



**MEMORANDUM 01**

To: Chief Engineer  
James Harper

From: Deputy Chief Engineer  
Derek Boeldt

Initiated: CTA Engineering

Date: 06/18/2018

**Subject: Update Memo to Various Sections for the REV 0 of ACM**

Effective 07/02/2018, Memorandum 01 dated 06/18/2018 supersedes the corresponding Sections/paragraphs of the Adjacent Construction Manual Revision 00 dated November 2017.

For questions or concerns on application to a specific project, consultants/local Agencies should contact CTA Adjacent Construction Oversight per [Section 1.3](#) in the current version of Adjacent Construction Manual.

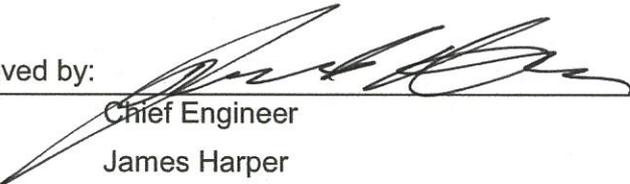
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Approved by:   
Deputy Chief Engineer  
Derek Boeldt

Date: 6-18-18

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Approved by:   
Chief Engineer  
James Harper

Date: 6-20-18

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Approved by:   
General Manager, Construction  
Steve Mascheri

Date: 6/28/18

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Approved by:   
Vice President, Construction  
Robert Wittmann

Date: 6/27/18

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Approved by:   
Chief Infrastructure Officer  
Carole Morey

Date: 6/29/18

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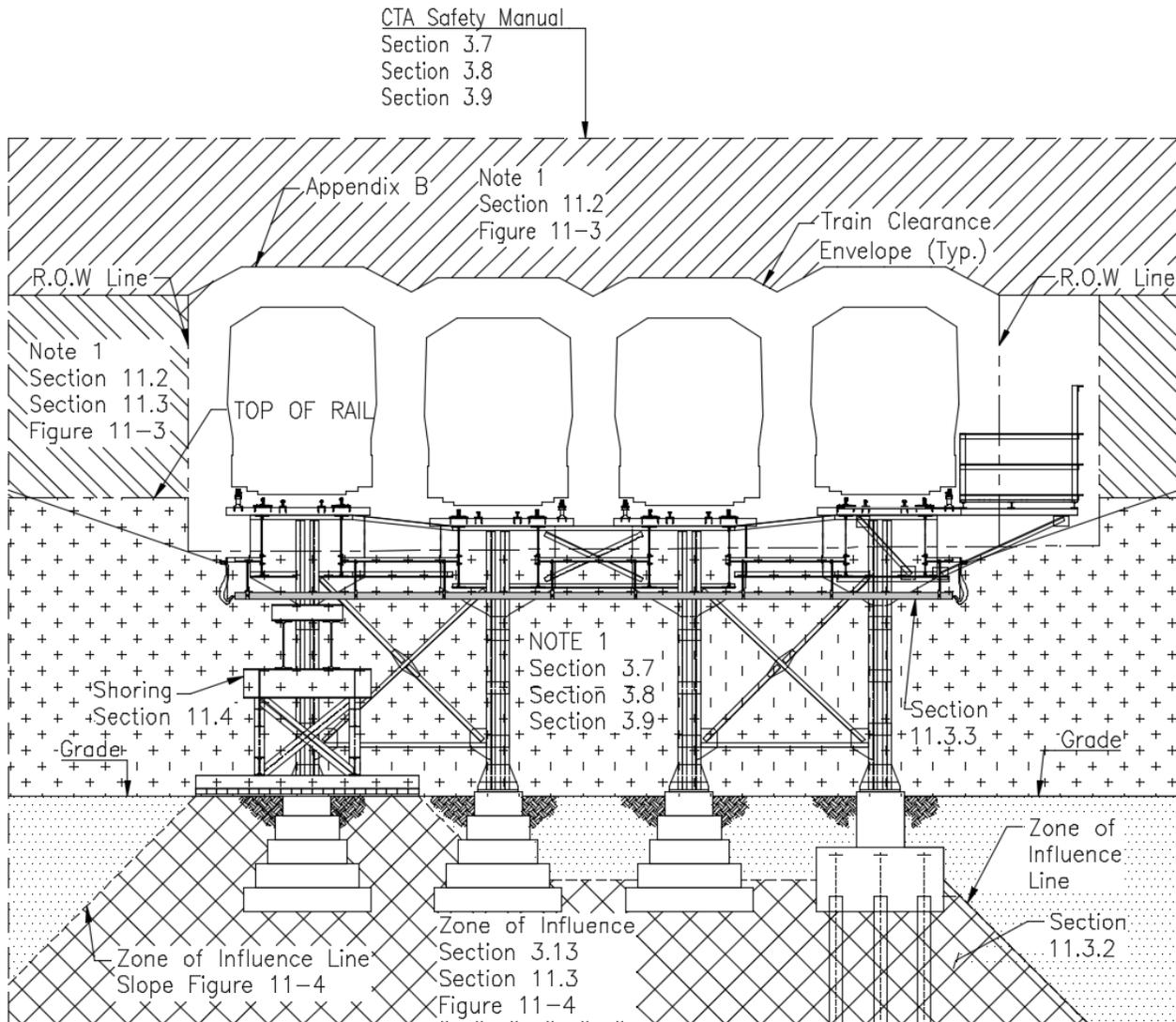


PREFACE

DIAGRAM CASES FOR ADJACENT CONSTRUCTION WORK

(...)

CASE 1 – ELEVATED TRACK STRUCTURES

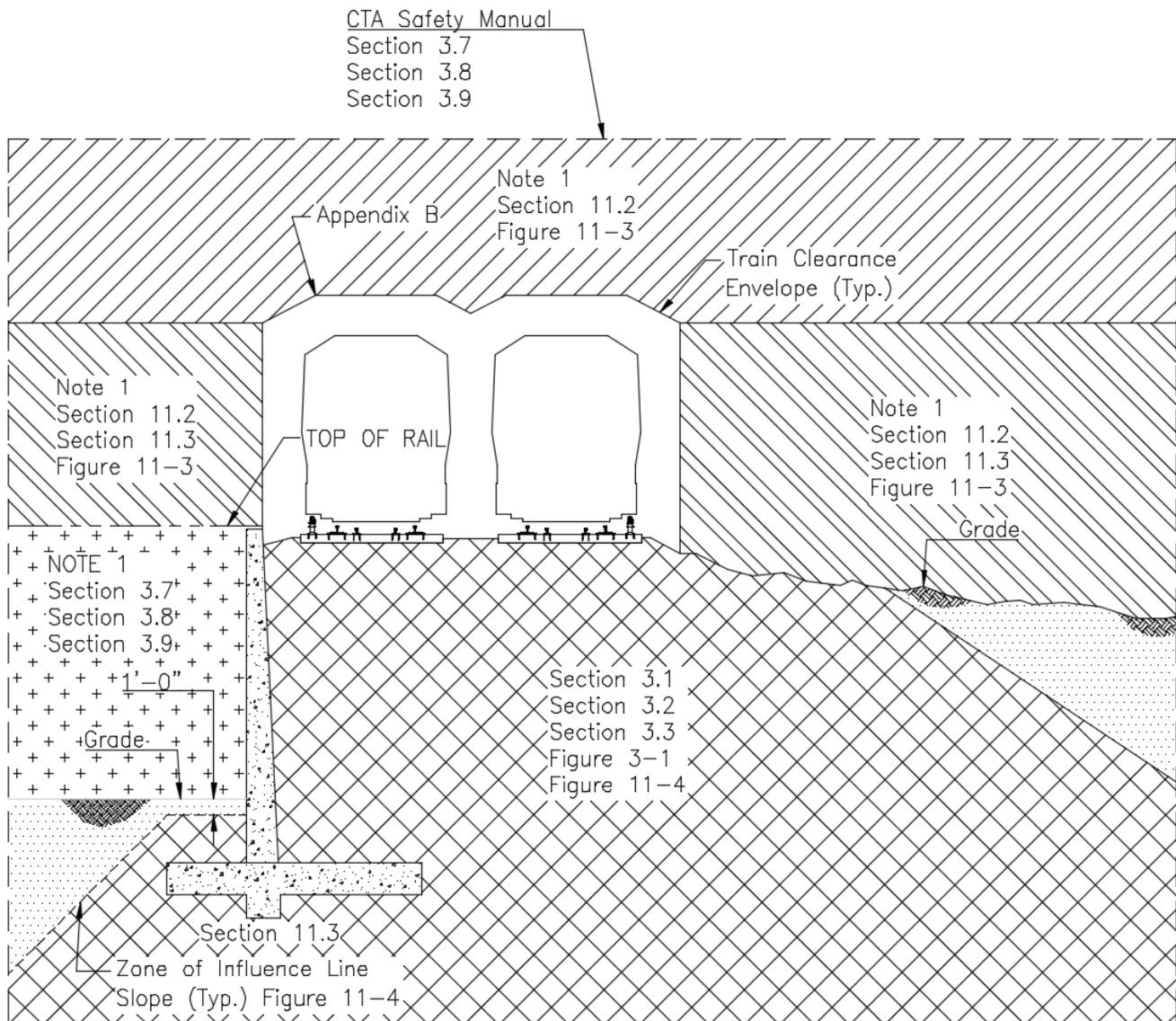


Notes:

1. Consult CTA Safety for requirements. Track flaggers will be required if its determined there is a risk that will extend above tracks. See Sections 3.7, 3.8, and 3.9.
- ~~2. From drilled probe that clears the outer tunnel edge (typical each side).~~



**CASE 2 – ON-GRADE AND RETAINING WALL TRACKS**



**Notes:**

1. Consult CTA Safety for requirements. Track flaggers will be required if its determined there is a risk that will extend into train clearance envelop. See Sections 3.7, 3.8, and 3.9.
- ~~2. From drilled probe that clears the outer tunnel edge (typical each side).~~

(...)



## SECTION 1 INTRODUCTION

(...)

### 1.4 REFERENCES

The following documents are referenced in this Manual:

- Chicago Transit Authority (CTA) Documents, latest edition:
  - CTA Requirements for Contractors Working Along the Right-of-Way (R.O.W.)
  - CTA Safety Manual
  - ~~Specification for working near the ROW~~
  - CTA Roadway Worker Protection Manual

(...)

### 1.6 ACRONYMS

The following acronyms are used in this document:

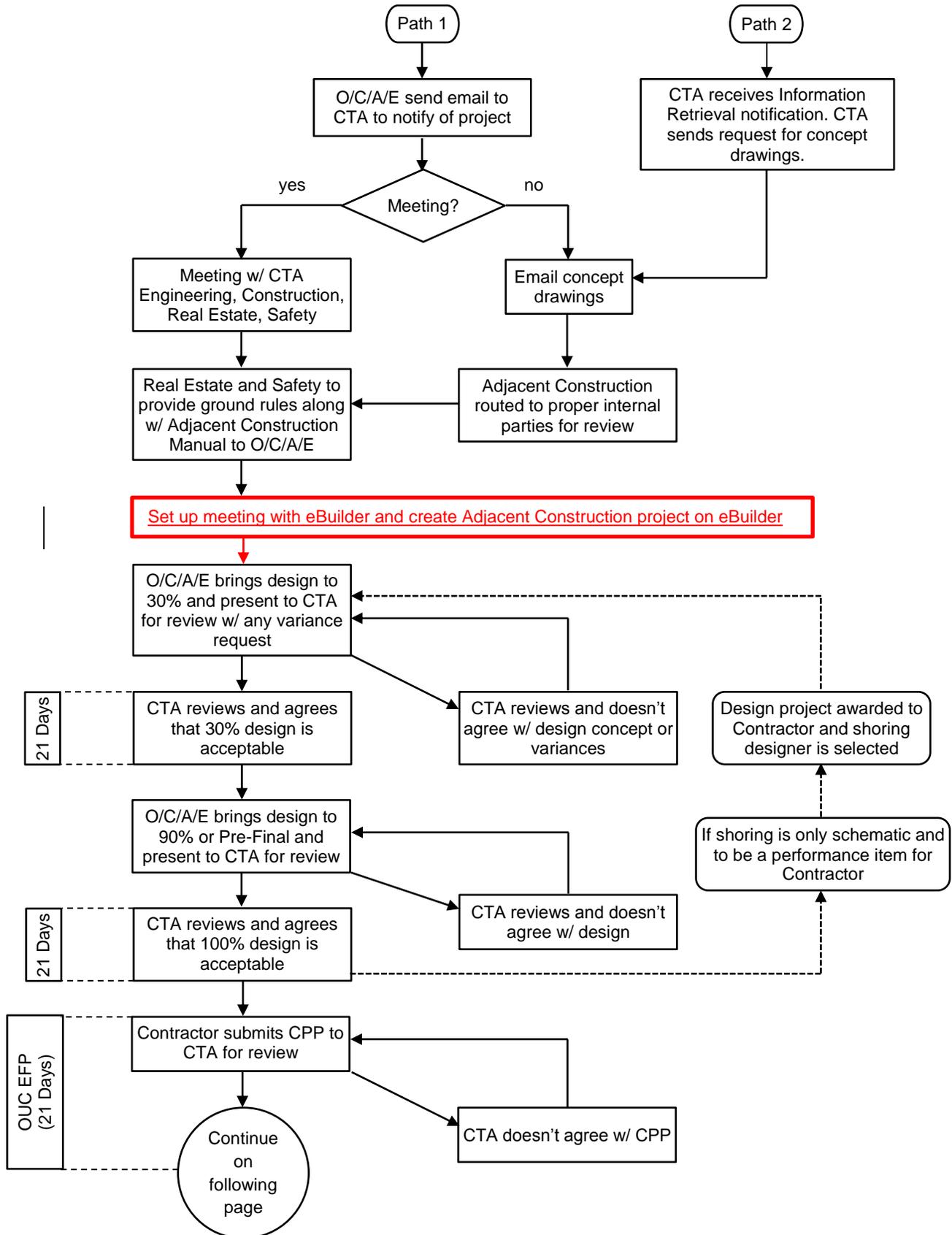
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HDD	Horizontal Directional Drilling
IC	Illinois Central Railroad
IDOT	Illinois Department of Transportation
<del>JULIE</del>	<del>Joint Utility Locating Information for Excavators</del>
LOCID	CTA Location Identifier
NAVFAC	Naval Facilities Engineering Command
NHI	National Highway Institute

(...)



SECTION 2 COORDINATION FLOWCHART AND SUBMITTAL REQUIREMENTS





## 2.1 GENERAL

(...)

Forms, drawings and calculations shall be submitted to CTA for review in electronic format transmitted by email, ~~ftp~~ or mail (with CD-R or DVD-R properly labeled) as means to notify CTA of the Adjacent Construction. After the initial coordination with CTA, a project coordination website will be created by CTA and all submittals and CPP's must be uploaded to the appointed project website. Any documents not uploaded to the project website will not be considered as received by CTA. User Instructions for the project website will be provided. Files shall be Bluebeam and Adobe PDF compatible. Each separate document shall be a separate PDF file (drawings, specifications, calculations, forms, etc.). Files shall be named using the following guidelines:

(...)

## 2.7 CONSTRUCTION PROCESS PLAN (CPP)

The construction of all shoring and all other construction activities within the Basic Safety Envelope and the Zone of Influence will require the Contractor to submit a Construction Process Plan (CPP). Adjacent Construction shall not commence without an approved CPP.

(...)

## 2.8 CONSTRUCTION VERIFICATION

(...)

### Potholing Utilities

When potholing is required to verify existing CTA utilities per Section 3.6, Section 4.4, and Section 4.5, Contractor shall submit a confirmation letter and provide evidence that existing CTA utilities have been located before commencing the proposed Adjacent Construction work. Evidence shall include:

- Photos during the potholing process
- Photos showing the existing CTA utilities after discovered, if visible.
- Photos showing the depth measurement process
- Updated drawings with the field verified existing CTA utility locations and clearance dimensions to the proposed work



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## SECTION 3 BASIC EXCAVATION REQUIREMENTS

(...)

### 3.6 UTILITIES

In the City of Chicago, existing utilities shall be located prior to commencing any excavation. The Office of Underground Coordination (OUC) is the distribution agency within the Chicago Department of Transportation, Division of Infrastructure Management, for all requests regarding existing utility information and the review/approval of construction work in or adjacent to the Public Way. Proposed projects for new construction and installation work must be processed through the OUC Information Retrieval process to procure CTA infrastructure drawings. CTA is a member of OUC. Acceptance of the project by CTA does not constitute a representation as to the accuracy or completeness of location of the existence or non-existence of any utilities or structures within the limits of the project. For locating CTA existing utilities within the Basic Safety Envelope as defined in Section 1.5, such as duct banks for signal cables, traction power cables, etc., it is required by CTA that Ground-Penetrating Radar (GPR) be used for any work that contains the scope of soil removal, i.e., excavation, boring, etc. For locating CTA existing utilities outside the Basic Safety Envelope, GPR shall also be used when the proposed work is within 10 feet clear distance from the faces of CTA existing utilities. GPR must be done by a qualified company that has successfully located utilities on railroad tracks (ballast can result in additional noise for GPR and is different from pavement). CTA would also recommend GPR be used to locate all other utilities. Refer to [Section 4.4](#) for additional potholing requirements for locating utilities for Jack-and-Bore Construction and Horizontal Directional Drilling Construction.

When locating non-CTA utilities outside the City of Chicago, follow the standard operating procedures of the local municipalities. At a minimum, coordinate with JULIE for underground utilities identification.

(...)



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## SECTION 4 TEMPORARY SHORING SYSTEM

(...)

### 4.4 JACK AND BORE CONSTRUCTION

(...)

Pipelines perpendicular to the transit Right-of-Way shall be laid across the entire width of the Right-of-Way. Casing pipe shall extend beyond the Zone-of-Influence line shown in **Figure 3 - 1** by at least 3'-0" each end. All casing pipes, except those laid longitudinally, shall be sloped not less than 0.3%.

(...)

The minimum clearance from the ~~bottom edge~~ of CTA existing ~~utilities ductbank~~ to ~~top edge~~ of proposed pipeline shall be 2'-0" as shown in **Figure 3 - 1**. In most cases, CTA will provide the general location of the ~~ductbank utilities~~ upon initial coordination. However, in addition to requirements shown in Section 3.6, potholing must be performed whenever proposed infrastructure or utilities will traverse CTA utilities. Contractor must make reasonable efforts to expose the edge of existing CTA utility nearest the proposed pipeline to verify clearance. When reasonable efforts do not allow for exposure of nearest edge of existing CTA utility, CTA will require additional clearance to account for unknowns. CTA may request Ground Penetrating Radar (GPR) to locate existing duct banks and potholing to verify the ductbank location and depth before construction.

(...)

### 4.5 HORIZONTAL DIRECTIONAL DRILLING CONSTRUCTION

The American Railway Engineering and Maintenance-of-Way (AREMA) has assigned a working committee to develop a recommended railroad industry practice for horizontal directional drilling (HDD) under railroad right-of-way. The interim guidelines listed below are issued by the Union Pacific Railroad (UPRR) and are adopted by the CTA. Pending completion of the AREMA recommended practice, at which time CTA will review and determine whether to adopt it. Existing CTA utilities verification shall comply with Section 3.6 and Section 4.4.

(...)



## SECTION 9 SPECIAL CONDITIONS

(...)

### 9.4 GLOBAL STABILITY

Typical shoring applications may not require global slope stability analysis. The Engineer in Responsible Charge shall determine if global stability calculations are warranted. However, CTA Engineering reserves the right to require global stability calculations at their sole discretion. As an example, when ERS is proposed outside the Zone of Influence in **Figure 3-1** with existing building demolished, global stability can be affected when the soil is soft or medium clay.<sup>33</sup>

If applicable and/or required by CTA, temporary shoring systems and sloped excavations shall be demonstrated to be safe using limit equilibrium analyses with appropriate potential failure surfaces (A potential failure mode is mentioned in [Section 5.6](#)). Slope stability analyses shall consider the presence of rapid transit live loading, applicable railroad live loading such as Cooper's E-80 on active tracks, and/or construction equipment.

The minimum factor of safety against failure of the whole, or any portion of, shored or sloped cuts shall be 1.5.

(...)

(Note: Comment 33 was added in Appendix F. Commentary number changes to the sequential Sections are considered minor and will not be shown in Memorandum.)



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## SECTION 10 TRACK, STRUCTURE, AND SHORING MONITORING

(...)

### 10.3 MINIMUM MONITORING REQUIREMENTS

(...)

i. For Jack-and-Bore Construction, follow above requirement (a) to set up baseline reading prior to starting any work. The Contractor shall monitor the track and ground/ballast movement immediately after the Jack-and-Bore operation. Refer to Section 4.5 for additional monitoring requirements for Jack-and-Bore Construction and Horizontal Directional Drilling Construction.

†j. For Horizontal Direction Drilling Construction, follow above requirement (a) to set up baseline reading prior to starting any work. The Contractor shall monitor the track and ground/ballast movement immediately after drilling, reaming, and pullback operations.

(...)



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## SECTION 11 OTHER TYPES OF ADJACENT CONSTRUCTION

All sections of this Manual shall apply to this Section 11, where applicable, unless specifically modified within this Section.

### 11.1 CONSTRUCTION ADJACENT TO CTA UNDERGROUND STRUCTURES

#### 11.1.1 General

The structural response and safety of underground Structures affected by Adjacent Construction activities has been a primary concern and CTA has attempted to establish criteria to restrict ground movements to be induced. However, most criteria adopted by other agencies are mostly arbitrary because of the lack of research and case study, and the complicated nature of this topic. Currently this concern is primarily addressed by monitoring movement and vibration with equipment such as inclinometer, tiltmeter, crack monitor, and survey. Therefore, Special Monitoring required in [Section 10.5](#) will be requested when the Adjacent Construction is adjacent to or over existing CTA underground structures and/or structures and will be handled on a case-by-case basis depending on the existing condition of the underground structures after initial inspection, existing soil condition, excavation size, tunnel alignment in relation to the excavation (direction of ground movement), etc. **Figure 11 - 1** demonstrates an example on how the damage potential would depend on tunnel alignment in relation to the excavation (direction of ground movement).

(...)

#### 11.1.4 Drilled, Augered, Driven and Vibrated Penetration Construction Protocol

(...)

- General

(...)

Prior to proceeding with any penetration above, including probing, adjacent to, and beyond the underground structures, a Structural or Professional Engineer licensed in State of Illinois shall inspect and document both by photograph(s) and videotape the existing conditions and structural integrity of the underground structures. The owner of the property or its representative at its sole cost shall employ the services of a licensed State of Illinois Engineering Firm. All inspections shall be done in the presence of CTA. The right of way lines and excavation locations shall be clearly identified at grade level by use of monuments and marked as approved by CTA. Within thirty (30) days after the completion of all penetrations the licensed State of Illinois Structural or Professional Engineer shall schedule a final tunnel inspection with CTA. A final inspection report



signed and stamped by the licensed State of Illinois Structural or Professional Engineer shall be submitted within thirty (30) days after the final inspection. Based on the type, depth, and location of the penetration; CTA will determine the distance from the underground structures to the penetration that will require a pre and post inspection. The minimum required distances are twenty (20) feet.

(...)

If the underground structure is penetrated or damaged during probing, or by any other penetration, all operations are to cease and CTA is to be notified immediately. The Contractor shall not remove the casing, drill bit, auger, rods or etc. from the borehole or shaft. A repair procedure approved by CTA shall be implemented. Upon completion of the repair work a licensed State of Illinois Structural Engineer shall inspect and approve the repairs to the interior of the tunnel liner and provide photographs and documentation of the final repairs to CTA.

(...)

#### 11.2.6 Miscellaneous Temporary Structure Adjacent to CTA Tracks

Tuckpointing, façade inspections, ComEd line work, or other activities requiring scaffolding, swing stages, crawler cranes, man lifts, etc. next to CTA tracks. These cases do not require an engineering review but will require a safety department review, flaggers and inspectors on site for these activities. Refer to [Section 3.7](#) for safety requirements.

For swing stages, overnight or longer periods require the platform to be parked in its storage position and secured to the structure to prevent movement or damage due to wind. Trailing ropes and cables should be securely stored, protective devices locked onto ropes, electric cables disconnected from supply and if air operated air-lines, disconnected and pressure released. The control box should be removable, unless an alternative method is used to isolate power to the cradle, for safety and security when the suspended scaffold is not in service.

(...)

#### 11.2.8 Small Unmanned Aircraft System

Unmanned Aircraft Systems or Drones are not to be flown at any time on CTA property, as defined per Basic Safety Envelope, without express authorization from CTA. Request shall be submitted using the Variance Request Form attached in ACM Appendix H.



### 11.3.1 Excavation Shoring Required

For construction adjacent to CTA elevated track structures where excavation is required, the Zone of Influence diagram shown in **Figure 11 - 1** shall be used instead of **Figure 3 - 1**. All other requirements of this Manual shall apply, where applicable, except those specifically modified under this Section. Excavation adjacent to other CTA facilities and structures can also use **Figure 11 - 1**.

- Zone 1:**
- Excavation is prohibited, unless written permission is given from CTA to shore the existing track structure column. Refer to [Section 11.4](#).
- Zone 2:**
- Temporary ERS shall be designed with horizontal pressure from the footing surcharge.
  - Bottom heave shall also be evaluated per [Section 9.3.2](#) when soil condition warrants.
- (Note: Zone block was flipped in the ACM Rev 0.)

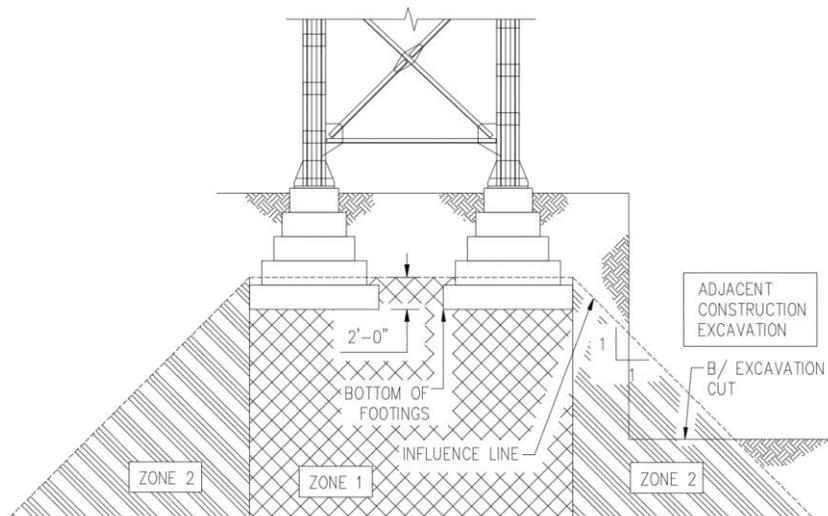


Figure 11 - 1: Elevated Track Structure Footing Zone of Influence



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## APPENDIX C – SAMPLE CALCULATIONS

### **Disclaimer Note:**

(...)

### **EXAMPLE 4.1 – BENDING STRENGTH OF THREADED MICROPILE CONNECTIONS**

#### **PROBLEM:**

(...)

BASED ON THE RECOMMENDATIONS OF THE REFERENCE PAPER, THE BENDING ~~CAPAICTY~~CAPACITY OF THE CASING WILL BE DETERMINED USING THE PLASTIC TENSION-LINEAR COMPRESSION MODEL. BEFORE THE BENDING ~~CAPAICTY~~CAPACITY CAN BE DETERMINED, THE LOCATION OF THE NEUTRAL AXIS MUST BE FOUND. THE NEUTRAL AXIS CAN BE FOUND BY TRIAL AND ERROR METHOD.

(...)

### **EXAMPLE 6.4 – CONSTRUCT THE ACTUAL RAPID TRANSIT SURCHARGE PRESSURE**

#### **PROBLEM:**

PER SECTION 5.3, THERE ARE CASES WHERE “SIMPLIFIED” SURCHARGE PRESSURE DISTRIBUTION MAY NOT BE ALLOWED (REFER TO SECTION 6.3). CONSTRUCT THE ACTUAL TRANSIT SURCHARGE PRESSURE FOR A SHORING WALL 10'-0" FROM THE CENTERLINE OF TRACK. CTA RAILBOUND CRANE TRAIN MAY OPERATE ON THIS TRACK.

(...)

### **EXAMPLE 8.3 – SHORING WALL DESIGN**

#### **PROBLEM:**

THE DESIGN BENDING MOMENT FOR A SHORING WALL IS 84 KIP-FT PER LINEAL FOOT. SIZE THE FOLLOWING ~~SHORINGS~~SHROING WALL MEMBERS FOR THIS DESIGN MOMENT\*:

(...)



## APPENDIX F – COMMENTARY

(...)

## SECTION 9 SPECIAL CONDITIONS COMMENTARY

(...)

### **C9.4 GLOBAL STABILITY**<sup>33</sup>

When the excavation is outside the Zone of Influence or even the Basic Safety Envelope certain conditions exist where the global stability of tracks or structures can still be affected. As an example, this can occur when Adjacent Construction proposes to remove, even temporarily, a large structure that serves to provide stability to embankment structure/tracks. In this example, this may occur where the soil profile contains weak clay with sand, or other similar poor soil conditions. Global stability of the tracks will be affected and stability analysis needs to be performed to ensure existing tracks will not be affected. It is not practical or safe to expect CTA Engineering reviewers to provide directions on when a global stability analysis is warranted since CTA Engineering reviewers would not be familiar with the Adjacent Construction site, geotechnical soil profile and the scope of the work. Therefore, the Engineer in Responsible Charge must determine if global stability analysis is warranted.

(...)