flows into an electrolyte, the ODC is further cautioned to investigate the site for stray current and to provide the means for stray current mitigation when needed. This may include bonding all adjacent structures subject to corrosion in close proximity to WMATA's energized roadway.
- B. Further information concerning stray current mitigation can be obtained by contacting The Association of Materials Protection and Performance, 15835 Park Ten Place, Houston, Texas 77084, (+1-800-797-6223) or website located at www.ampp.org.
- C. Casing, pipe, tunnel, sleeve or similar structure(s) that will be subject to corrosion, when installed under any WMATA facility, structure, or at-grade roadway, will

require corrosion protection. The proposed corrosion protection design scheme should be submitted to WMATA for acceptance and specifically identified or highlighted as proposed corrosion protection measures.

- D. Underground casing, pipe, tunnel, sleeve or similar structure(s) that will be subject to corrosion, when installed on the sides adjacent to any WMATA structure, may require corrosion protection. Coordinate with WMATA the necessity of any such structure, and if it is required the proposed corrosion protection design scheme should be submitted to WMATA for acceptance.

8.10 Considerations for the Design of New Structures

- A. Wind loads shall be considered for any adjacent structure to be built above or adjacent to existing WMATA facilities. Design loads must satisfy minimum requirements of the local jurisdictional codes and must be not less than 50 pounds per square foot of the projected area of the structure for overall design capacity (on a vertical plane at right angles to the wind direction). For design of components, this load may be divided into the ratio of 60% for the windward face and 40% for the leeward face.
- B. New structures designed for vehicular traffic must have adequate provisions and strength to prevent failure of the structure and incorporate protective measures to guard against objects or debris from entering WMATA Roadway.

8.11 Considerations for Work Over, Adjacent to and Underneath WMATA Tunnels

- A. Tunnel Analysis Criteria: All existing tunnels shall be considered as already under the long-term loads. Any changes in the loading, due to adjacent excavation and construction, shall not increase stresses and deformations in the WMATA tunnels and other underground structures.
- B. If new construction is adjacent to or over existing WMATA bored tunnels, cut and cover tunnels, or other underground structures:
 - 1. Establish earth pressure diagrams based on the WMATA Manual of Design Criteria and soil properties in Table C-3 in [Appendix C](#).
 - 2. Establish the short-term and long-term loading conditions that will result from the adjacent construction.
 - 3. Any additional loadings must be transferred outside and below the tunnel structure unless expressly permitted by WMATA.
- C. The structural check of existing WMATA bored tunnel liners or cut and cover tunnel sections must include calculations for the following:

1. Stresses in the tunnel structure or liner.
2. Tunnel section distortion.
3. Lateral shift of tunnel.
4. Opening of the joints and possibility of water leakage at bolted joints. Bolt stresses shall be calculated.

The support of excavation system of a large number of existing WMATA cut and cover tunnels consisted of a soldier pile and lagging system. This support of excavation system was frequently left in place. When this system is encountered, it shall not be removed.

D. Additional Requirements for Excavation Adjacent to Underground WMATA Tunnel Structures and Facilities

1. For excavations adjacent to WMATA underground structures within the WMATA ZOI, provide an excavation support system conforming to this manual's requirements. For excavations within a plan distance of five (5) feet from cut and cover, and ten (10) feet from the bored tunnel, and when the excavation subgrade extends below the level which is five (5) feet above the bottom of tunnel use a rigid or stiff support of excavation system with slurry walls, tangent piles or secant piles. Reference Plate A-9 in [Appendix C](#).
2. Any other system, if a prior acceptance of WMATA is obtained, may have to be designed for a higher stiffness factor and requirements, based on a case-by-case basis, at the sole discretion of WMATA. When the ground conditions warrant, use of ground stabilization with flexible support of excavation in lieu of rigid support of excavation may be accepted by WMATA at its sole discretion.

E. WMATA tunnel structures shall be underpinned per the requirements of this manual and as contained in [Appendix C](#), Plate A-3A and Plate A-3B. Structure movement shall be monitored during excavation in accordance with the monitoring plan.

8.12 Considerations for Work Adjacent to WMATA At-Grade Roadway or Facilities

- A.** Work to install casings, drive tunnels and micro tunnels or construct other facilities under WMATA tracks shall normally be done continuously. If the facility is to be installed near the surface where ground borne vibrations or projected settlement/heave may be a problem, then the work will be restricted to non-revenue hours.

- B.** A subsidence detection plan and a detailed tunneling schedule will be required prior to scheduling any such operation adjacent to WMATA structures. Provide detailed description and design of underground crossing (tunneling, micro tunneling, etc.).
- C.** A geotechnical or soils report with a proposed dewatering plan shall accompany the plan submitted for an underground crossing of WMATA at-grade operating Roadway, or excavation adjacent to WMATA at-grade Roadway or operating Roadway. Any ground improvements, like grouting, necessary for the underground crossing should be specified in the geotechnical/soils report.
- D.** Tunneling underneath WMATA at-grade Roadway or facilities may be permitted only for tunnels smaller than eight (8) feet in diameter, under the following criteria. Proposed tunnels larger than eight (8) feet in diameter will require a preliminary presentation to be made to WMATA prior to proceeding with final design.

 - 1.** The plans and specifications for the proposed tunnel shall be submitted for review and acceptance in advance of construction.
 - 2.** Monitor WMATA track/subgrade movement during underground crossing or excavation in accordance with the monitoring plan developed in compliance with WMATA's Manual of Technical Specification and Requirements for Survey Services provided by WMATA's Geomatics Survey Engineering Office. At a minimum, subsidence detectors are required along the centerline of the tunnel. Heaving or subsidence of WMATA at-grade Roadway is not permitted. Survey Roadway above the underground crossing or adjacent to the excavation and submit survey data to WMATA prior to start of work.
 - 3.** A contingency construction plan is required to allow adjustment of track to compensate for movements in accordance with, and to the track geometry tolerances specified in the WMATA Track and Structures Standards Manual (TRST-1000). The WMATA TRST-1000 is available upon request. For Monitoring Threshold or Limiting Values of track and rail movement, see [Section 9.08](#) for details.
- E.** No drainage, either surface or subsurface, is to be diverted into WMATA drainage systems from adjacent facilities without calculations to verify that the WMATA facilities will not be overloaded. Specific acceptance from WMATA is required for such diversions. Detail on design of drainage systems adjacent to WMATA facilities may be reviewed in [Section 7.10](#).
- F.** Excavation support systems adjacent to surface sections or WMATA at-grade Roadway shall be designed when Roadway is located partially or entirely within the WMATA ZOI.
- G.** Batter piles that require the pile to lean towards or over WMATA Roadway shall be driven during non-revenue hours. Plumb and batter piles that lean away from the WMATA Roadway may be driven during non-peak revenue hours. A WMATA

flagperson will be required for all pile auguring within 25 feet (horizontal dimension) of the Metrorail fence and structures. Fixed-leads are required for all pile driving where fouling or encroachment onto WMATA property is possible.

8.13 Considerations for Work Adjacent to WMATA Aerial Roadway or Structures

- A. For excavations adjacent to WMATA aerial structures, an excavation support system conforming to requirements for excavations adjacent to aerial facilities must be provided when the facility is located partially or entirely within the WMATA ZOI.
- B. For aerial structure foundations that fall partially or entirely above the adjacent excavation influence line as shown in [Appendix C](#), Plate A-2E, underpinning shall be provided. Underpinning for WMATA aerial structures must be extended to bear at least ten (10) feet below the ZOI line. Structure movement shall be monitored during excavation in accordance with the monitoring plan developed in compliance with the requirements of this manual. As coordinated with WMATA, the ODC will be held financially responsible for any damage to WMATA structures, including any loss of revenue operations due to detrimental impact from the adjacent construction, restoration, and alternate service in the event of disruption to scheduled revenue service.
- C. WMATA will support local jurisdictions and states' (ODC's) regular bridge inspections and painting within WMATA's Roadway. This section does not exempt the ODC from any applicable section of this manual.
 - 1. Most inspections and/or painting activities will occur from the ground at track level using ladders or from overhead via the bridge deck by use of a snooper truck or similar equipment. Since, in both cases, the inspection will be within the WMATA Roadway, [Section 2.02](#), applies to the ODC.
 - 2. WMATA will review the safety plan as provided in the SSWP. The ODC must submit the work description, plans, materials, SDS, protection and schedule. In addition to the type, size and location of the bridge, the ODC must depict the inspection and painting equipment for WMATA review. Any structure that will be installed to perform the work must be submitted for review. Note that there is no WMATA equipment available for ODC use.
 - 3. WMATA will estimate costs in accordance with [Section 1.08](#) of this manual. All work will be performed during non-revenue hours. The ODC will provide a copy of the bridge inspection report at the completion of the work for WMATA's record.

8.14 Considerations for Blasting

The following criteria will apply if the proposed rock blasting is in the WMATA ZOI. The ODC must verify the proposed blasting impact with WMATA via shop drawing submittals and a blasting plan.

- A.** The peak particle velocity (PPV) imparted to existing WMATA facilities caused by blasting shall not exceed two (2) inches per second in all cases. Jurisdictional requirements of the locality in which the proposed project is located in may have stricter requirements—in such cases the stricter requirement shall apply. It is the ODC's responsibility to comply with all jurisdictional requirements.
- B.** If blasting is to be used in the excavation, the following information shall be provided for review and acceptance:

 - 1.** The ODC will provide WMATA with a site plan to illustrate blasting relative to WMATA structures if a proposed rock blasting operation is within a 100-foot radius from the WMATA facility, designating blasting to be within WMATA's ZOI.
 - 2.** A blasting plan, which shall include the size, depth and spacing of the blast holes, the blasting agent, the average charge per hole, the blast monitoring program and the blast monitoring equipment and seismographs.
- C.** Test blasting in WMATA's ZOI is required, starting from 100 feet horizontal distance from WMATA's facilities or utilities. The initial blast, which must start with a low weight per charge, will serve as a "test blast". Depending on results of seismograph reading after the test blast, an increase in the weight of the charge may be allowed. The maximum weight of charge shall not exceed five (5) pounds/hole/delay. Deviation from test blasting methodology may be permitted at the sole discretion of and after review and acceptance from WMATA.
- D.** Blasting operations shall be generally restricted to the hours of 9:30 AM to 3:30 PM weekdays or according to the jurisdictional requirements of the project. Blasting time may be accepted at the sole discretion of WMATA. A request may be submitted for blasting outside of these hours for review and acceptance. Seismograph instrumentation is required to monitor the blasting operation in the vicinity of existing WMATA facilities. Seismograph instrumentation should be installed inside or on the WMATA facilities as close to the blasting as feasible. The blasting plan shall include the monitoring and contingency plan.
- E.** Once the blasting plan is accepted, the ODC is to notify the Construction Inspection Facilitator in accordance with the accepted WMATA Blasting Notification Procedures Plan developed for each project.
- F.** The ROCC Superintendent shall also be contacted five minutes before each blasting event so that train movement through the area can be halted temporarily when WMATA deems it necessary. Blasting shall not be conducted without verbal confirmation, via radio or telephone, by the ROCC Superintendent or their designee, that necessary preparation has been completed. If problems are experienced, WMATA monitoring personnel on site are authorized to immediately stop the blasting and notify the ROCC.
- G.** Train movement is generally required to be stopped during test blasting. Movement of trains during regular blasting operations is not required to be stopped if the peak

particle velocity recorded by the seismograph is below two (2) inches per second, unless otherwise noted by WMATA.

- H. Requests for obtaining WMATA support and WMATA supervision of ODC personnel required for the location of a seismograph in an underground tunnel or station must be submitted for acceptance prior to initiation of blasting activities. The ODC requesting support of WMATA personnel will be required to compensate WMATA for the personnel costs associated with the support.
- I. Roadway entry requests, track rights requests, Roadway Worker Protection safety training, operational support and Site-Specific Work Plans for WMATA structural monitoring program(s) are to be as required by this manual as specified in [Section 2](#). The Blasting Schedule must be input into the WMATA General Orders and Track Rights System (GOTRS) to enable internal communication of such activity with other WMATA offices (such as Rail Transportation or Station Managers).
- J. Use of any WMATA land or right-of-way will require a real estate permit. The WMATA Office of Real Estate and Development will establish the fair market value or fee for the use or temporary lease of WMATA property.

8.15 Considerations for Demolition

- A. Demolition of structures adjacent to WMATA facilities by blasting, or by implosion of the structure by blasting shall not be allowed unless explicitly accepted by WMATA.
- B. Any structure, device, equipment, system, or other asset owned by WMATA that may be recovered and reused shall be removed prior to demolition and returned to WMATA. Recoverable assets include, but are not limited to, communications equipment and survey monuments.
- C. During piece-by-piece demolition, WMATA escalators shall be protected from dust generated by the demolition. See [Section 8.08 – Escalator Protection](#). Demolition adjacent to a WMATA station entrance, that requires protection from dust, shall be done during non-revenue hours.
- D. During demolition, WMATA vents located adjacent to the site shall be protected with a vent cover. See [Section 8.07 – Vent Shaft Protection](#) and [Appendix C](#), Plate L-1.
- E. The ODC must provide the complete demolition plan for WMATA review and acceptance. Based on the demolition plan and the nature of the adjacent WMATA structure, WMATA may require the ODC to check the structural adequacy of the WMATA structure due to the effects of the impact of the demolition.

- F.** Submit a copy of any requests to utility companies owning or agency controlling services and appurtenances affected by demolition work for discontinuance of services along with certificates of severance. The ODC must ensure that WMATA's facilities are not impacted by demolition operations whether due to adjacent utility damage or temporary service discontinuation.
- G.** Submit a copy of the demolition permit from the jurisdictional agency and owner.

SECTION 9 – Construction Monitoring



Section 9 – Construction Monitoring**9.01 General**

- A.** The ODC is required to design, submit for acceptance, and implement a monitoring program.
- B.** Selection, design, installation, reading, and documentation of the monitoring program are to be conducted by a licensed Land Surveyor or a Professional Engineer registered in the jurisdiction of the proposed project. All monitoring data and reports requiring optical surveying submitted to WMATA must be signed, sealed and certified by a licensed Land Surveyor or a Professional Engineer registered in the jurisdiction of the proposed project. It is the responsibility of the ODC to document and convey compliance of their proposed monitoring system with WMATA's minimum requirements as specified in this manual.
- C.** Instrumentation and monitoring of WMATA structures, utilities, and track are required to ensure that structural or functional inadequacy does not develop as a result of the proposed adjacent construction. Monitoring is done by measurement of displacement, deformation, strain, stress, crack width, joint separation, water leaks, observation of the formation of new cracks, and other items as determined by the project team to ensure impact to WMATA facilities is properly tracked. In addition, monitoring will be required to ensure the adjacent construction support of excavation system is functioning as designed and the loads on WMATA structures remain within design limits. If changes are observed, the frequency of monitoring will be increased. If the changes exceed the established threshold limits, the ODC will implement contingency measures.
- D.** The ODC will be required to develop a written Monitoring and Contingency Plan for procedures to ascertain structural condition(s) of WMATA facilities and proposed procedures for monitoring potential movement; these procedures shall be submitted and accepted prior to entry onto WMATA property. The plan will contain contingency measures listing the immediate remedial action to be taken in the event movement reaches the established threshold limits and/or damage is observed. The Monitoring and Contingency Plan for each adjacent construction project will be evaluated for acceptable threshold limits for WMATA structures or facilities.
- E.** All instrumentation, monitoring work, documentation, monitoring reports, and any contingency measures required as a result of the adjacent construction shall be the sole responsibility of the ODC for the adjacent construction project.
- F.** Additional monitoring requirements, such as continuous monitoring and daily engineering evaluation, may be imposed for work performed adjacent to underground facilities, such as steel-lined tunnels, known to be particularly sensitive to disturbance or changes in soil or hydrostatic pressure. Monitoring frequency is to be determined by the WMATA engineer.

9.02 Monitoring Stages

- A. Stage 1 - Initial Pre-Construction Monitoring:** Stage 1 requires a survey of conditions within the WMATA structure or facility, including a track alignment existing conditions survey performed in accordance with WMATA's Manual of Technical Specification and Requirements for Survey Services provided by the WMATA Geomatics Survey Engineering Office, and obtaining initial readings at established monitoring points. Required surveys shall be determined by the WMATA Civil/Structural Engineering Office, Geomatics Survey Engineering Office, and JDAC.

The first stage of monitoring shall be done before construction and excavation begins in WMATA's ZOI. However, monitoring phases of soldier beams, top supports and heel blocks shall be completed immediately after installation. The initial readings shall be based on a minimum of three (3) sets of initial readings, taken on three separate dates, and taken at least 30 days in advance of the adjacent construction work.

The ODC will provide the preconstruction survey, a summary report, a baseline reading summary report, and photographs of findings for WMATA review and record. All preconstruction items shall be submitted prior to construction within WMATA ZOI.

- B. Stage 2 - Project Monitoring During Construction:** Stage 2 includes monitoring during demolition, excavation, and construction, and will be done at WMATA-accepted frequency intervals, normally every week. The monitoring frequency will be increased as necessary during critical construction activities such as blasting or tunneling.

The ODC may request, in writing, to suspend monitoring when the slab-at-grade level or the first slab above grade is placed and concrete has acquired at least 85% design strength along with backfill zones completed to grade level or otherwise at the conclusion of construction activity. The request must show a minimum of four (4) weeks consecutive reports showing no movement after these conditions are met. All requests to suspend monitoring activity shall be evaluated and accepted at the sole discretion of WMATA. After WMATA has agreed movements have ceased and/or stabilized, Stage 2 monitoring may be stopped.

Termination of monitoring activities and removal of monitoring equipment shall be accepted at the sole discretion of WMATA, based on construction activity, noted movement, and other project-specific factors.

- C. Stage 3 - Post-Construction Monitoring:** Stage 3 includes final survey monitoring performed after substantial construction completion to determine changes to the alignment, document the post-construction condition, and provide photographic records. In addition to structural monitoring, a final track alignment existing conditions survey, performed in accordance with WMATA's Manual of Technical Specification and Requirements for Survey Services provided by the

WMATA Geomatics Survey Engineering Office, of the rail/tracks will be required for comparison with the pre-construction track alignment existing condition survey data.

The ODC shall examine each property to determine/assess changes from original conditions as established by preconstruction survey(s). These post-construction engineering assessments shall be furnished in a written report in addition to final monitoring data results.

The ODC shall also provide written remedial or corrective measures to be taken should any deviations and/or damage occur as a result of the adjacent construction project and/or monitoring phases.

9.03 Monitoring Plan

- A.** The monitoring plan for the WMATA facility should be coordinated with the overall project design. Project design plans, with the exception of the Support of Excavation plans, should be reviewed and accepted by WMATA prior to submission of a monitoring and contingency plan. The monitoring and contingency plan must be prepared and certified by a Professional Engineer or a licensed Land Surveyor registered in the jurisdiction of the proposed project. As a minimum, the plan is to include:
1. A key plan with north arrow illustrating WMATA track stationing, the limits of the structural monitoring program, the limits of the Zone of Influence (ZOI), supporting survey control point types and locations, monitoring observational instrument setup location/s, and observed monitoring point types and locations.
 2. Instrumentation details including accuracy, technical specification from manufacturer, survey field procedures, calibration requirements, and certifications (see [Appendix B](#) example). ODC is required to use the "Monitoring Plan Instrumentation Checklist" provided in [Appendix B](#).
 3. Schedule of surveying and monitoring.
 4. Data reduction, presentation, and evaluation, and details of the monitoring report.
 5. Threshold or limiting values.
 6. Contingency measures.
- B.** In order to detect movement of buildings or structures affected by construction, the ODC will, prior to excavation, establish a system of vertical and horizontal control points on or about potentially affected buildings or structures, tied to stable survey control points located beyond the ZOI, preferably in WMATA's design datum.

WMATA has a network of survey control points which will be made available to the ODC upon request.

- C. Prior to any core drilling activity within the WMATA ZOI, all structural steel and other embedded components must be located, using methods subject to the acceptance from WMATA.
- D. The ODC will employ Certified Survey Technicians to perform horizontal and vertical movement detection survey work in accordance with WMATA's Manual of Technical Specification and Requirements for Survey Services provided by WMATA's Geomatics Survey Engineering Office, or other WMATA-accepted standards and procedures.

9.04 Instrumentation

- A. The extent of the instrumentation and monitoring will depend on the size and type of the WMATA facilities and the adjacent construction. A detailed instrumentation plan for the monitoring program will be prepared by the ODC for each structure potentially affected by the work. Instrumentation scope and selection will be based on the requirements of the specific project including groundwater levels and pressures; strut, tieback, and anchor loads; anticipated horizontal and vertical movement of the WMATA facilities and the adjacent construction support of excavation elements; and the sensitivity of the soil or rock between the support of excavation system and WMATA facilities.
- B. WMATA strongly encourages the ODC to use instrumentation solutions that include remote and automated monitoring systems that are capable of reporting and post processing monitoring data to a password protected web site that only authorized users have access to. Please note, access to many areas of the system are restricted.
- C. All proposed methods of instrumentation installation and operation will be in accordance with the recommendations of the instrument manufacturer, unless otherwise accepted by WMATA.
- D. Inspection, installation, reading, and removal of instrumentation within WMATA structures may require closure of adjacent tracks, de-energization of adjacent third rail, and Roadway protection. All such activities will be planned in a timely manner and coordinated with WMATA's assigned CIF/CE.
- E. For monitoring programs not utilizing automated and remote monitoring, monitoring observational instruments and the surveying of the monitoring points to be observed shall be from a single control point for all readings. In the event this is not possible, a procedure is to be established, accepted by the WMATA Geomatics Survey Engineering Office, where a cross check is viable to reduce errors due to multiple setups of instruments.

- F.** The ODC is responsible for ensuring immediate replacement of damaged instruments. When possible, readings for the damaged instrument will be plotted continuously, without an offset at the time of damage. The time of damage and replacement must be documented on the plot and / or data reports.
- G.** Security and Safety: Instrumentation installed (affixed) in any WMATA facility shall be accompanied by a small identification placard illustrating ownership information. The placard shall be securely and safely affixed to the instrumentation at eye level and labeled with ODC's name, phone number, WMATA project affiliation, adjacent construction project number, and WMATA contact person / phone number.

9.05 Guidelines – Monitoring & Instrumentation Minimum Requirements

- A.** The ODC is required to provide monitoring reports to WMATA.
- B.** The report of results of all instrumentation readings and movement detection surveys is to include:

 - 1.** WMATA adjacent construction project name and number.
 - 2.** Statement of who performed the work with contact information and a point of contact who WMATA may contact to discuss technical aspects of the report.
 - 3.** Last observation(s) date and time and date and time of next scheduled observation(s).
 - 4.** Observer(s).
 - 5.** Interpretive summary of monitoring findings relative to the current construction activities (e.g., excavation is 2 feet below the top-level support) or significant events that affect the readings.
 - 6.** Other pertinent data including a statement of weather conditions at the time of observational data capture, relative humidity, barometric pressure, ambient temperature and any other events that may affect the observation(s).
 - 7.** Drawing showing a plan view of the limits of the structural monitoring program, the limits of the Zone of Influence (ZOI) of potential movement, monitoring observational instrument setup location/s, supporting survey control point types and locations, and observed monitoring point types and locations.
 - 8.** Current readings.
 - 9.** Initial readings.

10. Total movement for each monitoring point computed by subtracting the current readings from the initial readings.
11. Graphical representation of reduced data plotted against accepted baselines which may include time, initial readings or fixed features such as centerline of tracks/structures. Graphical arrows can also be used to show direction and magnitude of movement using exaggerated scales.
12. Summary of survey instrument and accuracy, survey and or geotechnical equipment description, and survey methodology report.

C. The movement detection report will:

1. Identify all values in English units, except crack gauges and/or crack calipers which may be measured in millimeters.
2. Identify the applicable tunnel section and WMATA stationing and track number (Inbound or Outbound/utility marker number, etc.).
3. Indicate the direction of movement (sign convention) for all monitoring points. For example, (+) = toward the excavation or away from WMATA's centerline of track. Graphical arrows can also be used to show direction and magnitude of movement.

D. Movement Detection Report Format

1. Provide field data and reduced data, summarized in tables, in Adobe Acrobat (PDF) format.
2. Provide data in Excel spreadsheet format when requested.
3. In general, the report should include 5 basic parts:
 - i. Part 1 - a cover sheet which contains project details as listed in Section 9.05.B.1-6; (sample shown in [Appendix B](#))
 - ii. Part 2 - a project layout drawing as described in Section 9.05.B.7;
 - iii. Part 3 - monitoring data in tabular or spreadsheet format as described in Section 9.05.B.8-10;
 - iv. Part 4 - monitoring data in graphical formats as described in Section 9.05.B.11;
 - v. Part 5 - summary of equipment and procedures as described in Section 9.05.B.12. (sample shown in [Appendix B](#))

4. Inclinometer data will be provided in tabular form and in graphs showing cumulative total displacement vs. elevation in WMATA's design datum (see [Appendix C](#)).
- E. Report Schedule
1. All data below Level 2 threshold values (see [Section 9.08](#)) will be provided in hard copy or in digital format no later than 3:00 P.M. on the day following the data collection date.
 2. When the specified reporting date is interrupted by weekends or holidays, the due date will be increased by an equivalent period.
 3. When Level 2 threshold values have been exceeded, reports will be submitted on the date of reading.
- F. Report Certification: All reports submitted must be certified by the Engineer or Surveyor of Record providing assessment of readings and necessary action resultant from the readings based on the requirements of the accepted monitoring plan.

9.06 WMATA Administrative Requirements

- A. Entrance to WMATA property for inspection or monitoring will require a real estate permit issued by the WMATA Office of Real Estate and Development (LAND), an accepted SSWP and all ODC personnel must be in possession of a valid WMATA contractor ID badge.
- B. ODC indemnification and insurance policies and certificates of insurance (including Railroad Protective Liability Insurance) must be submitted and accepted by the WMATA Office of Risk Management (RISK) prior to entering WMATA property. The ODC must maintain current insurance policies and certificates of insurance with WMATA.
- C. Inspection and monitoring work inside WMATA facilities will require WMATA operational support. Work performed within the track bed will require a third-rail power outage. The support or outage request, indicating the desired dates for entry into WMATA facilities, must be submitted on a JDAC Support Request form (JSR).
- D. JDAC Support Request Forms must be submitted to the WMATA CIF and CE at least thirty (30) days prior to the beginning of the WMATA Operating Week of the requested date(s). The WMATA Operating Week begins Saturday morning at 0001 hours (12:01 AM). JDAC Support Request forms shall not be submitted until the ODC has obtained acceptance of a monitoring plan, an accepted SSWP and a fully executed real estate permit from WMATA LAND.
- E. The ODC must comply with [Section 2.02 – Access to WMATA Roadway and Facilities](#).

All work within WMATA's Roadway must be performed during nonrevenue hours as defined in [Section 2.02](#) or as accepted in advance by WMATA.

- F. The ODC must maintain compliance with the Letter Agreement, permit and funding in place. Failure to do so will prevent ODC from obtaining track access and staff support from WMATA.

9.07 Minimum Monitoring Requirements

- A. The extent of the instrumentation and monitoring program will depend on the size and type of both the adjacent construction project and the WMATA facility potentially affected, as well as the anticipated loads imposed on the WMATA structures. Instrumentation of the excavation support system for the new construction, the surrounding ground, and the WMATA facilities will normally be required.
- B. Excavation support systems for the portion of the adjacent construction within the WMATA ZOI will be instrumented and monitored to:
 - 1. Measure the movement and deflection of the sheeting/cofferdam wall, etc. by optical surveying or other WMATA accepted means. The top of the sheeting/cofferdam wall or soldier beams and the top level of support will be monitored for horizontal and vertical movement. The spacing of survey points at the top and at the top support (Tier One) shall not be greater than 25 feet.
 - 2. Monitor the horizontal and vertical movement of heel blocks where lateral support to the sheeting/cofferdam wall is provided by rakers.
 - 3. Monitor movement of the ground between the WMATA facility and the support of excavation system by means of inclinometers, movement detection points, or other WMATA-accepted instruments.
 - 4. Measure pre-load values and changes within struts, ground anchors, rakers, and other elements of the support system, by load cells or WMATA accepted instruments, so the support system can be kept within the limits established in design. The ODC shall submit load and stress measurement reports showing pre- and post-load measurements to WMATA.
 - 5. Measure groundwater levels to ensure compatibility with support of excavation design(s).
 - 6. After the establishment of the initial baseline data, monitoring of the support of excavation system shall be started after the wale and the lateral support system at the top support level (Tier One) is installed.
- C. WMATA Structures

1. Structures within the WMATA ZOI will be instrumented and monitored to measure horizontal and vertical movements.
2. Stress and strain monitoring of WMATA structures may be required for complex projects.
3. Monitoring of groundwater levels and pressures may be required and will be coordinated with WMATA.
4. Seismograph monitoring of peak particle velocities at WMATA facilities will be required whenever blasting is within 100 feet of the WMATA facility. Monitoring will be required for each blast.
5. Structural monitoring must extend a minimum of 75 feet beyond the limits of excavation or the depth of excavation plus 25 feet on each side (whichever is greater). The distance between monitoring sections shall be 25 feet.
6. Dome relief vaults, vent shafts, etc. shall be monitored with survey points at four corners of the top of the WMATA structures.
7. The condition of the WMATA structure located within the ZOI should be noted and monitored, including provision of a photographic record. Existing cracks will be monitored for change in width and length extension, and the formation of new cracks. Crack and/or caliper gauges should be mounted on significant structural cracks prior to demolition, excavation or other construction activities. Crack and/or caliper gauges may be used for crack monitoring. The width of the existing crack at the monitoring location should be recorded. The ends of each monitored crack shall be clearly marked to determine the extent of crack prior to the start of construction.
8. Retaining walls shall be monitored for both horizontal and vertical movement when excavation in close proximity to the foundation of a retaining wall is proposed. Retaining walls and track alignment shall be monitored independently of each other. Movement of retaining wall is an early warning sign of progress to track movement. Monitoring reports for retaining walls shall include horizontal and vertical movement, movement in relation to the track, cracks, and station and offset of movement location.
9. The monitoring of conditions within the WMATA facility should normally be done on a weekly basis, and the readings provided in accordance with the plan.

D. Tunnel Monitoring

1. Monitor and record any movement of the WMATA tunnels by inside measurement, using a system of instrumentation, during the adjacent construction excavation and initial construction. Submit data as stipulated on a case-by-case basis. The monitoring of tunnel movements shall be

done at 25-foot intervals. The extent of monitoring shall start 75 feet before and finish 75 feet beyond the limits of excavation and construction affecting the WMATA tunnel or tunnels. For a bored flexible tunnel, the data should include the three-point convergence readings and the lateral movement of the tunnel. For a cut and cover box section and bored rigid tunnel, the horizontal and vertical movements of four points (one each in the side walls, one at the roof slab and one on the invert) should be monitored (see Plate B-1 in [Appendix C](#)). In case of floating slabs in the tunnels an alternate point for monitoring shall be determined and coordinated with WMATA.

2. A monitoring section will consist of four points located at crown, invert, and at spring line on each side of the tunnel - for tunnels and similar underground structures. Monitor horizontal and vertical movement by optical surveying or by another method accepted by WMATA, such as tape extensometer. Provide a typical section of the monitoring points and identify the direction of movement relative to the location of construction.
3. Survey the tunnels from the inside and note all the existing open cracks. Install crack gauges on the cracks, with epoxy, or use caliper methods to monitor. Existing crack widths at crack gauge locations shall be recorded, photographed and submitted to WMATA prior to demolition, excavation, or any other construction activities.
4. A system of monitoring any vertical and horizontal movement of the excavation support structure must be submitted for acceptance prior to construction. The submitted information is also to include a sample chart and methods of data collection.
5. Installation of inclinometers at suitable locations is recommended between the tunnels and the adjacent excavation. Follow manufacturer's recommendations for installation locations of inclinometers relative to adjacent structures.
6. Prior to commencing construction, the WMATA tunnel structure shall be surveyed, including a track alignment survey performed in accordance with the standards and specifications as outlined in WMATA's Manual of Technical Specification and Requirements for Survey Services provided by the WMATA Geomatics Survey Engineering Office. The survey shall include vertical and horizontal alignment data.
7. Right-of-way entry requests, track rights requests, Roadway Worker Protection safety training, operational support and Site-Specific Work Plans for WMATA structural monitoring program(s) must be in accordance with the requirements in this manual.
8. Use of any WMATA land or right-of-way will require a real estate permit. The WMATA LAND will establish the fair market value or fee for the use or temporary lease of WMATA property.

9.08 Monitoring Threshold or Limiting Values

- A.** Level 1 requires increasing the monitoring frequency. Level 1 values serve as an alert that change (displacement, crack widening, etc.) is occurring. Level 1 values shall be reported to WMATA by 3:00pm on the date following measurement.
- B.** Level 2 requires remedial action. When Level 2 values are reached, the developer/contractor will stop work in the WMATA ZOI, and any other work considered causing excessive movement. Level 2 values shall be reported to WMATA immediately, by the end of the date of measurement.
- C.** WMATA maintains the right to stop construction activity if threshold values are reached without proper notification and remediation.
- D.** Table 9-1 contains suggested threshold values to be used for monitoring and implementation of contingency measures and are provided as a guide in assisting the developer/contractor in preparing job-specific structural monitoring tolerances:

Table 9-1: Limiting Values

	Level 1 (Threshold Limit Values)	Level 2 (Remedial Action Limit Values)
Track/Rail (Horizontal and Vertical)	0.0625" (1/16") in any 25' length, but not to exceed a total of 0.25" from the existing location.	0.125" (1/8") in any 25' length, but not to exceed a total of 0.50" from the existing location.
Station and Tunnel (Horizontal and Vertical)	0.125" (1/8") in any 25' length, but not to exceed a total of 0.25" from the existing location. Movement includes displacement, deformation and rotation of the tunnel.	0.125" (1/8") in any 25' length, but not to exceed a total of 0.50" from the existing location. Movement includes displacement, deformation and rotation of the tunnel.
Other structures (Horizontal and Vertical)	0.25" (unless otherwise noted)	0.5" (unless otherwise noted)
Change in Crack Width	0.02" (0.5 mm)	0.04" (1.0 mm)
Pier supporting Aerial Structure	0.125" Horizontal and Vertical	0.25" Horizontal and Vertical
Support of Excavation Soldier beam	0.50" (at top)	0.75" (at top)
	0.25" (at top bracing)*	0.50" (at top bracing)*
Support of Excavation Slurry Wall	0.25" (at top between supports)	0.5" (at top between supports)
	0.125" (at top bracing)*	0.375" (at top bracing)*
Support of Excavation Heel-block	0.125"÷	0.25"÷
Blast Vibration at WMATA Structure	Not applicable	2.0 inches per second (Peak Particle Velocity)
Shaft/Dome Relief Vault (Horizontal and Vertical)	0.125" (1/8") in any 25' length along shaft, but not to exceed a total of 0.25" from the existing location.	0.125" (1/8") in any 25' length along shaft, but not to exceed a total of 0.5" from the existing location.

Key

- * Displacement after bracing pre-loading.
- ÷ Horizontal displacement after pre-loading.

9.09 Contingency Plan and Corrective Action

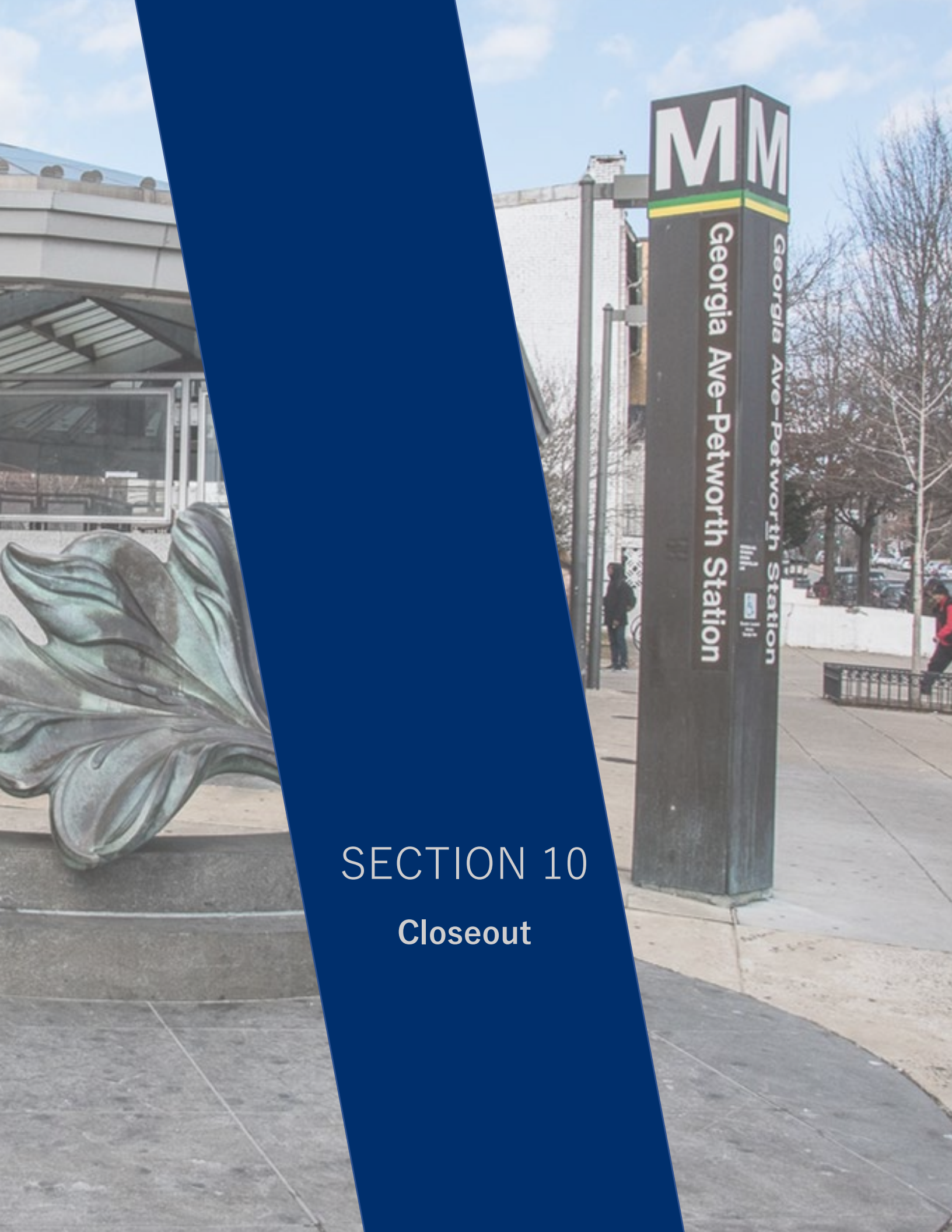
- A.** The need for implementing a contingency plan will be established by WMATA on a case-by-case basis. A contingency plan will be required for all major projects adjacent to an underground tunnel. Prior to commencing construction, the ODC shall submit a contingency plan with the details of the corrective action to be taken in case of an emergency involving the following:
1. Ground or structure movement exceeding the limits or threshold values.
 2. Cracking of concrete structures.

3. Excessive opening of joints, movement and translation of joints in tunnel liners.
- B. Settlement or horizontal movement of WMATA tunnels resulting from adjacent construction activity, or ring deformations in bored tunnels, shall not deviate from the pre-construction survey by more than the criteria specified in Table 9-1.
 - C. The corrective actions/measures necessary or the repairs necessary to WMATA structures due to the adjacent construction including excavation shall be the responsibility of the ODC.
 - D. Acceptance of the support of excavation system will be given when the monitoring and contingency plans have been reviewed and accepted by WMATA. Final WMATA acceptance of the support of excavation system shall be contingent on final acceptance of the monitoring and contingency plan.
 - E. Measures for Level 1 (Limit Values) - When the monitoring data reach or exceed Level 1 values, WMATA will be notified within 24 hours. The ODC will increase the frequency of monitoring to ascertain if a trend exists, as required by WMATA.
 - F. Measures for Level 2 (Remedial Action) - When the monitoring data reach or exceed Level 2 values, the ODC will immediately notify WMATA, stop all construction activities and implement the accepted contingency measures. When the readings have stabilized, construction work may be resumed with the acceptance of WMATA.
 - G. Examples of contingency measures to protect WMATA structures from deformation or change in condition are:
 1. Maintaining an adequate supply of structural steel at the job site to enable bracing of the support of excavation system at additional points and /or levels.
 2. Maintaining equipment on-site for compensation or compaction grouting to stop movement and stabilize the WMATA structure or track.
 3. Backfill as necessary.

9.10 ODC Monitoring Responsibilities

- A. The ODC has sole responsibility for providing monitoring until WMATA agrees in writing that monitoring may be terminated. The ODC is responsible for:

1. Requesting necessary site access and complying with access requirements for installation and continuous access to all monitoring instrumentation.
2. Furnishing, installing, protecting, and maintaining all equipment required for monitoring, including readout devices.
3. Collection, interpretation and storing of the monitoring data obtained. In addition to the requirements specified herein, the ODC is responsible during the course of the work to install, monitor and interpret additional instrumentation deemed necessary to ensure the safety of the public.
4. Certification and prompt submission of all monitoring data to WMATA as specified in the monitoring and contingency plans. When Level 1 or 2 values are achieved, reference Section 4.9 for the appropriate measures.
5. Promptly responding to threshold values specified herein or as accepted by WMATA and implementing agreed upon changes to construction.
6. When requested, providing safe access for WMATA representatives to all instrument locations. Safe access will include stopping work activities, temporary relocation of obstructing materials and equipment, provision of ladders, working platforms and hoisting services, and any other needs in the opinion of WMATA representatives are necessary to ensure safety. Furnish safety equipment including respirators and harnesses for use by WMATA representatives during site visits.
7. Restoration of areas affected by the monitoring program to the satisfaction of WMATA at completion of the work.
8. Installation of monitoring targets using epoxy or other methods. Disruption of substrate mounting surface is prohibited. Installation of monitoring targets in public areas and surfaces with architectural treatment must be specifically accepted by WMATA.



SECTION 10

Closeout

Section 10 – Closeout**10.01 Public Communication and Customer Impact Closeout**

- A.** The ODC shall be responsible for the collection of all public communication notices and takedown of any communication websites upon the termination of customer impact activities.
- B.** All WMATA property impacted by temporary construction measures shall be restored to pre-construction conditions prior to completion of the project.

10.02 Safety and Security Certification Program Plan Closeout

- A.** Steps 5-10 of the Safety and Security Certification Program, as defined in [Section 5.01](#), verify operational readiness of certified systems and equipment post-construction.
- B.** The ODC shall ensure that all items listed on the Operational Readiness Conformance Checklist are completed. Completion of the checklist shall ensure that plans, rules, procedures, and user manuals of new systems are prepared, that operational training has been completed, that emergency management training has been completed, and that all hazards have been eliminated or adequately controlled.
- C.** WMATA shall issue safety and security certification of applicable certifiable items once verification that all punch list items have been closed is complete.

10.03 Asset Management Turnover

- A.** The ODC shall ensure warranties of certifiable WMATA assets are valid.
- B.** WMATA requires the ODC to provide all spare parts unused from installation or original procurement of a certifiable asset to WMATA.
- C.** All operational and instructional manuals governing usage of certifiable WMATA assets shall be provided to WMATA as part of asset turnover.
- D.** The ODC shall adhere to the steps outlined in the WMATA-accepted asset management plan for asset turnover upon completion of the project. WMATA asset management program is detailed in [Section 5.03 – Asset Management](#).

10.04 As-Built Final Submission

- A.** ODC shall submit one set of as-built prints (using WMATA's As-Built Documentation Format ([Appendix C](#)) when indicated by the WMATA Document Configuration team) not later than two (2) weeks after final WMATA acceptance of the work.
- B.** Submitted as-built prints shall be reviewed by WMATA for final acceptance and comments returned if applicable. Final as-built prints and as-built models with CADD files shall be submitted to WMATA for recordkeeping after implementation of review feedback.
- C.** Completed as-built drawings shall bear the signature of an officer of the ODC's organization, certifying compliance with as-built conditions, using a rubber stamp to the effect of:

AS BUILT

Date

I certify that this drawing accurately depicts the work as constructed

Signed - Officer of the Developer / Contractor

Developer / Contractor's Printed Name and Company

- D.** As-builts shall be signed and sealed by a Professional Engineer, licensed to practice in the jurisdiction where the work was performed. Final as-built records submitted to WMATA shall be formatted as follows:
 - 1.** Submit two (2) CDs with the individual drawing as-built files to WMATA in PDF (portable document format) and CADD formats in accordance with WMATA's current CADD/BIM Standards.
 - 2.** ODC shall update the WMATA electronic as-built files, where the ODC project has modified WMATA facilities, if applicable.

3. Submit one (1) hard copy of 1/2-size as-built documents to WMATA. These records are to be signed and certified by the engineer of record as “as-built”.

10.05 Final Testing, Commissioning, and Training

- A. When indicated, the ODC must comply with applicable WMATA standard specifications for commissioning of new systems provided by the JDAC project team.
- B. The ODC shall be responsible for conducting training on newly installed systems/procedures when required for WMATA personnel and to turnover all training materials.
- C. WMATA shall only provide final acceptance of work after completion and certification of applicable post-construction testing as noted in [Section 4](#).

10.06 Installation Certification

- A. The ODC shall provide written certification that designs, installations, and monitoring are completed and implemented per accepted drawings and plans.

10.07 Project Debrief and Closeout Meeting

- A. Upon completion of every project, JDAC shall hold a project closeout meeting with the JDAC project team as a post-mortem debrief to optimize JDAC processes and collect lessons learned.
- B. The ODC shall be invited to the closeout meeting to share feedback on the project and the program. Attendance is highly encouraged.
- C. At any time, feedback may be submitted to JDAC through acpmfeedback@wmata.com.

10.08 Closeout of Project

- A. The ODC is responsible for coordinating any required certifications with local jurisdictions and/or other agencies.
- B. The ODC shall contact WMATA CE and CIF once all engineering, field support, and interface functions are completed within the WMATA ZOI.

- C.** WMATA and the ODC shall perform a final site walk and develop a closeout punch list of pending open items.
- D.** The ODC shall request and complete a project completion form for signature. The ODC shall verify that all punch list items are closed and all financial obligations are met prior to accepting and signing the project completion form.
- E.** Upon completion and acceptance of the project completion form, WMATA will issue a project completion letter to the ODC representing technical, fiscal, and administrative closeout of the project.

REFERENCES AND APPENDICES



Applicable References

WMATA Standards

Item	Last Updated	Purpose	Location
Manual of Design Criteria	08/2014	Design guidelines governing WMATA facilities	www.wmata.com
Standard Specifications		Standard specifications regarding WMATA facilities	www.wmata.com
Standard Drawings		Standard drawings and details of WMATA facilities and design components	Available upon request
Public Participation Plan	2020-2023	Collection of information regarding WMATA's effort to communicate work activity with the public	www.wmata.com
Track Inspection and Safety Standards (TRST-1000)	03/16/2021	Definition of minimum standards to which all tracks must be maintained for the safe and efficient operation of heavy rail rapid transit trains	Available upon request
Manual of Technical Specifications and Requirements for Survey Services		WMATA surveying and monitoring standards and requirements applicable to adjacent construction projects	Available upon request
Metrorail Operating Rulebook	09/01/2023	Inter-departmental collection of SOPs and best practices regarding safety on the rail system.	Available upon request
Construction Safety and Environmental Manual	03/2013	Establishes WMATA specific safety procedures and activities for certain activities.	www.wmata.com
SOP TAMO-PRO-P02-00		Establishes WMATA procedures regarding asset management.	Available upon request
Regulations Concerning the Use of WMATA Property	11/2018	Board-approved regulations governing the use by others of WMATA property	www.wmata.com
Metrorail Emergency Response Maps		Maps detailing emergency details and emergency evacuation routes for WMATA facilities	Available upon request
WMATA Language Assistance Plan	10/2017	Plan detailing WMATA language assistance program	www.wmata.com

Safety and Security Certification Program Plan	03/2023	Plan detailing WMATA's approach to system safety and security of certifiable assets	www.wmata.com
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External Sources, Manuals, Guides, and Standards

Item	Author	Location
49 C.F.R. Part 37 Transportation Service for Individuals with Disabilities	US DOT	Available from www.transit.dot.gov
FTA ADA Circular C 4710.1	US DOT	Available from www.transit.dot.gov
Transit Noise and Vibration Impact Assessment Manual	US DOT	Available from www.transit.dot.gov
2010 ADA Standards	US DOJ	Available from www.ada.gov
2006 ADA Accessibility Guidelines	US DOT	Available from www.access-board.gov
US Navy Design Manual 7.02 Foundations and Earth Structures	NAVFAC	Available upon request
NFPA 70 – National Electrical Code	NFPA	Available from www.catalog.nfpa.org
NFPA 72 – National Fire Alarm and Signaling Code	NFPA	Available from www.catalog.nfpa.org
AISC Steel Construction Manual	AISC	Available from retailer
Foundation Analysis and Design	Ralph B. Peck, Walter E. Hanson, Thomas H. Thornburn	Available from retailer
Foundation Engineering	Joseph E. Bowles	Available from retailer
SEI/ASCE Code 37-02	ASCE	Available from www.asce.org
AASHTO H-25	AASHTO	Available from retailer
USACE Engineering and Design - Blasting	USACE	Available from www.publications.usace.army.mil
Institute for Electrical and Electronics Engineers Std 80-2000 Guide for Safety in Substation Grounding	IEEE	Available from www.standards.ieee.org
Building Industry Consulting Service International (BICSI) standards & codes	BICSI	Available from www.bicsi.org

Appendix A – Forms, Applications, and Reports

JDAC Documents Index

Item	Purpose	Location
Adjacent Construction Project Flowchart	Provides birds-eye-view of the project lifecycle.	https://www.wmata.com/business/adjacent-construction/index.cfm
WMATA Joint Development / Adjacent Construction Workshop	Provides significant background information about the purpose, workflow, and extent of the JDAC program.	https://www.wmata.com/business/adjacent-construction/index.cfm
Typical WMATA Design & Coordination Checklist	Used by the ODC to track project health and compliance with WMATA requirements.	https://www.wmata.com/business/adjacent-construction/index.cfm
JDAC Document Request Form	Used by the ODC to request as-built drawings or other pertinent information about WMATA facilities.	https://www.wmata.com/business/adjacent-construction/index.cfm
JDAC Daily Support Tracking Form	Used to track WMATA support each day support is given.	https://www.wmata.com/business/adjacent-construction/index.cfm
JDAC Support Request Form	Used by the ODC to request JDAC support for construction activity.	https://www.wmata.com/business/adjacent-construction/index.cfm
Site Specific Work Plan Template	Template used for development of the SSWP.	https://www.wmata.com/business/adjacent-construction/index.cfm
Consumer Authorization for Release of Personal Information	Used by ODC personnel to authorize background check as part of the badging process.	Request from assigned CE or JDAC@wmata.com
OneBadge Request and Renewal Form	Used by ODC personnel to provide WMATA with needed information for badging.	Request from assigned CE or JDAC@wmata.com
Real Estate Permit Application	Used by the ODC to apply for WMATA real estate use, either temporary or permanent.	Request from assigned CE or JDAC@wmata.com
Project Completion Form	Used by JDAC to signify final completion of a project and overall closeout after all project items have been completed.	Issued by JDAC upon final completion of the project

Typical WMATA Design & Coordination Checklist (for Applicant's Use)**PROJECT Control No.** _____**Phase 1 – Inquiries & Initialization:**

- ☐ Initial inquiry sent to JDAC@wmata.com including initial review documents
- ☐ Impact determined
- ☐ Project Control Number established for proposed project by WMATA (All documents shall reference project number.)
- ☐ Reviewed WMATA's Adjacent Construction Project Manual (ACPM)
- ☐ Reviewed WMATA's Construction Safety & Environmental Manual
- ☐ Submitted Document Request Form & Consumer Authorization for Release of Personal Information Form
- ☐ Received and reviewed any WMATA applicable reference material (as-builts, right-of-way plans, etc.)
- ☐ Introductory meeting held
- ☐ Agreement executed
- ☐ Fulfillment of Letter Agreement invoice

Phase 2 - Design & Plan Review:

- ☐ Project Impact Statement completed
- ☐ Bus Impacts
- ☐ Sections showing foundations and WMATA structures
- ☐ Site Plan (detailing impact to WMATA with easements provided)
- ☐ Pertinent drawing/Zone of Influence diagram provided detailing level of impact on WMATA facilities
- ☐ Sheeting and shoring drawings
- ☐ Drainage area map(s) with calculations
- ☐ Architectural drawings
- ☐ Civil drawings
- ☐ Electrical drawings/photometric studies (as applicable)
- ☐ Support of Excavation design plans
- ☐ Structural drawings/calculations
- ☐ Column load tables
- ☐ Geotechnical report
- ☐ Finite element analysis
- ☐ Structural monitoring and contingency plans
- ☐ Blasting plan
- ☐ Demolition plan
- ☐ Public Communication Plan
- ☐ Safety and Security Certification Plan
- ☐ Asset Management Plan
- ☐ Shop Drawings

- ☐ Construction schedule/sequence plan identifying specific WMATA impact
- ☐ Construction layout of equipment relative to WMATA's right-of-way/roadway
- ☐ Equipment certifications for equipment working in WMATA's Zone of Influence
- ☐ Temporary safety plans and measures
- ☐ Structural monitoring and contingency plans
- ☐ All drawings/calculations signed and sealed
- ☐ JDAC given acceptance of all work plans and designs

Phase 3 - Pre-Construction:

- ☐ Permanent easement/utility easement w/ plat and metes and bounds of prospective property
- ☐ Submit Real Estate Permit Application
- ☐ Certification for Issuance of METRO SmarTrip Contractor Badge
- ☐ Safety training course required
- ☐ Site Specific Work Plan completed and submitted
- ☐ Submit JDAC Support Request Form
- ☐ JDAC Daily Support Tracking Form
- ☐ Indemnification /certification of insurance requirements
- ☐ Other local jurisdictional approvals/permits are obtained and forwarded
- ☐ Real Estate Permit Executed
- ☐ Operational support arrangement(s)
- ☐ Pre-construction meeting with WMATA's Construction Inspection Facilitator

Phase 4 – Construction:

- ☐ Pre-construction survey requirement met
- ☐ Boundary survey tie-in to WMATA coordinate system
- ☐ Coordination with WMATA's Office of Bus Planning for construction impact
- ☐ Locate any WMATA monumentation. Coordinate relocation/replacement with WMATA Survey Office.
- ☐ Utility location/identification and protection
- ☐ WMATA field contact(s) information and communication chain established
- ☐ Monitoring readings and monitoring reports performed & prepared according to monitoring and contingency plan
- ☐ Pre-Activity Meetings held as-needed
- ☐ JDAC Support Requests as-needed
- ☐ Installation, inspection, and testing activities as-needed
- ☐ Contact maintained with CIF for field oversight and support
- ☐ Request made to suspend monitoring activity
- ☐ Post-construction survey requirement met

Phase 5 - Closeout:

- ☐ Final site walk/Punch list development

- ☐ As-Built requirement(s) met
- ☐ Project financial items closed
- ☐ Other requirement(s) provided _____

Phase 6 – Maintenance and Repairs:

- ☐ Maintenance and repair structure discussed and implemented

NOTE: This list is provided as a suggested reference for requirements which may be imposed on an Owner/Developer/Contractor in coordinating and developing their construction plans which may or may not impact WMATA facilities. Under no circumstance is there a guarantee that construction plans will be expedited for review and acceptance. Planning, scheduling and coordination of the adjacent developer/contractors' project is at his/her sole expense and responsibility.

Appendix B – Example Submittal Documents

Example Site Specific Work Plan Template

SSWP Summary

SSWP Number: **Project Start Date & Time:**

Revision Number: **Project End Date & Time:**

SSWP Status: **Date Created:**

Expiration Date:

Title: (PCN Number and Title):

Summary Statement: (Example: K01 – JDAC 251xxx Monitoring of tunnel adjacent to 725 15th St. by ABC Inc.)

SSWP Summary/Distribution

Requested From: (Contractor and contractor representative submitting this SSWP)

Contract/Project Number: (PCN Number)

Project Manager:

Work: Work 2:

Cell: Home:

Distribution:

Description of Work (Work Plan):

Purpose:
(Type as much as necessary)

Scope of Work
(Provide details. Type as much as needed)

Location:

Location: (Wayside, Non-Wayside, Other)

Location Type: (Station, Electrical Rooms, Comm Rooms, etc)

Track Access: ☐ Yes ☐ No

	From Chain Marker:	To Chain Marker:
Track 1		
Track 2		
Track 3		
Yard Lead		

Station: (Ex. Van Ness/UDC Station Traction Power Substation)

Power Outage: (Supervisory, Red Tag, None)

Project Dates/Support/Equipment:

Project Start Date:

Proposed Work Start Date & Time:

Project End Date:

Proposed Work End Date & Time:

Equipment:

Staging:

ESCORT Group

Crew Size

TRST/STR
SMNT/PWR
SMNT/COMM
PLNT
ELES
Other:

Safety Plan:**Safety Plan:**

1. The contractor shall comply with all applicable WMATA safety procedures – No smoking is allowed within WMATA facilities and/or 25 feet from WMATA property. The contractor is required to provide a Job Hazard Analysis with all SSWPs.
2. All contractor personnel will be in possession of a Valid WMATA-Issued ID card. (Dependent on work activity RWP training may be required.)
3. A list of emergency phone numbers will be provided for all contractor supervisory personnel for WMATA use if needed in an emergency. WMATA's phone numbers will also be included on this list.
4. Review meetings will be held on a regular basis to discuss the upcoming elements of the work plan and place an emphasis on safety.

5. A tool box talk specifically written for the type of work being performed will be given to workers before each shift to review the work plan and other activities.
6. WMATA crew support personnel will be given an opportunity during the safety briefing at the beginning of each shift to explain and review WMATA procedures and safety requirements.
7. The following types of information, as applicable, will be kept by the contractor's onsite representative for reference by involved parties:
 - Installation Drawings
 - This site specific work plan (SSWP)
 - Emergency Telephone numbers for WMATA
 - Emergency Telephone numbers for all contractor supervisory personnel
 - Schedule of the Installation
8. (Add additional items as necessary for the specific work involved)

PPE and Other Safety Equipment:

RWPT badge, hard hats, safety vests, work boots, eye protection, flash lights (Add additional items as necessary for the work involved)

Work Activity Schedule:**Activity Name:****Start Date:****End Date:****Person/Dept:****Work Location:****Locations:****Critical Milestones:****Contingency Plans:**

(Add additional activities using the same format as above)

Workside Contacts:**Date/Hours:****Name:****Organization:****Title:****Phone:****Work
Phone:****Cell
Phone:****Email:****Supporting Documents: (List all attachments in support of this work)****Title:****Description:****Location:****Contact:****Contact Information:**

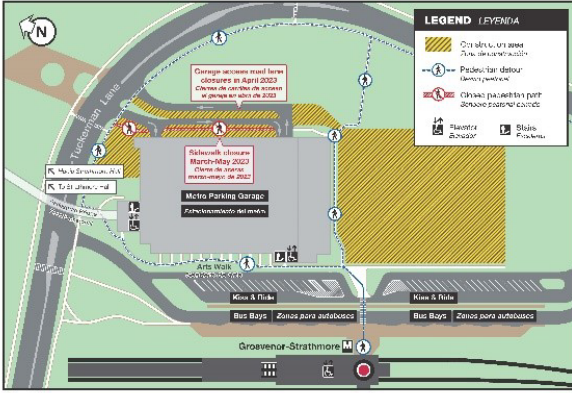
Example Public Communication Signage


CONSTRUCTION NOTICE
 Effective: March-May 2023


AVISO DE CONSTRUCCIÓN
 Duración: marzo-mayo de 2023

Grosvenor-Strathmore Metro Station Sidewalk and Lane Closures

Cierres de aceras y carriles en la estación de Metro de Grosvenor-Strathmore



 Two traffic lanes into the parking garage will be temporarily closed in April 2023. The parking garage will remain open and accessible.
En abril de 2023 se cerrarán temporalmente dos carriles de acceso al garaje de estacionamiento. El mismo permanecerá abierto y accesible.

 The garage access sidewalk will be temporarily closed from March to May 2023. Pedestrian detours will be in place.
La acera de acceso al garaje se cerrará temporalmente de marzo a mayo de 2023. Se realizarán desvíos peatonales.

 Be prepared for detours throughout construction. For your safety, stay clear of the construction zone and follow all posted signs.
Prepárese para los desvíos durante la construcción. Por su seguridad, aléjese de la zona de construcción y siga todas las señalizaciones.

 Please call 240-372-0275 with questions
Lláme al 240-372-0275 si tiene preguntas

Whiting-Turner
 6305 Ivy Ln Ste 800,
 Greenbelt, MD 20770



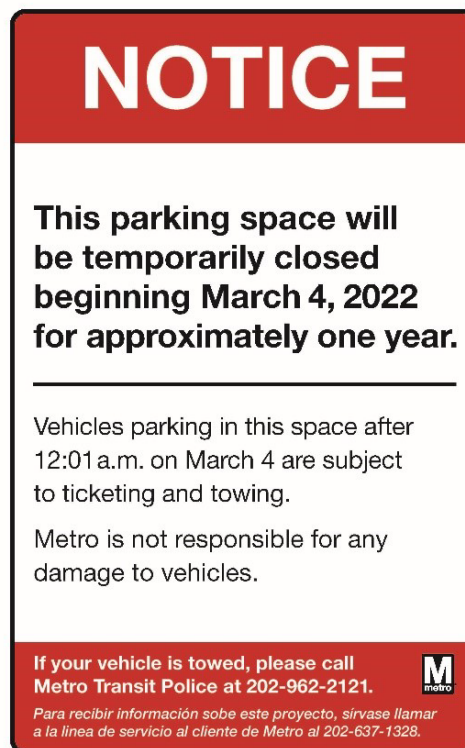
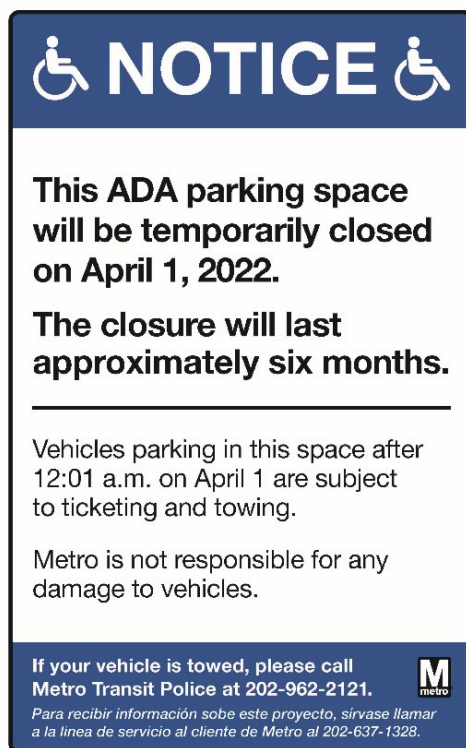
Example Banner style notification signage



Example A-Frame style notification sign



Example A-Frame style notification signage



Example notification of parking closures



*Example detour informational signage***Sample Movement Detection Report Cover Sheet**

Title: "SESSION 29" Movement Detection Survey of a Line (Shady Grove Route) Abutment A4027, Piers A4035, A4045, A4055, Girders Ar4031, Al4031 and Ground Monitoring Points

WMATA adjacent construction contract (name) WSSC water tunnel under A line at Station 521+25 and (contract number) 254178.

This movement detection survey is being performed by "DEF Survey Firm" on behalf of the WSSC. Technical questions about this report can be directed to:

Mr. Professional
Professional@DEF.com
Office 202-894-1234
Fax 202-894-4321
DEF Survey Firm
125 Main St.
Washington, DC 20001

"Session 29" movement detection survey was performed on 11/04/22 at 8 AM and the next scheduled observation date is 11/07/22 at 8 AM.

All optical and robotic survey instrument observations were performed by Mr. BP Point and Ms. Accurate. Geotechnical instrument readings were obtained by remote communication link to the DEF Survey Firm office by Ms. Geotech.

Please note, ground monitoring point GMP-3 shows the greatest observed horizontal movement of 0.5". GMP-3 is on the east side of the WMATA track embankment and was installed 1/28/22. Another ground monitoring point, GMP-1 located on the west side of the WMATA track embankment shows horizontal movement of 0.4".

One other ground monitoring point PMP-4 located on the north (CSX) side of the WMATA track embankment that was installed on 8/6/08 is also showing horizontal movement of 0.4". If the movement observed on PMP-4 continues at its present rate, then predicted movement of approximately X.X" might be expected over a X month period.

Additional movement at abutment monitoring points MP-7 and MP-8 is noted since Session 28 observations were made on 10/23/22.

Please note - 3.5 inches of rain fall was recorded at a nearby weather station on 10/25/22.

A graphical representation showing direction and magnitude of observed movement of all monitoring points to date is shown as page 2 of 17.

Spreadsheets showing results of all monitoring sessions 1 through 29 are shown as pages 3-16 of 17.

Survey instrument accuracy, equipment description and procedures used for this survey is provided as page 17 of 17.

Sample Movement Detection Report Summary

of survey instrument and accuracy, survey and or geotechnical equipment description, and survey procedures

Survey Instrument and Accuracy:

Since 27-Dec-2022 a Leica Nova TM60 (SN:238826) robotic instrument was used which has a horizontal and vertical angle measurement accuracy of 0.5" standard deviation ISO 17123-3 and an EDM accuracy of 0.6mm + 1.0 ppm standard deviation ISO 17123-4.

Survey Equipment Description:

LEICA Nova TM60 is a robotic total station which consists of precision angle measurement systems that provide instant horizontal and vertical circle readings. The instrument automatically corrects for any out of level condition by use of a centrally located twin-axis compensator. This instrument has a coaxial EDM and uses an infrared laser to measure distances to monitoring prisms.

All prisms used in this survey are permanently mounted Leica GMP104 L-Bar Monitoring Mini Prism, Part No: 641762. The GMP104 Mini Prism is fixed in a metal housing providing a precise monitoring target.

Survey Procedures:

The survey instrument is set on a permanently mounted forced centered bracket (point P1) outside the ZOI. The instrument is run through an on-board collimation check prior to starting the observations. The instrument is initialized in its robotic mode and performs a backsight check on three permanently mounted mini prisms which are also outside the ZOI (points BA1, BA2 and BA3).

The HI of the instrument is established by "bucking in" a Leica NA-2 automatic differential level into the vertical axis of the robotic instrument as marked on the side of the instrument by the manufacturer. Differential elevations are transferred from a known WMATA benchmark (A-652) located outside the ZOI.

Once a backsight check is performed, the instrument begins making observations to all movement detection mini prisms which are also permanently mounted. Observations consist of 8 sets of direct and reverse angle and distance measurements to each of the foresight prisms. The data from these observations are reduced to one mean horizontal and vertical angle and slope distance per foresight point and is then used to compute a north and east coordinate with elevation. The coordinate from the current observation is compared with the initial coordinate observation to compute the difference and is then organized in the accompanying report.

Sample Instrumentation details and accuracy

Leica Nova TM60 Monitoring Station

ANGLE MEASUREMENT

Accuracy ¹ Hz and V	■ Absolute, continuous, quadruple	0.5" (0.15 mgon) or 1" (0.3 mgon)
--------------------------------	-----------------------------------	-----------------------------------

DISTANCE MEASUREMENT

Range ²	■ Prism (GPR1, GPH1P) ³ ■ Non-Prism / Any surface ⁴	0.9 m to 3,500 m 0.9 m to >1,000 m
Accuracy / Measurement time	■ Single (prism) ^{2,5} ■ Single (any surface) ^{2,4,5,6}	0.6 mm + 1 ppm / typ. 2.4 s 2 mm + 2 ppm / typ. 2 s ⁹
Laser dot size	At 50 m	8 mm x 20 mm
Measurement technology	System analyser	Coaxial, visible red laser

IMAGING⁷

Overview and telescope camera	■ Sensor ■ Field of view (overview / telescope) ■ Frame rate	5 megapixel CMOS sensor 19.4° / 1.5° Up to 20 frames per second
-------------------------------	--	---

MOTORISATION

Direct drives based on Piezo technology	Rotation speed / Time to change face	Maximum 200 gon (180°) per s / typically 2.9 s
---	--------------------------------------	--

AUTOMATIC AIMING - LONG RANGE ATRplus

Target aiming range ²	■ Circular prism (GPR1, GPH1P) ■ 360° prism (GRZ4, GRZ122)	■ 3,000 m ■ 1,500 m
Accuracy ^{1,2} / Measurement time	ATRplus angle accuracy Hz, V	0.5" (0.15 mgon) or 1" (0.3 mgon) / typically 3-4 s

GENERAL

Operating System / Field Software	Windows EC7 / Leica Captivate with apps	
Processor	TI OMAP4430 1GHz Dual-core ARM® Cortex™- A9 MPCore™	
Autofocus ⁸ telescope	Magnification / Focus Range	30 x / 1.7m to infinity
Display and keyboard	5" (inch), WVGA, colour, touch, Face 1 standard, Face 2 optional	37 keys, illumination
Operation	3x endless drives, 1x Servofocus drive, 2x Autofocus keys ⁸ , user-definable SmartKey	
Power management	Exchangeable Lithium-Ion battery with internal charging capability	Operating Time up to 9 h
Data storage	■ Internal memory ■ Memory card	2 GB SD card 1 GB or 8 GB
Interfaces	RS232, USB, Bluetooth®, WLAN	
Weight	Total station including battery	7.2 kg
Environmental specifications	■ Working temperature range ■ Dust & Water (IEC 60529) / Blowing rain ■ Humidity	-20°C to +50°C IP65 / MIL-STD-810G, Method 506.5-I 95%, non-condensing

¹ Standard deviation ISO 17123-3² Overcast, no haze, visibility about 40 km, no heat shimmer³ 0.9 m to 2,000 m for 360° prisms (GRZ4, GRZ122)⁴ Object in shade, sky overcast, Kodak Gray Card (90% reflective)⁵ Standard deviation ISO 17123-4⁶ Distance > 500 m: Accuracy 4 mm + 2 ppm, Measurement Time typ. 6 s⁷ Available on TM60 I models⁸ Autofocus for TM60 I models, Servofocus only for TM60 models⁹ Up to 50 m, max. measurement time 15 s for full range

Laser radiation, avoid direct eye exposure.
Class 3R laser product in accordance with IEC 60825-1:2014.

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Integrate with LOC8 – Lock & Locate

For more information visit: leica-geosystems.com/LOC8

Leica Geosystems AG
Heinrich-Wild-Strasse
9435 Heerbrugg, Switzerland
+41 71 727 31 31

- when it has to be **right**

Leica
Geosystems

*WMATA does not endorse any particular vendor for monitoring equipment use; the above sheet is an example

Monitoring Plan Instrumentation Checklist

Total station instrument type (circle one): conventional total station robotic total station

Total station manufacturer and model: _____

Instrument angle accuracy (circle one): .5" 1" 2" 3"

Instrument EDM accuracy (circle one): 1 mm 2 mm 3 mm (fill in) ppm +/- _____

Dual compensator (circle one): yes no

Instrument and tribrach centering accuracy (circle one): 1 mm 2 mm 3 mm

Instrument location (circle one): forced centered platform tripod

Monitoring prism type (circle all that apply):	stick on target	model # _____
	mini 360	model # _____
	full size 360	model # _____
	mini circular	model # _____
	full size circular	model # _____

Level instrument type (circle one): automatic level digital level

Level instrument manufacturer and model: _____

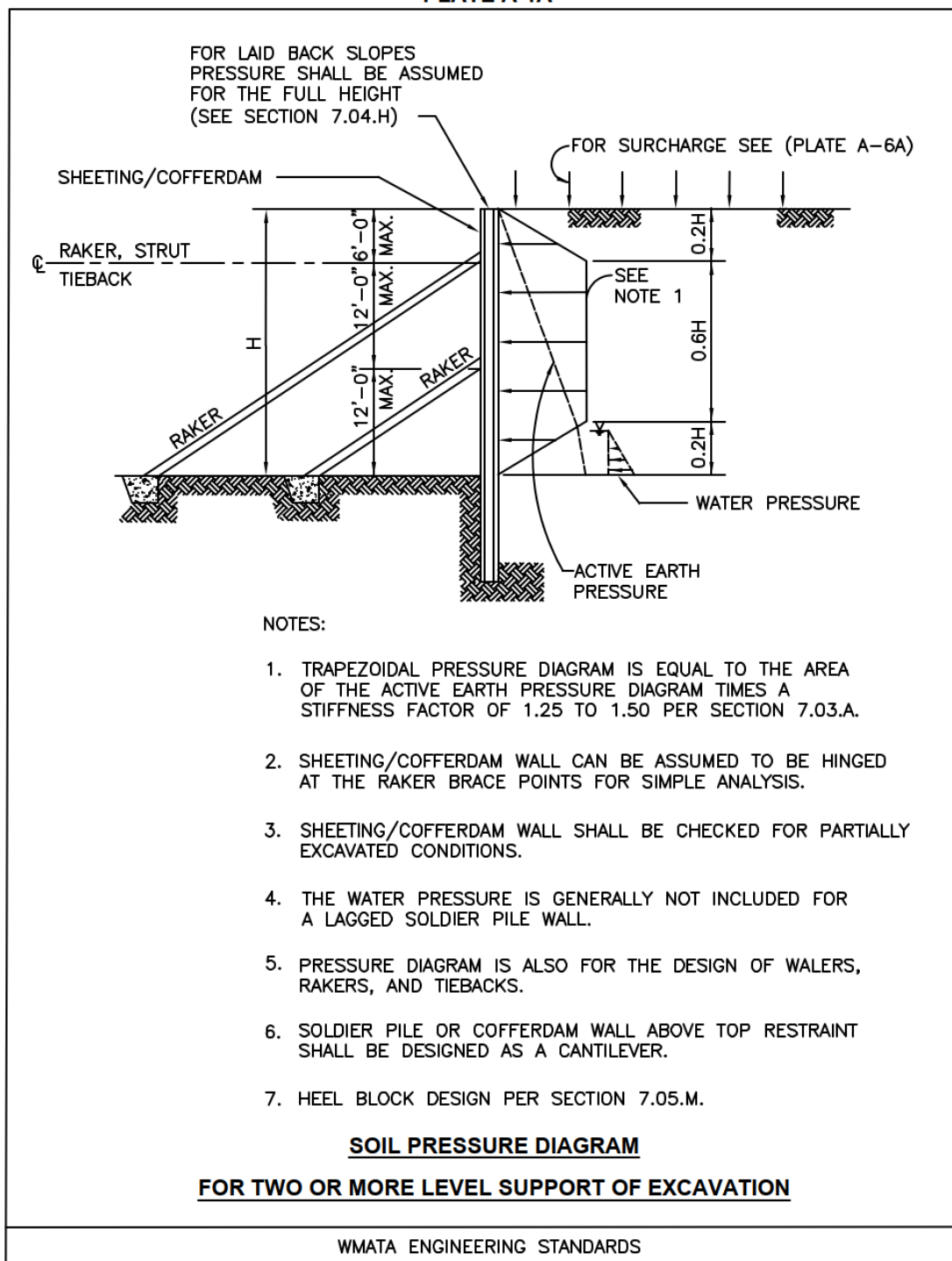
Level rod type (circle all that apply):	invar without struts	model # _____
	invar without struts	model # _____
	semi-precise single piece	model # _____
	semi-precise sectional	model # _____
	semi-precise folding	model # _____

Description of other monitoring equipment:

Appendix C – Plate Diagrams and Design Criteria

Plate A-1A: Soil Pressure Diagram for Two or More Level Support of Excavation

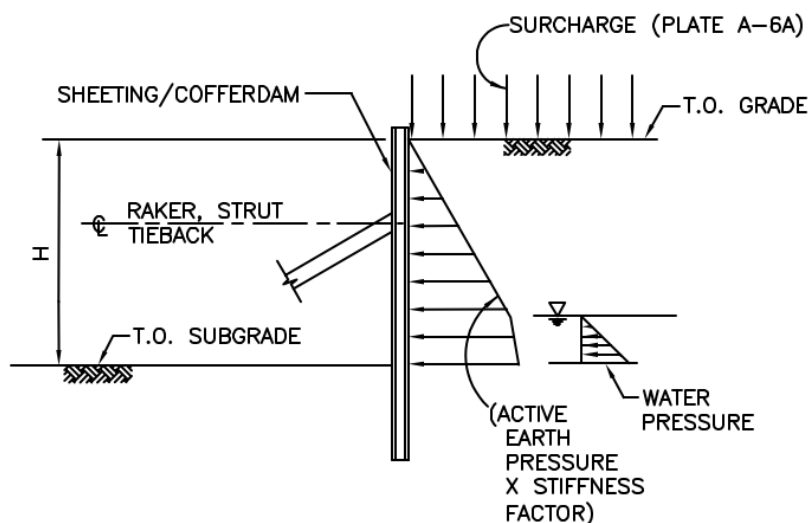
PLATE A-1A



APPENDIX-C

Plate A-1B: Soil Pressure Diagram for Cantilever and for One Level Support of Excavation

PLATE A-1B



NOTES:

1. STIFFNESS FACTOR OF 1.25 OR 1.50 SHALL BE USED PER SECTION 7.03.A.
2. SHEETING/COFFERDAM WALL SHALL BE CHECKED FOR PARTIALLY EXCAVATED CONDITION.
3. THE WATER PRESSURE IS GENERALLY NOT INCLUDED FOR A LAGGED SOLDIER PILE WALL.
4. PRESSURE DIAGRAM IS ALSO FOR THE DESIGN OF WALERS, STRUTS, RAKERS, AND TIEBACKS, FOR ONE LEVEL OF SUPPORT FOR THE EXCAVATION SUPPORT SYSTEM.
5. THE MAXIMUM DEPTH OF CANTILEVER SUPPORT SYSTEM SHALL NOT EXCEED 7 FEET. FOR THE CANTILEVER SUPPORT SYSTEM THE EMBEDDED DEPTH OF THE TOE SHALL BE TAKEN AS 1.3 X THEORETICAL EMBEDDED DEPTH REQUIRED.
6. FOR LAID BACK SLOPES SEE SECTION 7.04.H.
7. ASSUMPTION OF A HINGE POINT, AT OR BELOW SUBGRADE, SHOULD NOT BE USED IN THIS CASE WHERE A SINGLE EXTERNAL SUPPORT IS USED, UNLESS OTHERWISE APPROVED BY WMATA.

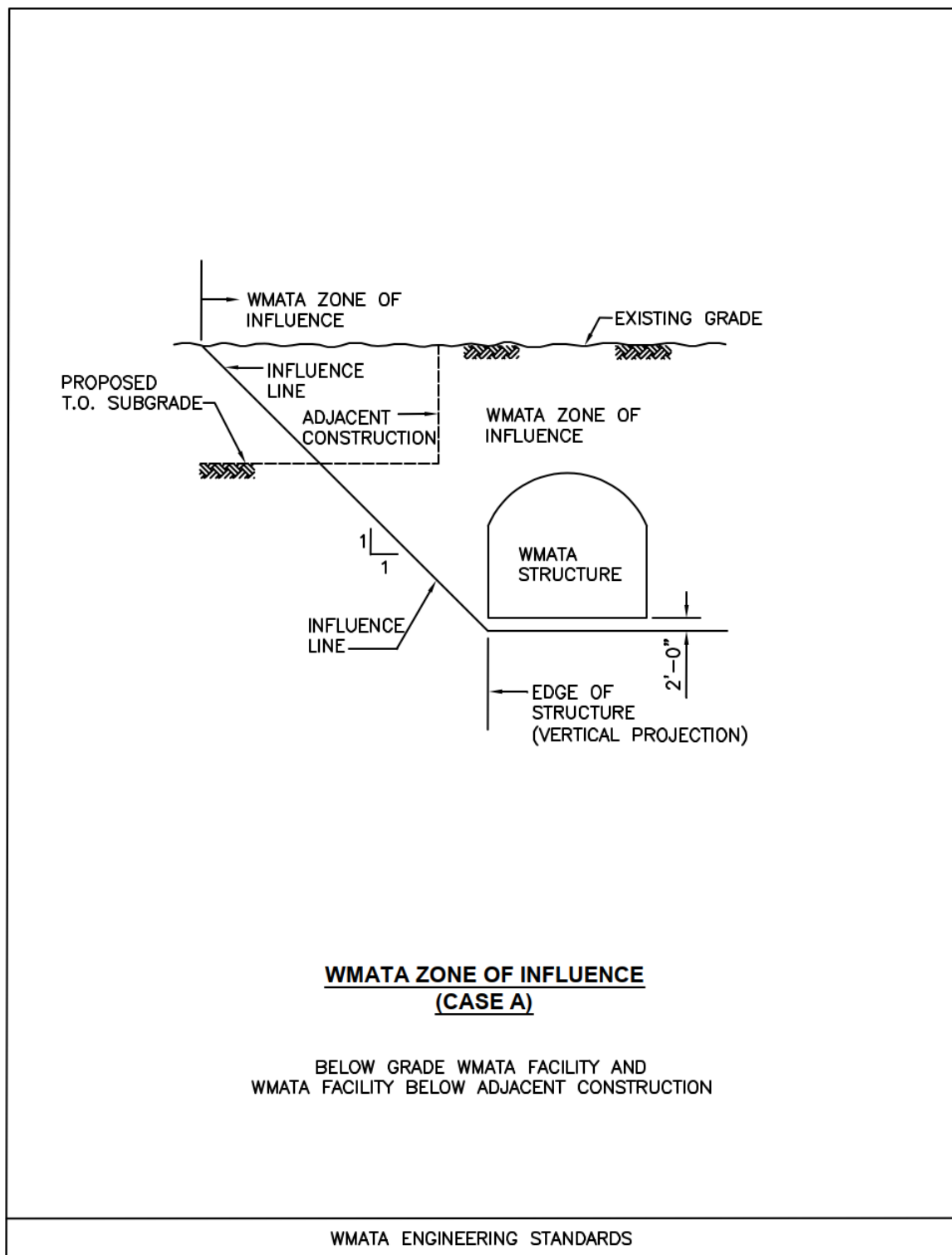
SOIL PRESSURE DIAGRAM
FOR CANTILEVER AND FOR ONE LEVEL SUPPORT OF EXCAVATION

WMATA ENGINEERING STANDARDS

APPENDIX-C

Plate A-2A: WMATA Zone of Influence (Case A)

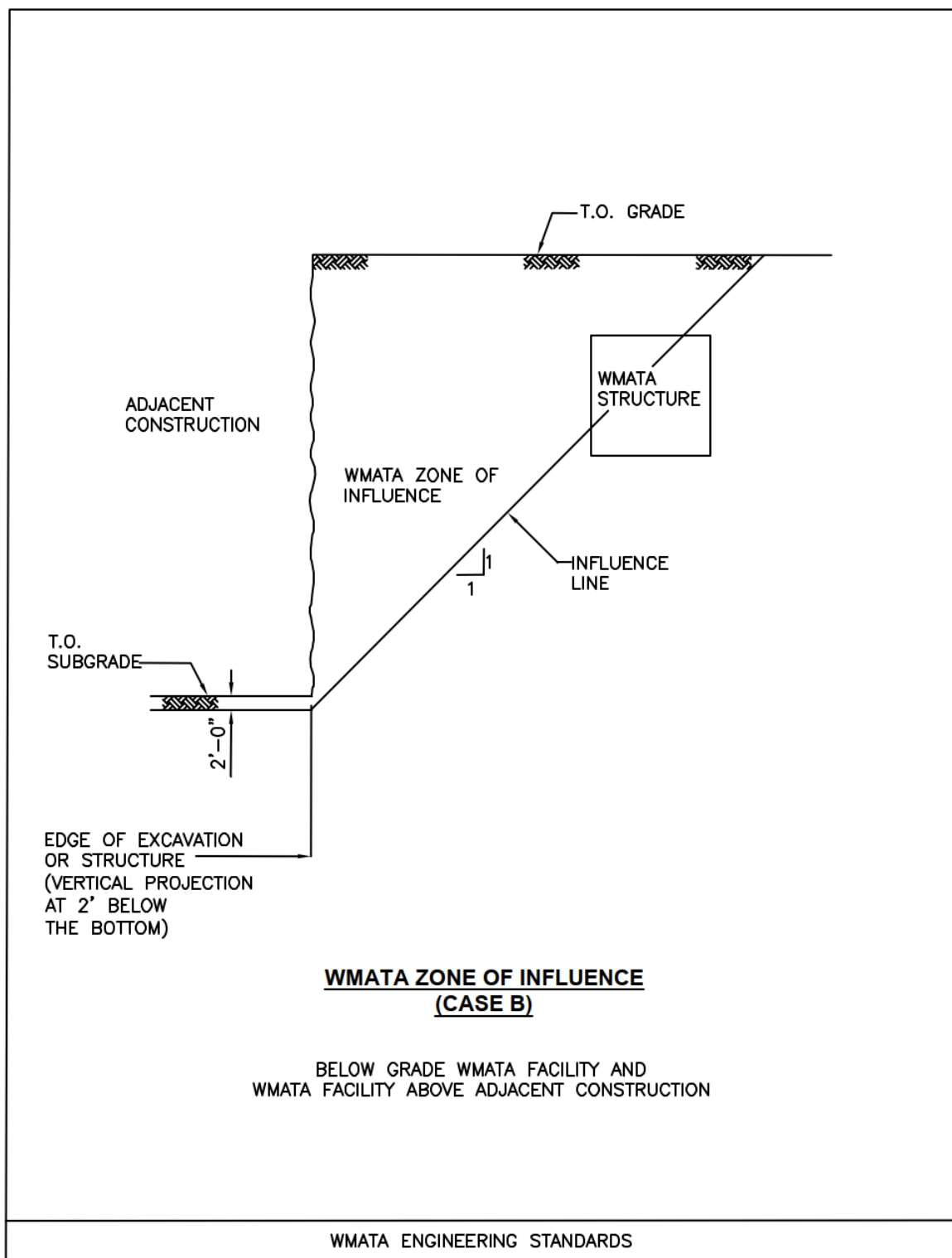
PLATE A-2A



APPENDIX-C

Plate A-2B: WMATA Zone of Influence (Case B)

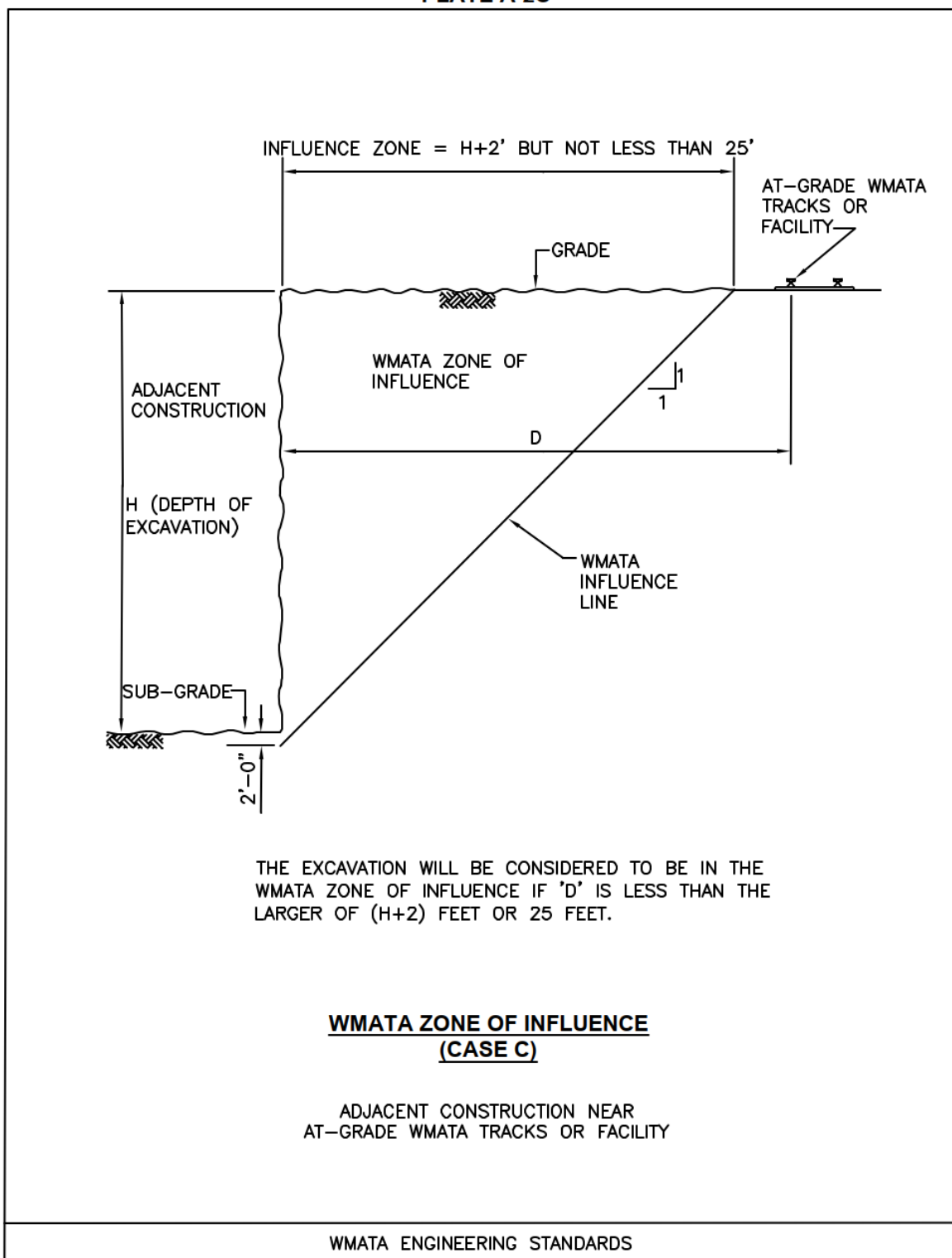
PLATE A-2B



APPENDIX-C

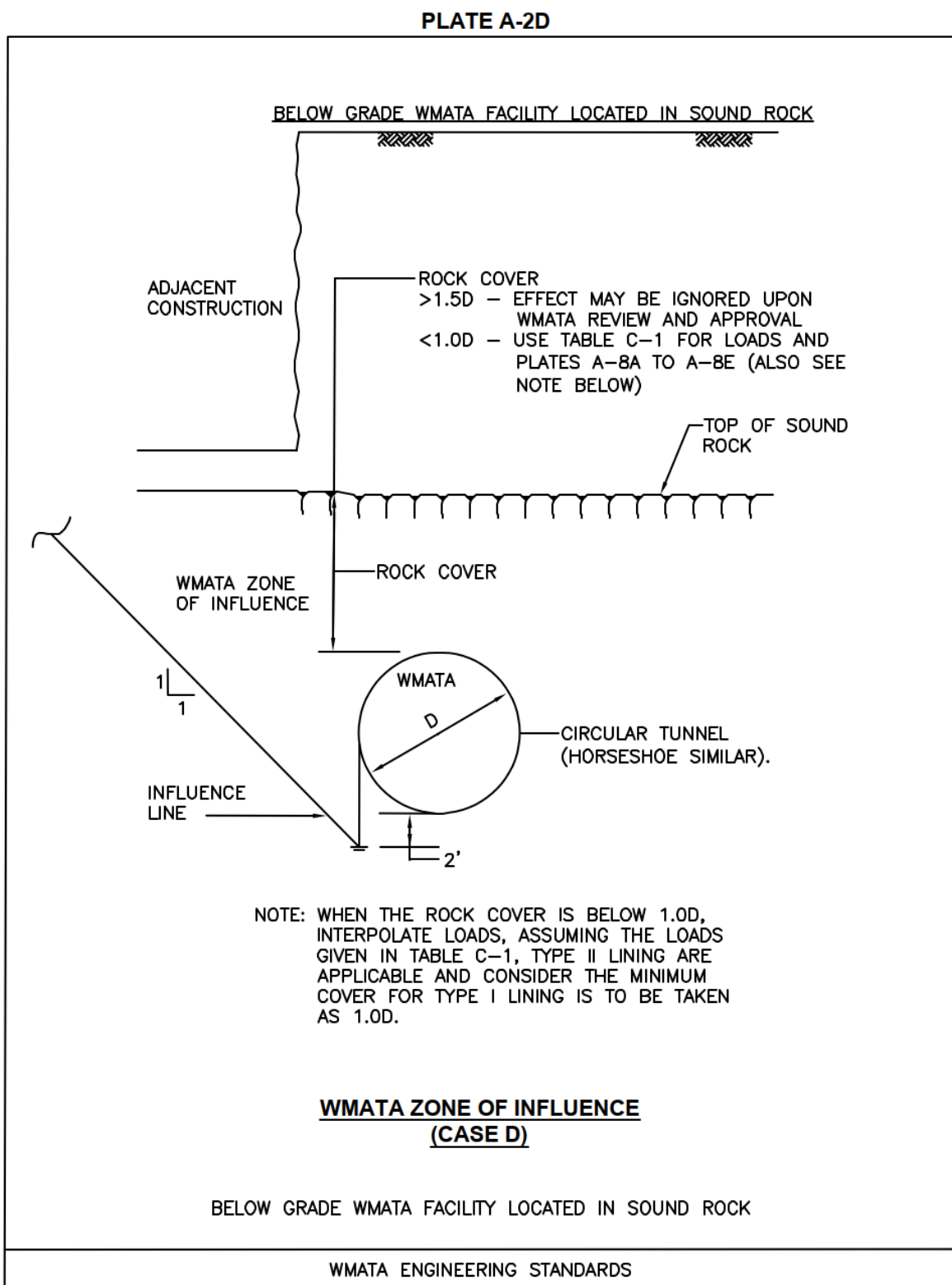
Plate A-2C: WMATA Zone of Influence (Case C)

PLATE A-2C



APPENDIX-C

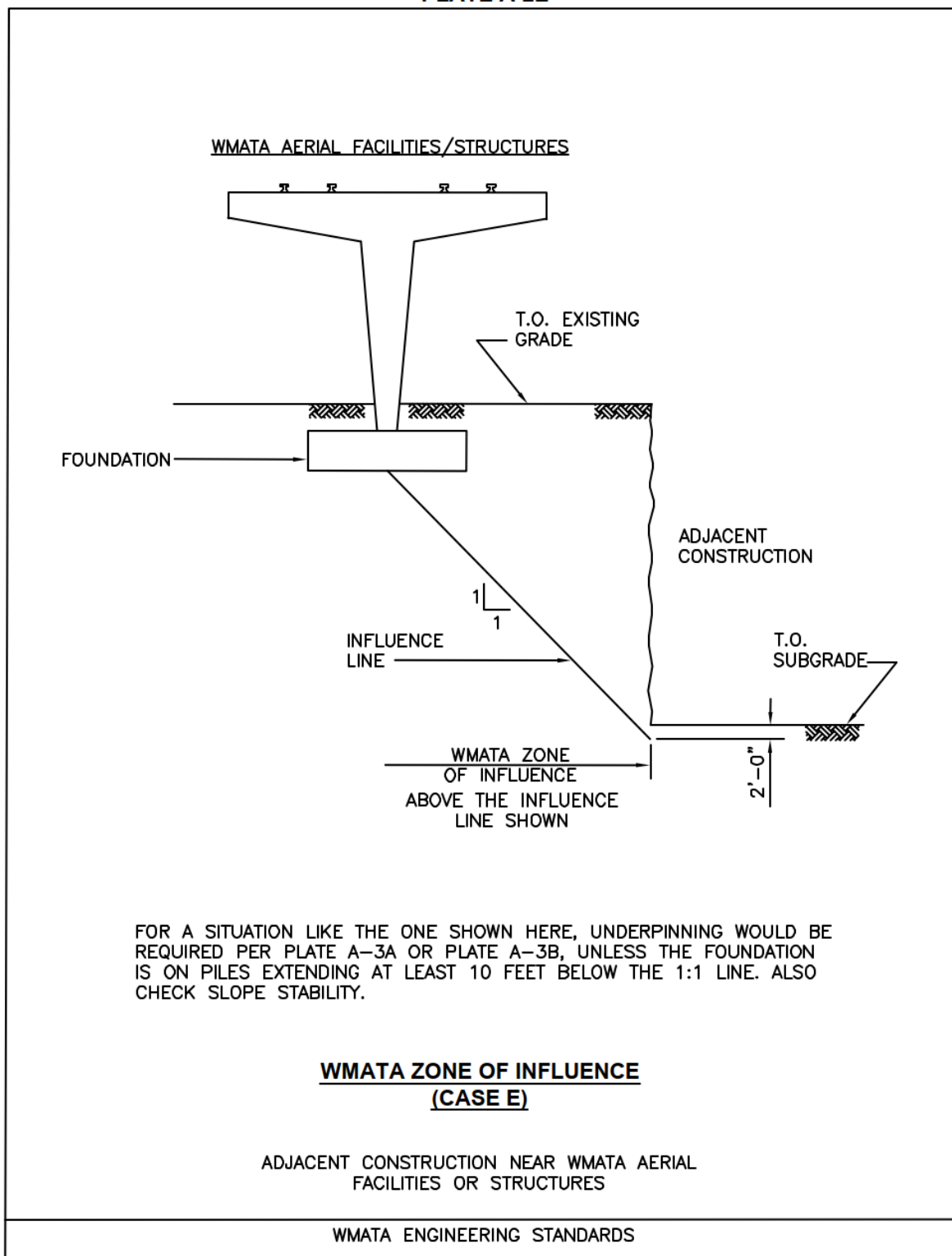
Plate A-2D: WMATA Zone of Influence (Case D)



APPENDIX-C

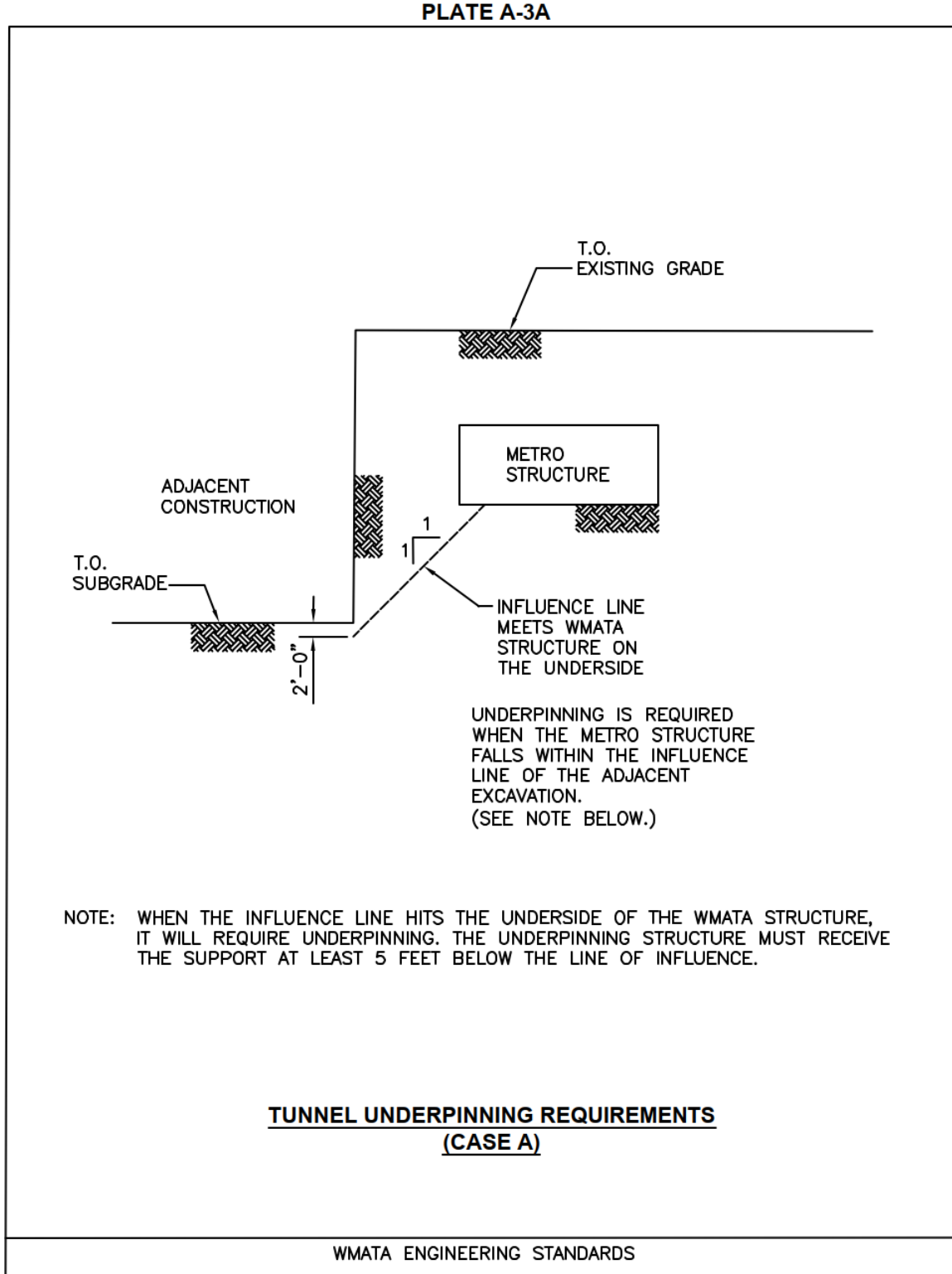
Plate A-2E: WMATA Zone of Influence (Case E)

PLATE A-2E



APPENDIX-C

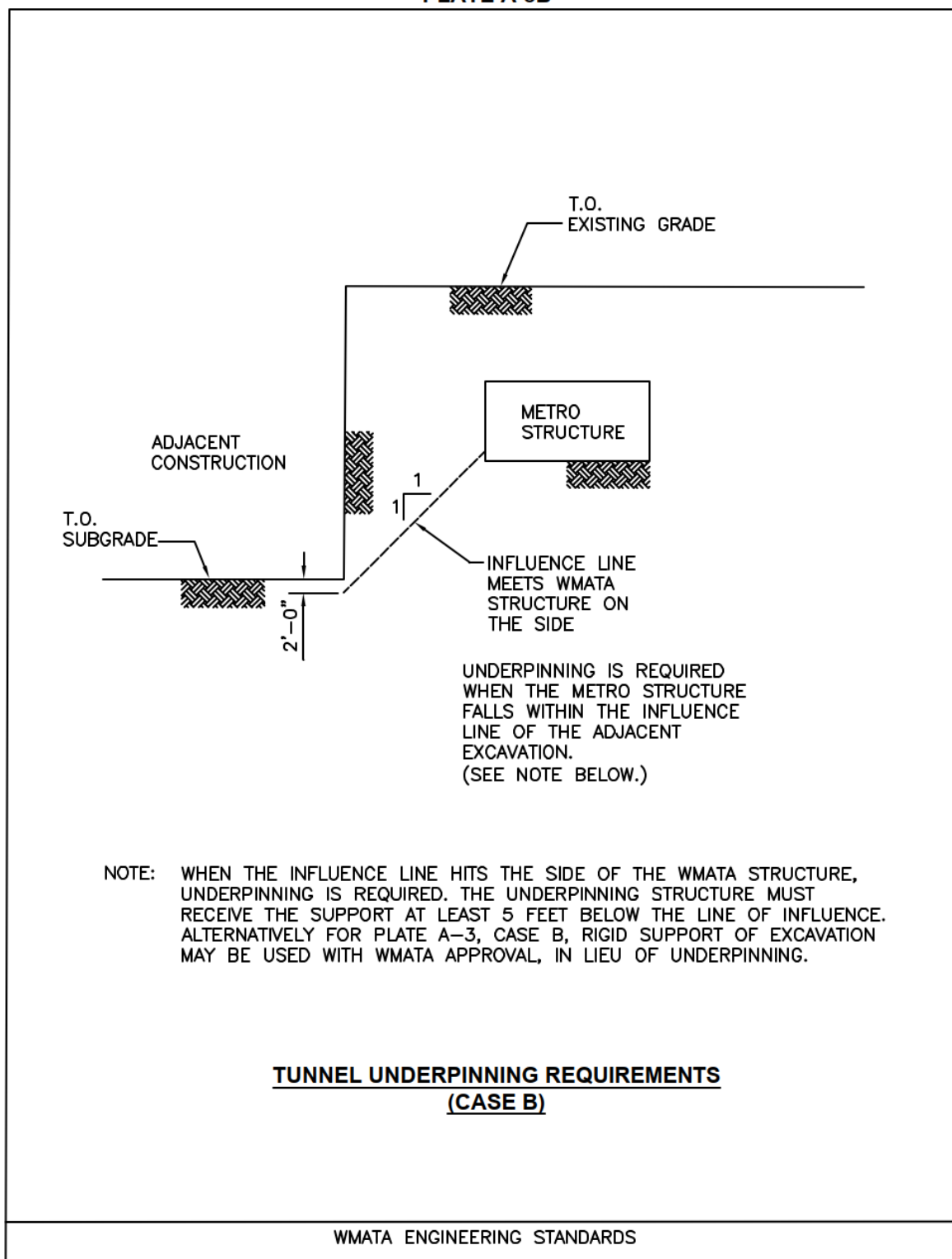
Plate A-3A: Tunnel Underpinning Requirements (Case A)



APPENDIX-C

Plate A-3B: Tunnel Underpinning Requirements (Case B)

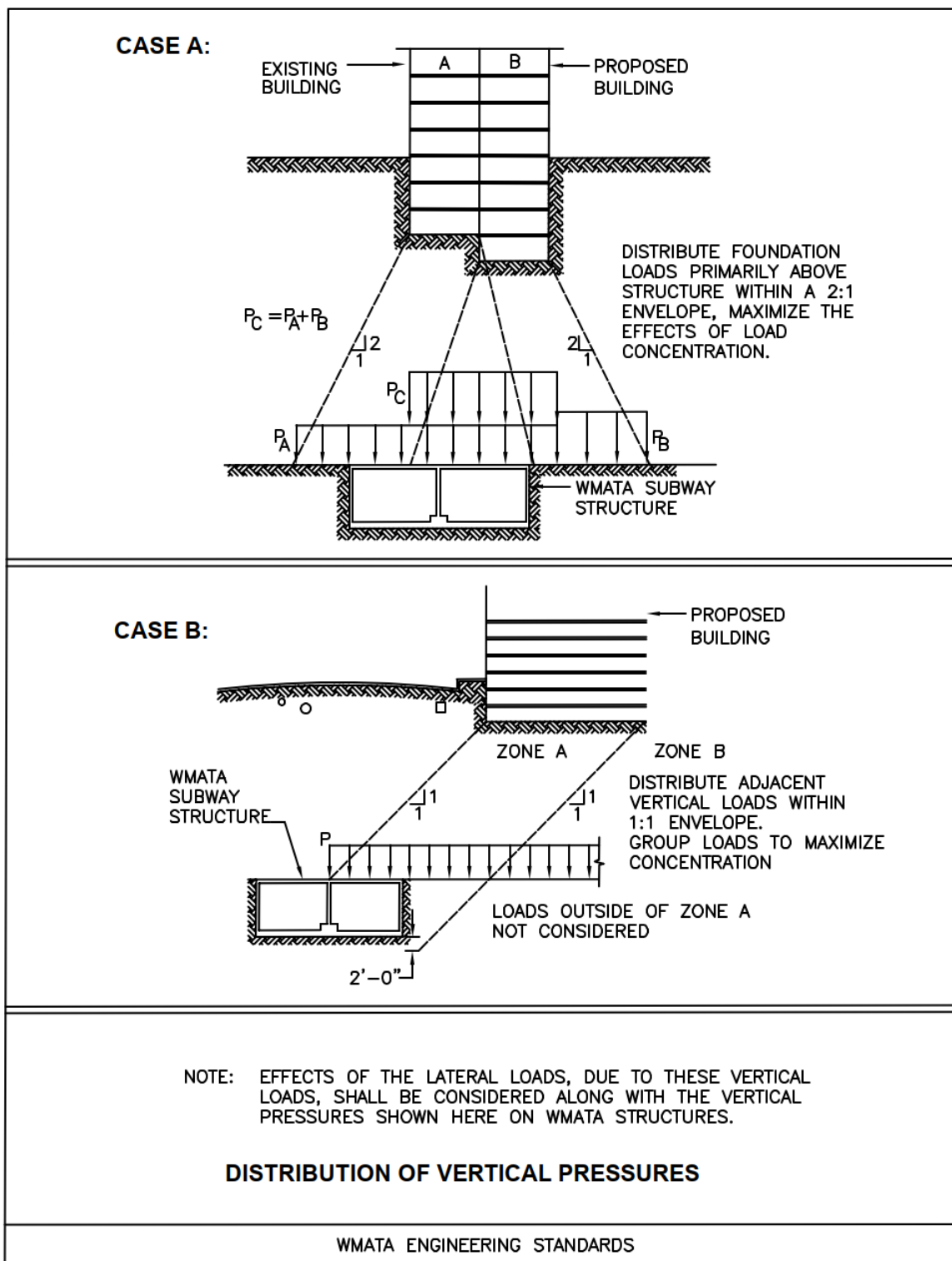
PLATE A-3B



APPENDIX-C

Plate A-4: Distribution of Vertical Pressures

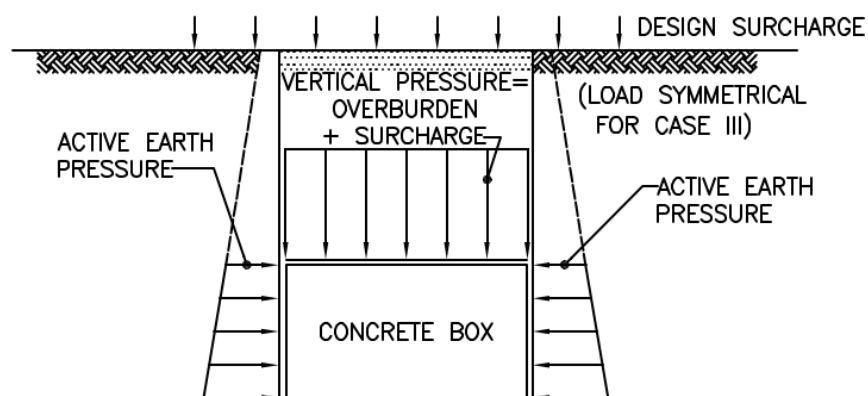
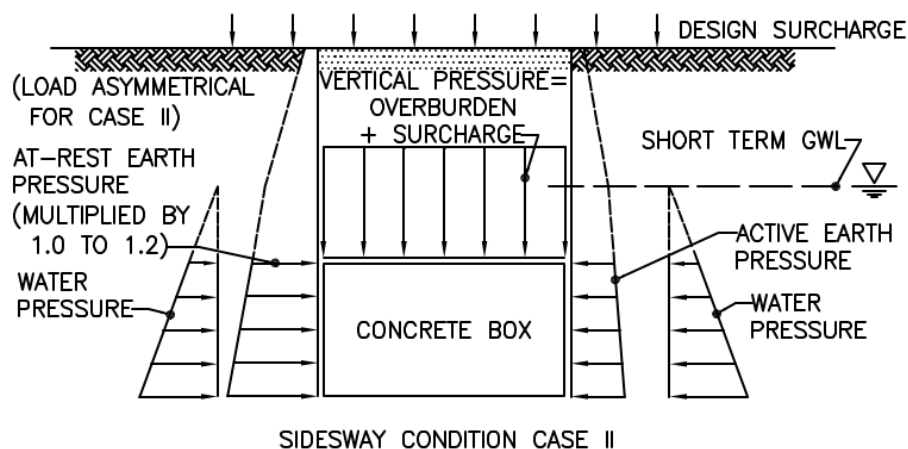
PLATE A-4



APPENDIX-C

Plate A-5A: Short Term Loading, Concrete Box Tunnel and Other Cut & Cover Structures

PLATE A-5A



SIDESWAY CONDITION CASE III
 FOR SHORT TERM LOADING, CASE III, USE
 SYMMETRICAL ACTIVE EARTH PRESSURES
 ON SIDES, ASSUMING NO WATER PRESSURES.

SHORT TERM LOADING
CONCRETE BOX TUNNEL AND OTHER CUT & COVER STRUCTURES

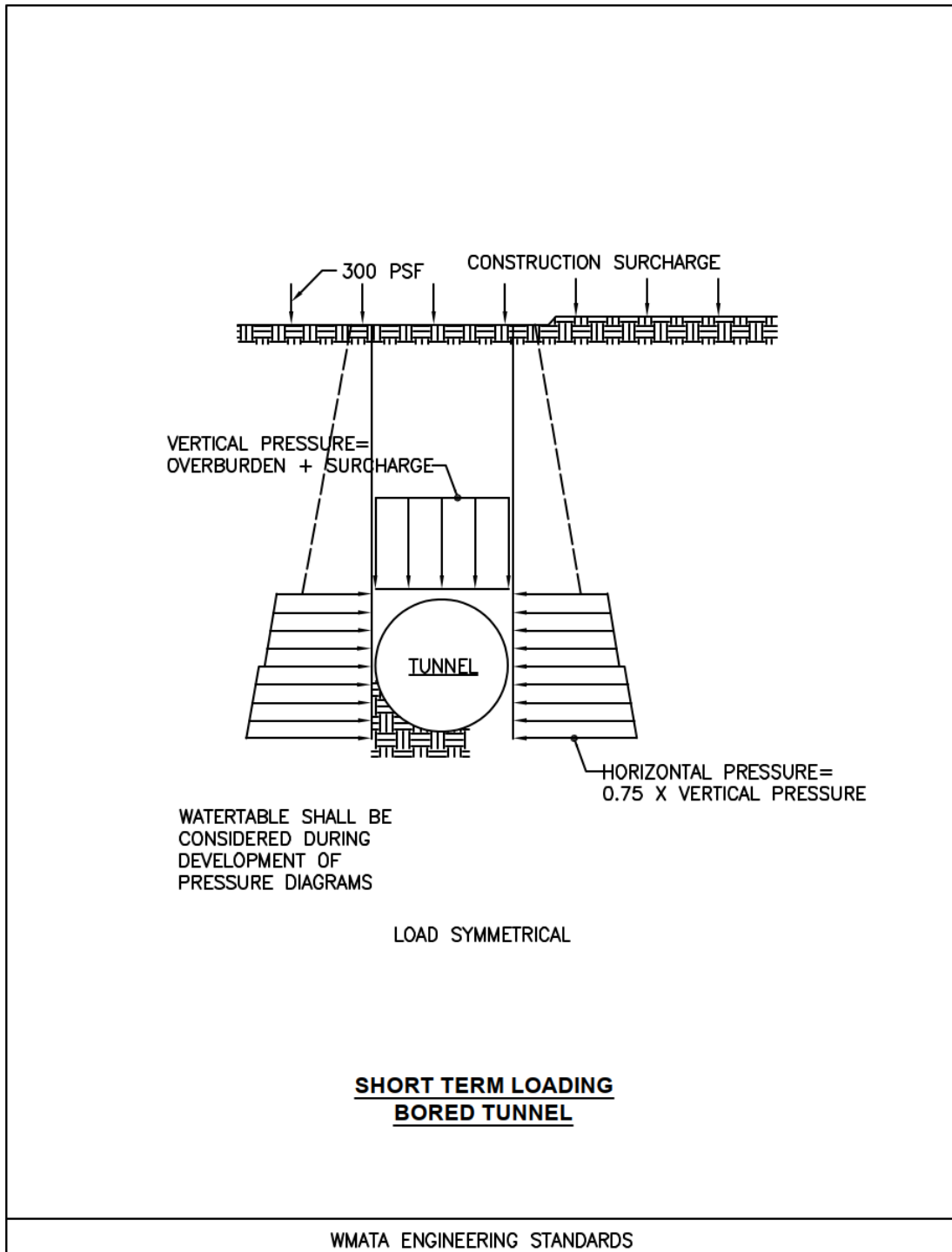
(SEE DESIGN CRITERIA SECTION 15.4 FOR DETAILS)

WMATA ENGINEERING STANDARDS

APPENDIX-C

Plate A-5B: Short Term Loading, Bored Tunnel

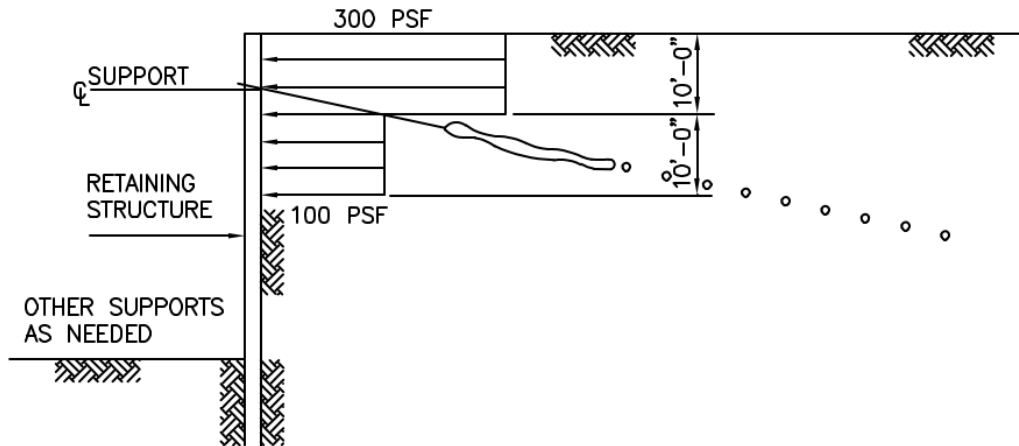
PLATE A-5B



APPENDIX-C

Plate A-6A: Traffic and Construction Equipment Loads

PLATE A-6A



THIS LATERAL PRESSURE IS BASED UPON AN ASSUMED TRAFFIC AND CONSTRUCTION EQUIPMENT SURCHARGE OF 600 PSF.

A SPECIAL ANALYSIS MUST BE MADE FOR MORE SEVERE CONSTRUCTION LOADS.

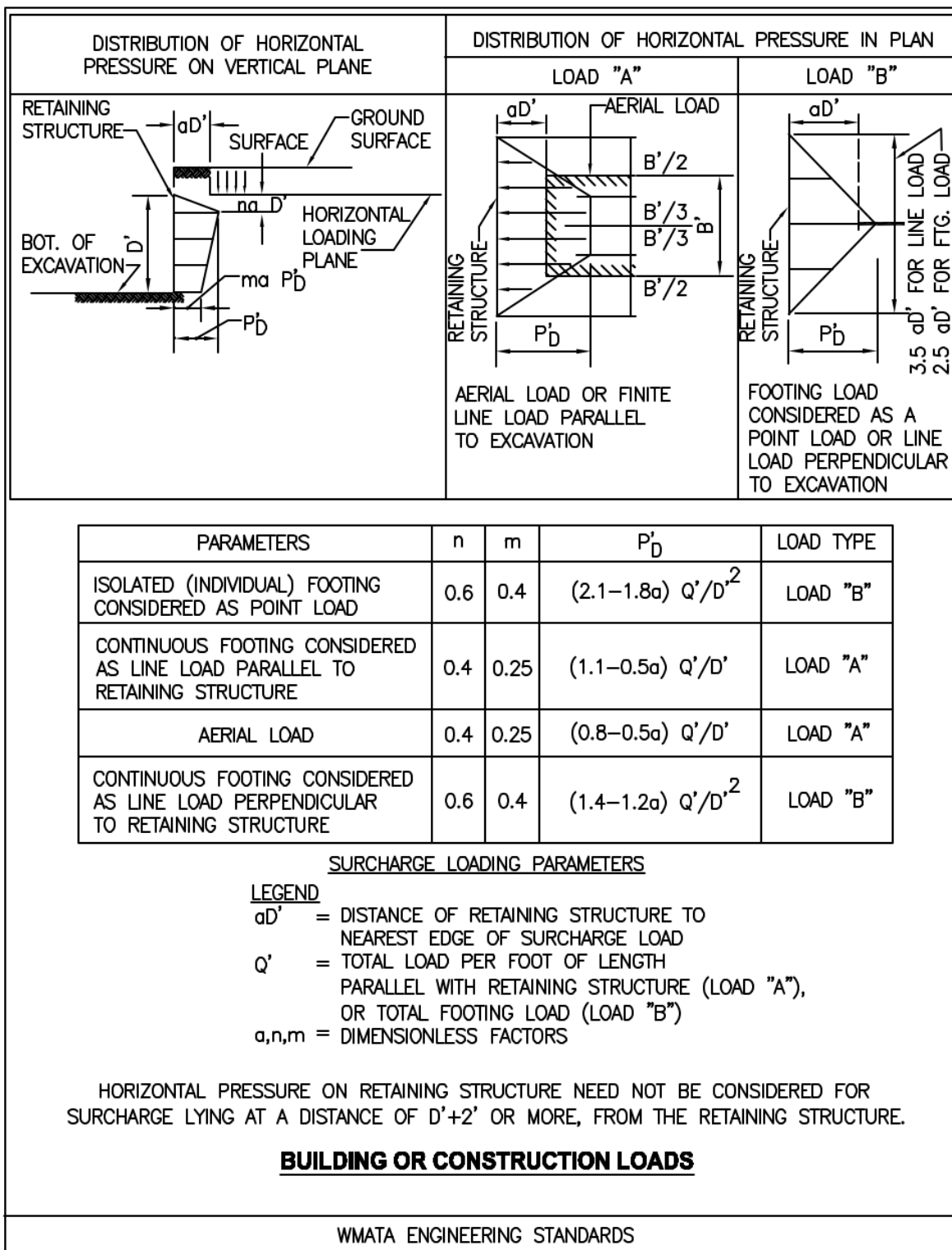
NOTE: A MINIMUM LATERAL LOAD FROM TRAFFIC AND CONSTRUCTION EQUIPMENT SHALL BE AS SHOWN IN PLATE A-6A. FOR HEAVIER LOADS, THE LATERAL LOADS AS SHOWN IN PLATE A-6B SHALL BE USED, UNLESS A MORE RIGOROUS ANALYSIS IS DONE WITH THE APPROVAL OF WMATA.

TRAFFIC AND CONSTRUCTION EQUIPMENT LOADS

WMATA ENGINEERING STANDARDS

APPENDIX - C

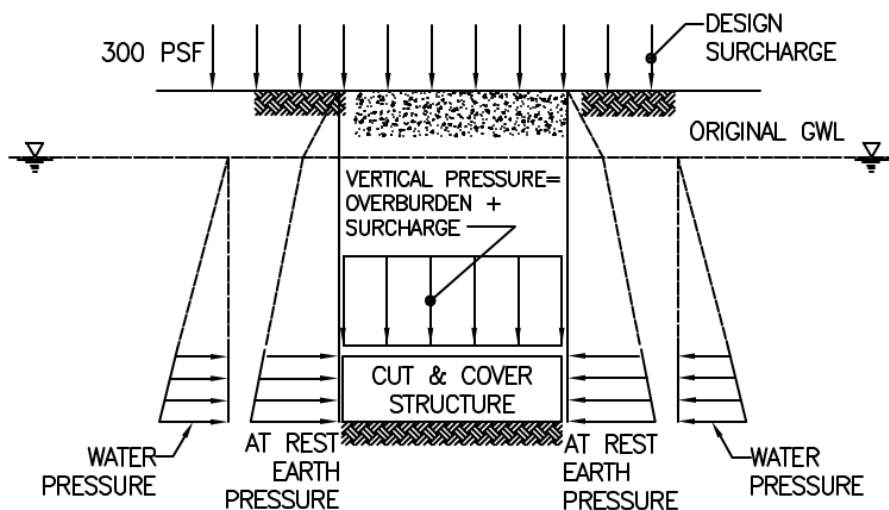
Plate A-6B: Building or Construction Loads

PLATE A-6B

APPENDIX - C

Plate A-7A: Long Term Loading, Concrete Box Tunnel and Other Cut & Cover Structures

PLATE A-7A



MULTIPLY AT REST EARTH PRESSURE BY FACTOR 1.0 OR 1.2,
(WHICHEVER PRODUCES THE MOST CRITICAL STRESSES)

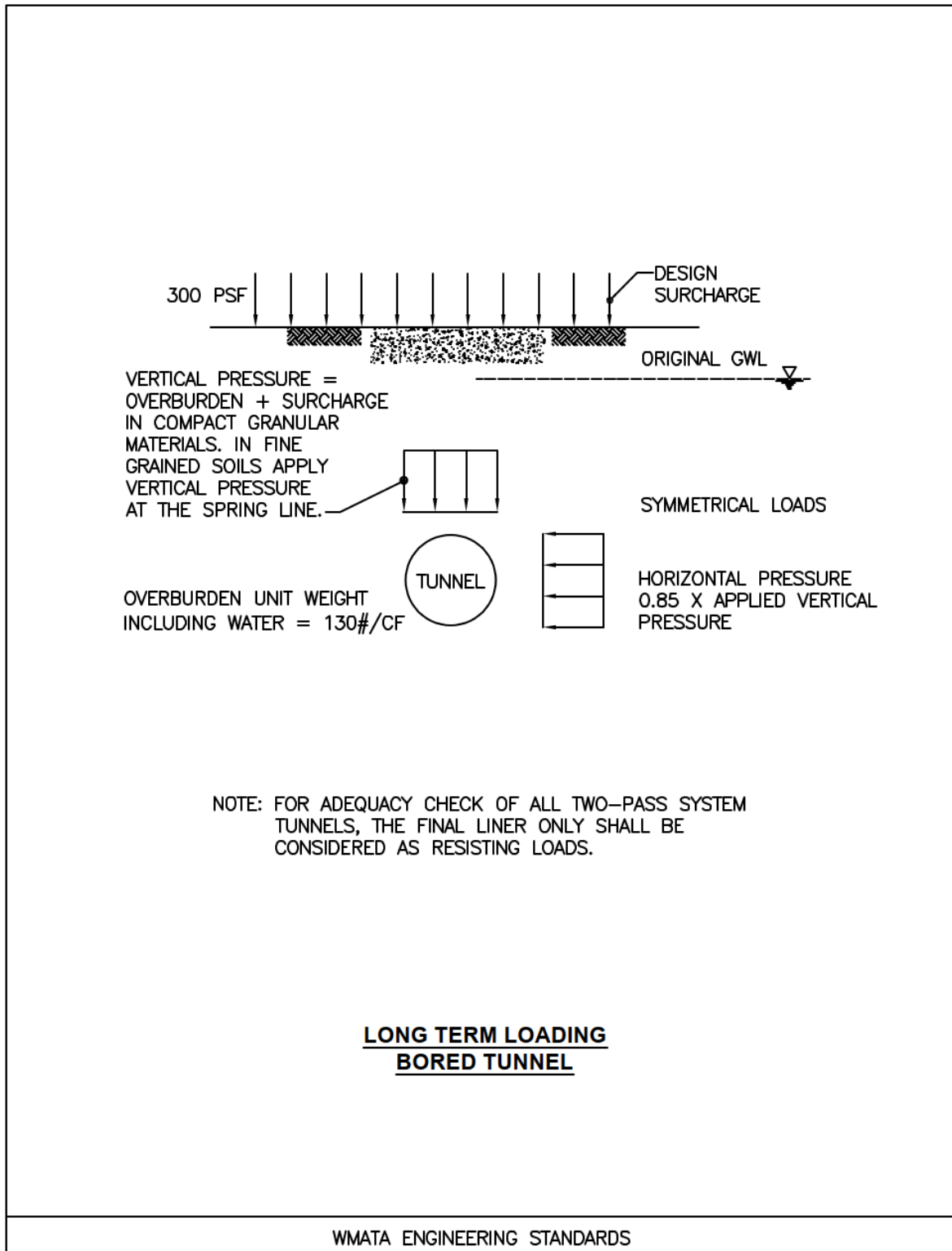
LONG TERM LOADING**CONCRETE BOX TUNNEL AND OTHER CUT & COVER STRUCTURES**

WMATA ENGINEERING STANDARDS

APPENDIX-C

Plate A-7B: Long Term Loading, Bored Tunnel

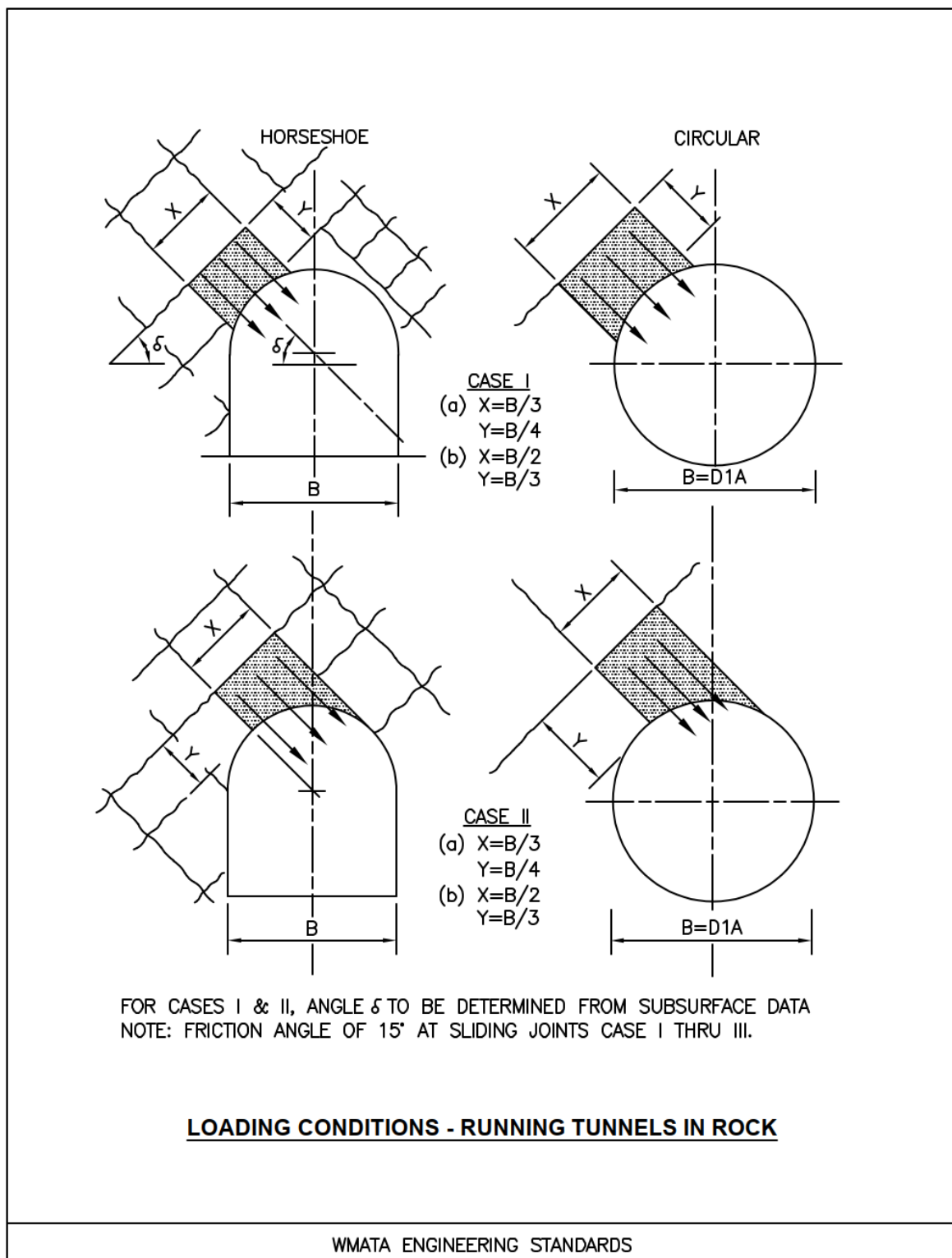
PLATE A-7B



APPENDIX - C

Plate A-8A: Loading Conditions – Running Tunnels in Rock, Case I & II

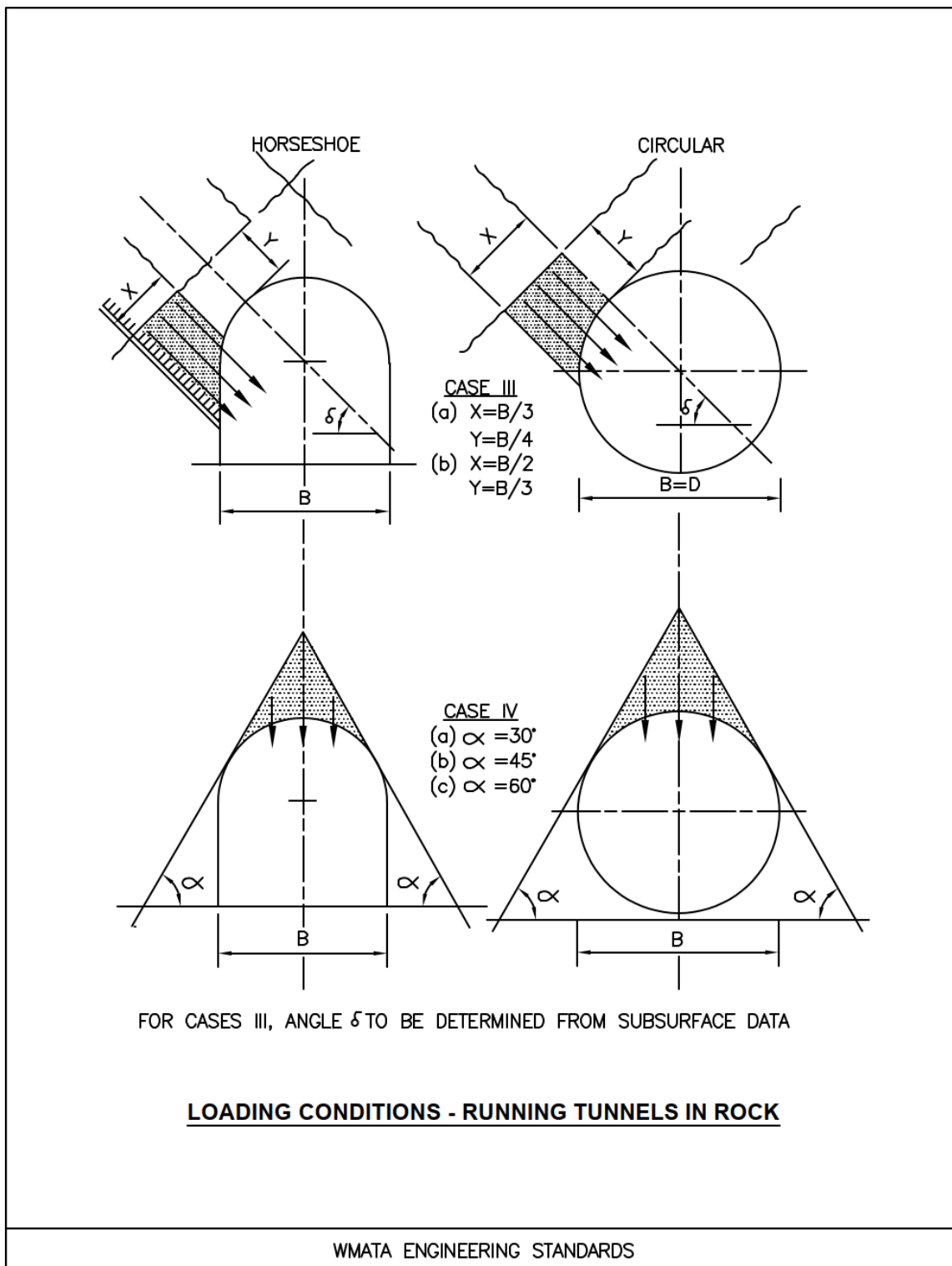
PLATE A-8A



APPENDIX - C

Plate A-8B: Loading Conditions – Running Tunnels in Rock, Case III & IV

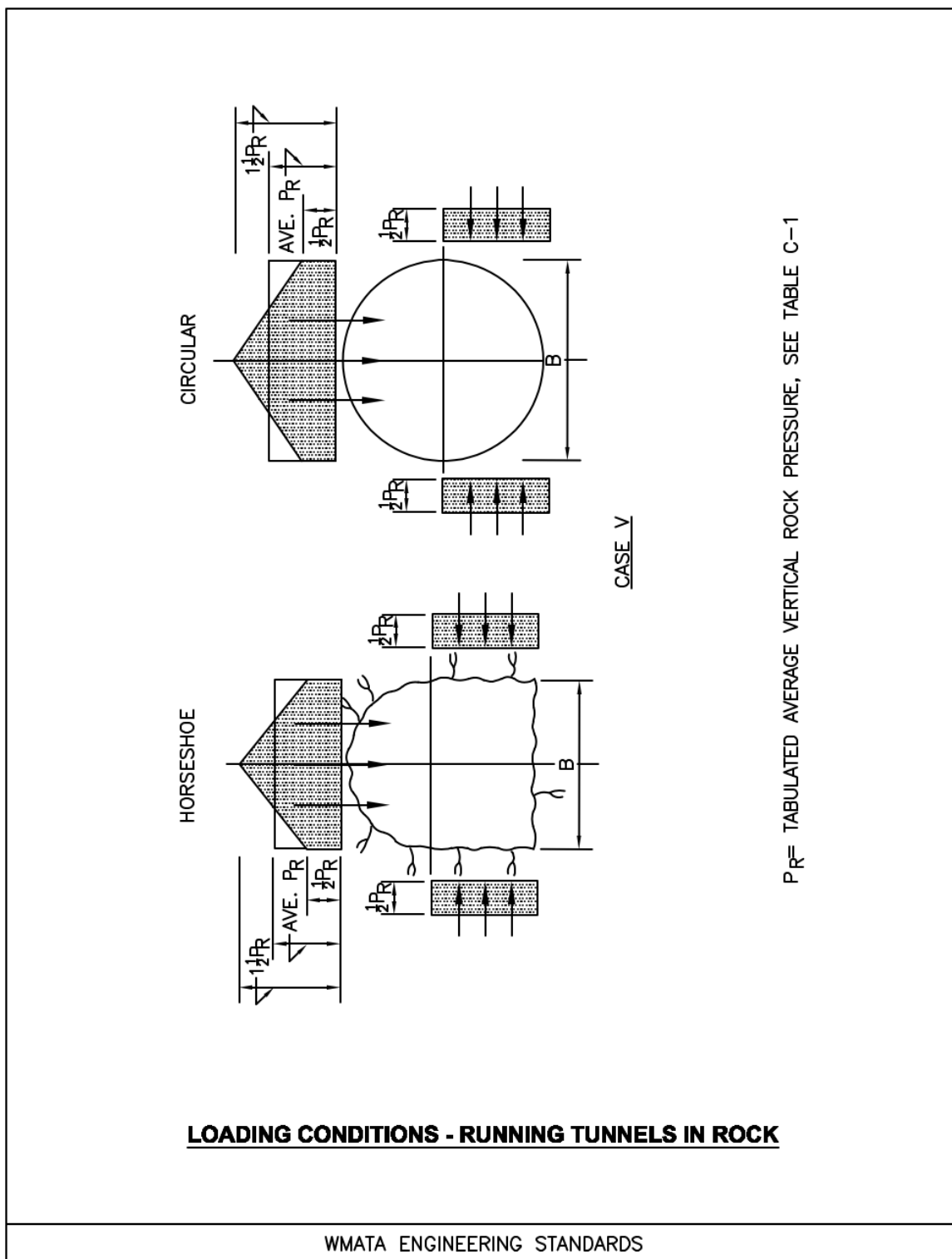
PLATE A-8B



APPENDIX - C

Plate A-8C: Loading Conditions – Running Tunnels in Rock, Case V

PLATE A-8C

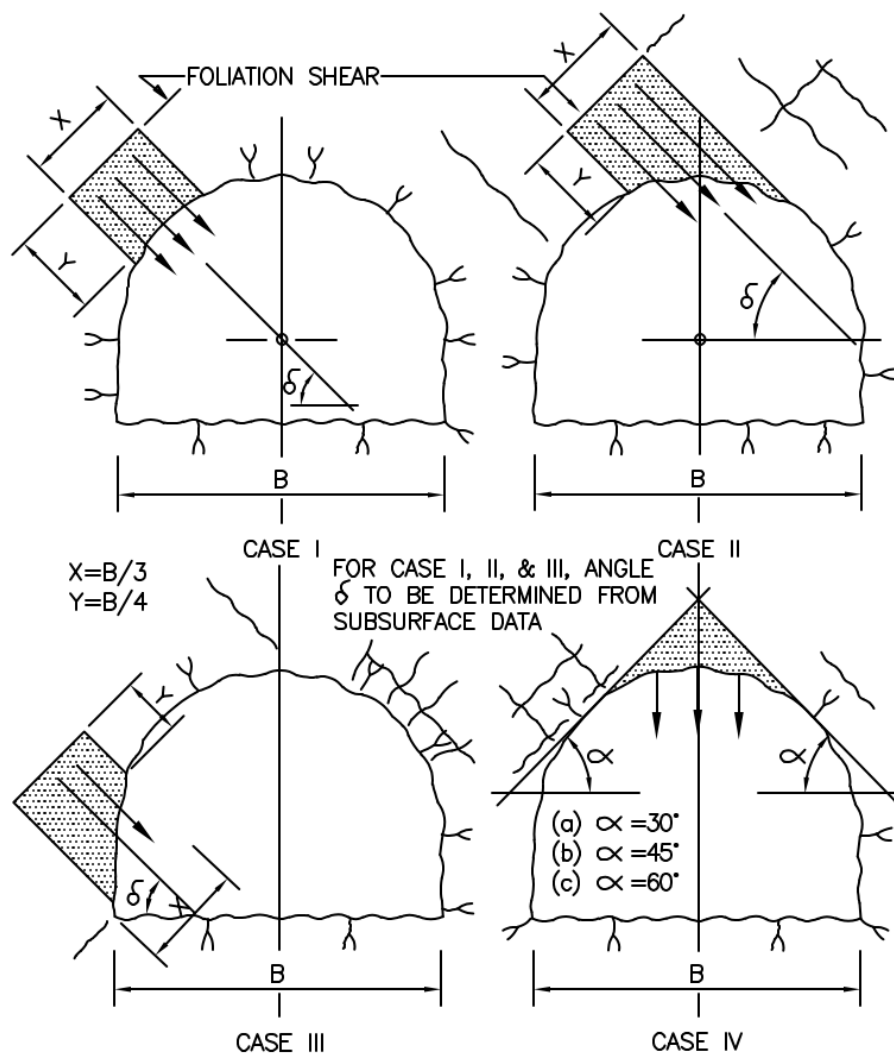


P_R = TABULATED AVERAGE VERTICAL ROCK PRESSURE, SEE TABLE C-1

APPENDIX-C

Plate A-8D: Loading Conditions – Stations, Case I, II, III, & IV

PLATE A-8D

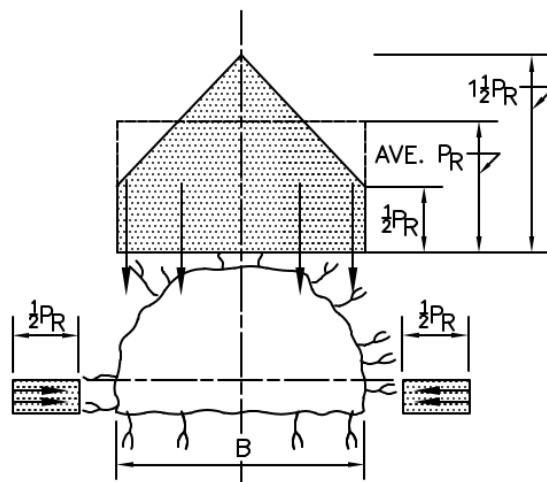
NOTE: FRICTION ANGLE OF 15° AT SLIDING JOINTS(CASE I THRU III)**LOADING CONDITIONS - STATIONS**

WMATA ENGINEERING STANDARDS

APPENDIX - C

Plate A-8E: Loading Conditions – Stations, Case V

PLATE A-8E

CASE V

P_R = TABULATED AVERAGE VERTICAL ROCK PRESSURE, SEE TABLE C-1

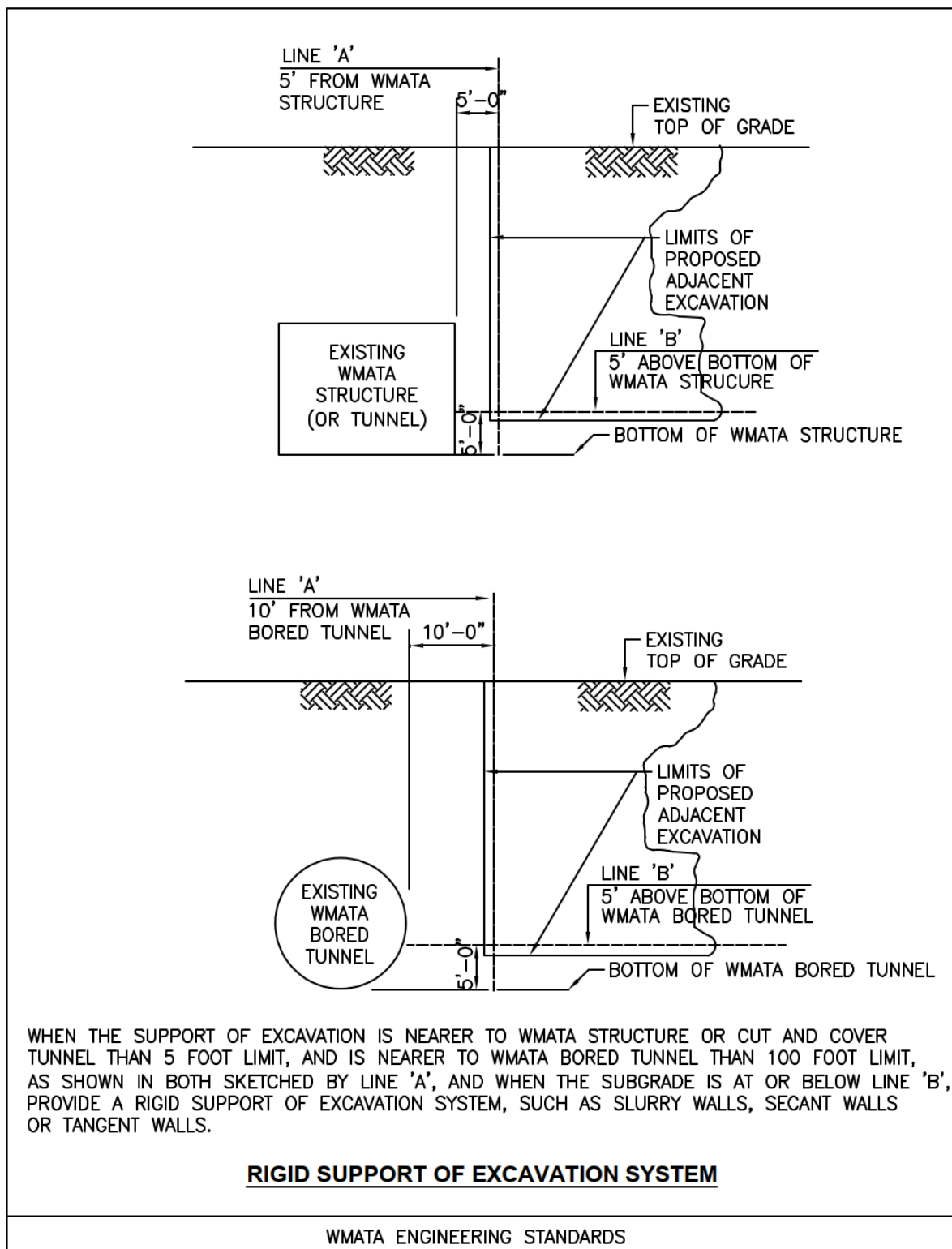
LOADING CONDITIONS - STATIONS

WMATA ENGINEERING STANDARDS

APPENDIX - C

Plate A-9: Rigid Support of Excavation System

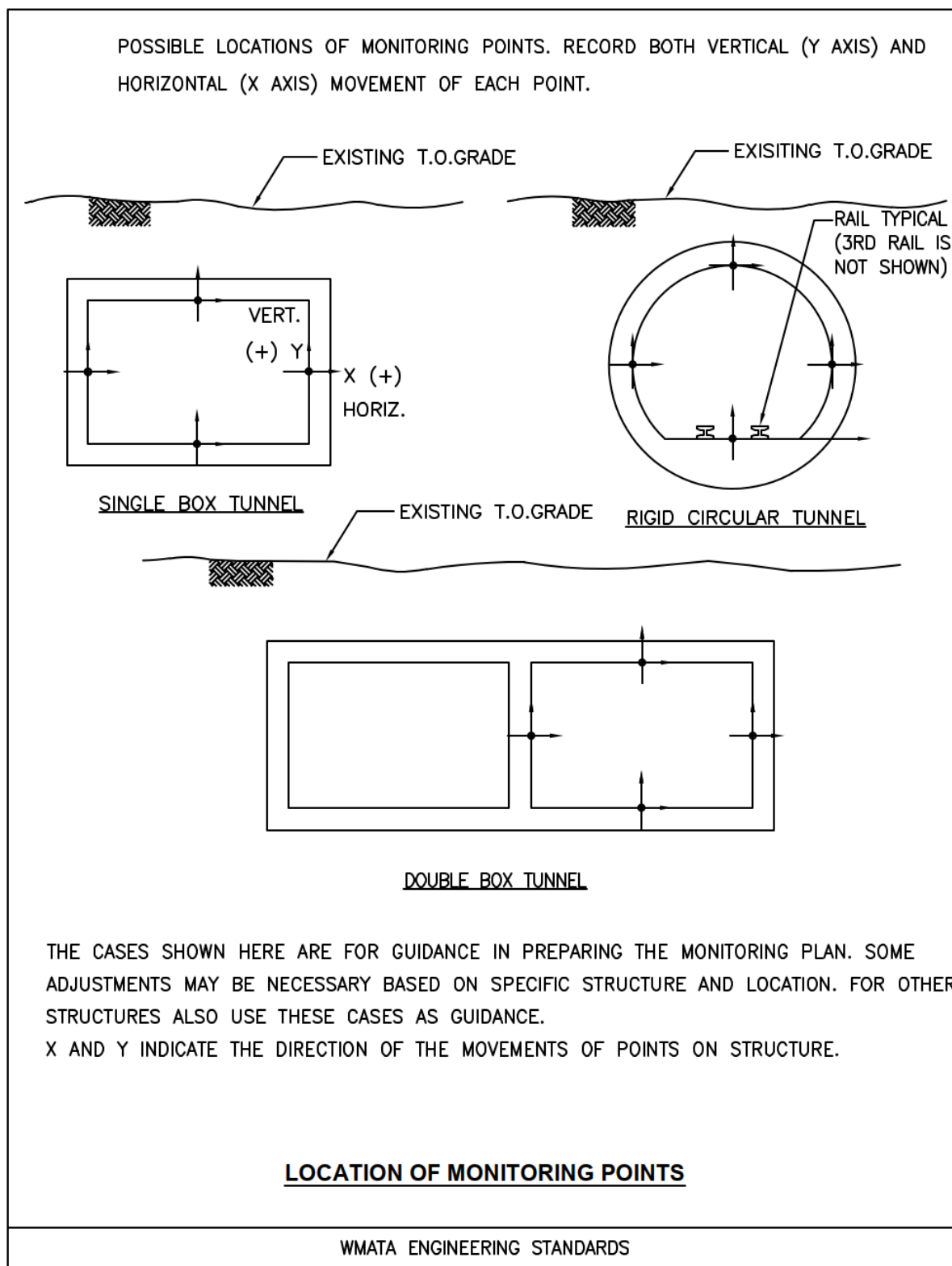
PLATE A-9



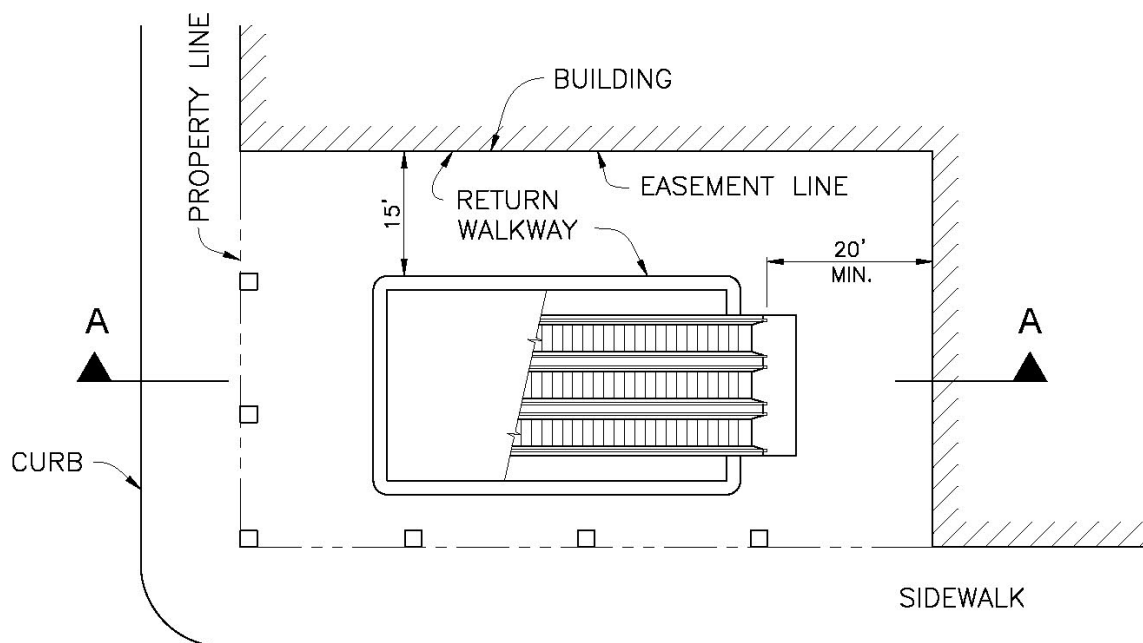
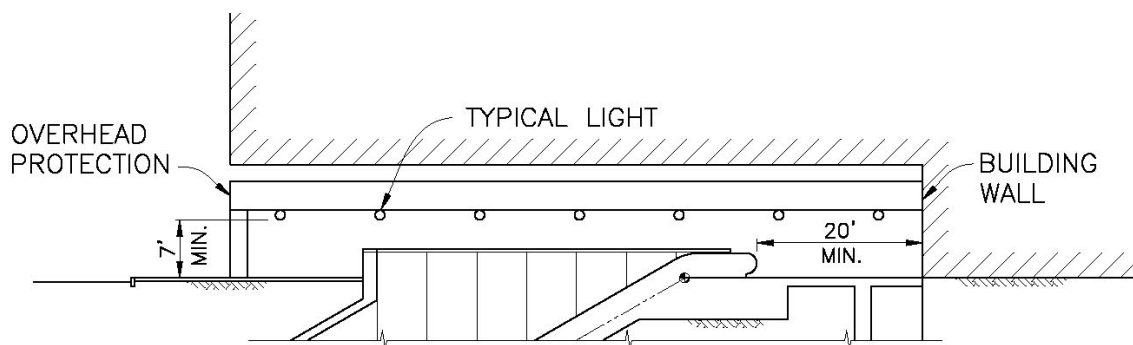
APPENDIX - C

Plate B-1: Location of Monitoring Points

PLATE B-1

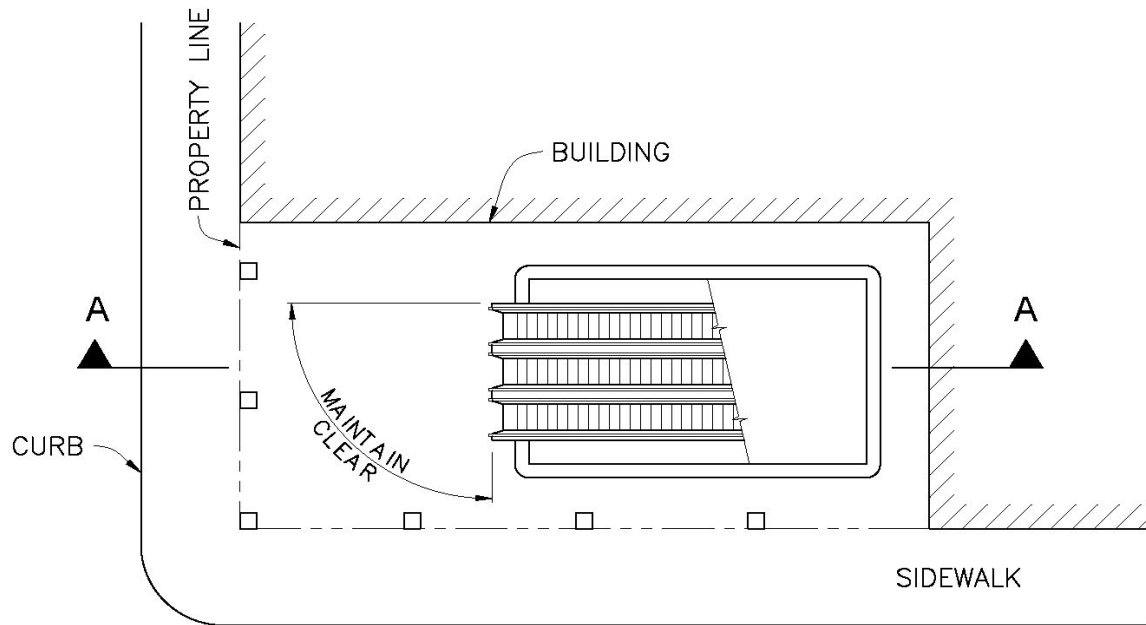
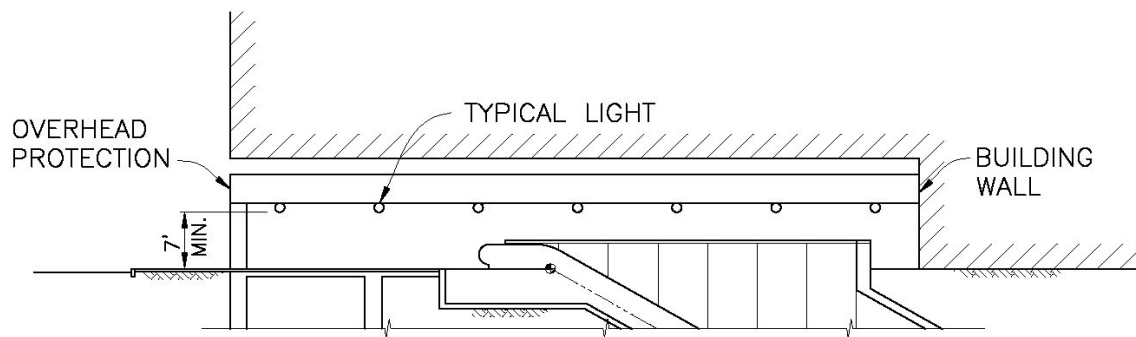


APPENDIX-C

Plate E-1: Overhead Protection for Escalators, Away From Street**PLAN****SECTION A-A**

1. MAINTAIN 15'-0" RETURN WALKWAY WIDTH FOR PEDESTRIAN ACCESS.
2. MAINTAIN 20'-0" WALKWAY FROM TOP OF ESCALATOR TO SIDEWALK.
3. MAINTAIN A LIGHT LEVEL OF 10 FOOT CANDLES AT ESCALATOR TREADS, OR WALKING SURFACE.

OVERHEAD PROTECTION ESCALATORS AWAY FROM STREET

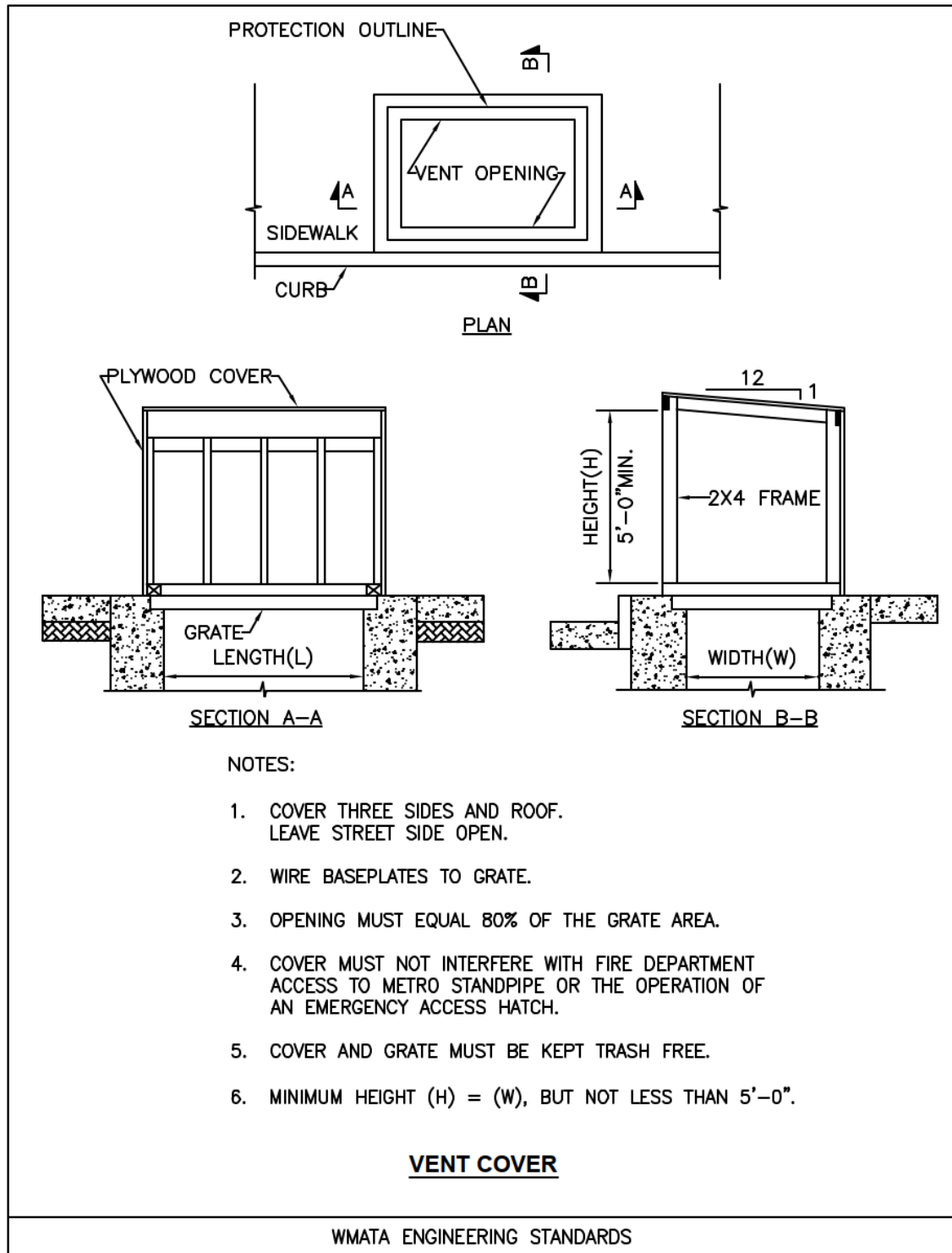
Plate E-2: Overhead Protection for Escalators, Toward Street**PLAN****SECTION A-A**

1. MAINTAIN CLEAR WALKWAY FROM TOP OF ESCALATOR TO SIDEWALK.
2. MAINTAIN A LIGHT LEVEL OF 10 FOOT CANDLES AT ESCALATOR TREADS, OR WALKING SURFACE.

OVERHEAD PROTECTION ESCALATORS TOWARD STREET

Plate L-1: Vent Cover

PLATE L-1



APPENDIX-C

Table C-1: Average Vertical Load On Rock Tunnels

TUNNEL TYPE		Single Track	Double Track	Station
Excavation Dimensions		20' Wide 18' High	35' Wide 24' High	70' Wide 40' High
Type I Lining: Minimum Cover of “Relatively Sound or sound Rock” required for Type I lining. (See Note 4)		See Note 5	See Note 5	See Note 5
Type II Lining: Type II lining is used for the following conditions		AVERAGE VERTICAL LOAD P_R		
(A)	Portal Sections, or where rock cover of any quality is ≤ 0.4 of minimum rock cover for Type I lining, or where thicker rock cover is highly jointed and weathered.	Full Overburden ΣV	Full Overburden ΣV	Full Overburden ΣV
(B)	Rock cover “relatively sound or sound” is ≥ 0.4 , but is ≤ 0.6 of minimum rock cover for Type I lining.	$(0.15) \times (\Sigma V)$	$(0.30) \times (\Sigma V)$	$(0.60) \times (\Sigma V)$
(C)	Rock cover “relatively sound or sound” is ≥ 0.6 , but is ≤ 0.8 of minimum rock cover for Type I lining.	$(0.10) \times (\Sigma V)$	$(0.20) \times (\Sigma V)$	$(0.40) \times (\Sigma V)$
(D)	Rock cover “relatively sound or sound” is ≥ 0.8 , but is ≤ 1.0 of minimum rock cover for Type I lining.	$(0.05) \times (\Sigma V)$	$(0.10) \times (\Sigma V)$	$(0.20) \times (\Sigma V)$
(E)	Rock cover ≥ 1.0 of minimum rock cover for Type I lining, but is not “relatively sound or sound” at tunnel top.	0.5 ksf	1.0 ksf	2.0 ksf

Notes:

- (1) ΣV = Total pressure of overburden, soil plus rock, above tunnel top.
- (2) Rock described in D. U. Deer report of November 1, 1967 as “good to excellent” with RQD values greater than 65 to 75 percent generally qualifies as “relatively sound or sound” rock cover.
- (3) Rock described on the geological sections in the WMATA soils reports prepared by MRCE, as “relatively sound or sound”, with RQD values greater than 60 to 70 percent generally qualifies as “relatively sound or sound” rock cover
- (4) No vertical load is considered for the design of the tunnel lining, in “relatively sound or sound” or better rock and is called Type I lining.
- (5) Minimum cover for Type I lining to be taken as 1.0D

Table C-2: Modulus Of Subgrade Reaction

STRATUM	MODULUS OF SUBGRADE REACTION - KCF
Fill, organic soils, T0, T1 Clays with Shear Strength of 1.5 KSF or less.	75
Stiff T1 Clay, Coarse-grained Pleistocene Terrace Materials	150
Cretaceous Strata	200
Decomposed Rock, Thoroughly Weathered Rock	300

Table C-3: Soil Properties for Design

(pg. 1/5)

UNIFIED SOIL CLASSIFICATION		SHORT DESCRIPTION	MRWJ* SYMBOLS	FULL DESCRIPTION/SOURCE/AGE	SHEAR STRENGTH AND CONSOLIDATION CONDITION OF A COHESIVE STRATA	MIN. UNIT WEIGHT (PCF)	COEF OF SUBGRADE REACTION (KCF)	UNDRAINED SHEAR STRENGTH (KSF)	YOUNG MOD. OF SUBGRADE (KSI)	COEF. OF AT REST PRESS.	MAX. EFFECTIVE ANGLE OF FRICTION (DEGREES)	MAX. ALLOWABLE BEARING CAPACITY (TSF)
PRIMARY	SECONDARY											
				FILL								
ML & SM	SC & CL	FILL	F	FILL GENERALLY COMPOSED OF INORGANIC SOIL OBTAINED FROM NEAR BY NATURAL MATERIALS. MAY BE DERIVED FROM TERRACE, CRETACEOUS SOIL OR DECOMPOSED ROCK.	PLACED OVER MARSH, MIXED WITH CINDERS. NO CONSOLIDATION	120					28	NONE, ORDINARILY
					FROM PLEISTOCENE SOILS	130					30	1.0 TO 1.50
					FROM DECOMPOSED ROCK (NW OF ROCK CREEK)	130					30	1.5 TO 2.0
					FROM CRETACEOUS CLAYS (NEAR UNION STATION). MAX. SHEAR STRENGTH, COHESIVE STRATA: 0.8 KSF	130					25	0.75
					MIXED WITH ORGANIC SOILS (SOUTH OF ROSSLYN)	120					28	
					OTHER LOCATIONS	130					30	1.0 TO 1.50
				RIVER ALLUVIUM OF POST GLACIAL TIMES.								
CL, CH, OH	OL & PT	ORGANIC CLAY	A1	VERY SOFT TO MEDIUMSTIFF DARK GRAY ORGANIC CLAY WITH LENSES OF HIGHLY ORGANIC MATERIAL (WHERE LOCATED UNDER WATER). SOFT TO STIFF MOTTLED GRAY-BROWN SLIGHTLY ORGANIC SILTY OR SANDY CLAY (WHERE LOCATED IN LAND).	BENEATH FILL OVERCONSOLIDATED 0.2 TO 0.3 TSF. STRENGTH 0.5 TO 0.7 KSF.	120					23	NONE, ORDINARILY
		ORGANIC CLAY			BENEATH WATER OVERCONSOLIDATED AS MUCH AS 0.2 TSF. STRENGTH 0.2 TO 0.3 KSF.	110					23	NONE
		ORGANIC CLAY			MAX. SHEAR STRENGTH, COHESIVE STRATA: 0.9 KSF	120					23	0.75
SM	SP	SILTY SAND	A2	LOOSE TO MEDIUM COMPACT GRAY OR DARK BROWN SILTY FINE TO MEDIUM SAND WITH OCCASIONAL POCKETS OR LENSES OF SMALL GRAVEL. MAY BE SLIGHTLY TO MODERATELY ORGANIC.		130					30	2 TO 2.5
		SILTY SAND				130					30	2

(pg. 2/5)

UNIFIED SOIL CLASSIFICATION		SHORT DESCRIPTION	MRWJ+ SYMBOLS	FULL DESCRIPTION/SOURCE/AGE	SHEAR STRENGTH AND CONSOLIDATION CONDITION OF A COHESIVE STRATA	MIN. UNIT WEIGHT (PCF)	COEF OF SUBGRADE REACTION (KCF)	UNDRAINED SHEAR STRENGTH (KSF)	YOUNG MOD. OF SUBGRADE (KSI)	COEF. OF AT REST PRESS.	MAX. EFFECTIVE ANGLE OF FRICTION (DEGREES)	MAX. ALLOWABLE BEARING CAPACITY (TSF)
				PORTIONS OF THE "25-FOOT" "50-FOOT" AND "90-FOOT" TERRACES, DEPOSITED BY RIVERS IN PLEISTOCENE TIMES.								
CL & OL	CH & OH		T0	MEDIUM STIFF TO STIFF DARK GRAY ORGANIC CLAY WITH NUMEROUS WOOD FRAGMENTS. USUALLY FOUND INTERLENSED WITH STRATUM T4.	MAX. SHEAR STRENGTH, COHESIVE STRATA: 1.4 KSF	130					25	1.2 TO 1.5
CL, CL&CH	LENSES OF SM OR SC		T1	STIFF TO MEDIUM STIFF LIGHT BROWN OR GRAY OR MOTTLED BROWN-GRAY SILTY CLAY OR CLAYEY SILT WITH LENSES OF BROWN SILT FINE SAND. IN SOME AREAS, SEVERAL SEPARATE LAYERS OF PLEISTOCENE CLAY HAVE BEEN ENCOUNTERED, WHICH ARE DISTINGUISHED BY A LETTER SUFFIX: T1A, T1C, ETC.								
		SILTY SAND			(DEPTH: 0 TO 40 FT) MAX. SHEAR STRENGTH, COHESIVE STRATA: 1.0 KSF TO 1.5 KSF	130					25	1.5 TO 2.0
		SILTY SAND			(DEPTH > 40 FT) MAX. SHEAR STRENGTH, COHESIVE STRATA: 1.0 TO 1.5 KSF	130					25	1.0 TO 1.5
		SILTY CLAY	T1 (A) & (G)		OVERCONSOLIDATED 3 TO 5 TSF. STRENGTH 1.5 TO 2.5 KSF, HIGHER NEAR SURFACE.	130					25 TO 28	1.50 TO 2.50
		ORGANIC CLAY	T1 (B)		OVERCONSOLIDATED 1.5 TO 2.5 TSF. STRENGTH 2 TO 3 KSF.	130					25	2
		SILTY CLAY	T1 (C) & (F)		OVERCONSOLIDATED 0.5 TO 1 TSF. STRENGTH 0.7 TO 0.9 KSF, HIGHER AT SURFACE.	130	150				25	1 OR LESS
		PLASTIC CLAY	T1 (D)		OVERCONSOLIDATED 2.5 TO 3.0 TSF. STRENGTH 2.5 TO 3.5 KSF.	130					25	2.0 TO 3.0
		MEDIUM PLASTIC CLAY	T1 (E)		OVERCONSOLIDATED 3.0 TSF. STRENGTH 2 TO 3 KSF.	130					25	2.0 TO 2.50
SM & SC	SP & SW	SILTY SAND	T2	MEDIUM COMPACT TO VERY COMPACT BROWN AND RED-BROWN SILTY OR CLAYEY FINE TO MEDIUM SAND WITH TRACE OF GRAVEL AND OCCASIONAL BOULDERS		130					34	2.0 TO 3.0
SW & SM	SP & GM	GRGEVALLY SAND	T3	COMPACT TO VERY COMPACT BROWN AND RED BROWN FINE TO COARSE SAND WITH SOME SILT AND SMALL GRAVEL AND VARIABLE AMOUNTS OF COBBLES AND BOULDERS		130	170				34-38	3.5 TO 4.0
SM & SP	SW	SILTY SAND	T4	MEDIUM COMPACT TO COMPACT GRAY AND GRAY-BROWN FINE TO MEDIUM SAND WITH SOME SILT AND SMALL GRAVEL, CONTAINING LENSES OF DARK GRAY CLAY, OCCASIONALLY SLIGHTLY ORGANIC.		130					30 TO 34	2.0 TO 3.0

(pg. 3/5)

UNIFIED SOIL CLASSIFICATION		SHORT DESCRIPTION	MRWJ* SYMBOLS	FULL DESCRIPTION/SOURCE/AGE	SHEAR STRENGTH AND CONSOLIDATION CONDITION OF A COHESIVE STRATA	MIN. UNIT WEIGHT (PCF)	COEF OF SUBGRADE REACTION (KCF)	UNDRAINED SHEAR STRENGTH (KSF)	YOUNG MOD. OF SUBGRADE (KSI)	COEF. OF AT REST PRESS.	MAX. EFFECTIVE ANGLE OF FRICTION (DEGREES)	MAX. ALLOWABLE BEARING CAPACITY (TSF)
SW & SM	SP & GM	GRAVELLY SAND	TS	COMPACT TO VERY COMPACT GRAY AND GRAY-BROWN FINE TO COARSE SAND WITH SOME GRAVEL, SOME TO TRACES OF SILT AND VARIABLE AMOUNTS OF COBBLES AND BOULDERS, OFTEN CONCENTRATED AT BASE OF LAYER.		130					32 - 38	2.5 TO 4.0
				BRANDYWINE FORMATION OF EARLY PLEISTOCENE OR PLOIOCENE TIMES.								
SM & SC		SILTY SAND	Q1	LOOSE TO MEDIUM COMPACT LIGHT BROWN SILTY OR CLAYEY FINE TO MEDIUM SAND WITH TRACE OF SMALL GRAVEL.		130					30	2.5
SM & SC	SP	GRAVELLY SAND	Q2	LOOSE TO MEDIUM COMPACT LIGHT BROWN OR TAN SILTY OR CLAYEY MEDIUM TO FINE SAND WITH SOME SMALL GRAVEL.		130	180	0.01-0.02	12-15	0.4	33	3.0
				MARINE DEPOSITS OF TERTIARY OR UPPER CRETACEOUS PERIODS								
SM & CH	SP & CL		C	MEDIUM COMPACT GRAY AND TANSILTY FINE SAND OR MEDIUM STIFF TO STIFF DARK GRAY TO OLIVE-GREEN CLAY. CALVERT FORMATION OF MIOCENE AGE.								
			C ₁	PLASTIC CLAY, SILTY AND SANDY CLAY OR CLAYEY SILT		130	100	1.5-2.5	6-8	0.55	25	1.5-2.0
			C ₂	FINE SAND, TRACE TO SOME SILT. CLAY AND CLAYEY FINE SAND		130	140		8-10	0.5	30-32	1.5 - 2.0
				AQUIA FORMATION OF EOCENE AGE.								
MH & CH	ML & CL		E	MEDIUM STIFF DARK GREEN OR BROWN CLAY AND SILTY CLAY. AQUA FORMATION OF EOCENE AGE.								
			E _s			130	140		8-10	0.5	30-32	1.5-2.0
			E _c			130	100	2.0-3.5	6-8	0.55	25	1.5 - 2.0
				UPPER CRETACEOUS PERIOD								
MH & CL	MH & CH		M	MEDIUM STIFF TO STIFF GREEN OR BROWN SILT AND CLAY. MONMOUTH FORMATION OF UPPER CRETACEOUS AGE.								
			M _c	SLIGHTLY ORGANIC FINE SANDY SILT AND CLAYEY SILT		130	120	3.0-3.5	8-10	0.6	25	2.0-4.0
			MS	SLIGHTLY ORGANIC MICA CEIOUS SILTY OR CLAYEY FINE SAND		130	160		10-12	0.45	32-34	2.0-4.0
				POTOMAC GROUP OF CRETACEOUS PERIOD,								

(pg. 4/5)

UNIFIED SOIL CLASSIFICATION		SHORT DESCRIPTION	MRWJ* SYMBOLS	FULL DESCRIPTION/SOURCE/AGE	SHEAR STRENGTH AND CONSOLIDATION CONDITION OF A COHESIVE STRATA	MIN. UNIT WEIGHT (PCF)	COEF OF SUBGRADE REACTION (KCF)	UNDRAINED SHEAR STRENGTH (KSF)	YOUNG MOD. OF SUBGRADE (KSI)	COEF. OF AT REST PRESS.	MAX. EFFECTIVE ANGLE OF FRICTION (DEGREES)	MAX. ALLOWABLE BEARING CAPACITY (TSF)
CH	CL	PLASTIC CLAY	P1	HARD MOTTLED RED-BROWN AND GRAY LIGHT GRAY AND TAN PLASTIC CLAY WITH OCCASIONAL POCKETS OF FINE SAND. GENERALLY CONSISTS OF PATAPSCO FORMATION BUT MAY INCLUDE RARITAN FORMATION AT UPPER LEVELS.	NORTH & WEST OF NEW JERSEY AVE. OVERCONSOLIDATED 15 TO 20 TSF. STRENGTH 4 TO 5 KSF BUT ERRATIC.	130	200	3.0 TO 5.0	10-15	0.6	25	3.0 TO 5.0
CL		SANDY CLAY				130	200	4.0-4.5	10-14	0.5	30	3.0-5.0
		PLASTIC CLAY			PARTIALLY WEATHERED ALONG B&O RIGHT-OF-WAY IN PHASE VII PROVIDE STRENGTH AND BEARING CAPACITY IN LOWER PORTION OF THE RANGE NOTED.	130					25	2.0 TO 5.0
SM & SP	SP	SILTY SAND	P2	COMPACT TO VERY COMPACT LIGHT GRAY OR TAN SILTY OR CLAYEY FINE TO MEDIUM SAND WITH POCKETS OF SILTY CLAY AND TRACE OF SMALL GRAVEL, OCCASIONAL LIGNITE FRAGMENTS. ALSO INCLUDES MAGOTHY FORMATION OF UPPER CRETACEOUS AGE.		130	200			0.5	33 TO 34	3.5 TO 6.0
G		SAND, SOME GRAVEL				130	200			0.5	34	3.0 TO 6.0
		SILTY SAND				130	200				33 TO 36	3.0 TO 6.0
					OVERCONSOLIDATED 15 TO 20 TSF. STRENGTH 4 TO 6 KSF.	130					34	4.0 TO 7.0
SM & SW	SP & GM	GRAVELLY SAND	P4	VERY COMPACT MOTTLED LIGHT GRAY, TAN BUFF OR WHITE SILTY OR CLAYEY FINE TO MEDIUM SAND WITH SOME GRAVEL AND SCATTERED LIGNITE FRAGMENTS, FREQUENTLY WITH DENSE NESTS AND POCKETS OF ANGULAR ROCK FRAGMENTS, COBBLES AND BOULDERS.		135					34 TO 38	4.0 TO 7.0
				WEATHERED IN-SITU FROM CRYSTALLINE BEDROCK								
ML & SM	MH	DECOMPOSED ROCK	D	DECOMPOSED ROCK; HARD ORANGE-BROWN OR YELLOW-BROWN MICACEOUS FINE SANDY SILT OR VERY COMPACT LIGHT GRAY AND GREEN MICACEOUS SILTY FINE TO MEDIUM SAND WITH VARIABLE AMOUNTS OF HARD, INCOMPLETELY DECOMPOSED ROCK FRAGMENTS AND LENSES. PROPORTION OF HARD ROCK FRAGMENTS INCREASES WITH DEPTH TOWARD THE BEDROCK SURFACE.	HIGH-QUASI-OVERCONSOLIDATED STRENGTH INCREASE WITH DEPTH: 1.5 KSF TO 3.5 KSF AND MORE.	140					36	5

(pg. 5/5)

UNIFIED SOIL CLASSIFICATION	SHORT DESCRIPTION	MRWJ* SYMBOLS	FULL DESCRIPTION/SOURCE/AGE	SHEAR STRENGTH AND CONSOLIDATION CONDITION OF A COHESIVE STRATA	MIN. UNIT WEIGHT (PCF)	COEF OF SUBGRADE REACTION (KCF)	UNDRAINED SHEAR STRENGTH (KSF)	YOUNG MOD. OF SUBGRADE (KSI)	COEF. OF AT REST PRESS.	MAX. EFFECTIVE ANGLE OF FRICTION (DEGREES)	MAX. ALLOWABLE BEARING CAPACITY (TSF)
REQUIRE DIAMOND CORE DRILLING TO ADVANCE BOREHOLE			TRANSITION ZONE								
	WEATHERED & JOINTED BEDROCK	WR	WEATHERED AND JOINTED BEDROCK. WEATHERING ALONG JOINTS AND ALSO AFFECTING THE MINERAL FABRIC. RQD GENERALLY LESS THAN 50%.	BECOMING MORE ROCK LIKE WITH DEPTH, TOO HARD TO OBTAIN SOIL SAMPLE FOR TEST.	150 TO 160					32 TO 38	5.0 TO 15.0
	JOINTED BEDROCK	J	JOINTED TO MODERATELY JOINTED BEDROCK. WEATHERING ON JOINTS BUT RELATIVELY SMALL EFFECT ON MINERAL FABRIC. RQD GENERALLY BETWEEN 50% TO 75%.	MODERATELY JOINTED TO RELATIVELY SOUND. COMPRESSIVE STRENGTH 5 TO 25 KSI.	170					45	30.0 TO 60.0
	BEDROCK	R	RELATIVELY SOUND TO SOUND BEDROCK. OCCASIONALLY MODERATELY JOINTED. WEATHERING CONFINED PRINCIPALLY TO JOINTS. RQD GENERALLY GREATER THAN 75%.	MODERATELY JOINTED TO RELATIVELY SOUND. COMPRESSIVE STRENGTH 5 TO 25 KSI.	170					45	30.0 TO 60.0

1. THIS TABLE IS INTENDED PRIMARILY FOR USE IN DESIGN OF PERMANENT STRUCTURES. IN ANY CASE, SPECIFIC BORING AND LABORATORY TEST INFORMATION AT THE LOCATION OF INTEREST SHOULD BE CONSULTED IN SELECTING THE PARAMETERS FOR DESIGN SINCE THE VALUES TABULATED ABOVE ARE GENERALIZED OVER A WIDE AREA.

2. "SHEAR STRENGTH" TABULATED FOR "COHESIVE STRATA" IS APPROXIMATE UNDRAINED COHESION AND IS NOT INTENDED TO BE COMBINED WITH OR SUPERPOSED ON THE "EFFECTIVE FRICTION ANGLE" FOR DRAINED SHEAR.

3. IN EVALUATING APPLIED PRESSURES OR STABILITY CONDITIONS IN THE TRANSITION ZONE AND VARIOUS BEDROCK ZONES, THE BORING INFORMATION ON ATTITUDE AND CHARACTER OF THE DISCONTINUITIES SHOULD BE TAKEN INTO CONSIDERATION. IF THERE IS EVIDENCE OF SLICKENSIDES, SHEARED ZONES OR SURFACES OR SMOOTH JOINTS DIPPING UNFAVORABLY INTO THE EXCAVATION, EFFECTIVE FRICTION ANGLES ON THESE DISCONTINUITIES CAN BE IN A RANGE OF 10 DEGREES TO 20 DEGREES.

NOTES: a) TABLE IS BASED ON MRWJ* GEOTECHNICAL INFORMATION FOR THE METRO PREVIOUS PROJECTS.

b) INFORMATION (ALLOWED LIMITS) NOT GIVEN IN THE TABLE SHALL BE PROVIDED BY DESIGNER/DESIGN-BUILDER FOR SPECIFIC PROJECT AS NECESSARY

* MEUSER RUTLEDGE WENTWORTH & JOHNSTON

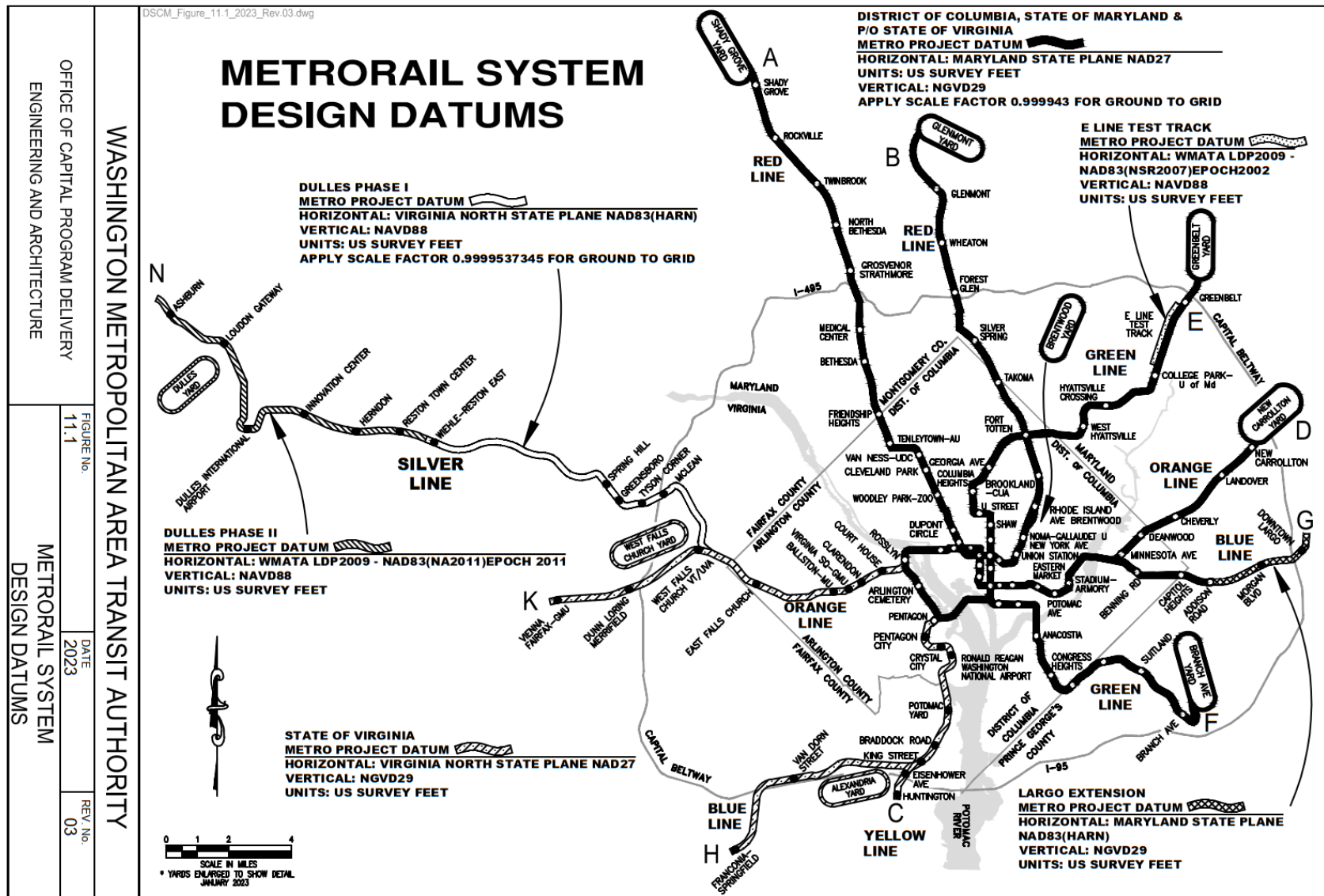
Updated: September 6, 2000

Table C-4: Generalized Strata Descriptions

GENERALIZED STRATA DESCRIPTIONS

SYMBOL	DESCRIPTION	UNIFIED SOIL CLASSIFICATION		SOURCE AND AGE	SYMBOL	DESCRIPTION	UNIFIED SOIL CLASSIFICATION		SOURCE AND AGE
		PRIMARY	SECONDARY				PRIMARY	SECONDARY	
(F)	FILL, GENERALLY OF INORGANIC SOIL OBTAINED FROM NEARBY NATURAL MATERIALS. MAY BE COMPOSED OF TERRACE, CRETACEOUS SOILS OR DECOMPOSED ROCK.	ML, SM	SC, CL	MAN MADE IN HISTORIC TIMES	(C)	MEDIUM COMPACT GRAY AND TAN SILTY FINE SAND OR MEDIUM TO STIFF DARK GRAY TO OLIVE GREEN CLAY, CALVERT FORMATION OF MIOCENE AGE.	SM, CH	SP, CL	MARINE DEPOSITS OF TERTIARY OR UPPER CRETACEOUS PERIODS
(A1)	SOFT TO MEDIUM STIFF DARK GRAY AND BROWN ORGANIC CLAY WITH LENSES OF HIGHLY ORGANIC MATERIAL UNDER WATER. MOTTLED GRAY-BROWN SLIGHTLY ORGANIC SILTY OR SANDY CLAY ON LAND.	CL, CH, OH	OL, PL	RIVER ALLUVIUM OF POST-GLACIAL TIMES	(E)	MEDIUM STIFF DARK GREEN OR BROWN CLAY AND SILTY CLAY, AQUIA FORMATION OF EOCENE AGE.	MH, CH	ML, CL	POTOMAC GROUP OF CRETACEOUS PERIOD
(A2)	LOOSE TO MEDIUM COMPACT DARK BROWN OR GRAY SILTY FINE TO MEDIUM SAND WITH OCCASIONAL POCKETS OR LENSES OF SMALL GRAVEL.	SM	SP		(M)	MEDIUM STIFF TO STIFF DARK GREEN OR BROWN SILT AND CLAY, MONMOUTH FORMATION OF UPPER CRETACEOUS AGE.	MH, CL	ML, CH	
(T1)	STIFF TO MEDIUM LIGHT BROWN OR GRAY OR MOTTLED BROWN-GRAY SILTY CLAY OR CLAYEY SILT WITH LENSES OF BROWN SILTY FINE SAND.	CL, ML	LENSES OF SM OR SC	PORTIONS OF THE "25-FOOT"	(P1)	HARD MOTTLED RED-BROWN AND GRAY OR LIGHT GRAY AND TAN PLASTIC CLAY WITH OCCASIONAL POCKETS OF FINE SAND. GENERALLY CONSISTS OF PATAPSCO FORMATION BUT MAY INCLUDE RARITAN FORMATION AT HIGHER LEVELS.	CH	CL	POTOMAC GROUP OF CRETACEOUS PERIOD
(T2)	MEDIUM COMPACT TO COMPACT BROWN AND ORANGE-BROWN SILTY OR CLAYEY FINE TO MEDIUM SAND WITH TRACES OF SMALL GRAVEL.	SM, SC	SP, SW	"50-FOOT" AND "90-FOOT"	(P2)	COMPACT TO VERY COMPACT LIGHT GRAY OR TAN SILTY OR CLAYEY FINE TO MEDIUM SAND WITH POCKETS OF SILTY CLAY AND TRACE OF SMALL GRAVEL. OCCASIONAL LIGNITE FRAGMENTS. INCLUDES ALSO MAGOTHY FORMATION OF UPPER CRETACEOUS.	SM, SP	SP	
(T3)	COMPACT TO VERY COMPACT BROWN AND RED-BROWN FINE TO COARSE SAND WITH SOME SILT AND GRAVEL, OR SAND AND GRAVEL WITH A TRACE OF SILT AND NUMEROUS BOULDERS.	SW, SM	SP, GM	TERRACES, DEPOSITED BY RIVERS IN PLEISTOCENE TIMES	(P3)	HARD GRAY-GREEN OR GRAY-BLUE SILTY OR SANDY CLAY AND SANDY AND SANDY SILT AND SILTY OR CLAYEY FINE SAND WITH OCCASIONAL SMALL GRAVEL.	CL, SC	ML, SM	
(T4)	MEDIUM COMPACT TO COMPACT GRAY AND GRAY-BROWN FINE TO MEDIUM SAND WITH SOME SILT AND SMALL GRAVEL CONTAINING LENSES OF DARK GRAY CLAY, OCCASIONALLY SLIGHTLY ORGANIC.	SM, SP	SW		(P4)	VERY COMPACT MOTTLED LIGHT GRAY, TAN, BUFF OR WHITE SILTY OR CLAYEY FINE TO MEDIUM SAND WITH SOME GRAVEL AND SCATTERED LIGNITE FRAGMENTS.	SM, SW	SP, GM	
(T5)	COMPACT TO VERY COMPACT GRAY AND GRAY-BROWN FINE TO COARSE SAND WITH SOME GRAVEL AND SOME TO TRACE SILT, OR SAND AND GRAVEL WITH NUMEROUS BOULDERS.	SW, SM	SP, GM		(D)	HARD ORANGE-BROWN OR YELLOW-BROWN MICACEOUS FINE SANDY SILT OR VERY COMPACT LIGHT GRAY AND GREEN MICACEOUS SILTY FINE TO MEDIUM SAND, DECOMPOSED BEDROCK.	ML, SM	MH	WEATHERED IN SITU FROM CRYSTALLINE BEDROCK
(Q1)	LOOSE TO MEDIUM COMPACT LIGHT BROWN SILTY OR CLAYEY FINE TO MEDIUM SAND WITH TRACE SMALL GRAVEL.	SM, SC		BRANDYWINE FORMATION OF EARLY PLEISTOCENE OR PLEISTOCENE TIMES	(WR)	MODERATELY TO HIGHLY WEATHERED AND JOINTED ROCK, REQUIRES CORE DRILLING. RQD VALUES GENERALLY LESS THAN 50%, CORE RECOVERY GENERALLY LESS THAN 70%.			ROCKS OF PALEOZOIC OR PRECAMBRIAN AGE
(Q2)	LOOSE TO MEDIUM COMPACT LIGHT BROWN OR TAN SILTY OR CLAYEY FINE TO MEDIUM SAND WITH SOME SMALL GRAVEL.	SM, SC	SP		(R)	BEDROCK, PRIMARILY WISSAHICKON SCHISTOSE GNEISS, IN SOME AREAS ALTERED BY INTRUSION, AND VARIOUS IGNEOUS ROCK INTRUDED INTO THE SCHISTOSE GNEISS. RQD VALUES GENERALLY GREATER THAN 50%, CORE RECOVERY GENERALLY GREATER THAN 60%.			

Metrorail System Design Datums



As-Built Documentation Format

NOTES:

1. The WMATA Section Designation must be identified. Example: Medical Center Project is **A10**.
2. All As-built documentation shall be provided in required formats with applicable Professional Engineer seal.
3. All As-built drawings sheets shall be individually provided in both .pdf format and CADD format.
4. The .pdf and CADD files shall be accompanied with an Excel Spreadsheet that lists all pertinent information about each document. A sample of the Excel Spreadsheet form is shown below.
5. The title blocks on all drawings should correlate with the information that appears on each row of the spreadsheet.
6. Other Miscellaneous WMATA Documentation includes all issued reports, calculations, etc.

SAMPLE

Document Designation/ Number	Document Revision No.	Discipline	Sub-Discipline	Sub-Sub Discipline (if applicable)	Title of Document	Document Issue Date	Document Final Status	Document Description / Type	AutoCAD File Name	PDF File Name	WMATA Location
A10-A-932	5	ARCHITECTURE	SYSTEM WIDE	WAYSIDE BUILDINGS	EXTENSION TO WIEHLE AVE WAYSIDE BUILDINGS TYPICAL DETAILS	4-Feb-14	IFC - Issued for Construction	Drawing	A10-A-932. AutoCAD extension	A10-A-932.pdf	A10 - Medical Center
A10-ATC-400	0	AUTOMATIC TRAIN CONTROL	SYSTEM WIDE	CONDUITS	AS-BUILT EXTENSION TO WIEHLE AVE- DIRECT FIXATION INTERLOCKING ATC CONDUIT REQUIREMENTS (FOR REFERENCE)	31-May-14	IFC - Issued for Construction	Drawing	A10-ATC-400. AutoCAD extension	A10-ATC-400.pdf	A10 - Medical Center
A10-C-001	2	CIVIL	PLANS		EXTENSION TO WIEHLE AVE SYSTEMWIDE SYSTEM KEY PLAN AND VICINITY MAP	11-Jun-14	IFC - Issued for Construction	Drawing	A10-C-001. AutoCAD extension	A10-C-001.pdf	A10 - Medical Center
A10-C-014	5	CIVIL	GENERAL NOTES	GENERAL NOTES	EXTENSION TO WIEHLE AVE SYSTEM WIDE CIVIL ABBREVIATIONS	18-Dec-14	IFC - Issued for Construction	Drawing	A10-C-014. AutoCAD extension	A10-C-014.pdf	A10 - Medical Center
A10-C-022	2	CIVIL	SURVEY		EXTENSION TO WIEHLE AVE SYSTEMWIDE SURVEY CONTROL	18-Jun-14	Issued	Drawing	A10-C-022. AutoCAD extension	A10-C-022.pdf	A10 - Medical Center
Geotechnical Report	0	GEOTECHNICAL			Insert - Title of Report		Issued	Report		Filename.pdf	A10 - Medical Center
Structural Calculations	0	STRUCTURAL			Insert - Title of Calculation		Issued	Calculation		Filename.pdf	A10 - Medical Center

Appendix D – Real Estate and Insurance Requirements

The below text is an excerpt from a WMATA Real Estate Permit denoting general insurance requirements and is not considered part of this manual's text.

WMATA'S INDEMNIFICATION AND INSURANCE REQUIREMENTS IN REAL ESTATE PERMITS

WMATA reserves the right to make any changes it deems appropriate to the following indemnification and insurance requirements.

Defined Terms

Permit is the written legal agreement which allows entry onto WMATA property (Permitted Premises).

Permitted Premises is the WMATA property which is the subject of the Permit.

Permitted Parties are those individuals and entities entering upon the Permitted Premises to do work for the Permittee in accordance with the terms of the Permit.

Permittee is the Owner/Developer/Contractor/Consultant (ODC) or any combination thereof.

Indemnification

- A. Permittee shall, and Permittee shall contractually require all other Permitted Parties to, indemnify, defend and hold harmless WMATA, its directors, officers, employees and agents from any and all claims, actions, proceedings, liabilities, losses, demands, damages, obligations, penalties, costs, charges and expenses, including, but not limited to, reasonable attorney's fees, of whatsoever kind and nature for injury, including personal injury or death of any person or persons, including employees of Permittee or any other Permitted Party, and for loss or damage to any property, occurring in connection with, or in any way arising out of the use, occupancy and performance of the work authorized by this Permit or related to this Permit or the Project, and/or any acts in connection with activities to be performed under this Permit resulting in whole or in part from the acts, errors or omissions of Permittee or any other Permitted Party, or any employee, agent or representative of Permittee or any other Permitted Party. Nothing in the preceding sentence shall be deemed to relieve Permittee from ultimate liability for any obligation of Permittee under this Permit.
- B. Permittee shall, and Permittee shall contractually require all other Permitted

Parties to, indemnify, defend and hold harmless WMATA, its directors, officers, employees and agents from all claims, actions, proceedings, liabilities, losses, demands, damages, penalties, costs, charges, remedial costs, environmental claims, fees or other expenses including attorney's fees, related to, arising from or attributable to any effluent or other hazardous waste or substance, toxic waste or substance, contaminant, pollutant, petroleum or petroleum-based product, asbestos, residue, contaminated soil or other similar material discharged from, removed from, or introduced on, about or under the Permitted Premises by Permitted Parties or anyone acting on their behalf.

- C.** If any claim, demand, action or proceeding relating to the indemnification required by this Section 21 is brought against WMATA, then upon written notice from WMATA to Permittee, Permittee shall, at Permittee's expense, resist or defend such action or proceeding by counsel accepted by WMATA in writing, such approval not to be unreasonably withheld, but no approval of counsel shall be required where the cause of action is resisted or defended by counsel of any insurance carrier obligated to resist or defend the same. WMATA reserves the right to use its own counsel under this indemnity at Permittee's sole cost and expense. Permittee shall be jointly and severally liable with any Contractor directly responsible for any claim, demand, action, proceeding, liability, loss, damage, obligation, penalty, cost, charge or expense arising under this Permit, and nothing in this Permit shall be deemed to relieve Permittee from ultimate liability for any obligation of Permittee under this Permit.
- D.** Permittee understands and agrees that it is Permittee's and all other Permitted Parties' responsibility to provide indemnification to WMATA pursuant to this Section 21. The provision of insurance, while anticipated to provide a funding source for this indemnification, is in addition to any indemnification requirements and the failure of insurance to fully fund any indemnification shall not relieve Permittee and other Permitted Parties of any obligation assumed under this indemnification.

Insurance

The following outlines the minimum insurance requirements, minimum insurance coverages, and minimum limits of insurance for those coverages that Permittee will be required to purchase and maintain as a means to gain access to WMATA property and/or perform work adjacent to WMATA property:

- A.** Permittee is required to maintain the insurance coverage(s) outlined herein through the completion of all construction and/or any activities in which Permittee may potentially need access to WMATA properties or is within WMATA's Zone of Influence.
- B.** The insurance coverage requirements and limits of insurance for those coverages

outlined herein are minimum coverage and limits. Permittee is encouraged, at its sole cost and expense, to purchase any additional insurance coverages and or limits of insurance that Permittee deems prudent and necessary to manage Permittee's risk.

- C.** Upon written request from WMATA, Permittee shall provide copies of any and all policy(s), including all endorsement(s), within five (5) business days of such request.
- D.** Receipt, review and communications regarding Certificates of Insurance, insurance policy(s), endorsements or other vehicles utilized to document compliance with these minimum insurance requirements does not constitute acceptance by WMATA.
- E.** Insurance policies must be written on admitted paper, unless otherwise indicated herein or agreed to in writing by WMATA, with an insurance company reasonably acceptable to WMATA.
- F.** Unless otherwise noted, "claims made" insurance policies are not acceptable.
- G.** Any insurance policy utilizing a self-insured retention (SIR) requires approval from WMATA.
- H.** Permittee is required to incorporate these minimum insurance requirements into contract requirements of all subcontractors of every tier.
- I.** Compliance with these minimum insurance requirements does not relieve Permittees from their respective liability to WMATA should their liability exceed the minimum insurance limits, or minimum coverage requirements outlined herein.

Workers' Compensation and Employer's Liability Required Minimum Limits of Coverage:

Workers' Compensation	Statutory	
Employers' Liability	\$1,000,000	Each Accident
	\$1,000,000	Disease Policy Limit
	\$1,000,000	Disease Each Employee

Required Minimum Coverage(s):

1. Workers' Compensation statutory coverage must be provided on "all states" basis.
2. Permittee and subcontractors of any tier performing work within 500 feet of navigable water must have their Workers' Compensation policy endorsed to provide coverage for both Jones Act Liability and Longshore and Harbor Workers' Compensation Act Liability.

Commercial General Liability Required Minimum Limits of Coverage:

Permittee and its Contractor(s): [TBD by WMATA's Office of RISK]

\$X,XXX,XXX	Each Occurrence Limit
\$X,XXX,XXX	General Aggregate Limit
\$X,XXX,XXX	Products and Completed Operations Limit

Required Minimum Limits of Coverage: Subcontractors of every tier:

\$X,XXX,XXX	Each Occurrence Limit
\$X,XXX,XXX	General Aggregate Limit
\$X,XXX,XXX	Products and Completed Operations Limit

Required Minimum Coverage(s) All Permittees:

1. Commercial General Liability (CGL) coverage form shall be ISO Occurrence Form CG0001 (12/04) or its equivalent. Equivalency determination shall be made in WMATA's sole and unreviewable discretion.
2. Required minimum limits of coverage may be achieved through a combination of the aforementioned CGL coverage form and umbrella excess liability coverage form(s), provided that the umbrella excess liability coverage form(s) provide the same or broader coverage than the prescribed CGL coverage form.
3. Policy shall be endorsed with Additional Insured Endorsement(s) in compliance with the Additional Insured Section 22.8 of this Permit. Commercial General Liability and Umbrella Excess Liability forms must provide defense coverage for additional insureds.
4. Policy shall be endorsed with a Waiver of Subrogation Endorsement(s) in compliance with the Waiver of Subrogation Section 22.9 of these minimum insurance requirements.
5. The definition of "insured contract" shall be modified to provide coverage for contractual liability for contracts for construction, demolition or any other operations that are within 50 feet of a railroad and sidetrack agreements.
6. Defense costs (allocated loss adjustment expense) must be included and in excess of the policy limits for all primary and umbrella excess policies.
7. Policy shall be endorsed with ISO endorsement CG 25 03 03 97; "Designated Construction Project(s) General Aggregate Limit", and

designate “any and all construction projects” as the designated construction project. This Section 22.3.7 applies only to the primary CGL policy.

Railroad Protective Liability Insurance (RRPL):

For work within 50 feet of WMATA railroad tracks or work within WMATA rail stations, Railroad Protective Liability Insurance is required with the following minimum limits of coverage: **[TBD by WMATA’s Office of RISK]**

\$X,XXX,XXX
\$X,XXX,XXX

Each Occurrence Limit
Aggregate Limit

Required Minimum Coverage(s):

1. Railroad Protective Liability (RRPL) policy on a policy form that is acceptable to WMATA, issued by an insurance company that is acceptable to WMATA.
2. WMATA shall be the first named insured.
3. Cost of RRPL shall be the sole responsibility of Permittee or a Permittee appointed entity.
4. The “wet ink” original RRPL policy shall be sent to WMATA at the following address:

Washington Metropolitan Area Transit Authority
Office of Risk Management, Room 903-02
4100 Garden City Drive
Hyattsville, MD 20785
5. WMATA Blanket RRPL Program Option: WMATA may offer to waive the requirement for Permittee to procure a standalone RRPL insurance policy if: (1) the work can be covered under WMATA’s blanket RRPL program; and (2) Permittee prepays the premium which shall be determined by the rate schedule promulgated by WMATA’s insurer in effect as of the Effective Date of this Permit. Permitted Parties shall be advised of and pay the applicable premium or procure a standalone RRPL policy on WMATA’s behalf.

Business Auto Liability Required Minimum Limits of Coverage:
[TBD by WMATA’s Office of RISK]

\$X,XXX,XXX

Combined Single Limit

Required Minimum Coverage(s):

1. Business Auto Liability shall be written on ISO Business Auto Coverage Form CA 00 01 03 06, or its equivalent. Equivalency determination shall be made in WMATA's sole and unreviewable discretion.
2. Policy shall be endorsed with Additional Insured Endorsement(s) in compliance with the Additional Insured Section 22.8 of this Permit.
3. Policy shall be endorsed with a Waiver of Subrogation Endorsement(s) in compliance with the Waiver of Subrogation Section 22.9 of this Permit.
4. Business Auto Liability Minimum Combined Single Limit requirements may be obtained through the combination of a primary business auto liability policy and an umbrella excess liability policy provided that the umbrella excess liability policy complies with items 22.5.1 through 22.5.3 above.

Professional Liability Insurance:

Should Permittee be required by the scope of work being performed on or adjacent to WMATA property to provide design services, the services of a professional engineer, including, but not limited to stamping, sealing, or certifying blueprints or other construction-related documents, Permittee is required to maintain Professional Liability Insurance as follows:

1. Minimum Policy Limits of \$2,000,000, each claim.
2. Actual coverage or tail coverage must be purchased and maintained for a period of time equal to the statute of repose.
3. Coverage can be written on an "occurrence" or "claims made" basis.
4. Coverage can be written on 'non-admitted" paper.

Pollution Liability Insurance:

Should Permittee be required by the scope of work being performed on or adjacent to WMATA property, to perform demolition of any pre-existing structures, moving, removal, or handling of any hazardous materials, Permittee is required to maintain Pollution Liability Coverage as follows:

1. Minimum Policy Limits of \$2,000,000, each claim.
2. Coverage can be written on an "occurrence" or "claims made" basis.
3. Coverage can be written on 'non-admitted" paper.
4. Policy shall be endorsed with Additional Insured Endorsement(s) in compliance with the Additional Insured Section 22.8 of this Permit.

5. Policy shall be endorsed with a Waiver of Subrogation Endorsement(s) in compliance with the Waiver of Subrogation article of this Permit.

Additional Insured(s):

Permittee is required to add WMATA and the WMATA Board of Directors as Additional Insured(s) on all insurance policies purchased by Permittee with the exceptions of Workers' Compensation and Professional Liability.

1. Coverage provided to any Additional Insured shall be primary and non-contributory to any other insurance available to the additional insured, including coverage afforded to WMATA as an Additional Insured by subcontractors, and from other third parties.
2. Coverage provided to any Additional Insured shall be for claims arising out of both ongoing operations and products and completed operations hazard. The coverage provided by the additional insured endorsement shall be at least as broad as the Insurance Service Office, Inc.'s Additional Insured Form CG 20 26 11 85 as determined by WMATA.
3. Coverage available to any Additional Insured under the products and completed operations hazard can only be limited to the applicable statute of repose in the jurisdiction where the contract scope of work takes place.
4. Coverage available to the Additional Insured shall not be limited to the minimum limits of coverage outlined in this document.

Waiver of Subrogation

Permittee is required to have all insurance policies purchased by all Permittees endorsed to waive the insurance company's rights of recovery against WMATA, the WMATA Board of Directors, and all Permittees. Coverage shall be provided on an endorsement that is acceptable to WMATA.

Certificate of Insurance (COI)

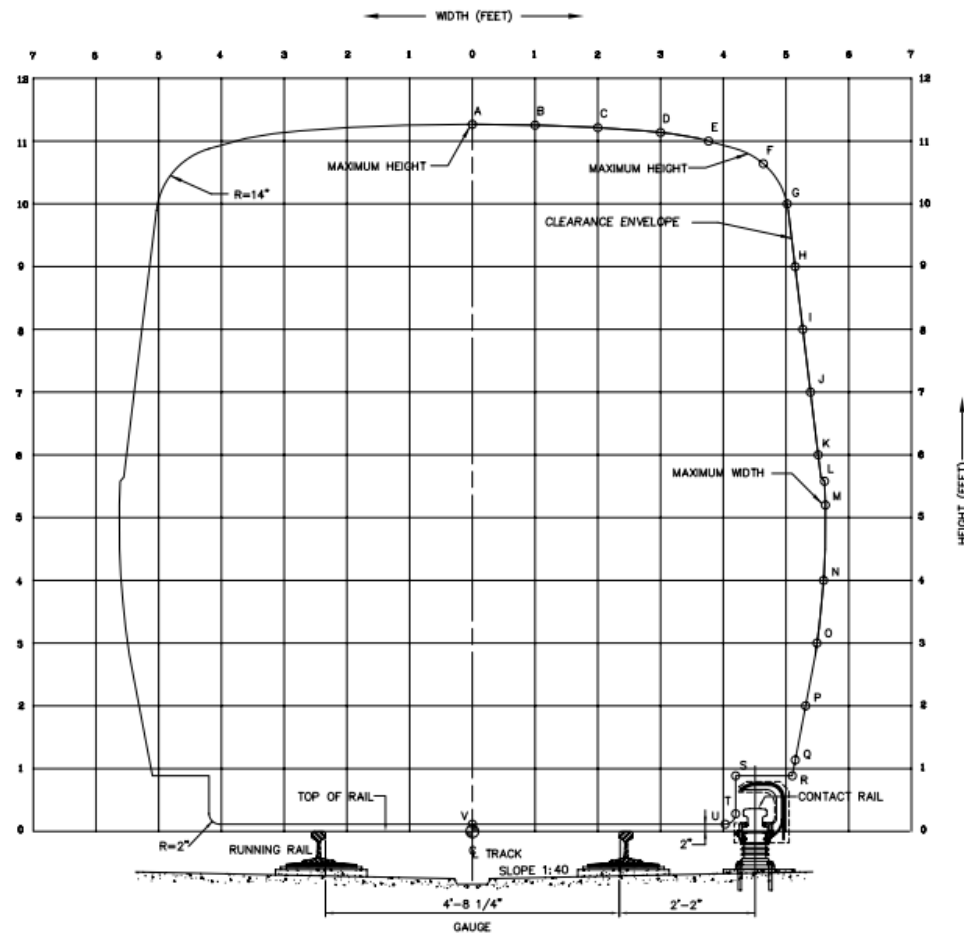
Permittee shall provide WMATA an ACORD Certificate of Insurance (COI) as evidence that the insurance requirements in this Permit have been satisfied. Certificates of Insurance shall be emailed to COI@WMATA.com. The "Description of Operations" box in the COI should reference the Permit PCN number located at the top of page 1 of this Permit and the "Certificate Holder" box should state:

Washington Metropolitan Area Transit Authority
Office of Risk Management, Room 903-02
4100 Garden City Drive
Hyattsville, MD 20785

1. Proposed material modifications to insurance required under this section must be received by WMATA at least thirty (30) days prior to the effective date of the proposed modifications to such insurance.
2. WMATA's receipt of copies of any COI, policy endorsements or policies does not relieve Permittee of the obligation to remain in compliance with the requirements of this section at all times. Permittee's failure to so comply, and to continuously comply, with these insurance requirements shall constitute a material default of the terms of this Permit.
3. Receipt of the COI does not constitute acceptance of the insurance outlined above.

Appendix E – Standard Drawings and Details

WMATA Standard Details applicable to JDAC projects can be found on the following sheets. Additional details may be provided upon request.

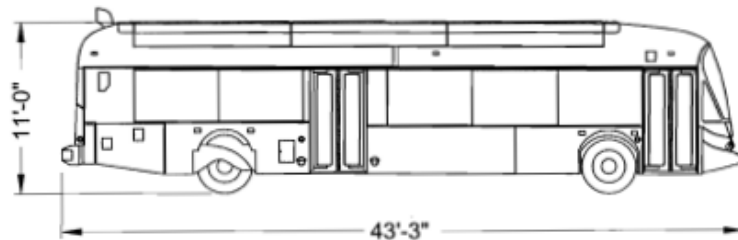


COORDINATES		
POINT	WIDTH	HEIGHT
A	0.000	11.267
B	1.000	11.252
C	2.000	11.213
D	3.000	11.136
E	3.761	11.000
F	4.638	10.638
G	5.018	10.000
H	5.148	9.000
I	5.268	8.000
J	5.388	7.000
K	5.511	6.000
L	5.616	5.580
M	5.627	5.200
N	5.593	4.000
O	5.498	3.000
P	5.316	2.000
Q	5.149	1.138
R	5.100	0.885
S	4.198	0.885
T	4.198	0.281
U	4.031	0.167
V	0.000	0.167

NOTES:

- THIS DIAGRAM IS TO BE USED TO VERIFY CLEARANCES TO WAYSIDE FACILITIES AND UNDERCAR FIXTURES. FOR EXAMPLE, FIRELINES, SPECIAL TRACK HARDWARE AND SAFETY WALKS.
- THIS DIAGRAM DOES NOT APPLY TO PLATFORMS AND MAJOR STRUCTURAL ELEMENTS, SUCH AS TUNNEL WALLS AND CEILINGS, RETAINING WALLS, AND PIERS. USE THE MANUAL OF DESIGN CRITERIA.
- THIS DIAGRAM IS DIRECTLY APPLICABLE ONLY FOR LEVEL, TANGENT TRACK. USE THE MANUAL OF DESIGN CRITERIA TO COMPENSATE FOR HORIZONTAL CURVATURE, TRACK SUPERELEVATION, AND MOVEMENT THROUGH TURNOUTS AND CROSSOVERS.
- THIS DIAGRAM AND DIMENSIONS ARE BASED ON THE FOLLOWING:
 - CAR BODY - THE CLEARANCE CAR FEELER OUTLINE, OR CLEARANCE ENVELOPE. THIS IS THE MAXIMUM POSSIBLE DYNAMIC OUTLINE PLUS AN ADDITIONAL ALLOWANCE OF 2 INCHES.
 - UNDERCAR - THE LOWEST POINT OF THE VEHICLE MINIMUM PROJECTED CLEARANCE. THIS IS DEFINED BY THE COLLECTOR PEDESTAL ASSEMBLY OF THE UNDERCARRIAGE. THESE CLEARANCES ARE DEFINED BY THE CLEARANCE ENVELOPE AND SHOULD ALSO ALLOW FOR AN ADDITIONAL 1/2 INCH AVERAGE PERMISSIBLE TOP RAIL WEAR.
 - CONTACT RAIL - THE RAIL CAR MAXIMUM POSSIBLE DYNAMIC OUTLINE FOR LOWER CAR BODY APPENDAGES.

DESIGNED _____ DATE _____	NUMBER _____ DESCRIPTION _____	DATE _____ BY _____ DESCRIPTION _____	WASHINGTON METROPOLITAN AREA TRANSIT AUTHORITY	CIVIL DESIGN DRAWING
DRAWN <u>A. DAVIS</u> DATE _____		06/2007/ENGA REVISED AND ISSUED BY THE AUTHORITY	OFFICE OF ENGINEERING SUPPORT SERVICES	WMATA RAPID TRANSIT CAR
CHECKED <u>L.B. PROBERT</u> DATE _____		06/2007/ENGF UPDATED NOTE #4.A		CLEARANCE ENVELOPE
APPROVED <u>C. WILKINS</u> DATE _____		06/2007/ENGS CLEARED UNDERCAR CLEARANCE ENVELOPE (SEE NOTE 4.B.)		
			SUBMITTED <u>VP/psj/tt</u> 10/2007 DATE _____	SCALE NOT TO SCALE
			APPROVED <u>[Signature]</u> 10/2007 DATE _____	DRAWING NO. DD-C-001



DE40FLA



D4505



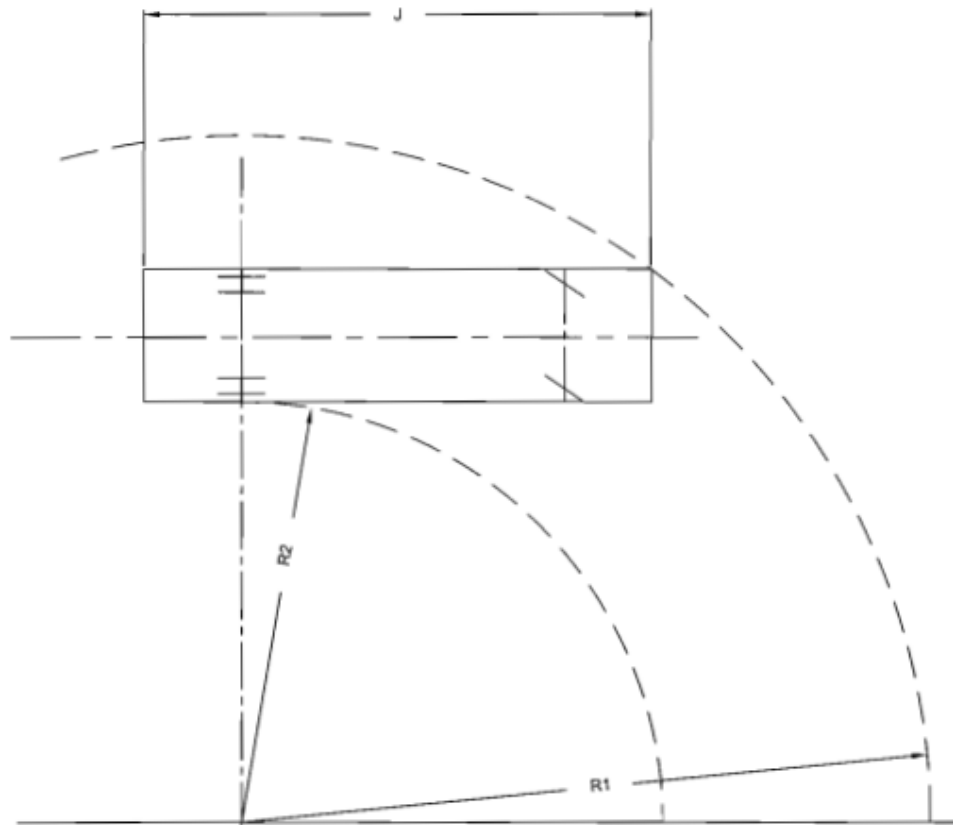
SIDE VIEW

FRONT VIEW

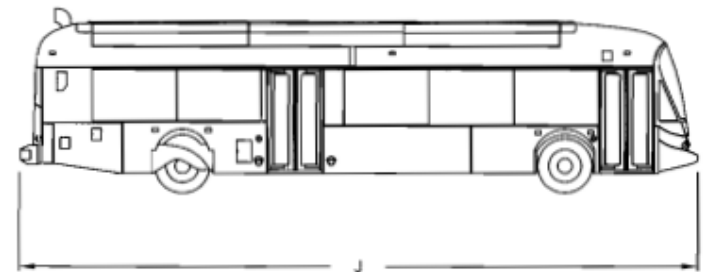
DESIGNED _____	CHECKED _____	REFERENCE DRAWINGS		REVISIONS		WASHINGTON METROPOLITAN AREA TRANSIT AUTHORITY		STANDARD DRAWING	
DRAWN _____	DATE _____	NUMBER	DESCRIPTION	DATE	BY	OFFICE OF ENGINEERING SUPPORT SERVICES		RIGID BODY TRANSIT BUS	
CHECKED _____	DATE _____							NFA DE40LFA & D4505	
								SCALE	DRAWING NO.
								NOT TO SCALE	ST-BUS-01

RIGID BODY BUS DIMENSIONS & TURNING RADIUS

	DESCRIPTION	BUSES BY MODEL	
		NFA DE40LFA	MCI D4505
J	BODY LENGTH, OVERALL	43'-2"	45'-5"
R1	OUTER BODY TURNING RADIUS	45'-8"	47'-8"
R2	INNER BODY TURNING RADIUS	23'-4"	25'-0"

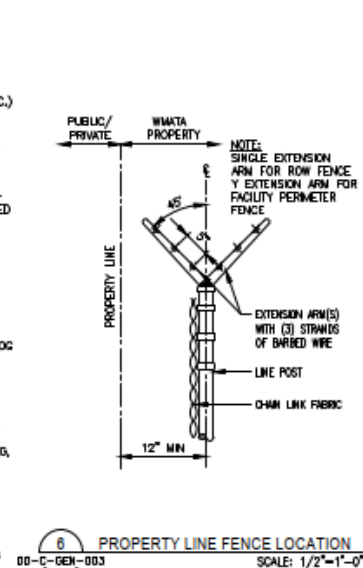
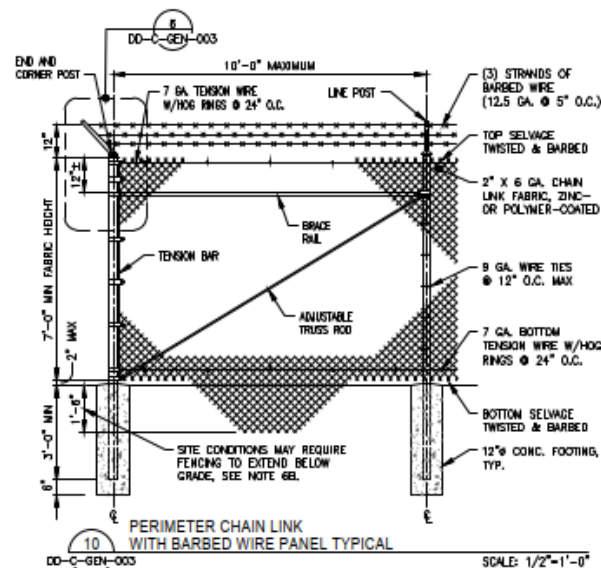
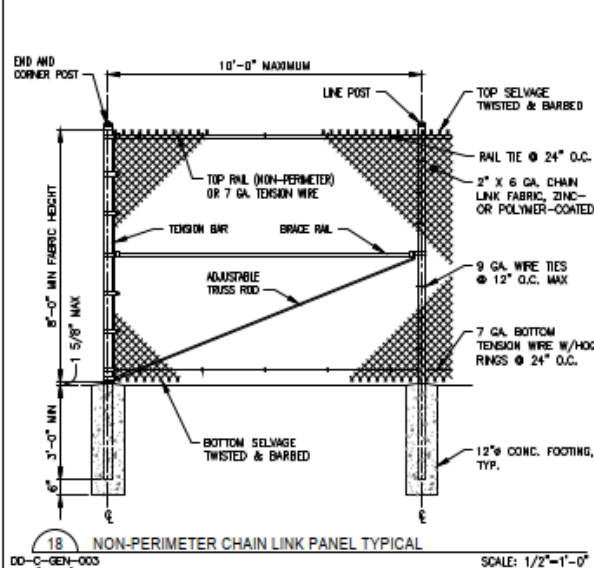


TURNING RADIUS



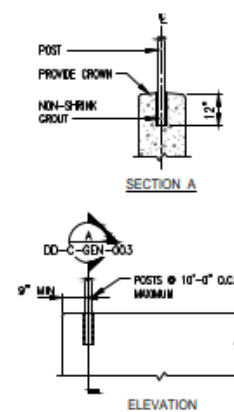
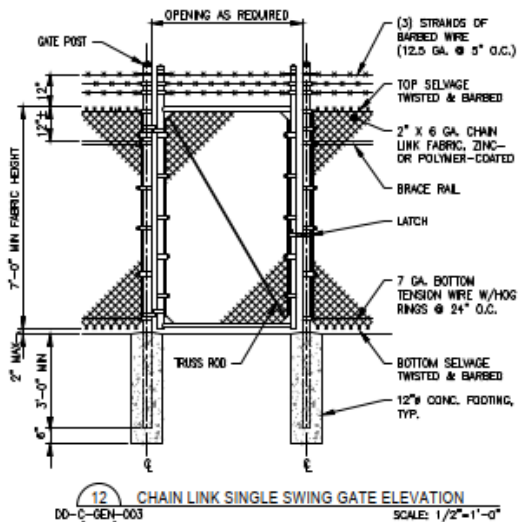
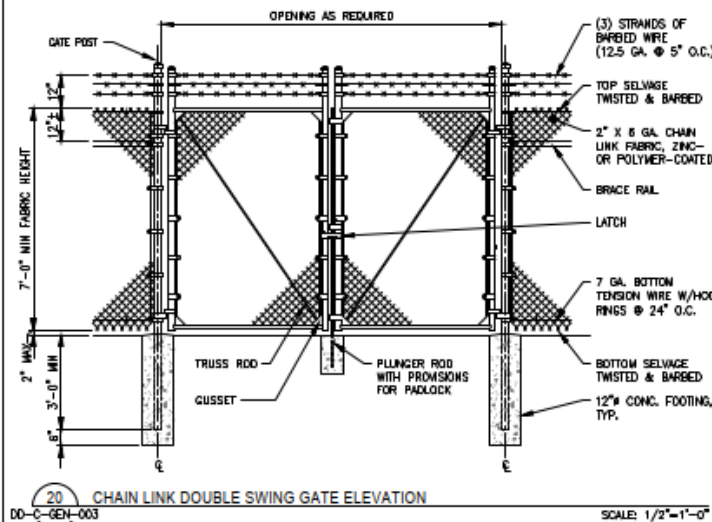
DE40FLA SHOWN

DESIGNED: _____	INCHES: _____	REFERENCE DRAWINGS		REVISIONS		WASHINGTON METROPOLITAN AREA TRANSIT AUTHORITY		STANDARD DRAWING	
DRAWN: VT	GAUGE: _____	NUMBER	DESCRIPTION	DATE	BY	DESCRIPTION	OFFICE OF ENGINEERING SUPPORT SERVICES		RIGID BODY TRANSIT BUS
CHECKED: RW	GAUGE: _____								DE40LFA & D4505
APPROVED: _____	GAUGE: _____								
						SUBMITTED _____ DATE _____		APPROVED _____ DATE _____	
						SCALE: NOT TO SCALE		DRAWING NO. ST-BUS-02	



GENERAL NOTES:

- CHAIN LINK FENCING SHALL COMPLY WITH "CHAIN LINK FENCE MANUFACTURERS INSTITUTE PRODUCT MANUAL".
- ZINC-COATED PERIMETER CHAIN LINK FENCING IS INTENDED FOR INSTALLATION ALONG THE RIGHT-OF-WAY (ROW); SUBJECT TO WMATA APPROVAL. OTHER LOCATIONS MAY BE ACCEPTABLE. ZINC-COATED NON-PERIMETER CHAIN LINK FENCING IS INTENDED FOR INSTALLATION WITHIN THE PERIMETER AND IS USED FOR STORAGE AREAS.
- POLYMER-COATED PERIMETER CHAIN LINK FENCING IS PRIMARILY INTENDED FOR INSTALLATION AT FACILITY LOCATIONS (I.E., BUS GARAGES AND RAIL YARDS); HOWEVER, SUBJECT TO WMATA APPROVAL, OTHER LOCATIONS MAY BE ACCEPTABLE.
- PERIMETER CHAIN LINK FENCING SHALL ALWAYS HAVE BARBED WIRE. ROW FENCING SHALL HAVE SINGLE EXTENSION ARMS FOR BARBED WIRE. FACILITY FENCING SHALL HAVE Y EXTENSION ARMS FOR BARBED WIRE.
- FENCE HEIGHT SHOWN IS MINIMUM AND DEPENDS UPON SITE REQUIREMENTS AND MTPD THREAT ASSESSMENT; HOWEVER, THE FOLLOWING HEIGHTS GENERALLY APPLY:
 - ROW - MINIMUM 7'-0" FABRIC WITH 1'-0" BARBED WIRE.
 - RAIL YARD AND TRAIN STORAGE AREA PERIMETER FENCE - MINIMUM 10'-0" FABRIC WITH 1'-0" BARBED WIRE. PROVIDE 1'-0" FABRIC BELOW GRADE UNLESS OTHERWISE INDICATED.
 - BUS GARAGE PERIMETER FENCE - MINIMUM 7'-0" FABRIC WITH 1'-0" BARBED WIRE.
- POST SIZE DEPENDS UPON FENCE HEIGHT, WEIGHT AND WIND LOADS. COORDINATE W/MANUFACTURER'S REQUIREMENTS.
- FOOTING SIZE SHOWN IS MINIMUM AND DEPENDS UPON FENCE HEIGHT, WIND LOADS AND LOCAL CODE REQUIREMENTS. COORDINATE WITH MANUFACTURER'S REQUIREMENTS.
- ZINC-COATED FABRIC TO BE ASTM A392, CLASS 2 WITH COATING APPLIED AFTER WEAVING.
- POLYMER-COATED FABRIC TO BE ASTM F688, CLASS 2b OVER ZINC-COATED STEEL WIRE. COLOR BLACK UNLESS OTHERWISE INDICATED.
- FENCE, GATE POSTS AND FRAMES SHALL BE GROUNDED IN ACCORDANCE WITH WMATA DESIGN CRITERIA. SEE SHEET DD-E-GRND-007 FOR GROUNDING AND BONDING DETAILS.
- POSTS, RAILS AND RODS TO BE INSTALLED INSIDE FENCE FABRIC.
- POSSIBLE GATE DESIGNS INCLUDE SINGLE SWING, DOUBLE SWING, CANTILEVER SLIDING AND/OR SLIDING ROLL. GATE CONFIGURATIONS ARE SITE AND USER DEPENDENT.



DESIGNED	P. FANJULIK	DATE	REFERENCE DRAWINGS		REVISIONS	
			NUMBER	TITLE	DATE	DESCRIPTION
DRAWN	P. FANJULIK	DATE				
CHECKED	K. KARADIMOV	DATE				

WASHINGTON METROPOLITAN AREA TRANSIT AUTHORITY OFFICE OF DESIGN AND CONSTRUCTION ENGA - CIVIL ENGINEERING			
APPROVED	DATE	APPROVED	DATE

CIVIL DESIGN DIRECTIVE DRAWINGS HIGH SECURITY ZINC- AND POLYMER- COATED STEEL CHAIN LINK FENCE DETAILS SHEET 1 OF 2			
W. NO.	CONTRACT NO.	SCALE	DRAWING NO.
M-	FQ-	AS NOTED	DD-C-GEN-003
			SHEET NO.
			04 of 08

