# Welcome!

## We will begin at 12 PM

HOUSTON PUBLIC WORKS

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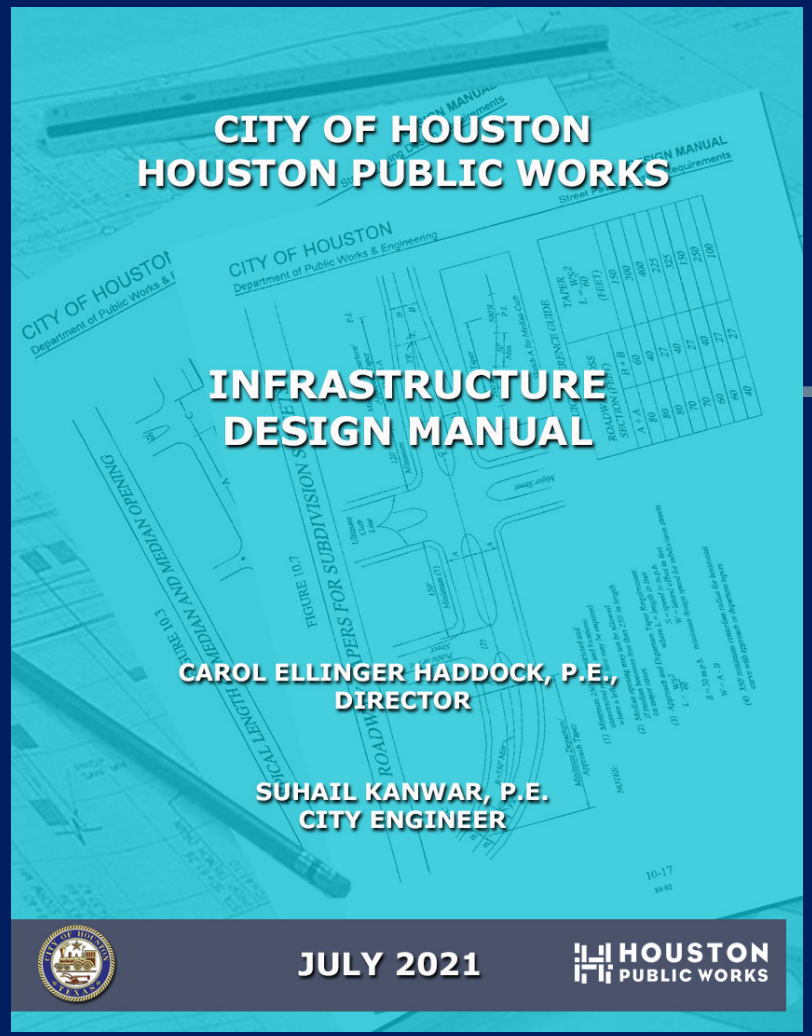
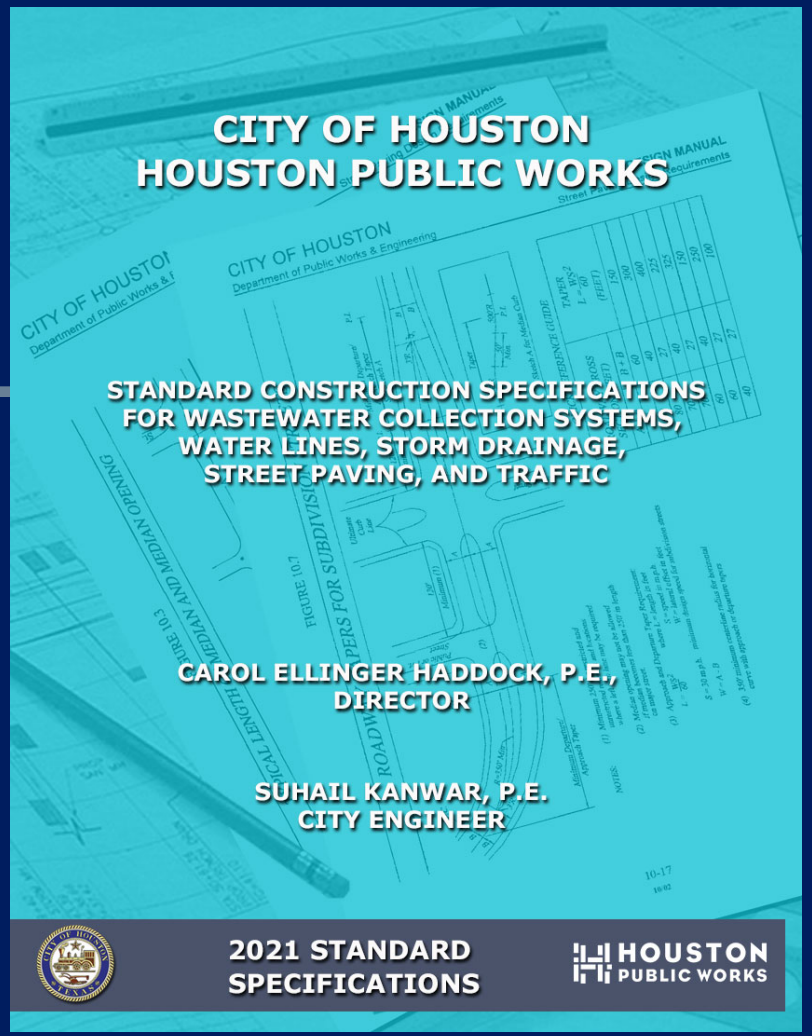
# INFRASTRUCTURE DESIGN MANUAL ROLL OUT

HOUSTON PUBLIC WORKS

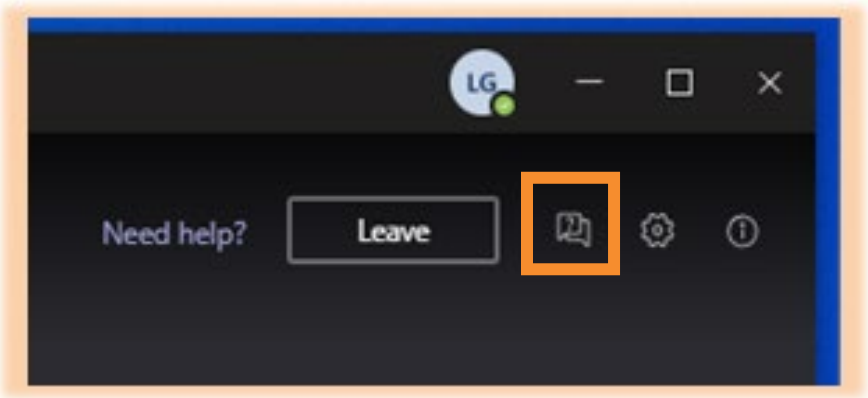



CITY OF HOUSTON TEXAS

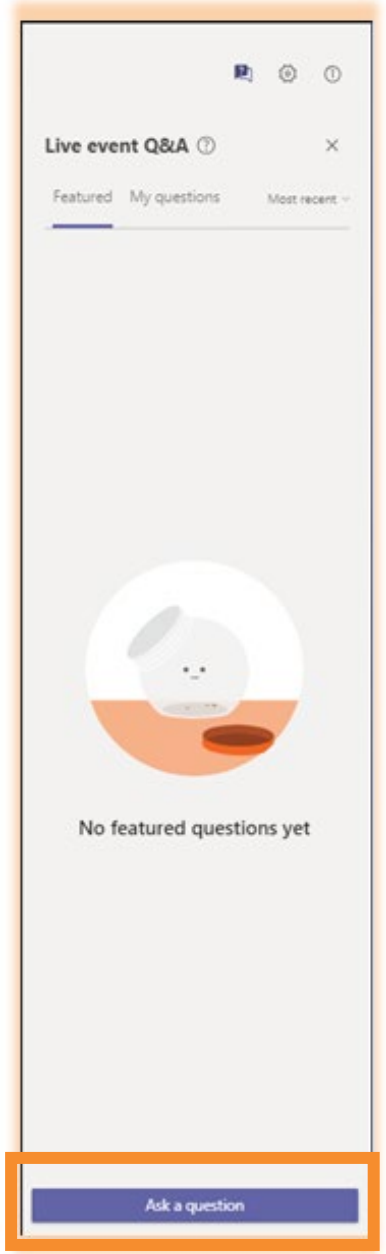
# BEFORE WE BEGIN

Select **Q&A** icon on the right side of the screen.




Select **Ask a question** to reveal the text box.

Type in your question and select Send.



# BEFORE WE BEGIN

Use the Q&A chat feature throughout the presentation:

- **Featured**—includes all attendee questions
- **My questions**—only lists your submitted questions

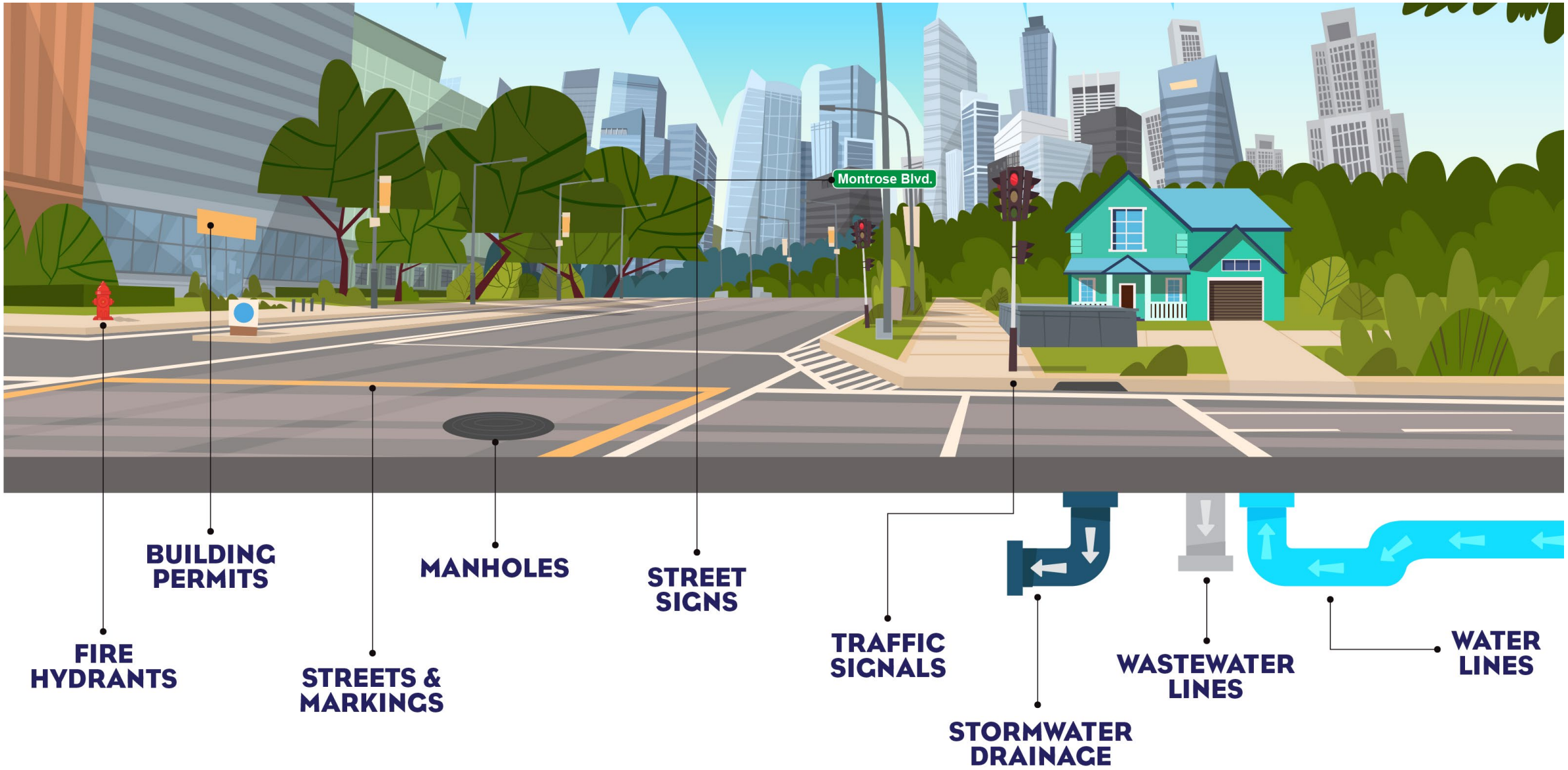
**Be specific**—note the chapter or topic in your question.

If we can't address your question today, we will respond to it on our website.

# INTRODUCTION

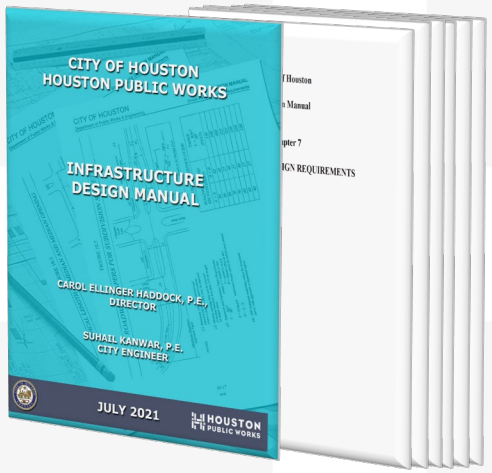
Standards and Specifications Group

# PUBLIC INFRASTRUCTURE



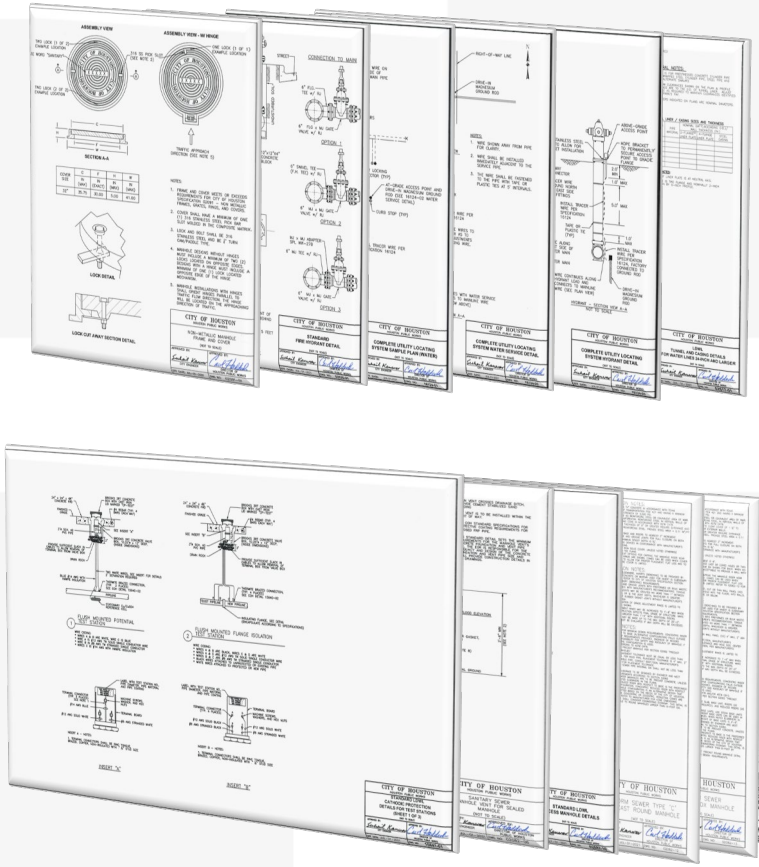

HOUSTON PUBLIC WORKS

# IDM




# SPECIFICATIONS

# STANDARD DRAWINGS



HOUSTON
PUBLIC WORKS

# INFRASTRUCTURE DESIGN MANUAL ROLL OUT AUGUST 19, 2021

LUIS A. GARZA, P.E.
STANDARDS AND SPECIFICATIONS

# AGENDA

| Time | Topic (Presenter) |
|---|---|
| 12:00 pm – 12:10 pm | Introductions and Overview (Luis Garza) |
| 12:10 pm – 12:20 pm | General Changes (Ross Ozuna) |
| 12:20 pm – 12:31 pm | Chapter 3: Graphic Req. & Chapter 6: Utility Locations (Luis Garza) |
| 12:31 pm – 12:50 pm | Chapter 7: Water Line Design Requirements (Venus Price) |
| 12:50 pm – 1:02 pm | Chapter 8: Wastewater Collection System Design Req. (Daniel Oefner) |
| 1:02 pm – 1:10 pm | Chapter 14: Facility Design Requirements(Luis G.&Sandeep Aggarwal) |
| 1:10 pm – 1:20 pm | *Break* |
| 1:20 pm – 1:40 pm | Chapter 11: Geotechnical and Environmental Req. (Mike Pezeshki) |
| 1:40 pm – 1:51 pm | Chapter 13: GIS Data Digitization Standards (Ekaterina Fitos) |
| 1:51 pm – 2:10 pm | Chapter 9:Stormwater Design and Water Quality Req.(Kathlie Bulloch) |
| 2:10 pm – 2:26 pm | Chapter 17:Bicycle, Transit and Pedestrian Design Req. (Ian Hlavacek) |
| 2:26 pm – 2:39 pm | Specifications (Luis Garza) |
| 2:39 pm – 2:49 pm | Standard Details (Ross Ozuna) |
| 2:49 pm – 2:52 pm | Closing & Next Review Cycle (Luis Garza) |
| 2:52 pm – 3:00 pm | Address additional questions |

# OVERVIEW

2020 -2021 Review Cycle

# OVERVIEW

## 2020-2021 Review Cycle

**II. REVIEW SCHEDULE**

| Year | Documents Reviewed | |
|---|---|---|
| 1 | Storm Drainage | Ch 9, 13 |
| 2 | Pavement | Ch 6, 10, 12 |
| 3 | Water Distribution | Ch 7 |
| | Sewage Collection | Ch 8 |
| | Facilities | Ch 14 |
| | Tunneling | Ch 11 |
| 4 | Ancillary | Ch 1-5 |
| 5 | Traffic | Ch. 15 |

- Chapter 7 – Water Line Design Requirements
- Chapter 8 – Wastewater Collection System Design Requirements
- Chapter 11 – Geotechnical and Environmental Requirements
- Chapter 14 – Facility Design Requirements

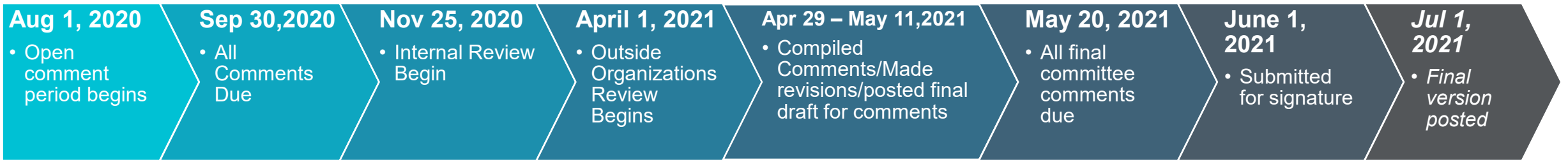
"Review of specifications and standard details will be achieved concurrent with applicable chapters of the Infrastructure Design Manual"

# OVERVIEW

## Out of Cycle Items

- Chapter 3: Graphic Requirements
- Chapter 6: Utility Locations
- Chapter 9: Storm Water Design and Water Quality Requirements
- Chapter 13: GIS Digitization Standards
- Chapter 17: Bicycle, Transit and Pedestrian Design Requirements

# 2020-2021 REVIEW CYCLE TIMELINE



# IMPLEMENTATION

## New Requirements:

- 90-day design grace period
- Effective Date: Oct. 01, 2021
- CIP Projects:
  - Phase II final designs
- Public/Private Sector
  - Submit substantially complete plans
- No grace period for Ch. 9 requirements

# IMPLEMENTATION: MORE INFO

## 2021 IDM Announcement & Executive Summary

### 2021 Infrastructure Design Manual Announcement

Houston Public Works (HPW) has completed the 2020-2021 Review Cycle. As a result, the Infrastructure Design Manual (IDM), Ground Water Plant Design Guidelines, General Requirements, Standard Construction Specifications, and Standard Details have been updated.

A 90-day design grace period for implementation of the City of Houston IDM is instituted for the 2021 edition. For Houston Public Works capital improvement projects managed by the Capital Projects service line, Phase II final designs that have not been submitted for a required review prior to October 1, 2021, must comply with all standards in the 2021 IDM.

For projects in the public or private sector, plans submitted for initial review after October 1, 2021, must comply with all standards in the 2021 IDM. The City must receive substantially complete plans before October 1, 2021, to be grandfathered under the 2020 standards.

The Houston Public Works Director signed the IDM Cover Letter & Executive Summary on July 1, 2021. The executive summary provides more background on when the 2021 design requirements and standards will be implemented. It also provides a summary of updates made to all documents during the review cycle. The IDM Redlines, Groundwater Plant Design Guidelines Redlines, Construction Specifications Redlines, and Standard Detail Redlines are also available for additional background.

A public IDM Webinar will be conducted by Microsoft Teams Live Event and held on Thursday, August 19, 2021, from 12 p.m. to 3 p.m. CDT. The IDM webinar will present a high-level view of the changes implemented during the 2020-2021 Review Cycle.

All of the content described here is accessible on the Design and Construction Standards webpage.

For additional questions about the changes, please contact the Office of the City Engineer at 832.394.9164 or HPWStandards@houstontx.gov.

HOUSTON PUBLIC WORKS

**EXECUTIVE SUMMARY**

2020-2021 Review Cycle

**Chapter 17 Bicycle, Transit and Pedestrian Design Requirements**

Chapter 17 – *Bicycle, Transit and Pedestrian Design Requirements* was not officially part of the 2020-2021 review cycle. This chapter was updated to conform to City Code of Ordinances published in 2020.

**IDM Supplements**

The City creates supplements for the IDM when there is a need to revise a current IDM chapter that is outside of its normal review cycle period. At the time when a new IDM is to be released, any active supplements are incorporated into the new IDM and those supplements subsequentially deactivated.

Prior to the completion of the 2020-2021 review cycle, there were four active IDM supplements (chapter 9.2.01, chapter 9.2.01H and the Frequently Asked Questions, and chapter 17.06). Those IDM supplements have now been officially incorporated into the IDM for the 2021 release.

**Infrastructure Design Manual Implementation**

- *Capital Improvement Projects*
  A 90-day design grace period will be given for Houston Public Works capital improvement projects managed by the Capital Projects service line. Phase II final designs that have not been submitted for a required review prior to October 1, 2021, will be required to completely comply with the new Infrastructure Design Manual.
- *Private Sector*
  A 90-day design grace period will be given for projects in the public/private sector. Plans submitted for initial review after October 01, 2021 will be required to comply with the new Infrastructure Design Manual.
- *IDM Supplements for Private and Capital Improvement Projects*
  IDM supplements were effective upon signature. There is no design grace period for Chapter 9 of the IDM. Therefore, Chapter 9 updates were effective April 01, 2021.

**CONSTRUCTION SPECIFICATIONS**

**Revised Specifications**

Various specifications, that are associated with the IDM chapters reviewed during the 2020-2021 review cycle, were reviewed and updated. A total of 17 specifications were revised and 3 new specifications were created, and one specification was retired. 02082 "Precast Concrete Manholes" was updated in coordination with the creation of new standard details for precast concrete manhole. The three new specifications created are 02614 "Large Diameter Line Stop", 02615 "Insertion Valves and Line Stop", and 16124 Trace Wire for Water Lines". The 16717 "Programmable Vehicle Signal Head" standard specification was retired since it is not in use by the City. A list of all specifications created or updated is provided at the end of this executive summary.

Page 3 of 5

# INTERNAL REVIEW REPRESENTATIVES

## OFFICE OF THE CITY ENGINEER

- SUHAIL KANWAR (CITY ENG.)
- HIEN PHAM (ASST. CITY ENG)
- KATHLIE BULLOCH

## OCE – STANDARDS GROUP

- LUIS GARZA
- ROSS OZUNA

## TRANSPORTATION & DRAINAGE OPERATIONS

- TANU HIREMATH
- AHMAD AHADI

## CAPITAL PROJECTS

- MIKE PEZESHKI
- ALKA AGARWAL
- RAM CHAKRADHAR
- GIWA SHAKIRUDEEN
- MUMTAZ BAIG

## HOUSTON WATER

- VENUS PRICE
- SANDEEP AGGARWAL
- DANIEL OEFNER
- FARID SADEGHIAN
- PHILLIP GOODWIN

# EXTERNAL REVIEW MEMBERS

ACEC HOUSTON

AMERICAN PUBLIC WORKS ASSOCIATION APWA Texas Chapter

HARRIS COUNTY ENGINEERING DEPARTMENT

HARRIS COUNTY FLOOD CONTROL DISTRICT

HOUSTON CONTRACTORS ASSOCIATION HCA Since 1956

METRO

# DESIGN AND CONSTRUCTION STANDARDS WEBSITE

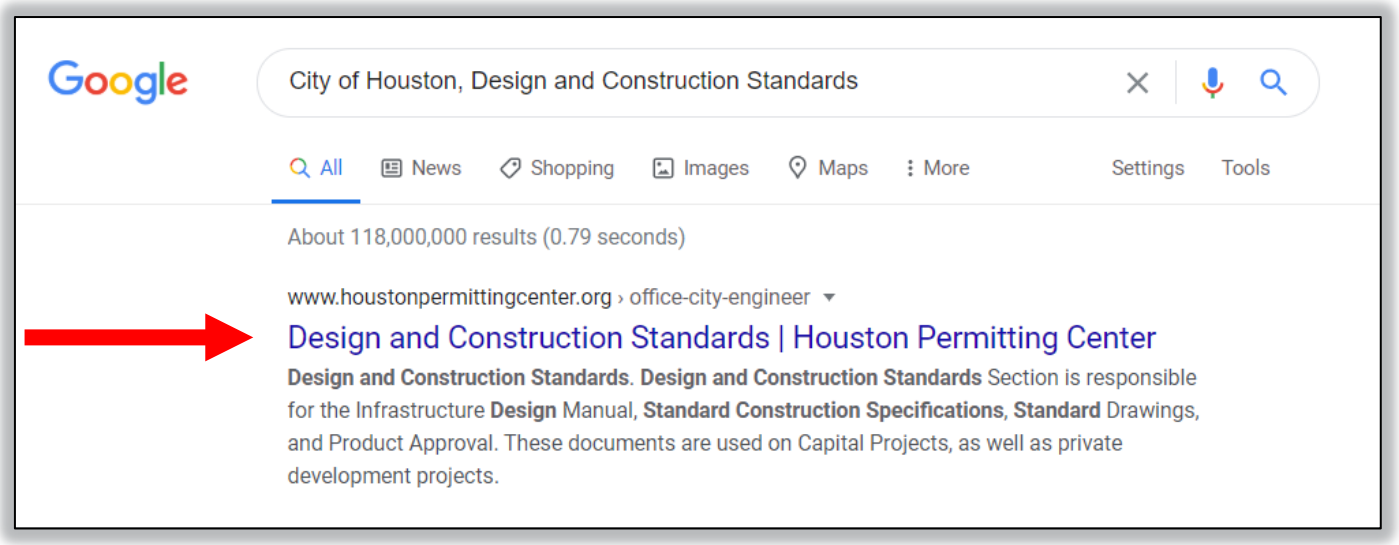
# DESIGN AND CONSTRUCTION STANDARDS WEBSITE

## Web Address

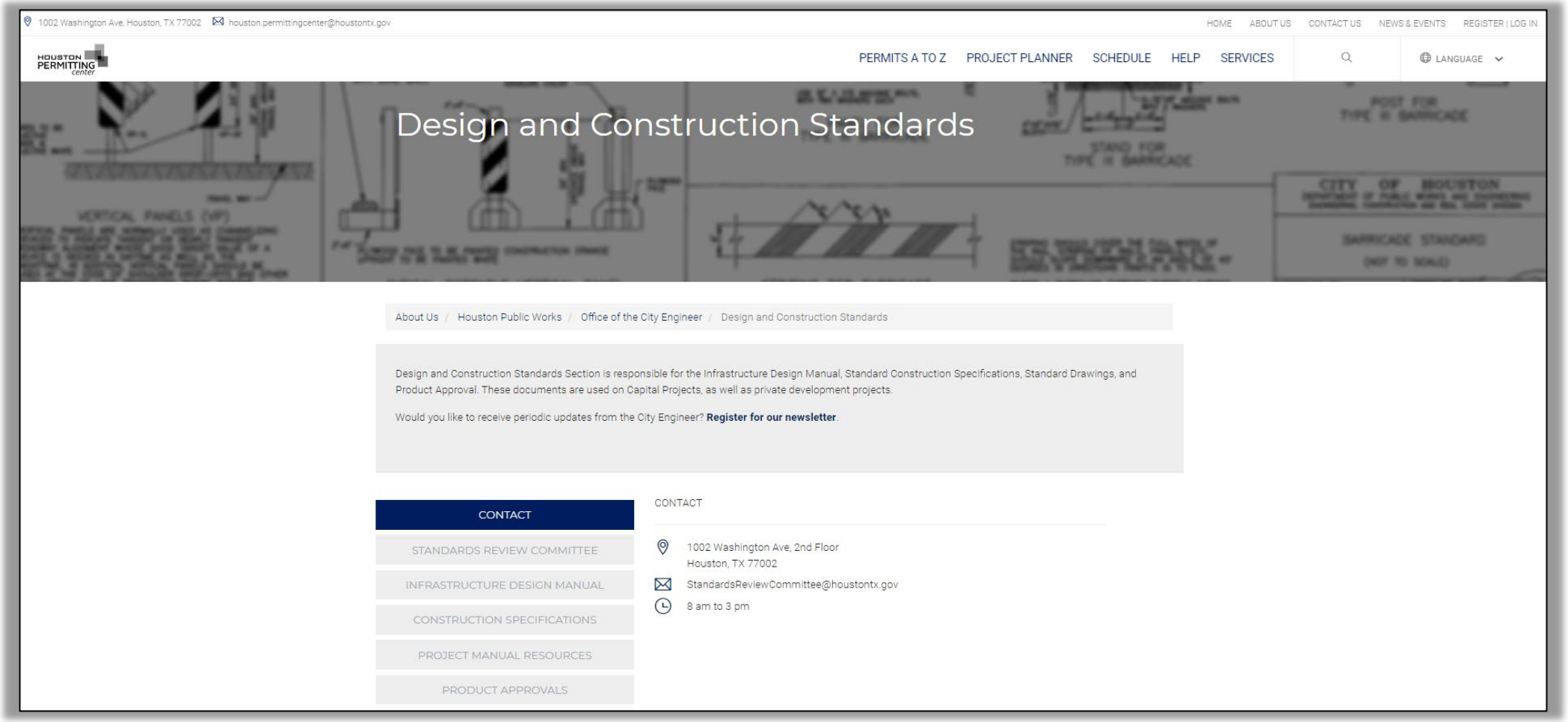
https://houstonpermittingcenter.org/office-city-engineer/design-and-construction-standards

## Easy way to find:

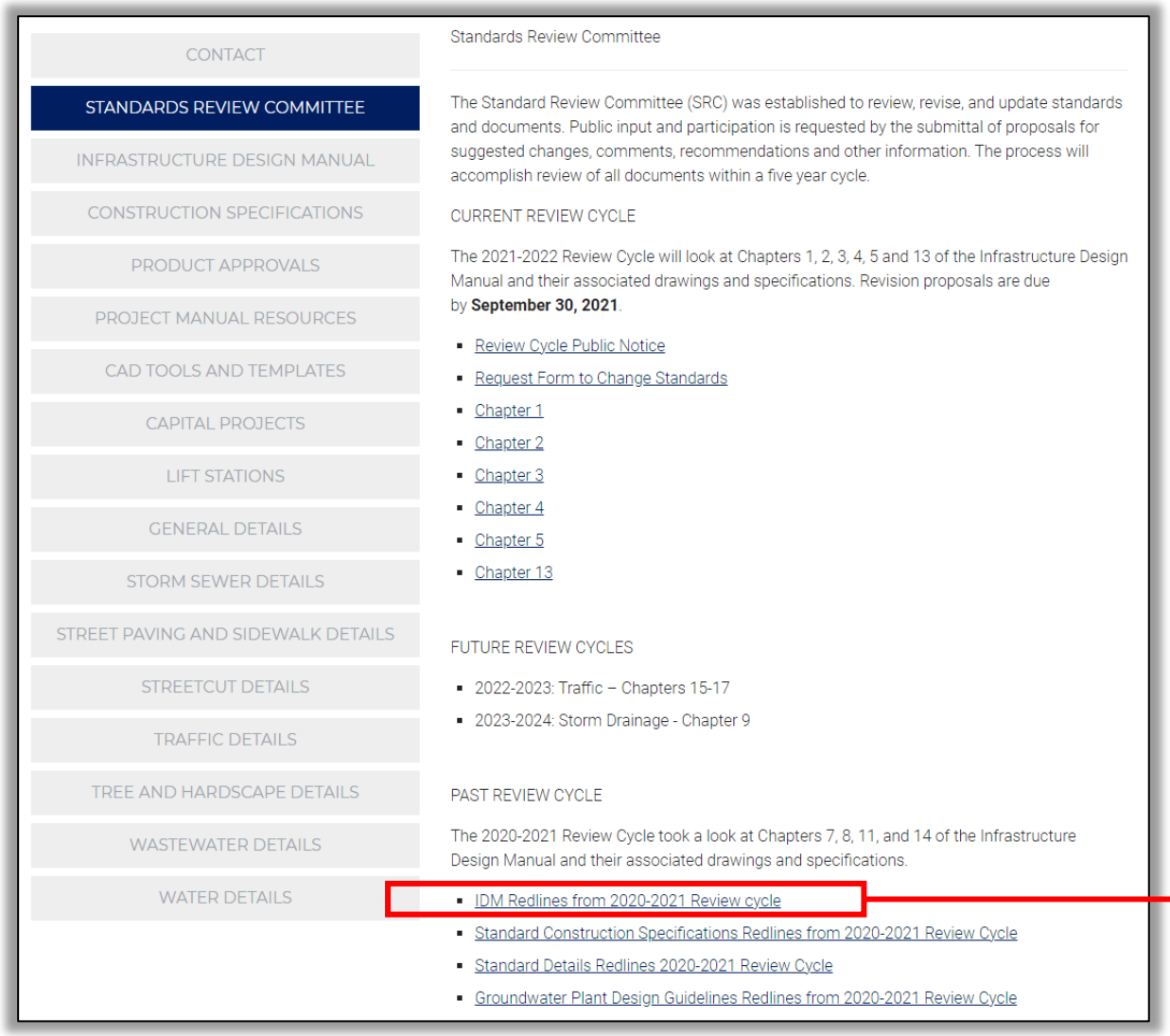
## Google “City of Houston, Design and Construction Standards”



# DESIGN AND CONSTRUCTION STANDARDS WEBSITE



# IDM REDLINES



CONTACT

STANDARDS REVIEW COMMITTEE

INFRASTRUCTURE DESIGN MANUAL

CONSTRUCTION SPECIFICATIONS

PRODUCT APPROVALS

PROJECT MANUAL RESOURCES

CAD TOOLS AND TEMPLATES

CAPITAL PROJECTS

LIFT STATIONS

GENERAL DETAILS

STORM SEWER DETAILS

STREET PAVING AND SIDEWALK DETAILS

STREETCUT DETAILS

TRAFFIC DETAILS

TREE AND HARDSCAPE DETAILS

WASTEWATER DETAILS

WATER DETAILS

Standards Review Committee

The Standard Review Committee (SRC) was established to review, revise, and update standards and documents. Public input and participation is requested by the submittal of proposals for suggested changes, comments, recommendations and other information. The process will accomplish review of all documents within a five year cycle.

CURRENT REVIEW CYCLE

The 2021-2022 Review Cycle will look at Chapters 1, 2, 3, 4, 5 and 13 of the Infrastructure Design Manual and their associated drawings and specifications. Revision proposals are due by **September 30, 2021**.

- Review Cycle Public Notice
- Request Form to Change Standards
- Chapter 1
- Chapter 2
- Chapter 3
- Chapter 4
- Chapter 5
- Chapter 13

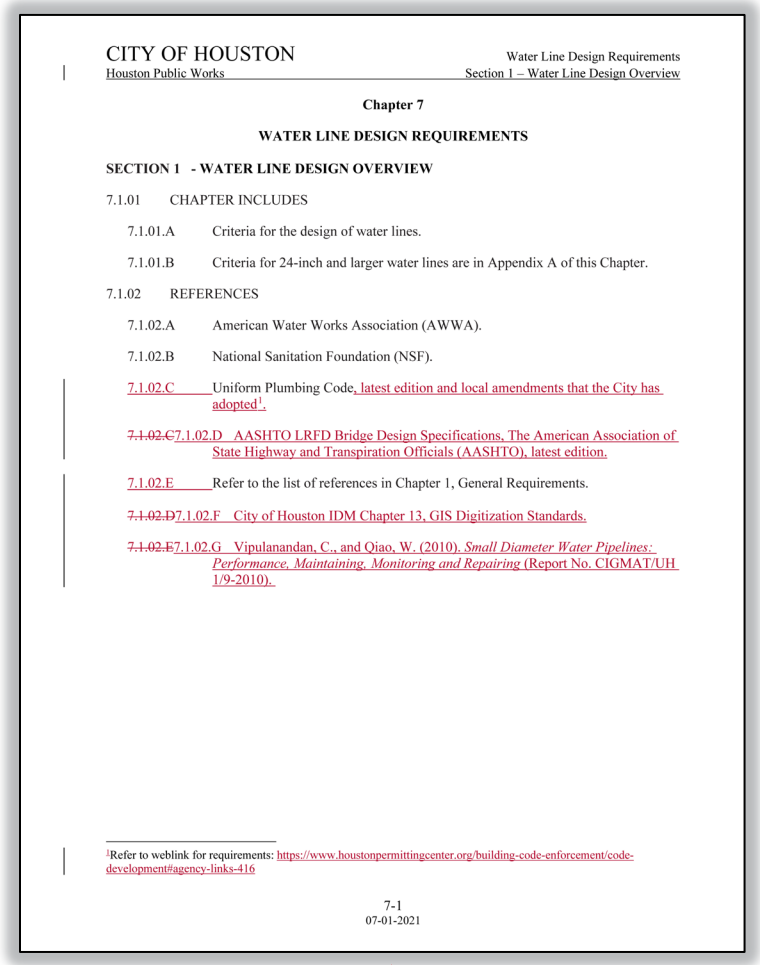
FUTURE REVIEW CYCLES

- 2022-2023: Traffic – Chapters 15-17
- 2023-2024: Storm Drainage - Chapter 9

PAST REVIEW CYCLE

The 2020-2021 Review Cycle took a look at Chapters 7, 8, 11, and 14 of the Infrastructure Design Manual and their associated drawings and specifications.

- IDM Redlines from 2020-2021 Review cycle
- Standard Construction Specifications Redlines from 2020-2021 Review Cycle
- Standard Details Redlines 2020-2021 Review Cycle
- Groundwater Plant Design Guidelines Redlines from 2020-2021 Review Cycle



CITY OF HOUSTON
Houston Public Works

Water Line Design Requirements
Section 1 – Water Line Design Overview

**Chapter 7**

**WATER LINE DESIGN REQUIREMENTS**

**SECTION 1 - WATER LINE DESIGN OVERVIEW**

7.1.01 CHAPTER INCLUDES

7.1.01.A Criteria for the design of water lines.

7.1.01.B Criteria for 24-inch and larger water lines are in Appendix A of this Chapter.

7.1.02 REFERENCES

7.1.02.A American Water Works Association (AWWA).

7.1.02.B National Sanitation Foundation (NSF).

7.1.02.C Uniform Plumbing Code, latest edition and local amendments that the City has adopted[1].

~~7.1.02.C~~7.1.02.D AASHTO LRFD Bridge Design Specifications, The American Association of State Highway and Transpiration Officials (AASHTO), latest edition.

7.1.02.E Refer to the list of references in Chapter 1, General Requirements.

~~7.1.02.D~~7.1.02.F City of Houston IDM Chapter 13, GIS Digitization Standards.

~~7.1.02.E~~7.1.02.G Vipulanandan, C., and Qiao, W. (2010). *Small Diameter Water Pipelines: Performance, Maintaining, Monitoring and Repairing* (Report No. CIGMAT/UH 1/9-2010).

[1]Refer to weblink for requirements: https://www.houstonpermittingcenter.org/building-code-enforcement/code-development#agency-links-416

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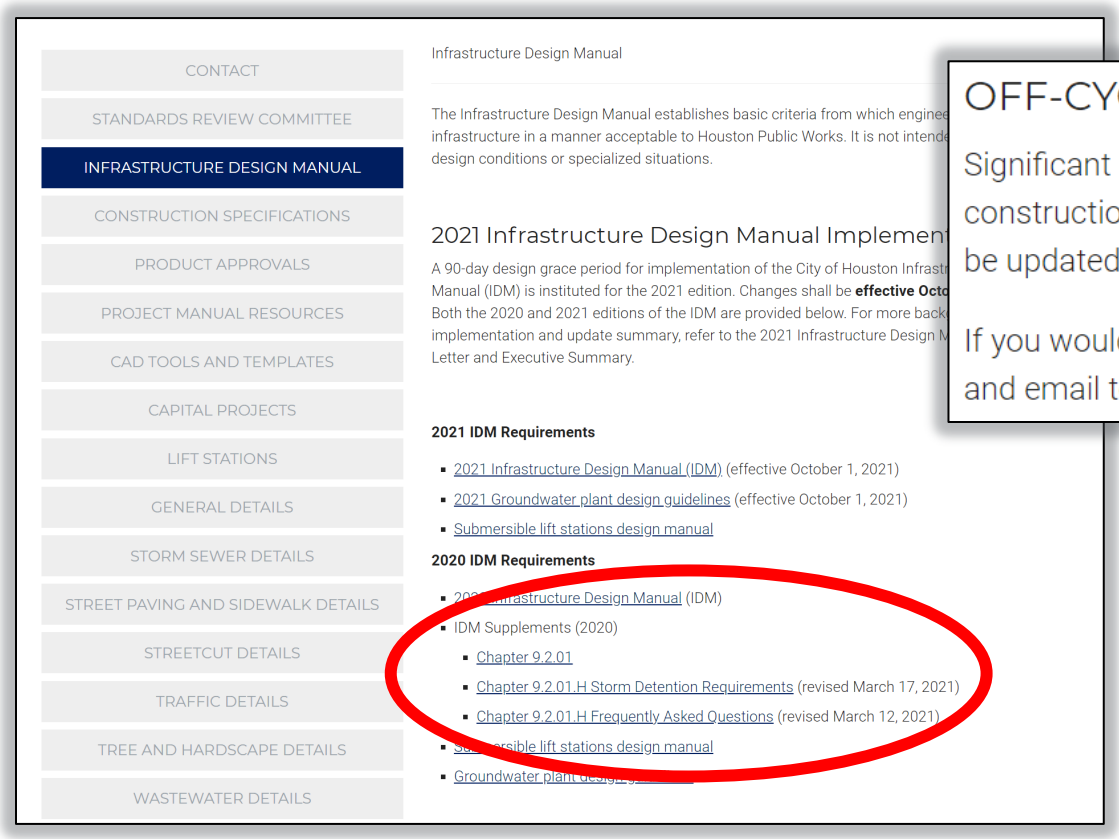
07-01-2021

HOUSTON PUBLIC WORKS

# GENERAL CHANGES

Ross Ozuna

# SUPPLEMENT INCORPORATION




## OFF-CYCLE REVIEWS

Significant issues may be considered outside of the 5-year cycle for existing standard drawings, construction specifications and the IDM. Issues will be vetted and, if determined applicable, will be updated or saved for future review cycles.

If you would like to request changes, please fill out the **Document/Detail Change Request Form** and email to the SRC at **StandardsReviewCommittee@houstontx.gov**.

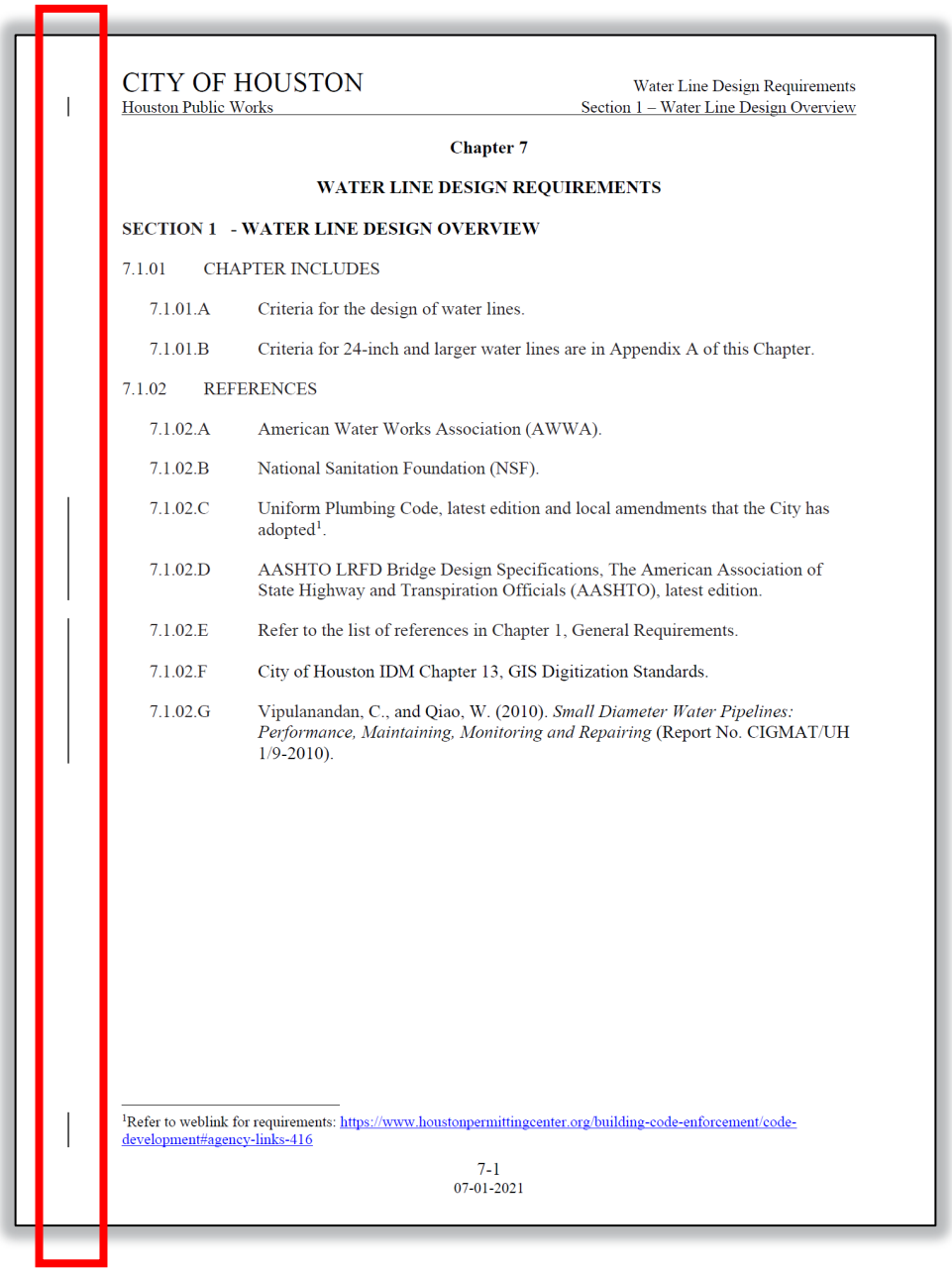
# SUPPLEMENT INCORPORATION CONT.

## Chapter 9 – Stormwater Design and Water Quality Requirements

- 9.2.01 Design Requirements
- 9.2.01.H Storm Detention Requirements
- 9.2.01.H Frequently Asked Questions

# CHANGE BARS

- We have included change bars on the left-hand side of the revised documents to indicate a change.
- Additional details on changes can be found in the redlines which are provided online for Chapter 3, 6, 7, 8, 9, 11, 13, 14 and 17.



CITY OF HOUSTON
Houston Public Works

Water Line Design Requirements
Section 1 – Water Line Design Overview

**Chapter 7**

**WATER LINE DESIGN REQUIREMENTS**

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07-01-2021

HOUSTON PUBLIC WORKS

# CHAPTER SECTIONS



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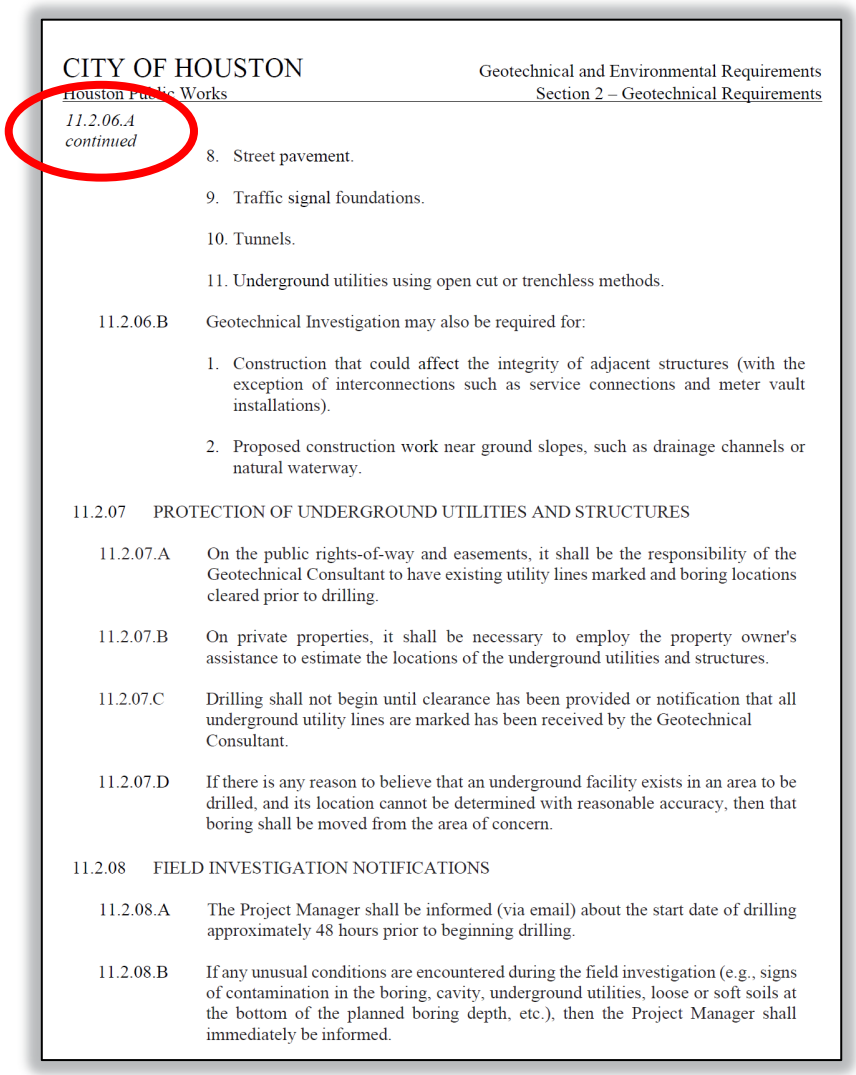
# CHAPTER PLACEHOLDERS



CITY OF HOUSTON
Houston Public Works

Geotechnical and Environmental Requirements
Section 2 – Geotechnical Requirements

*11.2.06.A continued*

8. Street pavement.

9. Traffic signal foundations.

10. Tunnels.

11. Underground utilities using open cut or trenchless methods.

11.2.06.B Geotechnical Investigation may also be required for:

1. Construction that could affect the integrity of adjacent structures (with the exception of interconnections such as service connections and meter vault installations).

2. Proposed construction work near ground slopes, such as drainage channels or natural waterway.

11.2.07 PROTECTION OF UNDERGROUND UTILITIES AND STRUCTURES

11.2.07.A On the public rights-of-way and easements, it shall be the responsibility of the Geotechnical Consultant to have existing utility lines marked and boring locations cleared prior to drilling.

11.2.07.B On private properties, it shall be necessary to employ the property owner's assistance to estimate the locations of the underground utilities and structures.

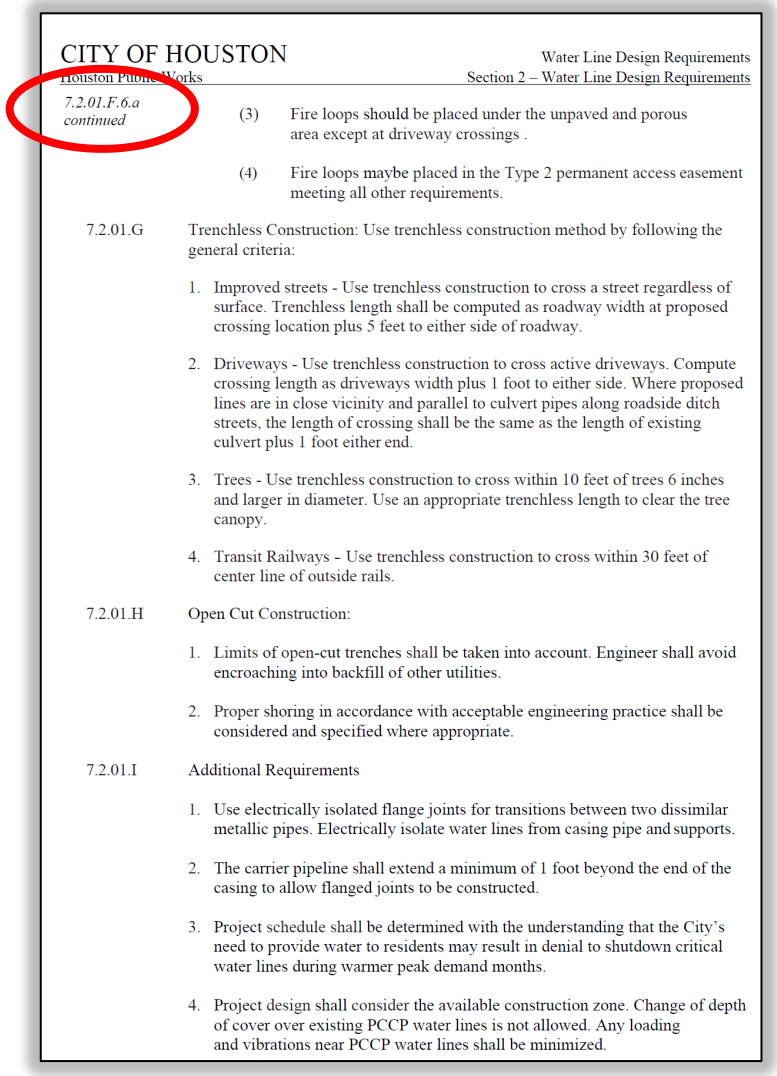
11.2.07.C Drilling shall not begin until clearance has been provided or notification that all underground utility lines are marked has been received by the Geotechnical Consultant.

11.2.07.D If there is any reason to believe that an underground facility exists in an area to be drilled, and its location cannot be determined with reasonable accuracy, then that boring shall be moved from the area of concern.

11.2.08 FIELD INVESTIGATION NOTIFICATIONS

11.2.08.A The Project Manager shall be informed (via email) about the start date of drilling approximately 48 hours prior to beginning drilling.

11.2.08.B If any unusual conditions are encountered during the field investigation (e.g., signs of contamination in the boring, cavity, underground utilities, loose or soft soils at the bottom of the planned boring depth, etc.), then the Project Manager shall immediately be informed.



CITY OF HOUSTON
Houston Public Works

Water Line Design Requirements
Section 2 – Water Line Design Requirements

*7.2.01.F.6.a continued*

(3) Fire loops should be placed under the unpaved and porous area except at driveway crossings .

(4) Fire loops maybe placed in the Type 2 permanent access easement meeting all other requirements.

7.2.01.G Trenchless Construction: Use trenchless construction method by following the general criteria:

1. Improved streets - Use trenchless construction to cross a street regardless of surface. Trenchless length shall be computed as roadway width at proposed crossing location plus 5 feet to either side of roadway.

2. Driveways - Use trenchless construction to cross active driveways. Compute crossing length as driveways width plus 1 foot to either side. Where proposed lines are in close vicinity and parallel to culvert pipes along roadside ditch streets, the length of crossing shall be the same as the length of existing culvert plus 1 foot either end.

3. Trees - Use trenchless construction to cross within 10 feet of trees 6 inches and larger in diameter. Use an appropriate trenchless length to clear the tree canopy.

4. Transit Railways - Use trenchless construction to cross within 30 feet of center line of outside rails.

7.2.01.H Open Cut Construction:

1. Limits of open-cut trenches shall be taken into account. Engineer shall avoid encroaching into backfill of other utilities.

2. Proper shoring in accordance with acceptable engineering practice shall be considered and specified where appropriate.

7.2.01.I Additional Requirements

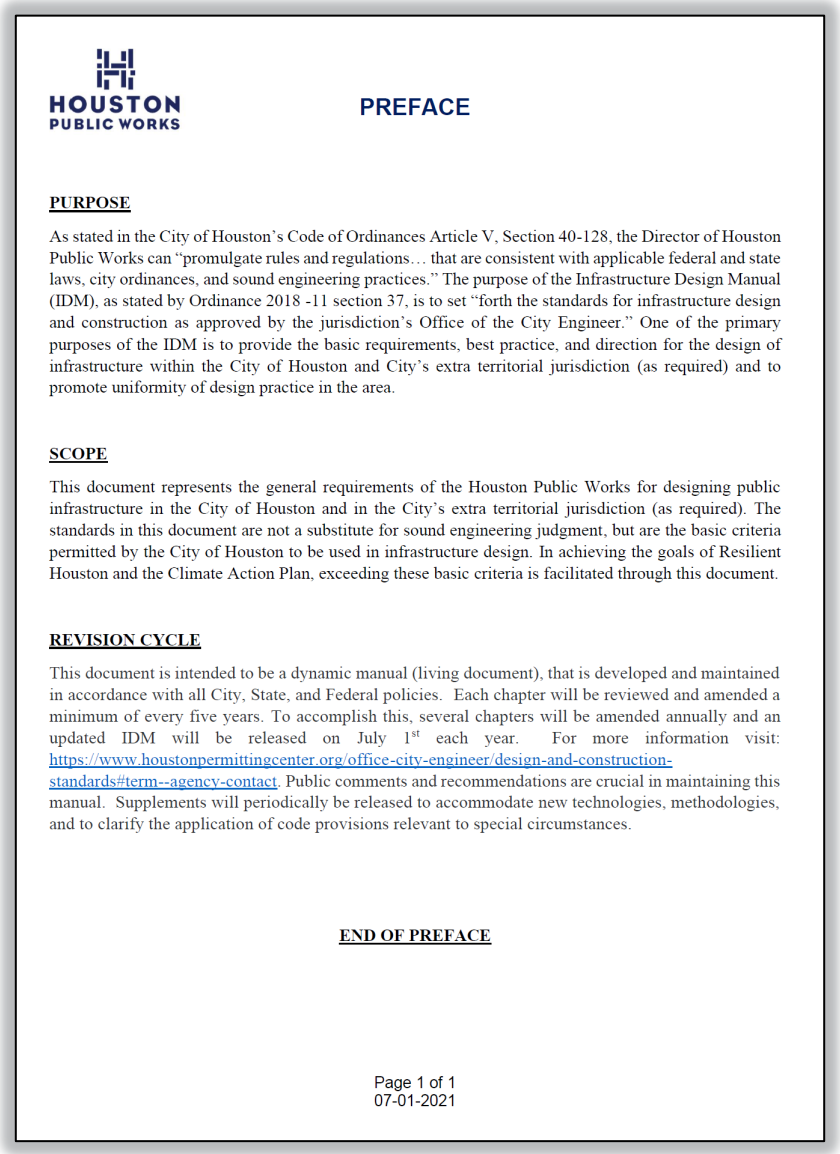
1. Use electrically isolated flange joints for transitions between two dissimilar metallic pipes. Electrically isolate water lines from casing pipe and supports.

2. The carrier pipeline shall extend a minimum of 1 foot beyond the end of the casing to allow flanged joints to be constructed.

3. Project schedule shall be determined with the understanding that the City's need to provide water to residents may result in denial to shutdown critical water lines during warmer peak demand months.

4. Project design shall consider the available construction zone. Change of depth of cover over existing PCCP water lines is not allowed. Any loading and vibrations near PCCP water lines shall be minimized.

# INFRASTRUCTURE DESIGN MANUAL - PREFACE



HOUSTON PUBLIC WORKS

## PREFACE

**PURPOSE**

As stated in the City of Houston's Code of Ordinances Article V, Section 40-128, the Director of Houston Public Works can "promulgate rules and regulations… that are consistent with applicable federal and state laws, city ordinances, and sound engineering practices." The purpose of the Infrastructure Design Manual (IDM), as stated by Ordinance 2018 -11 section 37, is to set "forth the standards for infrastructure design and construction as approved by the jurisdiction's Office of the City Engineer." One of the primary purposes of the IDM is to provide the basic requirements, best practice, and direction for the design of infrastructure within the City of Houston and City's extra territorial jurisdiction (as required) and to promote uniformity of design practice in the area.

**SCOPE**

This document represents the general requirements of the Houston Public Works for designing public infrastructure in the City of Houston and in the City's extra territorial jurisdiction (as required). The standards in this document are not a substitute for sound engineering judgment, but are the basic criteria permitted by the City of Houston to be used in infrastructure design. In achieving the goals of Resilient Houston and the Climate Action Plan, exceeding these basic criteria is facilitated through this document.

**REVISION CYCLE**

This document is intended to be a dynamic manual (living document), that is developed and maintained in accordance with all City, State, and Federal policies. Each chapter will be reviewed and amended a minimum of every five years. To accomplish this, several chapters will be amended annually and an updated IDM will be released on July 1st each year. For more information visit: https://www.houstonpermittingcenter.org/office-city-engineer/design-and-construction-standards#term--agency-contact. Public comments and recommendations are crucial in maintaining this manual. Supplements will periodically be released to accommodate new technologies, methodologies, and to clarify the application of code provisions relevant to special circumstances.

**END OF PREFACE**

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# QUESTIONS?

Enter it into the chat.

Note the chapter or topic in your question.

We will respond to unanswered questions on our website after this event.

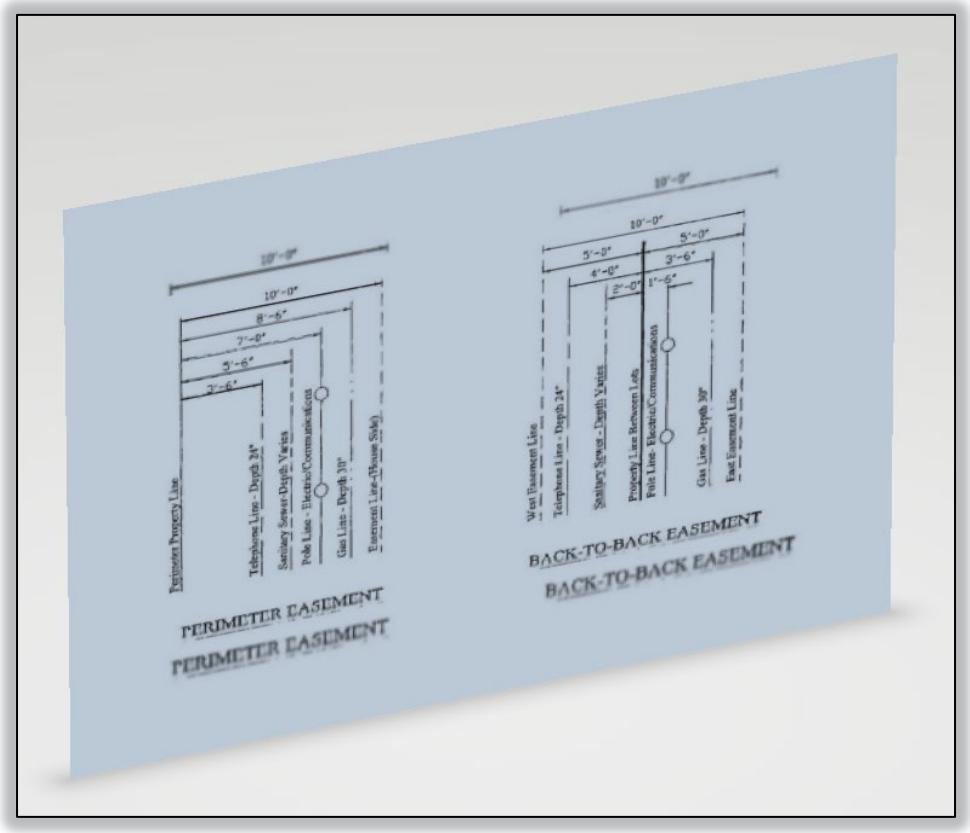
# CHAPTER 3 – GRAPHIC REQS & CHAPTER 6 - UTILITY LOCATIONS

LUIS GARZA, P.E.
STANDARDS AND SPECIFICATIONS

# CHAPTER 3 – GRAPHIC REQUIREMENTS & CHAPTER 6 – UTILITY LOCATIONS

## Summary of changes:

- Changes due to updates Chapters 7 & 11
- New submission requirements for .PDF Drawings
- New bore hole drawing requirements
- Defining of levels of SUE



# CHAPTER 3 – GRAPHIC REQUIREMENTS

## Electronic Drawings Submission Requirement:

- Minimum 400 dpi resolution
- Devoid of auto-generated SHX comments
- Annotations and from fields to be flattened

3.1.04 SOFTWARE AND DATA FORMAT

1. All CAD files, both references and sheet file deliverables, shall be provided in .DWG file extension format compatible with the most recent version of AutoCAD. However, the use of other software with the ability to convert files into the proper DWG format, will also be acceptable.

2. Electronic .PDF drawings submitted to the City of Houston are to be devoid of AutoCAD SHX comments or .PDF comments automatically generated during the .PDF conversion process, and shall have a minimum of 400 dpi resolution. Annotations and form fields are to be flattened prior to submittal.

# CHAPTER 11 – GEOTECH. & ENV. REQUIREMENTS

- Bore holes must be shown in Drawings if both the following apply:
  - Tunnel Shafts >30 ft deep
  - Std. Spec. 02400 – Tunnel Shaft used
- See IDM Chapter 3 for examples

11.4.02 DRAWING REQUIREMENTS

11.4.02.A Bore Holes

The Engineer of Record shall include geotechnical boring information in the Drawings if both the project scope requires construction of tunnel shafts greater than 30 feet deep and the contract documents utilize City of Houston Standard Specification 02400-Tunnel Shafts. See IDM Chapter 3 for graphic requirements and example plan sheets.

11.4.02.B Precast Storm Manhole Foundations

The engineer of record shall select the foundation type and provide this information to the contractor in the contract documents.

# CHAPTER 3 – GRAPHIC REQUIREMENTS

## Bore Hole Drawing Requirements:

- Must provide a bore hole layout and bore hole log drawings
- Layout to show required information
- Bore log drawing shall show bore logs in ascending stationing
- 6 bore logs per sheet

3.2.15 BORE HOLE REQUIREMENTS

See chapter 11 for project types that require geotechnical bore hole information in the Drawings. A Bore Hole Layout along with the corresponding Bore Hole Logs is to be included as part of the Drawings.

The Bore Hole Layout shall contain the following information:

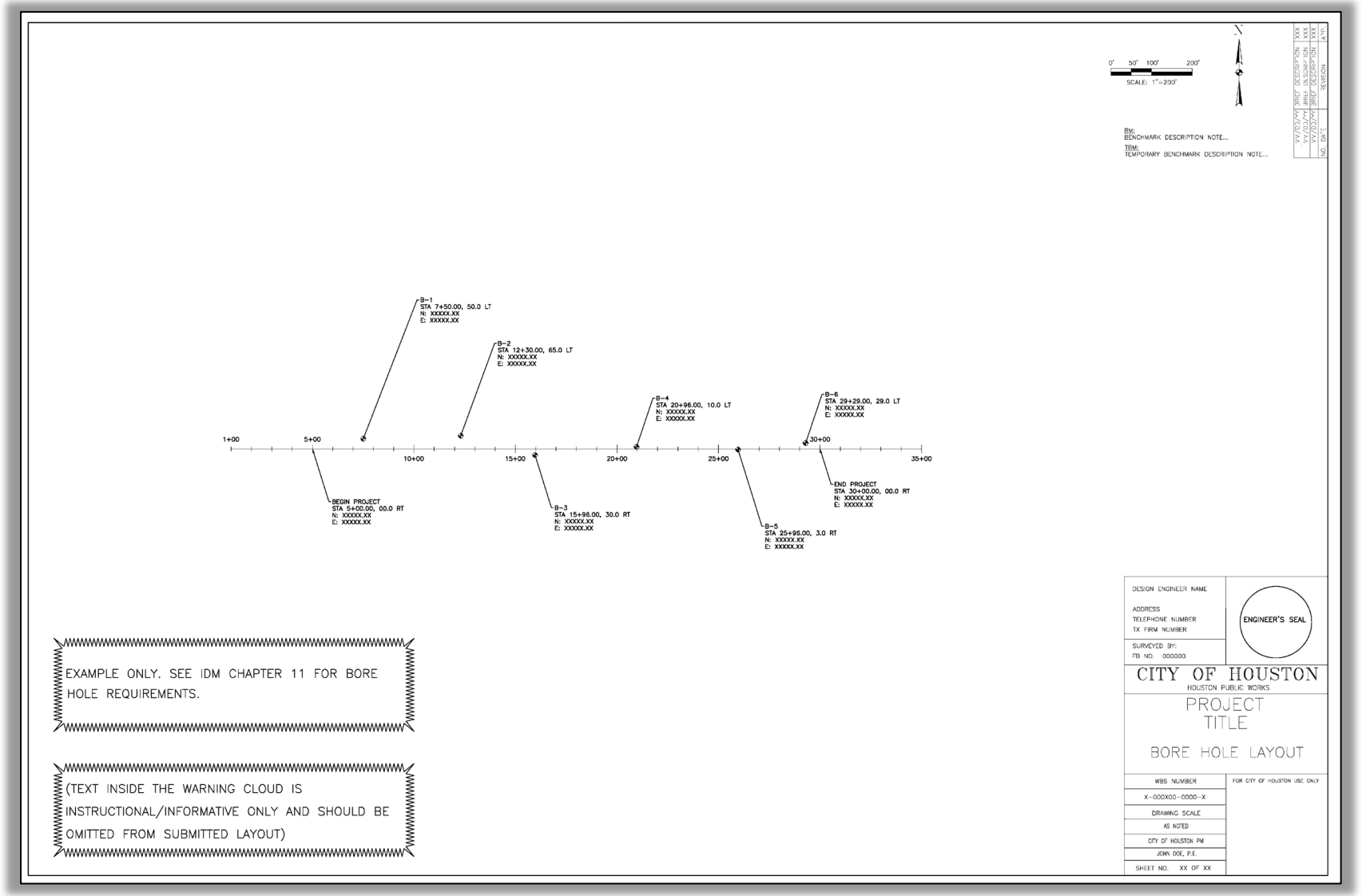
1. Project bore holes at the correct location and providing – Bore Hole Number, Station, Offset, Northing and Easting. Station and offset provided should be determined from the project's design base line.
2. Bore hole number or identifier matching the geotechnical report.
3. Topographic Survey and Surveyed Benchmark.
4. Design Baseline.

The Bore Hole Log Drawings shall contain the following information:

1. Project bore logs, arranged on sheet from left to right, in order of ascending stationing with 6 bore hole logs per sheet. Bore logs should match the project geotechnical report.

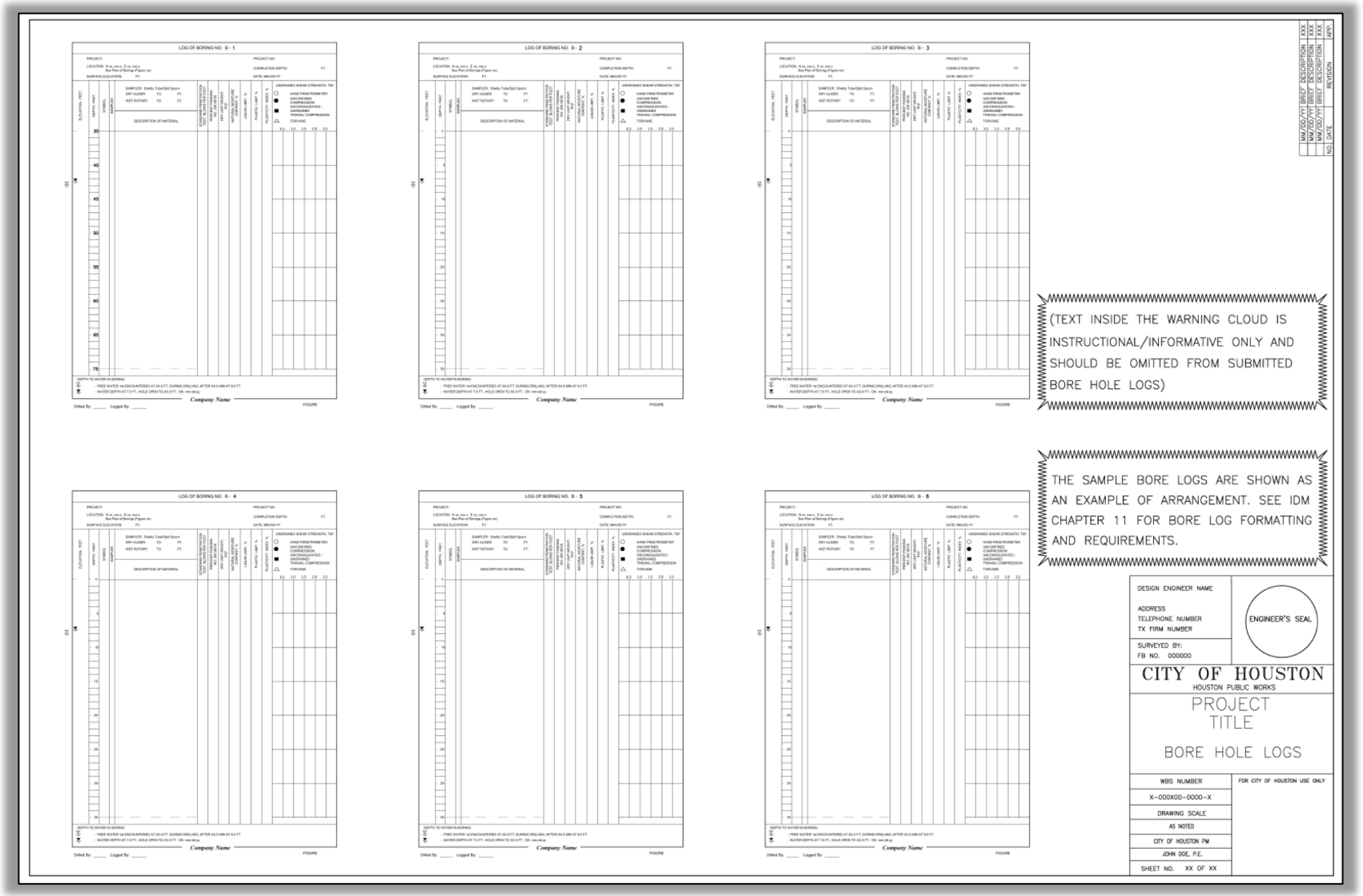
# CHAPTER 3 – GRAPHIC REQUIREMENTS

## Bore Log Drawing Examples: Bore Hole Layout



# CHAPTER 3 – GRAPHIC REQUIREMENTS

## Bore Log Drawing Examples: Bore Hole Log Drawing



# CHAPTER 6 – UTILITY LOCATIONS

## Subsurface Utility Engineering (SUE):

Subsurface Utility Engineering (SUE) – A branch of engineering practice that involves managing certain risks associated with utility mapping at appropriate quality levels, utility coordination, utility relocation design and coordination, utility condition assessment, communication of utility data to concerned parties, utility relocation cost estimates, implementation of utility accommodation policies, and utility design[1].

# CHAPTER 6 – UTILITY LOCATIONS

## Defining Levels of SUE:

- Chapter 7 – Appendix A sets criteria for SUE for LDWL
- Defined levels of SUE in Chapter 6 to provide more guidance
- References ASCE's Standard Guidelines

~~6.2.01.D~~6.2.01.E Conduct where appropriate, a subsurface utility exploration (SUE) to definitively locate potential utilities (public and private) that are in conflict with the project. Located utilities shall be shown on the plans as "location verified".

1. Levels of SUE as defined by ASCE 38-02[2]

a. Utility quality level A – Precise horizontal and vertical location of utilities obtained by the actual exposure (or verification of previously explored and surveyed utilities) and subsequent measurement of subsurface utilities, usually at a specific point. Minimally intrusive excavation equipment is typically used to minimize the potential for utility damage. A precise horizontal and vertical location, as well as other utility attributes, are shown on plan documents. Accuracy is typically set to 15-mm vertical, and to applicable horizontal survey and mapping accuracy as defined or expected by the project owner.

b. Utility quality level B – Information obtained through the application of appropriate surface geophysical methods to determine the existence and approximate horizontal position of subsurface utilities. Quality level B data should be reproducible by surface geophysics at any point of their depiction. This information is surveyed to applicable tolerances defined by the project and reduced onto plan documents.

~~a.~~c. Utility quality level C – Information obtained by surveying and plotting visible above-ground utility features and by using professional judgment in correlation with this information to quality level D information.

# QUESTIONS?

Enter it into the chat.

Note the chapter or topic in your question.

We will respond to unanswered questions on our website after this event.

# CHAPTER 7 – WATER LINE DESIGN REQUIREMENTS


## VENUS PRICE, P.E.
## DRINKING WATER OPERATIONS

# CHAPTER 7 – WATER LINE DESIGN REQUIREMENTS

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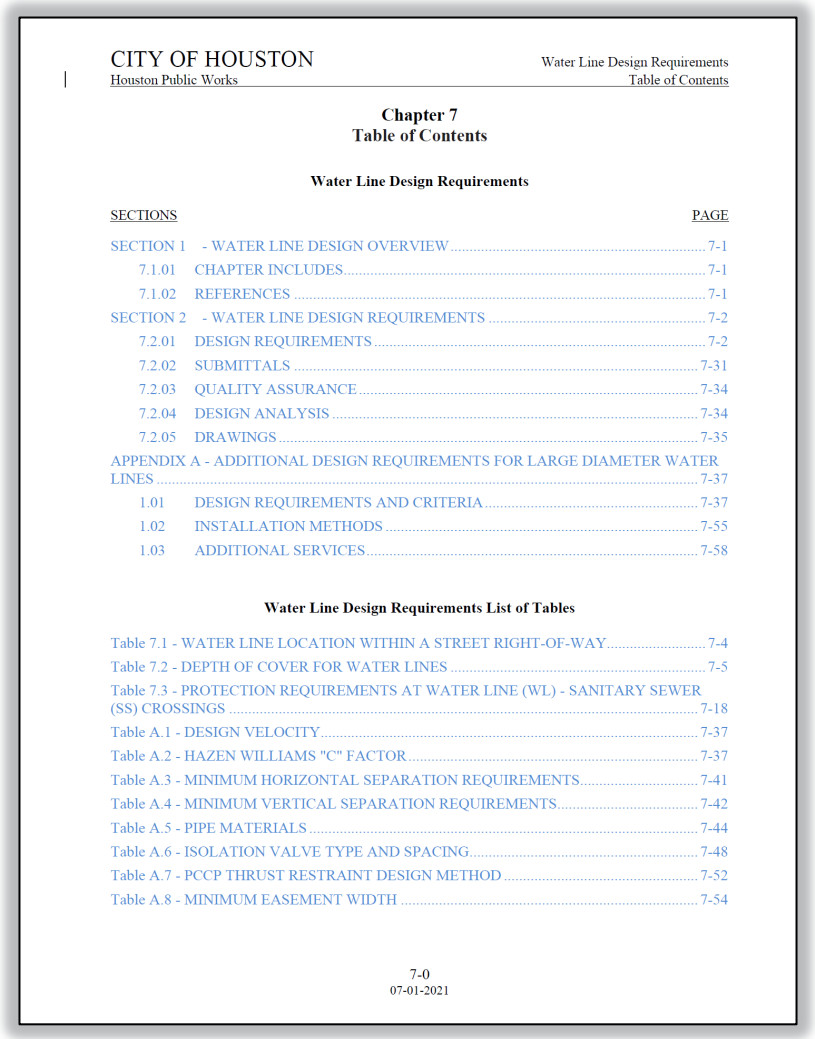



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**Water Line Design Requirements**

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# CHAPTER 7 - WATER LINE DESIGN REQUIREMENTS

## Summary of changes and updates:

- Dead-ends are disallowed
- Non-metallic pipes require trace wire
- Depth of cover is 5-feet for 16-inch and smaller; Absolute Minimum is 3-feet
- Location of appurtenances and use of engineering judgement
- Water Meter locations, call-outs, verification, and fire systems
- Considerations for Construction Phase – Scheduling and Construction Zones
- Wet Connection vs TS&V
- Interconnections
- Restrained Joints vs Thrust Blocks
- As-Builts
- Appendix A – Minimum Clearances Charts
- Appendix A – Minimum Easement Widths

# CHAPTER 7 – WATER LINE DESIGN REQUIREMENTS

## Dead ends

g. ~~Dead-end lines within public right-of-way:~~Dead-end water lines are prohibited, and existing dead-end water lines within reasonable reach of the proposed project shall be evaluated for connection and dead-end elimination.

~~(1) In temporary dead end situations the water line shall be 6-inch diameter or larger, shall not exceed more than 200 feet in length from the closest interconnection water line, and shall terminate with a fire hydrant or blowoff valve. The terminus of the line shall end with a plug and clamp. The fire hydrant or blowoff valve shall be located considering adequate drainage to avoid flooding during flushing.~~

~~(2) In permanent dead ends situations the water line shall be~~

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Houston Public Works

Water Line Design Requirements
Section 2 – Water Line Design Requirements

*7.2.01.B.g.(1).(b)*
*continued*

~~6-inch diameter or larger, shall not exceed more than 500 feet in length from the closest interconnection water line and shall terminate with a fire hydrant or blowoff valve. The terminus of the line shall end with a plug and clamp.The fire hydrant or blowoff valve shall be located considering adequate drainage to avoid flooding during flushing.~~

(1) Water lines within cul-de-sac:

~~(a) Reduce pipe sizes successively. Carry 8-inch and/or 6-inch and/or 4-inch diameter pipe in accordance with requirements found in paragraph 7.03. The water line shall terminate with a fire hydrant and/or blowoff valve. Carry 6-inch diameter pipe to the last fire hydrant. If the water line continues beyond the last fire hydrant, use 4-inch diameter pipe to end the water line. The water line shall terminate with a standard 2-inch blowoff valve and box at the end of a 4-inch diameter water line. Place last service as near as possible to the end of water line. The fire hydrant and/or blowoff valve shall be located considering adequate drainage to avoid flooding during flushing. The terminus of the line shall end with a plug and clamp.~~

~~(b) Use following alternate if approved or requested by OCE.~~ When adjacent cul-de-sacs are present, extend water line to the adjacent cul-de-sac under the following conditions:

# CHAPTER 7 – WATER LINE DESIGN REQUIREMENTS

## Trace wire for non-metallic pipes

~~h.~~k. The water line alignment shall have the minimum number of bends and appurtenances as is reasonable for the project scope.

~~i.~~l. Restrained joint calculations shall be utilized at all such locations governed by Best Practices and shall be provided to the City upon request.

A continuous trace wire, such as high strength copper-clad steel for open trench installations, and extra high strength copper-clad steel for trenchless installation, shall be specified for new non-metallic water lines according to the standard details and specifications.

m.

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**NEW IN THE 2021 REVISION**

*Standard Construction Specifications for Wastewater Collection Systems, Water Lines, Storm Drainage, Street Paving, and Traffic – 2021 Revisions to the 2020 Edition*

The City of Houston Standards Review Committee (SRC) was established to review, revise, and update documents and standards for Houston Public Works. Public input and participation was requested by the submittal of proposals for suggested changes, comments, recommendations and other information.

The 2020-2021 City of Houston Review Cycle Committee reviewed Infrastructure Design Manual (IDM) chapters 3, 6-9, 11, 13, 14 and 17 along with their associated standard drawings and standard construction specifications. Refer to the IDM Executive Summary for a summary of major updates to the design requirements made this review cycle. Below is a list of standard specifications and standard drawings that were revised during this review cycle. The Standard Construction Specifications have change bars on the left side of the page to indicate a major revision has taken place.

**New Specifications:**

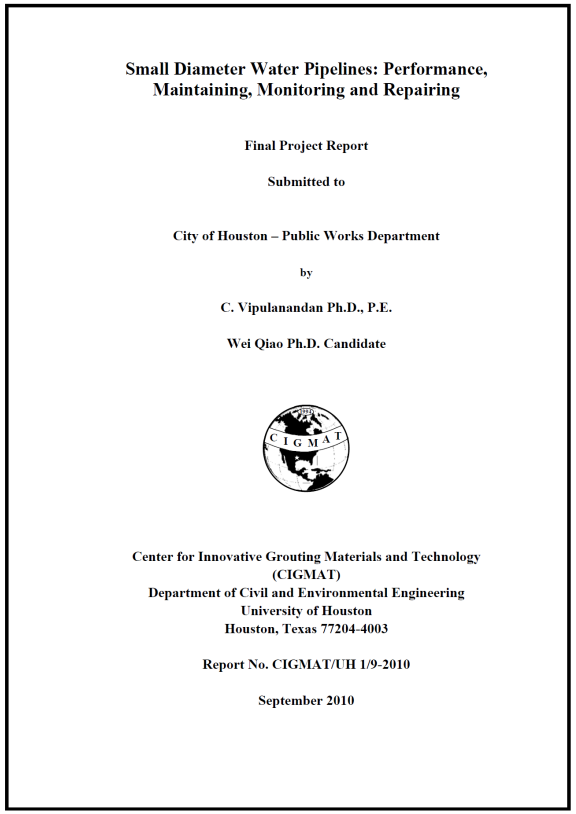
- 02614 – Large Diameter Line Stop
- 02615 – Insertion Valves and Line Stops
- 16124 – Conductive Trace Wire for Non-Metallic Water Line Pipes

**New Standard Details (Cont.):**

- 16124-02 – Complete Utility Locating System Water Service Detail (Water)
- 16124-03 – Complete Utility Locating System Hydrant Detail (Water)

# CHAPTER 7 - WATER LINE DESIGN CHANGES

## Depth of cover



**Small Diameter Water Pipelines: Performance, Maintaining, Monitoring and Repairing**

**Final Project Report**

**Submitted to**

**City of Houston – Public Works Department**

**by**

**C. Vipulanandan Ph.D., P.E.**

**Wei Qiao Ph.D. Candidate**

**Center for Innovative Grouting Materials and Technology (CIGMAT)**
**Department of Civil and Environmental Engineering**
**University of Houston**
**Houston, Texas 77204-4003**

**Report No. CIGMAT/UH 1/9-2010**

**September 2010**

~~7.~~6. Depth of cover

a. Provide the following minimum depths of cover from the top of curb for curb- and-gutter streets or from mean elevation of the nearby ditch bottom and the nearby right-of-way for open-ditch section:

Table 7.2 - DEPTH OF COVER FOR WATER LINES

| SIZE OF LINE | DEPTH OF COVER | | ABSOLUTE MINIMUM(3) |
|---|---|---|---|
| | TOP-OF-CURB | OPEN-DITCH SECTION | |
| ~~12-INCH & SMALLER~~ | ~~4 feet (2)~~ | ~~5 feet~~ | ~~3 feet(2)~~ |
| 16-INCH & SMALLER | 5 feet(2) | 6 feet | 3 feet(2) |
| 20-INCH | 6 feet | 8 feet | 4 feet(1,2) |

(1) Cement stabilized embedment required.

(2) Minimum 6 feet of cover where crossing railway.

(3) Water lines installed within predominantly high plasticity, fat clay (CH) soils shall be installed with an additional 2 feet of cover beyond the absolute minimum requirements (Vipulanandan & Qiao, 2010).

# CHAPTER 7 – WATER LINE DESIGN REQUIREMENTS

## Location of Appurtenances

- Use engineering judgment when placing appurtenances
- Consider appurtenance functionality and minimize conflicts

7.2.01.D Appurtenances

~~2.~~1. ~~Do not place appurtenances under pavement.~~ Appurtenance location shall ~~consider~~ minimize conflicts with pavement, landscaping, other structures, other utilities, and vehicular traffic.

~~1.~~2. Isolation Valves

a. Spacing - set at maximum distances along the line as follows, however, use sound engineering judgement to identify placing of valves, and any locations where additional valves may be necessary to enable isolation of any given segment of the water line for maintenance.

(1) 4-inch through 12-inch diameter - 1000 feet.

(2) 16-inch and 20-inch diameter - 2000 feet.

# CHAPTER 7 – WATER LINE DESIGN REQUIREMENTS

## Water Meters

7.2.01.E Water Meter Service

1. Water meter service for lines in or along street rights-of-way. Locate in areas with easy access and with protection from traffic and adjacent to rights-of-way whenever possible. Do not locate meters in areas enclosed by fences. Obtain approval from OCE to locate meters within 30 feet from the center line of outside rail.

   a. Obtain water meter count from City Project Manager.

   b. Obtained water meter count shall be confirmed for accuracy in the field at the time of the post survey walk through.

   ~~a.~~c. Label all meter line sizes in drawings as per water meter report and any modifications made as a result of the project.



*7.2.01.E.1.k. continued*

chemical environs must be installed in an above ground meter installation assembly.

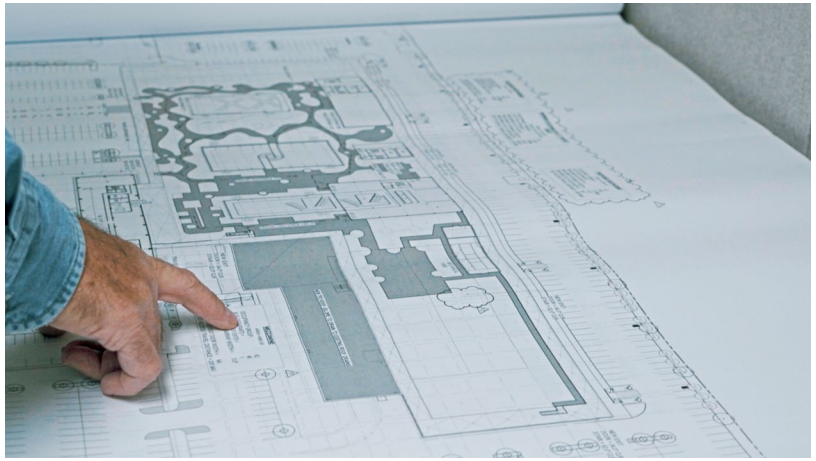
~~k.~~l. Irrigation meters will require a backflow preventer of PVB type and shall be installed 12" above the highest sprinkler head.

~~l.~~m. Dedicated water meter easements shall be placed in unpaved and porous area.

n. Water meters must be located outside of building structures.

# CHAPTER 7 – WATER LINE DESIGN REQUIREMENTS

## Water Meters – Fire Systems



- Open & Closed System Requirements

o. Both open and closed fire systems connected to the City of Houston water distribution system must be metered with a City of Houston approved fire rated meter.

(1) Open type fire systems, as defined in City of Houston Ordinance Chapter 47, must have a Reduced Pressure Zone Device (RPZ) or tank with air gap for back flow protection.

(2) Chemical injected fire systems are required to install a RPZ before injection point.

(3) Closed type fire systems, as defined in City of Houston Ordinance Chapter 47, must have a minimum double check valve backflow assembly.

~~m.~~p. Fire systems shall not be designed based on pressures obtained from fire flow tests which are indicative only as pressure at a given time; rather, with the understanding that system pressures fluctuate and that the City provides a minimum pressure of 35 psi during normal and 20 psi under combined fire and drinking water flow conditions.

# CHAPTER 7 – WATER LINE DESIGN REQUIREMENTS

## Consideration for construction phase

- LDWL Shutdowns Unlikely during high demand months
- Consider existing PCCP when placing materials and machinery

7.2.01.I Additional Requirements

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CITY OF HOUSTON
Houston Public Works

Water Line Design Requirements
Section 2 – Water Line Design Requirements

*7.2.01.I continued*

1. Use electrically isolated flange joints for transitions between two dissimilar metallic pipes. Electrically isolate water lines from casing pipe and supports.

2. The carrier pipeline shall extend a minimum of 1 foot beyond the end of the casing to allow flanged joints to be constructed.

3. Project schedule shall be determined with the understanding that the City's need to provide water to residents may result in denial to shutdown critical water lines during warmer peak demand months.

~~1.~~4. Project design shall consider the available construction zone. Change of depth of cover over existing PCCP water lines is not allowed. Any loading and vibrations near PCCP water lines shall be minimized.

# CHAPTER 7 – WATER LINE DESIGN REQUIREMENTS

## Wet connection vs TS&V

- Criteria added for when to use Wet Connect or TS&V

~~7.2.01.I~~7.2.01.J Connections to Existing Water Lines

1. Wet connections are normally preferred in any locations where:

   a. Existing water line is to be abandoned and a cut, plug & abandon is required to complete existing water line abandonment.~~-~~

   b. Size on size connection is necessary and a full size tap is not feasible.

   ~~a.~~ Limited work zone is available to perform a tap.

   c.

2. Tapping Sleeve and Valve connections are normally preferred when there is adequate work zone and clearances to existing utilities:

   a. To tie into an existing line that will remain in service.

   b. Connecting perpendicularly~~-~~ one standard pipe size smaller than the existing water line.

   c. Needed to supply water for testing. A minimum of one Tapping ~~s~~Sleeve and Valve connection shall be provided per contiguous project, unless another water source is available.

~~7.2.01.I~~7.2.01.K Circulation and Flushing for Water Quality:

1. The layout of the water distribution system and appurtenances shall provide maximum circulation of water to prevent ~~future~~ problems of odor, taste, or color due to stagnant water.

2. Provide a source of fresh water at each end or at multiple points of a subdivision. Provide ways to create circulation and place valves and fire hydrants to allow simple flushing of lines.

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# CHAPTER 7 – WATER LINE DESIGN REQUIREMENTS

## Interconnections

~~7.2.01.K~~7.2.01.L Interconnections

1. For interconnections between utility districts outside the City, written approval must be ~~given~~ obtained from ~~by~~ the TCEQ and provided to the City in the design submittal.

2. A written agreement between the districts must be approved by the City and recorded in the county records and furnished to the City.

3. Set meter at the point of connection in a separate easement sized to conform to requirements of Chapter 5. Meter to conform to requirements given in the City of Houston Standard Specifications and Standard Details.

~~3.~~4. Customers shall not take pump suction directly from City water lines. Design appropriate backflow device or approved air gap downstream of the meter and show in the plans.

# CHAPTER 7 – WATER LINE DESIGN REQUIREMENTS

## Restrained joints vs thrust blocks

- The City would like to move away from thrust blocks toward restrained joint systems

~~7.2.01.M~~7.2.01.N Restraint System

1. Concrete thrust blocks may be approved on a case by case basis and may be used in conjunction with restrained joint system as approved or required by OCE. In cases where concrete thrust blocks are utilized, at a minimum the Engineer shall include block dimensions and locations on Drawings. The proximity to other utilities and structures must be taken into account when specifying the use of thrust blocks.

2. Joint restraint shall be calculated for all fittings that require thrust restraint. Joint restraints that require calculations shall be shown on plan.

# CHAPTER 7 – WATER LINE DESIGN REQUIREMENTS

## As-builts

7.2.02.F As-Builts

1. Engineer shall monitor the up-keep of the As-Builts so that they are a true representation of existing conditions in the field. If Engineer has reason to believe that the As-Builts are not being meticulously and appropriately maintained by the construction team, Engineer shall notify City Project Manager.

   a. As-Builts must also contain any materials that were left in place by the Contractor such as shoring, or other elements not expressly shown in the Drawings.

2. Engineer shall add the water line pipe material(s) including the type of lining and coating, in the As-Builts by any of the following methods:

   a. Add the pipe material on the project Layout Sheet, in a tabular format, separated by station number when there is a change in pipe material.

   b. If there is no project Layout Sheet, add the pipe material on the Notes Sheet, in a tabular format, separated by station number when there is a change in pipe material.

   c. If there is no project Notes Sheet, add the pipe material on the Cover Sheet, in a tabular format, separated by station number when there is a change in pipe material.

   d. Label each plan and profile sheet, at the appropriate location.



*7.2.02.F*
*continued*

3. For every different type of valve used in the project, Engineer shall add the water line valve manufacturer, number of turns, and direction to open, in the As-Built Drawings by either of the following methods:

   a. Add the valve information on the project Layout Sheet, in a tabular format, separated by station number when there is a change in valve type.

   b. If there is no project Layout Sheet, add the valve information on the Notes Sheet, in a tabular format, separated by station number when there is a change in valve type.

   c. If there is no project Notes Sheet, add the valve information on the Cover Sheet, in a tabular format, separated by station number when there is a change in valve type.

   d. Label on each plan and profile sheet, at the appropriate location.

4. Engineer shall submit the As-Builts to OCE no later than two weeks following final acceptance of the project.

5. Private interconnections to City water lines 24-inch and larger are not allowed.

# CHAPTER 7 – WATER LINE DESIGN REQUIREMENTS

## Appendix A – Minimum Clearances Charts

Table A.3 - MINIMUM HORIZONTAL SEPARATION REQUIREMENTS

| LDWL Water Pipe Material | Water Horizontal Separation Requirement (1)(2) | Type of Parallel Utility (5) | | | | |
|---|---|---|---|---|---|---|
| | | Water Line | Non-Pressure Rated Sanitary Sewer (3) | Pressure Rated Sanitary Sewer (3) | Storm Sewer | All other Utilities/ Pipelines |
| | Fiberglass Reinforced Pipe | 4 feet | 9 feet | 9 feet | 4 feet | 4 feet |
| | HDPE | 4 feet | 9 feet | 9 feet | 4feet | 4 feet |
| | Ductile Iron | 4 feet | 9 feet | 9 feet | 4 feet | 4 feet |
| | PCCP | 5 feet or 1 WL Pipe Diameter whichever is greater | 9 feet | 9 feet | 5 feet or 1 WL Pipe Diameter whichever is greater | 5 feet |
| | Bar Wrap Concrete Cylinder | 4 feet or 1 WL Pipe Diameter whichever is greater | 9 feet | 9 feet | 4 feet or 1 WL Pipe Diameter whichever is greater | 4 feet |
| | Steel | 4 feet | 9 feet | 9 feet | 4 feet | 4 feet |

(1) Minimum clearances are measured from outside of pipe to outside of pipe.

(2) Avoid overlapping trench width of proposed water line with trench width of existing utility, to the extent possible.

(3) Place 1 full section of SS centered at WL crossing and provide restraint joints on SS

(4) For water lines 54-inches in diameter and greater, provide at least 5 feet horizontal clearance from OD to OD from other buried utilities or buried structures.

~~a.~~(5) For possible reduction in separation limits, see Section 7.2.01.M.3.

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07-01-2021

*1.01.C.5 continued*

Table A.4 - MINIMUM VERTICAL SEPARATION REQUIREMENTS

| LDWL Water Pipe Material | Water Vertical Separation Requirement Table (1) | Type of Parallel Utility(3) | | | | |
|---|---|---|---|---|---|---|
| | | Water Line | Non-Pressure Rated Sanitary Sewer (2) | Pressure Rated Sanitary Sewer (2) | Storm Sewer | All other Utilities/ Pipelines |
| | Fiberglass Reinforced Pipe Above Utility | 2 feet | 2 feet | 2 feet | 2 feet | 2 feet |
| | Fiberglass Reinforced Pipe Below Utility | 4 feet | 4 feet | 4 feet | 4 feet | 4 feet |
| | HDPE Above Utility | 2 feet | 2 feet | 2 feet | 2 feet | 2 feet |
| | HDPE Below Utility | 4 feet | 4 feet | 4 feet | 4 feet | 4 feet |
| | Ductile Iron Above Utility | 1 foot | 2 feet | 1 foot | 2 feet | 1 foot |
| | Ductile Iron Below Utility | 2 feet | 2 feet | 2 feet | 2 feet | 2 feet |
| | PCCP Above Utility | 6 feet | 6 feet | 6 feet | 6 feet | 6 feet |
| | PCCP Below Utility | 5 feet | 5 feet | 5 feet | 5 feet | 5 feet |
| | Bar Wrap Concrete Cylinder Above Utility | 4 feet | 4 feet | 4 feet | 4 feet | 4 feet |
| | Bar Wrap Concrete Cylinder Below Utility | 6 feet | 6 feet | 6 feet | 6 feet | 6 feet |
| | Steel Above Utility | 2 feet | 2 feet | 2 feet | 2 feet | 2 feet |
| | Steel Below Utility | 3 feet | 3 feet | 3 feet | 3 feet | 3 feet |

(1) Minimum clearances are measured from outside of pipe to outside of pipe.

(2) Place 1 full section of SS centered at WL crossing and provide restraint joints on SS.

~~(1)~~(3) For possible reduction in separation limits, see Section 7.2.01.M.3.

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07-01-2021

# CHAPTER 7 – WATER LINE DESIGN REQUIREMENTS

## Appendix A – Minimum Easement Widths

1.01.L Minimum Easement Widths:

1. The minimum easement width required to install, operate and maintain water lines are summarized in Table A.8.

~~b.~~2. Provide all-weather access to water lines easements parallel to public right-of-way through the use of cleared, graded and stabilized access roadway or driveways.



*1.01.L continued*

Table A.8 - MINIMUM EASEMENT WIDTH

| SIZE OF WATERLINE | MINIMUM EASEMENT WIDTH (1)(2)(3) |
|---|---|
| 24" through 48" (3) | 30 ft |
| 54" through 72" (3) | 40 ft |
| 84" and Larger (3) | 50 ft |

(1) Minimum easement width applicable for easements adjacent to public ROW. Water line easement not parallel to public rights-of-way shall be 10 feet wider than the above.

(2) Water line shall be centered in the easement for 20 ft and smaller easements

(3) Do not locate lines 16-inch diameter and larger in side lot easements. For location within side lot easements, see Chapter 5, Easement Requirements.

(4) Narrower easements will be considered where Engineer provides evidence, to the satisfaction of OCE, that maintenance activities will not be hindered by reduced width.

# QUESTIONS?

Enter it into the chat.

Note the chapter or topic in your question.

We will respond to unanswered questions on our website after this event.

# CHAPTER 8 – WASTEWATER COLLECTION SYSTEM DESIGN REQUIREMENTS

DANIEL OEFNER, P.E
WASTEWATER OPERATIONS &
KATHLIE BULLOCH, P.E.
OF THE CITY ENGINEER

# CHAPTER 8 - UPDATES

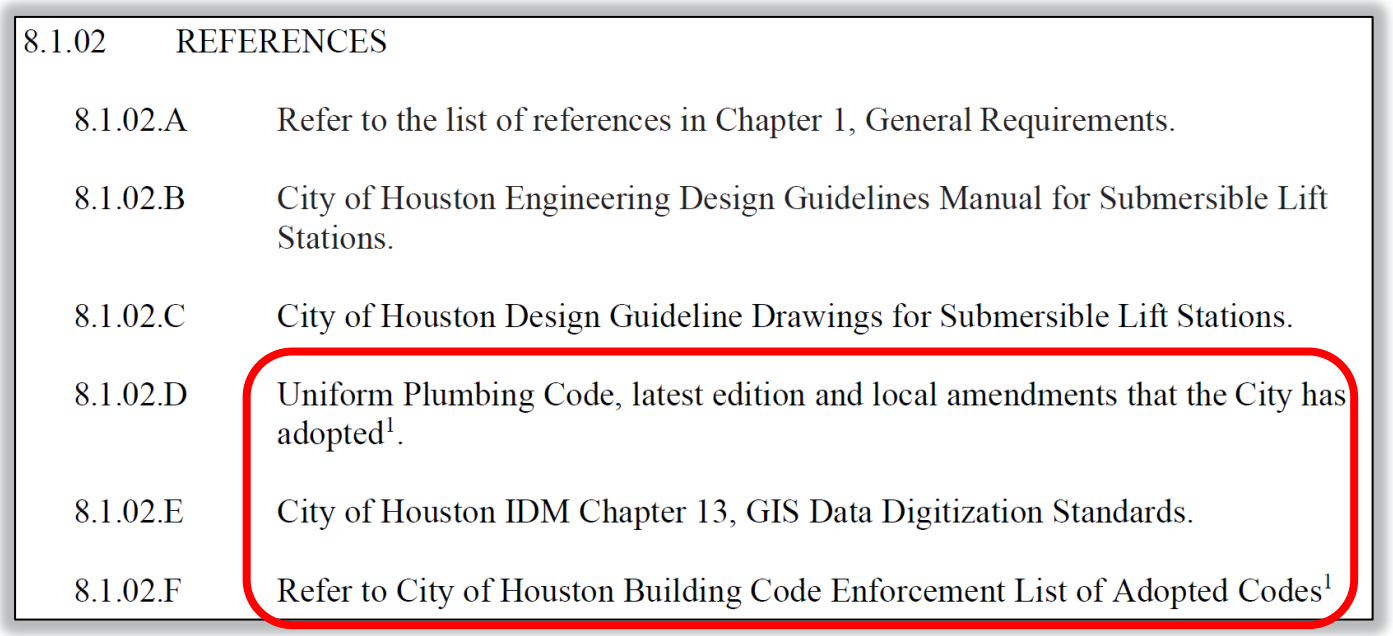
- Section 1:  Wastewater Collection System Overview
- Section 2:  Wastewater Collection Design Requirements

# CHAPTER 8 - UPDATES

## Sect 8.1.02 - References

New References added

- Uniform Plumbing Code with local amendments
- Data Digitization Standards
- Building Code Enforcement



| 8.1.02 | REFERENCES |
|---|---|
| 8.1.02.A | Refer to the list of references in Chapter 1, General Requirements. |
| 8.1.02.B | City of Houston Engineering Design Guidelines Manual for Submersible Lift Stations. |
| 8.1.02.C | City of Houston Design Guideline Drawings for Submersible Lift Stations. |
| 8.1.02.D | Uniform Plumbing Code, latest edition and local amendments that the City has adopted[1]. |
| 8.1.02.E | City of Houston IDM Chapter 13, GIS Data Digitization Standards. |
| 8.1.02.F | Refer to City of Houston Building Code Enforcement List of Adopted Codes[1] |

# CHAPTER 8 - UPDATES

## Sect 8.1.03 – Definitions

Revisions:

- Public Sewer – 50’ wide PAE, reference to Chapter 6
- Sewer Line – definition deleted and assimilated into the Public Sewer definition
- Service Lead – minor rewording
- Building Sewer - minor rewording, private sewer
- Community Sewer – minor rewording
- Single-Family Residence – definition added

| | |
|---|---|
| 8.1.03 | DEFINITIONS |
| 8.1.03.A | Public Sewer - A closed conduit which conveys wastewater flow and which is located within a public Right-Of-Way, or a dedicated public sanitary sewer easement, or a Type 1 Permanent Access Easement (PAE) that is a minimum width of 50 ft . A public sewer is maintained and operated by the City and is intended to serve more than one residential, commercial, or industrial site. Refer to IDM Chapter 6 for definition of Type 1 Permanent Access Easement. |
| 8.1.03.B | Private Sewer - A closed conduit which conveys wastewater flow and is constructed and maintained by a private entity (e.g. homeowner's association). Private sewers may be located in areas such as a private street or common area. Private sewers are subject to the design and construction requirements of the Infrastructure Design |

| | |
|---|---|
| 8.1.03.C | Service Lead – A portion of sanitary sewer pipe located within the public Right-Of-Way or public easement that connects a building sewer to a sewer main and is owned and maintained by the City. A service lead may not exceed 150 linear feet. No more than the equivalent of two single-family residences may be served by one service lead. |
| 8.1.03.D | Building Sewer – A private sewer that connects a building to a service lead that is wholly located within private property. If routed through another tract of land, it shall be located in a private easement, which will include the City as a third party in the easement documents. Building Sewers will be owned and maintained by the owner of the property being served, including portions that may be routed through another tract of land through a private easement. Design shall adhere to the Design Manual or Plumbing Code, whichever is more stringent. |
| 8.1.03.E | Community sewer - A private sewer that serves more than two single-family residences. Community sewer will adhere to this manual using an 8-inch pipe terminating in a manhole and will be located within a private easement, which will include the City as a third party in the easement documents. It will be owned and maintained by the owner(s) of the properties being served bythe community sewer. |
| 8.1.03.F | Project Area - The area in the immediate vicinity of a public sewer to be constructed. This includes the entire road Right-Of-Way and any adjoining easements used for the proposed wastewater line construction. |
| 8.1.03.G | Stack - A minimum 6-inch riser pipe, constructed on public sewer or lead, with a maximum of 6-feet of cover on the stack. A stack will be used for connecting service leads to deep public sewers. |
| 8.1.03.H | Stub-Outs- A minimum 5-feet of sewer pipe extended from the manhole for future expansion and terminated with a sanitary sewer plug. |
| 8.1.03.I | Force Main- A pressure-rated conduit which conveys wastewater from one pump station to one discharge point. |
| 8.1.03.J | Single-family residence – A residential establishment serving a single family, or household, which may not include separate living quarters. In those instances where there is no meter on the water supply to the principal household, separate living quarters shall be considered as a separate residence and a separate sewer service charge shall be applied (Refer to City of Houston Code of Ordinances Chapter 47, Article III, Sec.47-121). |

# CHAPTER 8 - UPDATES

## Sect 8.2.01 - Design Requirements

- Updated floodplain delineation criteria for the collection system based upon changes to Chapter 19 of the Houston Code of Ordinances
- Record drawing number required for all existing public sewers

**8.2.01.B Drawing/Design Information**

1. The detailed drawings will show the exact location of the proposed line in the street, alley, or easement with respect to the edge of the particular Right-Of-Way, the transit base line, any nearby utilities, "0.2 percent flood elevation" as defined by Chapter 19 Section 19-33 of the City of Houston Code of Ordinances within the project area, major landscaping, and other structures affecting construction.
2. Sewers and manholes shall be identified by number, letter, combination of, or other identification and shown on the sanitary sewer layout sheet.
3. Where sewers are to be placed between existing pavement and the street Right-Of- Way line (or interior easement line) show the existing ground line at both sides (or the closest side for sewers near the edge) of the Right-Of-Way or adjacent sewer easement. Prior approval will be required if proposed sewers are to be placed under existing pavements or toppings.
4. For connection to the City sanitary sewer system include one of the following: a copy of the City's Wastewater Capacity Reservation (WCR) letter or, a copy of the City's Wastewater short form, and a Wastewater Impact Fee Receipt for any proposed wastewater design.

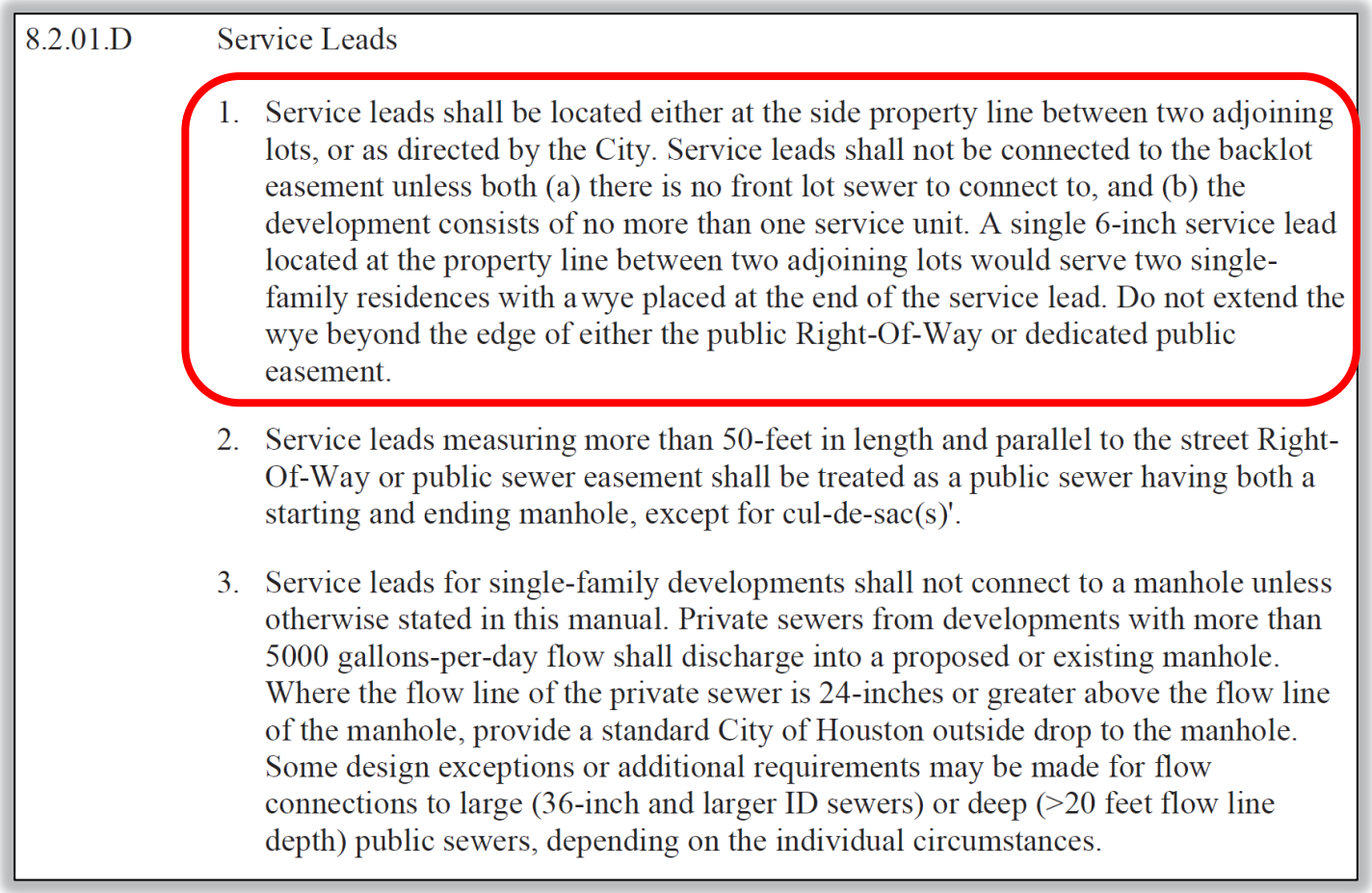
**8.2.01.C Drawing Requirements**

1. All sewers and connections must be shown in both plan and profile (P&P) views. A record drawing number for all existing public sewers in the P&P shall be provided.

# CHAPTER 8 - UPDATES

## Sect 8.2.01 - Design Requirements

- Updated standards for limiting new connections to public sewers located in backlot utility easements



8.2.01.D Service Leads

1. Service leads shall be located either at the side property line between two adjoining lots, or as directed by the City. Service leads shall not be connected to the backlot easement unless both (a) there is no front lot sewer to connect to, and (b) the development consists of no more than one service unit. A single 6-inch service lead located at the property line between two adjoining lots would serve two single-family residences with a wye placed at the end of the service lead. Do not extend the wye beyond the edge of either the public Right-Of-Way or dedicated public easement.
2. Service leads measuring more than 50-feet in length and parallel to the street Right-Of-Way or public sewer easement shall be treated as a public sewer having both a starting and ending manhole, except for cul-de-sac(s)'.
3. Service leads for single-family developments shall not connect to a manhole unless otherwise stated in this manual. Private sewers from developments with more than 5000 gallons-per-day flow shall discharge into a proposed or existing manhole. Where the flow line of the private sewer is 24-inches or greater above the flow line of the manhole, provide a standard City of Houston outside drop to the manhole. Some design exceptions or additional requirements may be made for flow connections to large (36-inch and larger ID sewers) or deep (>20 feet flow line depth) public sewers, depending on the individual circumstances.

# CHAPTER 8 - UPDATES

## Sect 8.2.01 Design Requirements

- Updated floodproofing criteria for the collection system based upon changes to Chapter 19 of the Houston Code of Ordinances
- New cleanout sizing criteria
- New manhole location criteria

8.2.01.E General Requirements

11. Manholes located within Houston Special Flood Hazard Areas, as defined by Chapter 19 of the City of Houston Code of Ordinances, shall have manhole covers that are gasketed and bolted down to prevent inflow. Manhole covers shall be floodproofed to the base flood elevation required by Chapter 19 Section 19-33 of the City of Houston Code of Ordinances. The Engineer of Record (EOR) shall provide a gasketed and bolted manhole detail in Drawings. Manhole vents must be located at least every 1500' or per the latest TCEQ requirements in Chapter 217 Subchapter C, whichever is more stringent. Vent piping shall be designed in accordance with COH standard detail 02082-06 and City of Houston Code of Ordinances Chapter 19 Section 19-33. Engineering judgement and Aesthetics shall be considered in selecting the location of vent piping. Tunnels must be vented in accordance with TCEQ requirements.

12. A cleanout diameter must be at least equal to the diameter of the pipe to which it is attached.

13. New manholes shall not be located between the top of banks for ditches or swales, unless approved by the City.

14. Manhole covers shall not be placed within driveways and where possible, manhole covers shall not be designed within the tire path along roadways.

15. Wastewater lines along State Right-of-Way shall be installed outside of the right-of-way in a separate contiguous easement; width of easement shall be as provided in Chapter 5.

# CHAPTER 8 - UPDATES

## Sect 8.2.01 Design Requirements

- Updated requirements for commercial service leads

8.2.01.F Line Size

1. The minimum pipe diameter for a public sanitary sewer shall be 8-inches.
2. Service leads 4-inches in diameter shall be confined to the limits of the lot which they serve and shall serve only the equivalent of one single-family lot. No 4-inch sewer shall be laid in any street, alley, dedicated sewer easement or Right-Of-Way.
3. Service leads 6-inches in diameter shall not serve more than the equivalent of 2 single-family lots or other types of small land tracts.
4. Service leads of 6-inch and 8-inch diameter for single-family residential lots shall have a minimum grades as shown in Table 8.1.
5. For all service leads that requires a street bore, submit a copy of the wastewater capacity letter to establish the required size of the line.
6. For commercial service leads, the minimum size service lead shall be 8-inches in diameter. Connect all service leads directly to a manhole.
7. Public sewers shall be laid at a size and depth to conform to designs permitting an orderly expansion of the sewer system of the City and so as to avoid a duplication of lines in the future.
8. The City shall be the final judge as to size and depth required and any exception to service leads as previously defined.

# QUESTIONS?

Enter it into the chat.

Note the chapter or topic in your question.

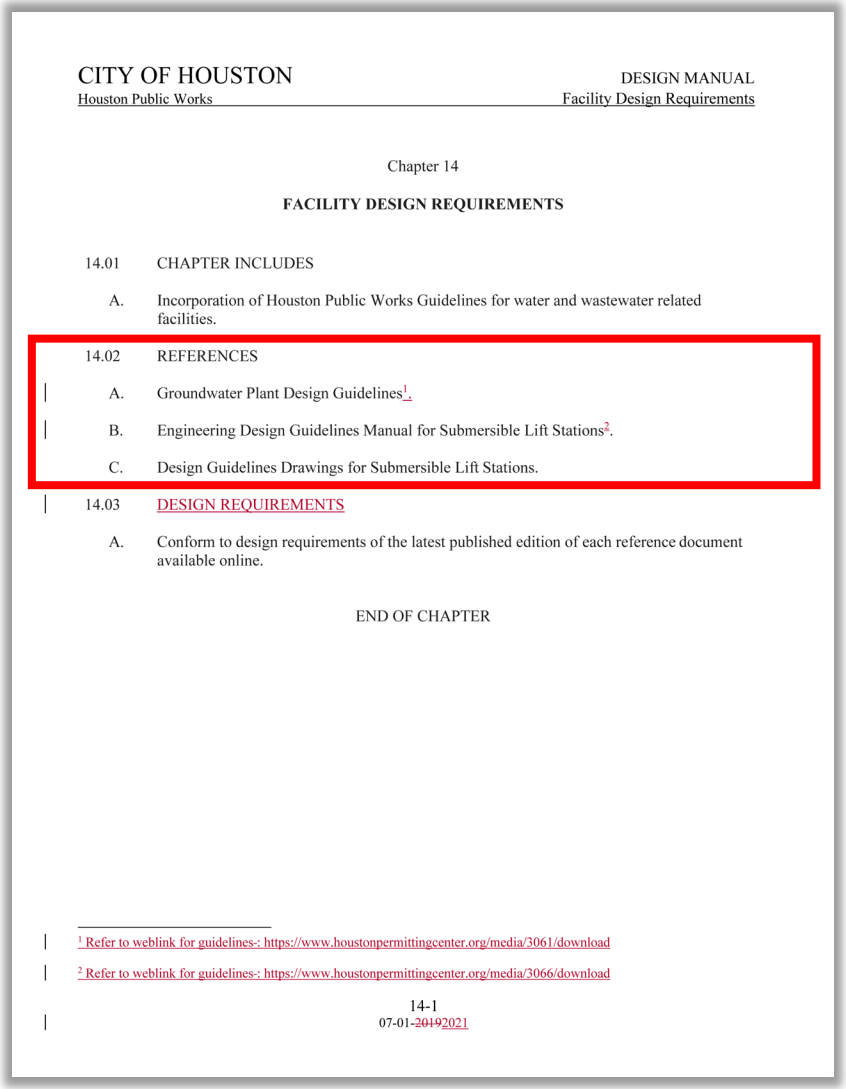
We will respond to unanswered questions on our website after this event.

# CHAPTER 14 – FACILITY DESIGN REQUIREMENTS


## LUIS GARZA, P.E
## STANDARDS AND SPECIFICATIONS &
## SANDEEP AGGARWAL, P.E.
## DRINKING WATER OPERATIONS - FACILITIES

# CHAPTER 14 – FACILITY DESIGN REQUIREMENTS

## Chapter 14 Contents:





Chapter 14

**FACILITY DESIGN REQUIREMENTS**

14.01 CHAPTER INCLUDES

A. Incorporation of Houston Public Works Guidelines for water and wastewater related facilities.

14.02 REFERENCES

A. Groundwater Plant Design Guidelines[1].

B. Engineering Design Guidelines Manual for Submersible Lift Stations[2].

C. Design Guidelines Drawings for Submersible Lift Stations.

14.03 DESIGN REQUIREMENTS

A. Conform to design requirements of the latest published edition of each reference document available online.

END OF CHAPTER

[1] Refer to weblink for guidelines-: https://www.houstonpermittingcenter.org/media/3061/download

[2] Refer to weblink for guidelines-: https://www.houstonpermittingcenter.org/media/3066/download

# CHAPTER 14 – FACILITY DESIGN REQUIREMENTS

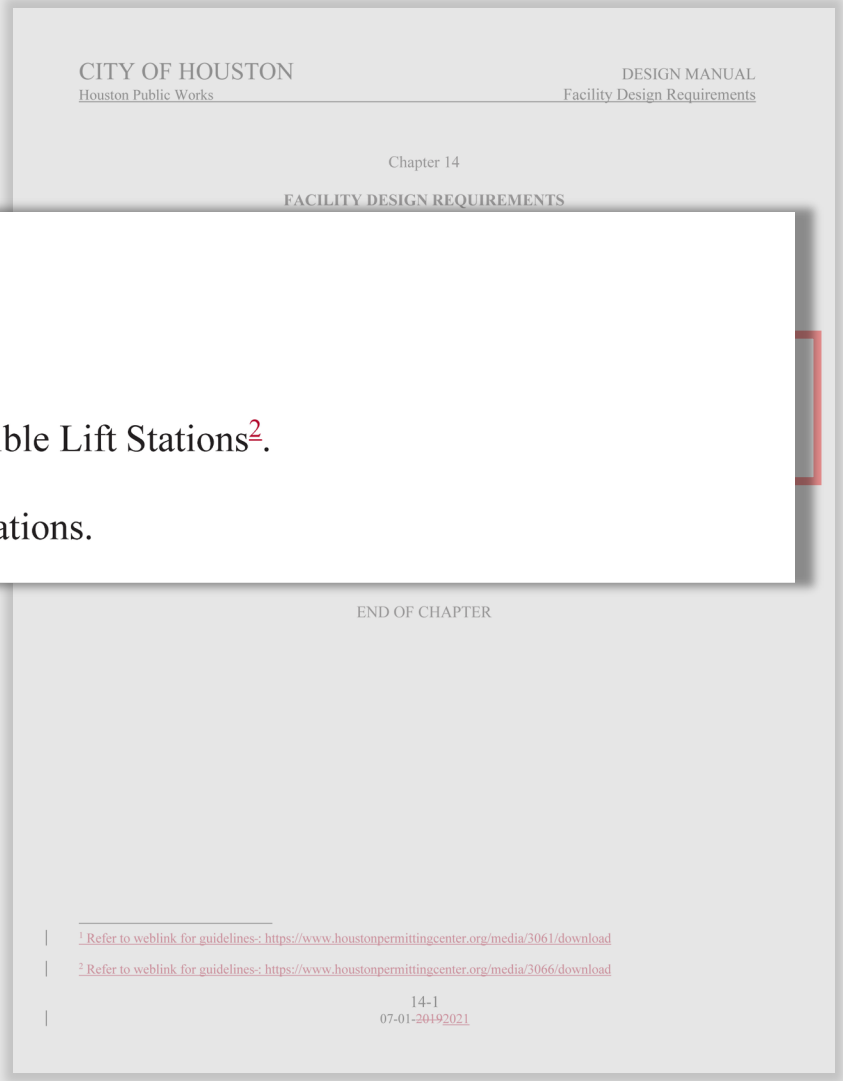
## Chapter 14 Contents:

14.02 REFERENCES

A. Groundwater Plant Design Guidelines[1].

B. Engineering Design Guidelines Manual for Submersible Lift Stations[2].

C. Design Guidelines Drawings for Submersible Lift Stations.



CITY OF HOUSTON
Houston Public Works

DESIGN MANUAL
Facility Design Requirements

Chapter 14

FACILITY DESIGN REQUIREMENTS

END OF CHAPTER

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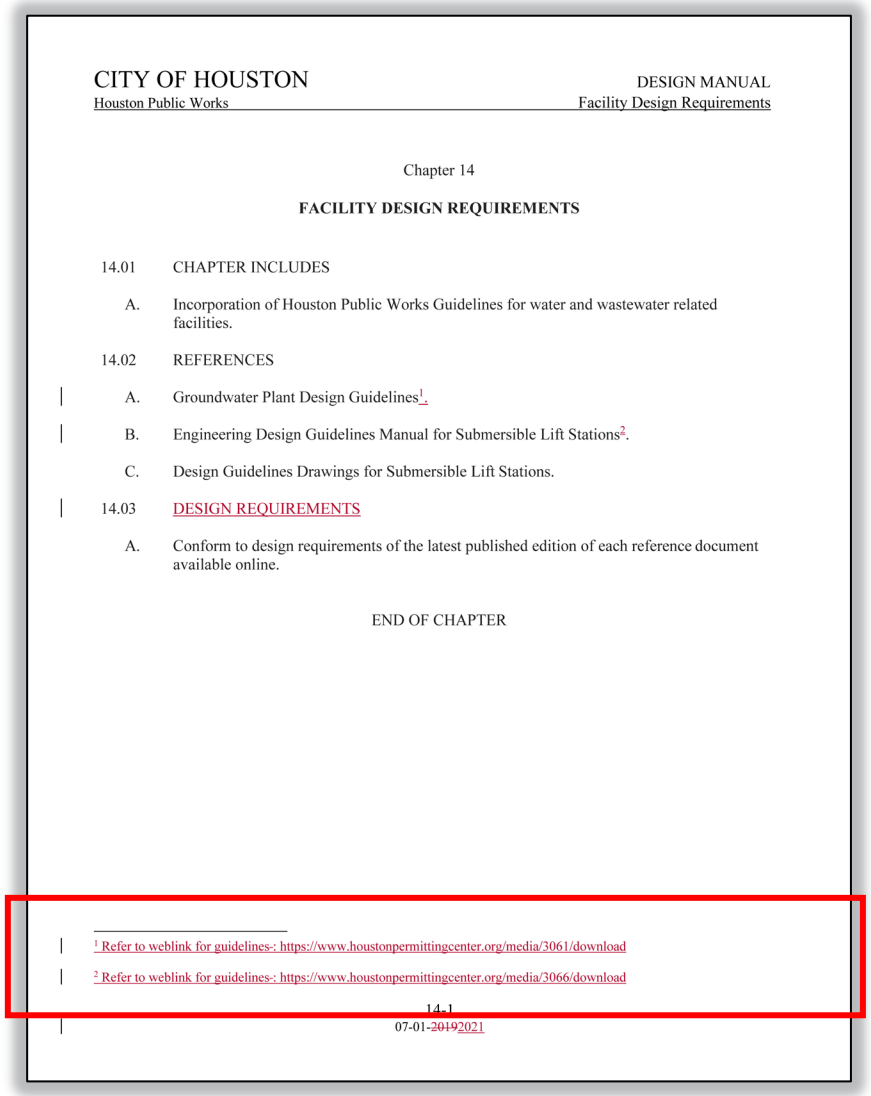
# CHAPTER 14 – FACILITY DESIGN REQUIREMENTS

## Chapter 14 Contents:

- Groundwater Plant Design Guidelines
- Engineering Design Guidelines Manual for Submersible Lift Stations
- Design Guideline Drawings for Submersible Lift Stations



CITY OF HOUSTON
Houston Public Works

DESIGN MANUAL
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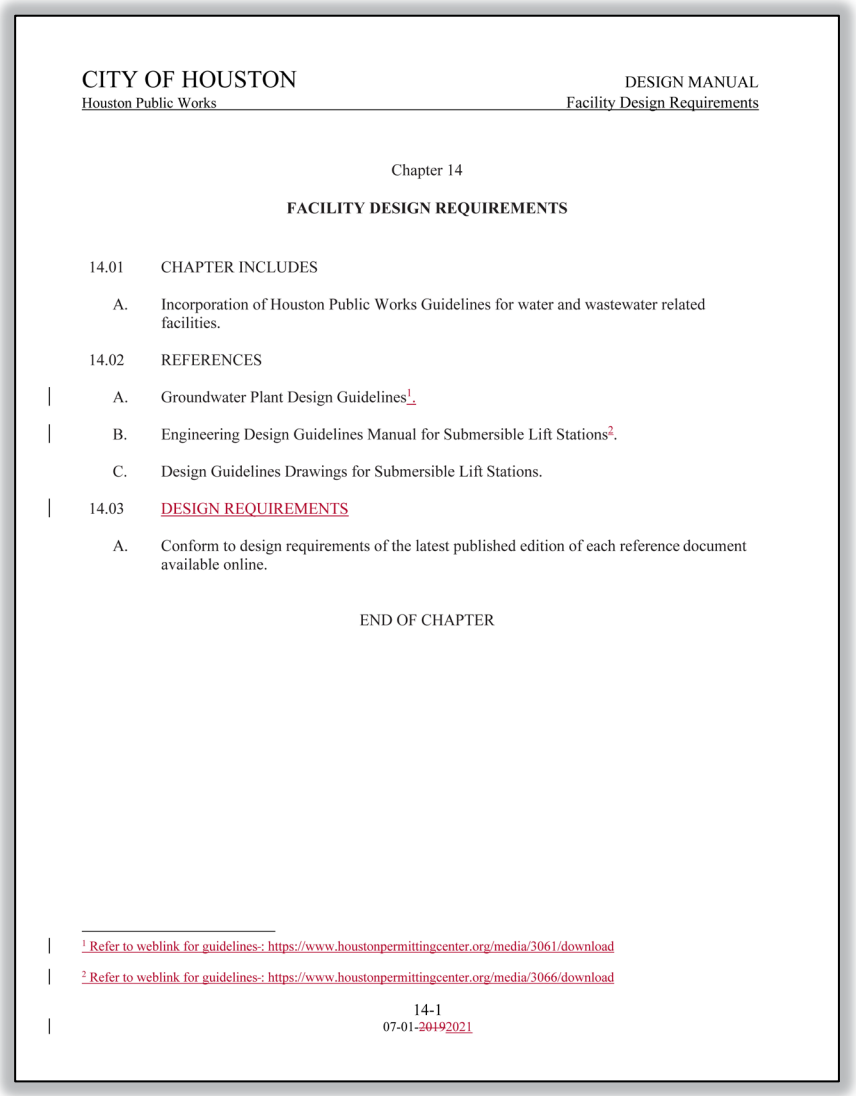
HOUSTON PUBLIC WORKS

# CHAPTER 14 – FACILITY DESIGN REQUIREMENTS

## Chapter 14 Contents:

- Groundwater Plant Design Guidelines
- Engineering Design Guidelines Manual for Submersible Lift Stations (Future Updates)
- Design Guideline Drawings for Submersible Lift Stations (Future Updates)



CITY OF HOUSTON
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DESIGN MANUAL
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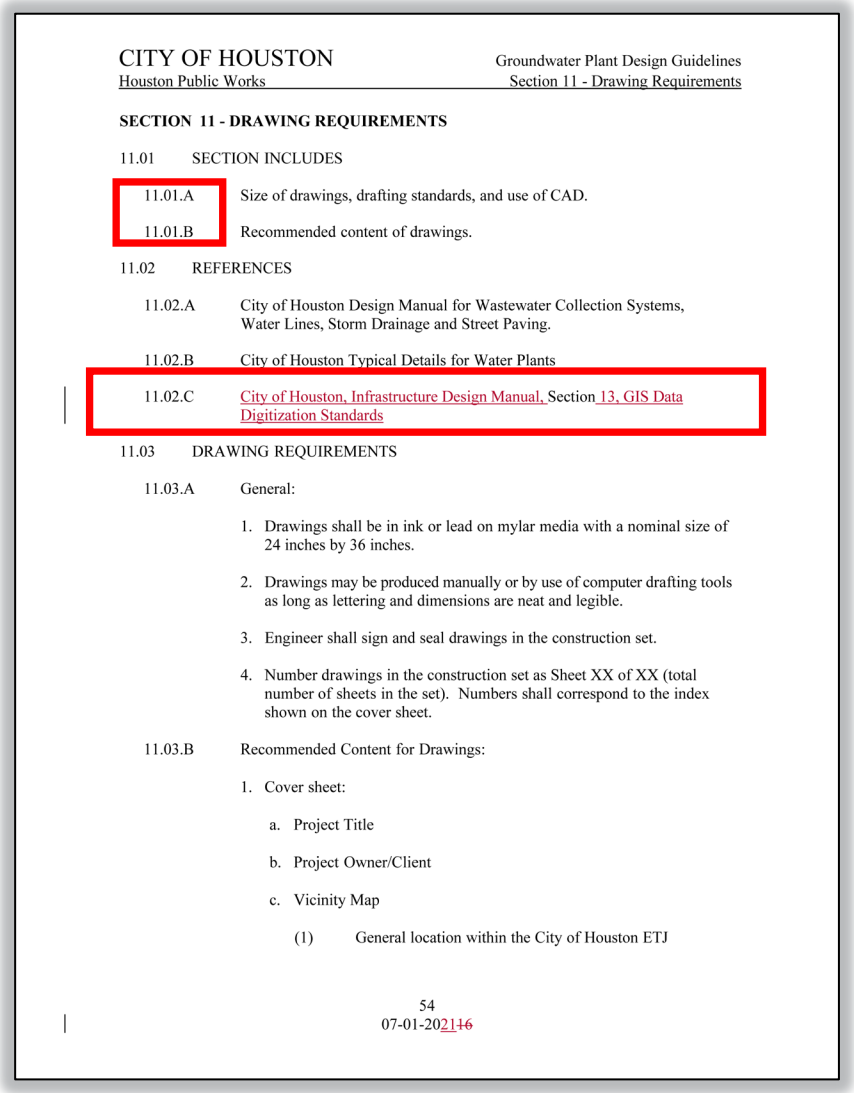
07-01-~~2019~~2021

HOUSTON PUBLIC WORKS

# CHAPTER 14 – FACILITY DESIGN REQUIREMENTS

## Groundwater Plant Design Guidelines:

- Updated Formatting
- Added TOC to Document
- Added Reference to Ch. 13 GIS Data Digitization Standards



CITY OF HOUSTON
Houston Public Works

Groundwater Plant Design Guidelines
Section 11 - Drawing Requirements

**SECTION 11 - DRAWING REQUIREMENTS**

11.01 SECTION INCLUDES

11.01.A Size of drawings, drafting standards, and use of CAD.

11.01.B Recommended content of drawings.

11.02 REFERENCES

11.02.A City of Houston Design Manual for Wastewater Collection Systems, Water Lines, Storm Drainage and Street Paving.

11.02.B City of Houston Typical Details for Water Plants

11.02.C City of Houston, Infrastructure Design Manual, Section 13, GIS Data Digitization Standards

11.03 DRAWING REQUIREMENTS

11.03.A General:

1. Drawings shall be in ink or lead on mylar media with a nominal size of 24 inches by 36 inches.
2. Drawings may be produced manually or by use of computer drafting tools as long as lettering and dimensions are neat and legible.
3. Engineer shall sign and seal drawings in the construction set.
4. Number drawings in the construction set as Sheet XX of XX (total number of sheets in the set). Numbers shall correspond to the index shown on the cover sheet.

11.03.B Recommended Content for Drawings:

1. Cover sheet:
   a. Project Title
   b. Project Owner/Client
   c. Vicinity Map
      (1) General location within the City of Houston ETJ

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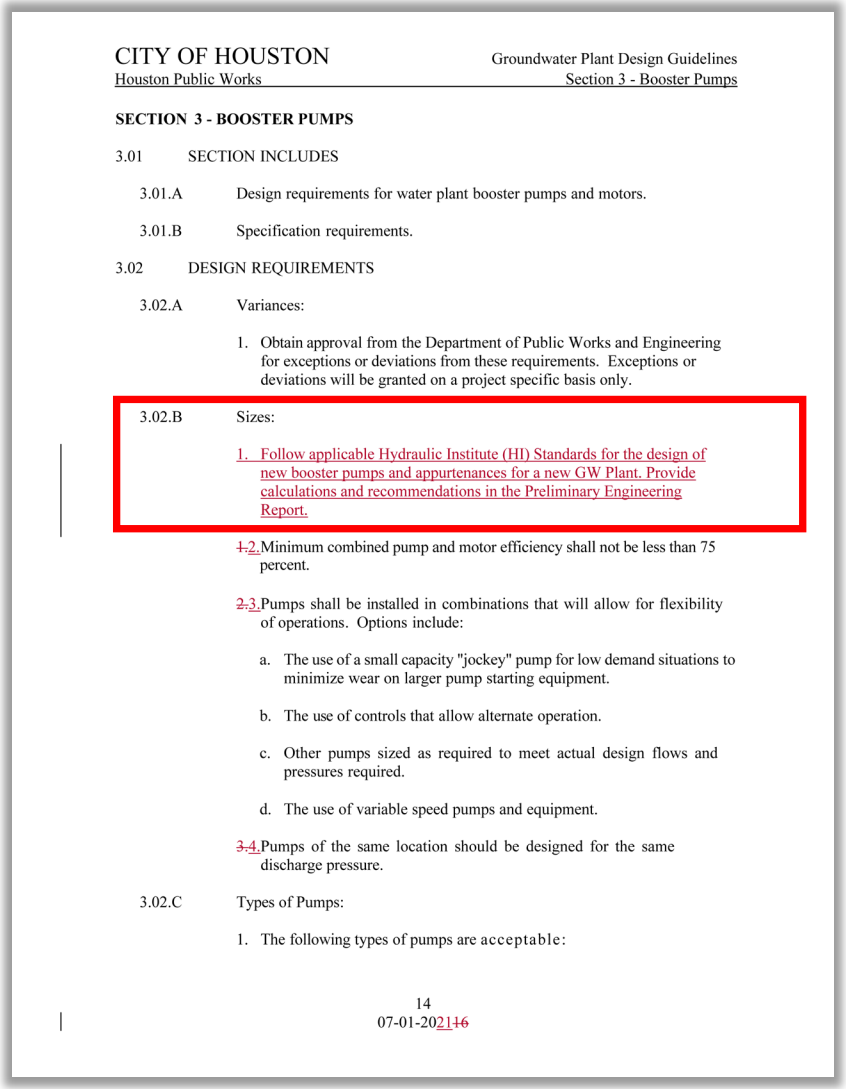
# CHAPTER 14 – FACILITY DESIGN REQUIREMENTS

## Groundwater Plant Design Guidelines:

- One proposed change was accepted by the Review Cycle Committee
- 3.02.B Booster Pump Sizes & 4.03.A Header and Yard Piping (Valve) Design
    - Require to follow Hydraulic Institute (HI) standards for design



CITY OF HOUSTON
Houston Public Works

Groundwater Plant Design Guidelines
Section 3 - Booster Pumps

**SECTION 3 - BOOSTER PUMPS**

3.01 SECTION INCLUDES

3.01.A Design requirements for water plant booster pumps and motors.

3.01.B Specification requirements.

3.02 DESIGN REQUIREMENTS

3.02.A Variances:

1. Obtain approval from the Department of Public Works and Engineering for exceptions or deviations from these requirements. Exceptions or deviations will be granted on a project specific basis only.

3.02.B Sizes:

1. Follow applicable Hydraulic Institute (HI) Standards for the design of new booster pumps and appurtenances for a new GW Plant. Provide calculations and recommendations in the Preliminary Engineering Report.

~~1.~~2. Minimum combined pump and motor efficiency shall not be less than 75 percent.

~~2.~~3. Pumps shall be installed in combinations that will allow for flexibility of operations. Options include:

a. The use of a small capacity "jockey" pump for low demand situations to minimize wear on larger pump starting equipment.

b. The use of controls that allow alternate operation.

c. Other pumps sized as required to meet actual design flows and pressures required.

d. The use of variable speed pumps and equipment.

~~3.~~4. Pumps of the same location should be designed for the same discharge pressure.

3.02.C Types of Pumps:

1. The following types of pumps are acceptable:

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07-01-2021~~6~~

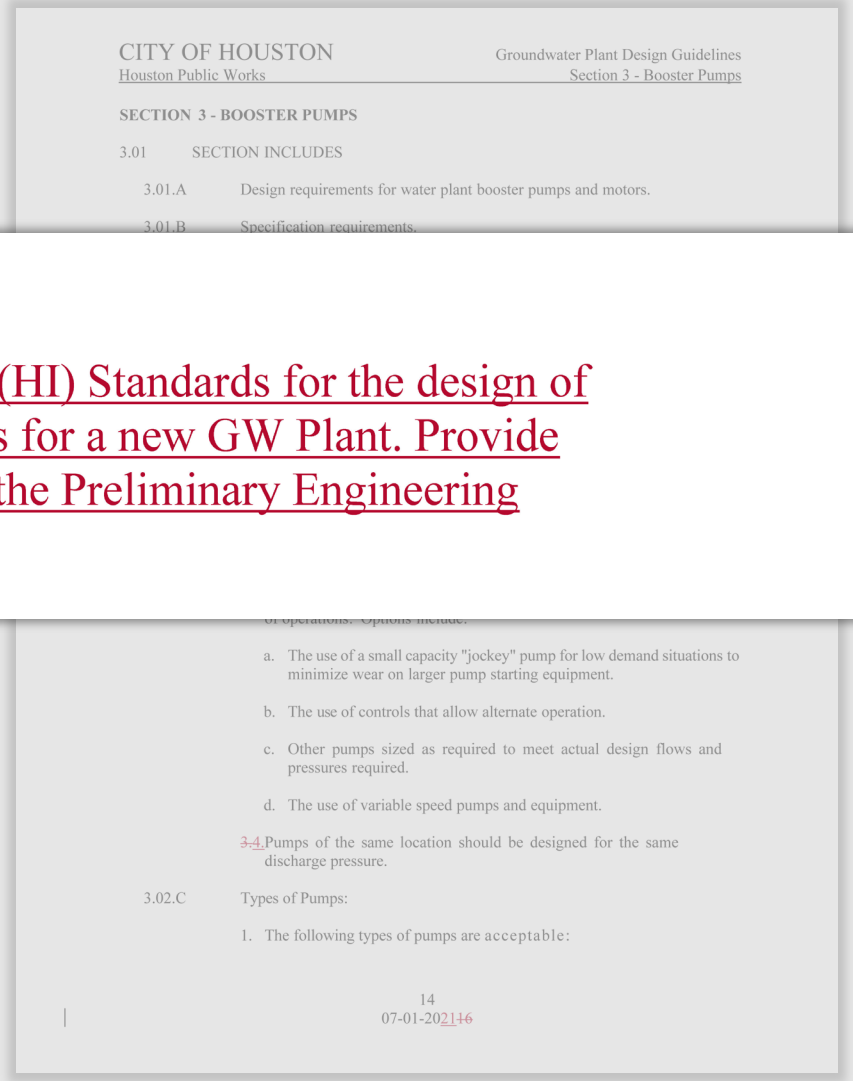
# CHAPTER 14 – FACILITY DESIGN REQUIREMENTS

## Groundwater Plant Design Guidelines:

3.02.B Sizes:

1. Follow applicable Hydraulic Institute (HI) Standards for the design of new booster pumps and appurtenances for a new GW Plant. Provide calculations and recommendations in the Preliminary Engineering Report.

- Require to follow Hydraulic Institute (HI) standards for design



CITY OF HOUSTON
Houston Public Works

Groundwater Plant Design Guidelines
Section 3 - Booster Pumps

**SECTION 3 - BOOSTER PUMPS**

3.01 SECTION INCLUDES

3.01.A Design requirements for water plant booster pumps and motors.

3.01.B Specification requirements.

a. The use of a small capacity "jockey" pump for low demand situations to minimize wear on larger pump starting equipment.

b. The use of controls that allow alternate operation.

c. Other pumps sized as required to meet actual design flows and pressures required.

d. The use of variable speed pumps and equipment.

~~3.~~4. Pumps of the same location should be designed for the same discharge pressure.

3.02.C Types of Pumps:

1. The following types of pumps are acceptable:

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# QUESTIONS?

Enter it into the chat.

Note the chapter or topic in your question.

We will respond to unanswered questions on our website after this event.

# 10 minute break!

## We will resume at 1:20 PM

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HOUSTON PUBLIC WORKS

# CHAPTER 11
# GEOTECHNICAL AND ENVIRONMENTAL REQUIREMENTS

Mike Pezeshki, P.E. (CP)

CITY OF HOUSTON TEXAS

# REVISION

1. Organized Into Sections
2. New Section: Requirements For Engineer Of Record (EOR)
3. Geotechnical Drawing Requirements
4. Geotechnical Baseline Report (GBR) Requirement
5. GIS requirements
6. Requirements for:
    - boring spacing and depth,
    - Environmental Site Assessment (ESAI/ESA II),
    - Geotechnical Fault Study,
    - Potentially Petroleum Contaminated Area (PPCA) investigation,
    - and bore hole termination requirements have been updated.

# PREVIOUSLY



Chapter 11

**GEOTECHNICAL AND ENVIRONMENTAL REQUIREMENTS**

11.01 CHAPTER INCLUDES

A. Section I: Includes minimum Geotechnical Investigation Requirements for projects inside the city limits of Houston and within its extra territorial jurisdiction (ETJ).

B. Section II: Includes minimum Phase I Environmental Site Assessment (ESA I) and Phase II Environmental Site Assessment (ESA II) Requirements for land involved in the City of Houston real estate transactions, interdepartmental transfers, ETJ, and rights-of-way which will be involved in the construction projects.

11.02 REFERENCES

The latest versions of the following references shall be reviewed in conjunction with this chapter:

A. The American Association of State Highway and Transportation Officials (AASHTO) Guide for Design of Pavement Structures.

B. The American Society for Testing and Materials (ASTM) standard test methods and environmental site assessments processes.

C. The City of Houston's Standard Construction Specifications.

D. The Harris County Flood Control District's (HCFCD) Geotechnical Investigation Guidelines.

E. The Houston Geological Society (HGS) requirements for conducting fault studies.

F. Rules and regulations published by the Occupational Safety and Health Administration (OSHA).

G. Rules and regulations published by the Texas Commission on Environmental Quality (TCEQ).

H. Rules and regulations published by the Texas Department of Licensing and Regulation (TDLR) including Texas Administrative Code (TAC) Chapter 76 - Water Well Drillers and Water Well Pump Installers.

I. Rules and regulations published by the Texas Board of Professional Engineers (TBPE).

J. Geotechnical Manual issued by the Texas Department of Transportation (TxDOT).



**Chapter 11 is now organized into sections for easier navigation and referencing**

# NOW



**Chapter 11**

**GEOTECHNICAL AND ENVIRONMENTAL REQUIREMENTS**

**SECTION 1 - GEOTECHNICAL AND ENVIRONMENTAL OVERVIEW**

11.1.01 CHAPTER INCLUDES

11.1.01.A Section 2: Includes minimum Geotechnical Investigation Requirements for projects inside the city limits of Houston and within its extra territorial jurisdiction (ETJ).

11.1.01.B Section 3: Includes minimum Phase I Environmental Site Assessment (ESA I) and Phase II Environmental Site Assessment (ESA II) Requirements for land involved in the City of Houston real estate transactions, interdepartmental transfers, ETJ, and rights-of-way which will be involved in the construction projects.

11.1.01.C Section 4: Includes minimum Engineer of Record efforts and Drawing requirements.

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11.1.02.D The Harris County Flood Control District's (HCFCD) Geotechnical Investigation Guidelines.

11.1.02.E The Houston Geological Society (HGS) requirements for conducting fault studies.

11.1.02.F Rules and regulations published by the Occupational Safety and Health Administration (OSHA).

11.1.02.G Rules and regulations published by the Texas Commission on Environmental Quality (TCEQ).

11.1.02.H Rules and regulations published by the Texas Department of Licensing and

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CITY OF HOUSTON
Houston Public Works

DESIGN MANUAL
Geotechnical and Environmental Requirements

Chapter 11

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**New sections have been added to the chapter**

**Requirements for Engineer of Record (EOR) have been moved to a new section**

# NOW

CITY OF HOUSTON
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Geotechnical and Environmental Requirements
Section 1 – Geotechnical and Environmental Overview

**Chapter 11**

**GEOTECHNICAL AND ENVIRONMENTAL REQUIREMENTS**

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11.1.02.H Rules and regulations published by the Texas Department of Licensing and

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11.1.01.C Section 4: Includes minimum Engineer of Record efforts and Drawing requirements.

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K. The Texas Manual on Uniform Traffic Control Devices (TMUTCD).

11.03 DEFINITIONS

A. Engineer of Record - Project Civil Design Consultant.

B. Project Manager - An authorized representative of the City of Houston who manages the project or the Engineer of Record for private development.

C. Geotechnical Consultant - A consultant who is practicing in the field of Geotechnical Engineering in the State of Texas and has a valid status with the TBPE.

D. Environmental Consultant - An environmental professional who is meeting the education, training, and experience requirements as set forth in 40 CFR 312.10(b).

E. Licensed Engineer - An engineer currently licensed to practice engineering in the State of Texas and is in good standing with the TBPE.

F. Licensed Geoscientist - A geoscientist currently licensed to practice geosciences in the State of Texas and is in good standing with the Texas Board of Professional Geoscientists.

SECTION I

11.04 GEOTECHNICAL REQUIREMENTS

A. A detailed Geotechnical Investigation (by borings) is required for the completion of the design of the proposed facilities. Subsurface information from the earlier project design activities shall be incorporated if it is sufficient and reliable for the current project as determined by the Project Manager in consultation with the Geotechnical Consultant.

B. The purpose of the Geotechnical Requirements is to outline the minimum recommended procedures for implementing a uniform approach for the preparation of the Geotechnical Investigation Reports on the City of Houston projects including its ETJ.

C. The scope of the Geotechnical Investigation may need to be expanded or modified on a case by case basis as determined necessary and appropriate by the Project Manager. It is not the intent of the Geotechnical Requirements to specify methods or scope of Geotechnical Investigation for individual projects, or to supplant the judgment of the Licensed Engineer. No provision in these requirements should be construed to constitute a statute, ordinance, or regulation, unless stipulated elsewhere.

D. In the event that any part of the Geotechnical Requirements should be found to be in conflict with laws or regulations of competent jurisdiction or ruled to be invalid by a court authority of competent jurisdiction, the remainder of the Geotechnical Requirements shall remain in full force and effect, and the conflicting section or item shall be deleted or revised as required and as determined necessary by the City of Houston.



**Three definitions have been added and one has been revised**

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*11.2.05.H continued* Regulation (TDLR) including Texas Administrative Code (TAC) Chapter 76 - Water Well Drillers and Water Well Pump Installers.

11.1.02.I Rules and regulations published by the Texas Board of Professional Engineers and Land Surveyors (TBPELS).

11.1.02.J Geotechnical Manual issued by the Texas Department of Transportation (TxDOT).

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11.1.03.D Geotechnical Baseline Report (GBR) – An interpretive report that establishes a contractual baseline of the subsurface conditions for bidding.

11.1.03.E Environmental Consultant – A consultant who is practicing in the environmental field.

11.1.03.F Environmental Professional - An individual who is meeting the education, training, and experience requirements as set forth in 40 CFR 312.10(b).

11.1.03.G Licensed Engineer - An engineer currently licensed to practice engineering in the State of Texas and is in good standing with the TBPELS.

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11.1.03.I Potentially Petroleum Contaminated Area (PPCA) – An area, within station-to-station locations, identified where petroleum contamination has been detected in the soil or groundwater.

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B. If a review of available existing information suggests that a known fault may impact the project, a Phase I Geological Fault Study shall be performed as defined by the current HGS guidelines.

C. At a minimum, the Phase I Geological Fault Study shall consist of a detailed literature review, a remote sensing study with examination of historical aerial photographs (including LiDAR and false color infra-red imagery), a study of subsurface geologic structure maps, topographic maps, and a detailed field reconnaissance.

D. If the project is part of a larger tract for which a Phase I, II, or III Geological Fault Study is available, the results of the study on the larger tract may satisfy this requirement. In this circumstance, the necessity of a Phase I Geological Fault Study shall be decided by the Project Manager.

E. The Phase I Geologic Fault Study may also be conducted on areas where no faults appear in published literature and maps but when there is evidence that surface faults and possibly blind faults could exist in that area. In this circumstance, the necessity of a Phase I Geological Fault Study shall be decided by the Project Manager.

F. When required, the Phase I Geological Fault Study shall be performed as a separate study to supplement the Geotechnical Investigation.

G. The entire Phase I Geological Fault Study, when required, shall be performed by a licensed geoscientist or a Licensed Engineer in the State of Texas who has substantial experience and training in investigating surface faults in the Greater Houston area. At the least, such experience and training should include a general knowledge of the location of known surface faults in the Gulf Coast, an understanding of fault mechanics, and a familiarity with the many subtle ways that surface faults manifest themselves.

Additional criteria that shall be met by a licensed geoscientist or a licensed engineer are as follows:

1. Ability to recognize surface faults on aerial images and topographic maps.
2. Ability to distinguish surface faults from other natural and man-made features.
3. Ability to distinguish ground deformation caused by expansive clay soils from that caused by active faults.
4. Ability to determine and map the width of the zone of disturbed ground along an active fault.

H. At a minimum, the Phase I Geologic Fault Study shall determine the likelihood of a surface fault impacting the project. If a fault is determined to be present at the project, it should be delineated on a map. In the event that the fault is clearly visible at the Earth's surface, the



**Additional requirement for Geotechnical Fault Study**

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*11.2.05.G.3 continued* that caused by active faults.

4. Ability to determine and map the width of the zone of disturbed ground along an active fault.

11.2.05.H At a minimum, the Phase I Geologic Fault Study shall determine the likelihood of a surface fault impacting the project along with estimated vertical and horizontal fault movements. If a fault is determined to be present at the project, it should be delineated on a map. In the event that the fault is clearly visible at the Earth's surface, the width of the fault's associated deformation zone should be determined and mapped. The mapping shall be considered as an additional study.

11.2.05.I When a fault is not clearly visible at the surface, its delineation and mapping may require an investigation employing Phase II and III subsurface methods. In this circumstance, the necessity of the Phase II or Phase III shall be decided by the Project Manager.

11.2.05.J The qualifications, including specific geologic fault project experience, of the professional performing the Phase I Geological Fault Study shall be included in the fault report.

11.2.05.K The draft report of the Phase I Geological Fault Study report shall be submitted before the final report.

11.2.05.L The final report of the Phase I Geological Fault Study shall be signed and may be stamped by the professional conducting the study.

11.2.05.M The Phase I Geological Fault Study Report, when required, shall be included in the appendix of the Geotechnical Investigation Report.

11.2.06 GENERAL INVESTIGATION

11.2.06.A Some of the facilities in which Geotechnical Investigation may be required are given below:

1. Above ground water storage tanks and associated structures.
2. Bridges (roadway, pedestrian, and pipe support).
3. Clarifiers and associated structures.
4. Detention/Retention basins.
5. Lift stations and associated structures.
6. Open channels.
7. Retaining walls.

# PREVIOUSLY

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Houston Public Works

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D. If the project is part of a larger tract for which
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E. The Phase I Geologic Fault Study may also be conducted on areas where no faults appear in published literature and maps but when there is evidence that surface faults and possibly blind faults could exist in that area. In this circumstance, the necessity of a Phase I Geological Fault Study shall be decided by the Project Manager.

F. When required, the Phase I Geological Fault Study shall be performed as a separate study to supplement the Geotechnical Investigation.

G. The entire Phase I Geological Fault Study, when required, shall be performed by a licensed geoscientist or a Licensed Engineer in the State of Texas who has substantial experience and training in investigating surface faults in the Greater Houston area. At the least, such experience and training should include a general knowledge of the location of known surface faults in the Gulf Coast, an understanding of fault mechanics, and a familiarity with the many subtle ways that surface faults manifest themselves.

Additional criteria that shall be met by a licensed geoscientist or a licensed engineer are as follows:

1. Ability to recognize surface faults on aerial images and topographic maps.

2. Ability to distinguish surface faults from other natural and man-made features.

H. At a minimum, the Phase I Geologic Fault Study shall determine the likelihood of a surface fault impacting the project. If a fault is determined to be present at the project, it should be delineated on a map. In the event that the fault is clearly visible at the Earth's surface, the width of the fault's associated deformation zone should be determined and mapped. The mapping shall be considered as an additional study.

**Additional requirement for Geotechnical Fault Study**

# NOW

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2. Continuous soil sampling shall be performed at about 2-foot depth intervals to a minimum depth of about 20 feet of the borings and at about 5-foot interval thereafter to the termination depth of borings with the exception for bridge, retaining wall, lift station, and tunnel borings. If the boring depth is less than 20 feet, then continuous sampling shall be performed to the termination depth of the boring.

3. If a soil boring for bridge or retaining wall is within the TxDOT right-of-way, then the current TxDOT guidelines shall be followed including performing Texas Cone Penetration (TCP) testing.

4. If a soil boring for bridge or retaining wall is outside the TxDOT right-of-way, then the TCP testing is not required. However, TxDOT sampling interval guidelines shall be followed.

5. For lift stations, continuous soil sampling shall be performed at 2-foot depth intervals from natural ground to 5-foot below the depth of the excavation.

6. For tunnels, continuous soil sampling shall be performed from one bore diameter (or minimum of 6 feet) above the bore crown to one bore diameter (or minimum of 6 feet) below the bore invert level and at about 5-foot intervals in the remainder of the boring.

7. If unusual soils are encountered (e.g., loose or soft soils, etc) after the depth of 20 feet, then the intermittent soil sampling shall be changed to continuous soil sampling through the anomalous layer.

E. Boring Spacing

1. Soil borings shall be conducted in order to obtain sufficient information about the subsurface soil stratigraphy and water level conditions.

2. The recommended boring spacing is given in Table 11.1 (Page 11-9), unless waived by the Project Manager in writing.

3. For geotechnical features that are not mentioned in Table 11.1, the Project Manager shall be contacted.

4. Based on the reliability of soil information available to the City of Houston from the previous project design activities, the recommended boring spacing may be modified by the Project Manager in consultation with the Geotechnical Consultant.

F. Boring Depth

1. The minimum boring depths are given in Table 11.1, unless waived by the Project Manager in writing.



**The depth of continuous soil sampling for tunnels has been revised**

# NOW



11.2.09 FIELD INVESTIGATION

11.2.09.A The field logging of the soil samples shall be performed by an experienced soils technician of the Geotechnical Consultant.

11.2.09.B For the proposed open cut utility construction, the borings shall be drilled along or as close as possible to the center line of the alignment.

11.2.09.C For the proposed trenchless construction, the borings shall be drilled outside the planned utility alignment but within 20 feet of the centerline of the alignment.

11.2.09.D Soil Sample Methods and Intervals:

1. Undisturbed cohesive soils samples should be recovered by using a thin-walled tube sampler in general accordance with ASTM D1587. For granular soils, Split-Barrel samplers should be used in general accordance with ASTM D1586.

2. Continuous soil sampling shall be performed at about 2-foot depth intervals to a minimum depth of about 20 feet of the borings and at about 5-foot interval thereafter to the termination depth of borings with the exception for bridge, retaining wall, lift station, and tunnel borings. If the boring depth is less than 20 feet, then continuous sampling shall be performed to the termination depth of the boring.

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5. For lift stations, continuous soil sampling shall be performed at 2-foot depth intervals from natural ground to 5-foot below the depth of the excavation.

6. For tunnels, continuous soil sampling shall be performed from two bore diameters (or minimum of 12 feet) above the bore crown to two bore diameters (or minimum of 12 feet) below the bore invert level and at about 5-foot intervals in the remainder of the boring.

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# PREVIOUSLY



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**The depth of continuous soil sampling for tunnels has been revised**

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11.2.09 FIELD INVESTIGATION

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DESIGN MANUAL
Geotechnical and Environmental Requirements

| Project Type | Approximate Spacing | Minimum Depth |
|---|---|---|
| **DRAINAGE** | | |
| Detention / Retention Basin | The HCFCD guidelines should be followed. | |
| Open Channel | The HCFCD guidelines should be followed. In addition, one boring with a minimum depth of 30 feet to be drilled on each side of the channel and as close as safely possible to the channel. | |
| **UNDERGROIND UTILITIES** | | |
| Open Cut | Minimum distance of 500 feet. | ○ 15 feet for trenches up to 10-foot deep.<br>○ Trench depth plus ten feet for trenches between 10-foot and 25-foot deep.<br>○ One and one half times the trench depth for trenches greater than 25-foot deep. |
| Augered | Minimum distance of 500 feet. | 5-foot below the proposed invert level. |
| Tunnels and Microtunnels | Minimum distance of 500 feet. | Minimum one tunnel diameter or 15-foot below the proposed invert level (whichever is greater). |
| Shafts for Tunnels | Each Location. | 1.5 times the shaft diameter below the bottom of the shaft but not less than 30 feet. |
| **STREET & BRIDGE** | | |
| Pavement (Street) only along each street | Maximum distance of 250 feet. | 5 feet. |
| Pedestrian and Pipe Bridge | Each side of drainage channel. | 40 feet below the bottom of drainage channel. |
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**Boring Spacing and Depth have been revised**

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|---|---|---|
| **UNDERGROUND UTILITIES** | | |
| Open Cut | Minimum distance of 500 feet. | ○ 15 feet for trenches up to 10-foot deep.<br>○ Trench depth plus ten feet for trenches between 10-foot and 25-foot deep.<br>○ One and one half times the trench depth for trenches greater than 25- foot deep. |
| Augered | Minimum distance of 500 feet. | 5-foot below the proposed invert level. |
| Tunnels and Microtunnels | Minimum distance of 250 feet. | Minimum one tunnel diameter or 15-foot below the proposed invert level (whichever is greater). |

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Geotechnical and Environmental Requirements
Section 2 – Geotechnical Requirements

| Project Type | Approximate Spacing | Minimum Depth |
|---|---|---|
| Shafts for Tunnels | Each Location. | One times the shaft diameter below the bottom of the shaft but not less than 30 feet. |
| **STREET & BRIDGE** | | |
| Pavement (Street) only along each street | Maximum distance of 250 feet. | 10 feet. |
| Pedestrian and Pipe Bridge | Each side of drainage channel. | 40 feet below the bottom of drainage channel. |
| Retaining Walls | The TxDOT guidelines should be followed. | |
| Roadway Bridge | The TxDOT guidelines should be followed. | |
| Traffic Signal Foundation | Each location. | 20 feet. |
| **OTHER** | | |
| Discretion of Geotechnical Consultant, Engineer of Record, and the City of Houston. | | |

# PREVIOUSLY

| | | |
|---|---|---|
| Tunnels and Microtunnels | Minimum distance of 500 feet. | Minimum one tunnel diameter or 15-foot below the proposed invert level (whichever is greater). |
| Shafts for Tunnels | Each Location. | 1.5 times the shaft diameter below the bottom of the shaft but not less than 30 feet. |

| | | |
|---|---|---|
| | side of the channel and as close as safely possible to the channel. | |
| **UNDERGROIND UTILITIES** | | |
| Open Cut | Minimum distance of 500 feet. | ○ 15 feet for trenches up to 10-foot deep.<br>○ Trench depth plus ten feet for trenches between 10-foot and 25-foot deep.<br>○ One and one half times the trench depth for trenches greater than 25-foot deep. |
| Augered | Minimum distance of 500 feet. | 5-foot below the proposed invert level. |
| Tunnels and Microtunnels | Minimum distance of 500 feet. | Minimum one tunnel diameter or 15-foot below the proposed invert level (whichever is greater). |
| Shafts for Tunnels | Each Location. | 1.5 times the shaft diameter below the bottom of the shaft but not less than 30 feet. |
| **STREET & BRIDGE** | | |
| Pavement (Street) only along each street | Maximum distance of 250 feet. | 5 feet. |
| Pedestrian and Pipe Bridge | Each side of drainage channel. | 40 feet below the bottom of drainage channel. |
| | | |

11-10
07-01-2020

# NOW

| | | |
|---|---|---|
| **UNDERGROUND UTILITIES** | | |
| Open Cut | Minimum distance of 500 feet. | ○ 15 feet for trenches up to 10-foot deep.<br>○ Trench depth plus ten feet for trenches between 10-foot and 25-foot deep.<br>○ One and one half times the trench depth for trenches greater than 25- foot deep. |
| Augered | Minimum distance of 500 feet. | 5-foot below the proposed invert level. |
| Tunnels and Microtunnels | Minimum distance of 250 feet. | Minimum one tunnel diameter or 15-foot below the proposed invert level (whichever is greater). |

11-11

| | | |
|---|---|---|
| Tunnels and Microtunnels | Minimum distance of 250 feet. | Minimum one tunnel diameter or 15-foot below the proposed invert level (whichever is greater). |
| Shafts for Tunnels | Each Location. | One times the shaft diameter below the bottom of the shaft but not less than 30 feet. |

| | | |
|---|---|---|
| **STREET & BRIDGE** | | |
| Pavement (Street) only along each street | Maximum distance of 250 feet. | 10 feet. |
| Pedestrian and Pipe Bridge | Each side of drainage channel. | 40 feet below the bottom of drainage channel. |
| Retaining Walls | The TxDOT guidelines should be followed. | |
| Roadway Bridge | The TxDOT guidelines should be followed. | |
| Traffic Signal Foundation | Each location. | 20 feet. |
| **OTHER** | | |
| Discretion of Geotechnical Consultant, Engineer of Record, and the City of Houston. | | |

# PREVIOUSLY

CITY OF HOUSTON
Houston Public Works

DESIGN MANUAL
Geotechnical and Environmental Requirements

| Project Type | Approximate Spacing | Minimum Depth |
|---|---|---|
| **DRAINAGE** | | |
| Detention / Retention Basin | The HCFCD guidelines should be followed. | |
| Open Channel | The HCFCD guidelines should be followed. In addition, one boring with a minimum depth of 30 feet to be drilled on each side of the channel and as close as safely possible to the channel. | |
| **UNDERGROIND UTILITIES** | | |
| Open Cut | Minimum distance of 500 feet. | ○ 15 feet for trenches up to 10-foot deep.<br>○ Trench depth plus ten feet for trenches between 10-foot and 25-foot deep.<br>○ One and one half times the trench depth for trenches greater than 25-foot deep. |
| Augered | Minimum distance of 500 feet. | 5-foot below the proposed invert level. |
| Tunnels and Microtunnels | Minimum distance of 500 feet. | Minimum one tunnel diameter or 15-foot below the proposed invert level (whichever is greater). |
| Shafts for Tunnels | Each Location. | 1.5 times the shaft diameter below the bottom of the shaft but not less than 30 feet. |
| **STREET & BRIDGE** | | |
| Pavement (Street) only along each street | Maximum distance of 250 feet. | 5 feet. |

11-10
07-01-2020

**Boring Spacing and Depth have been revised**

# NOW

| | | |
|---|---|---|
| **UNDERGROUND UTILITIES** | | |
| Open Cut | Minimum distance of 500 feet. | ○ 15 feet for trenches up to 10-foot deep.<br>○ Trench depth plus ten feet for trenches between 10-foot and 25-foot deep.<br>○ One and one half times the trench depth for trenches greater than 25- foot deep. |
| Augered | Minimum distance of 500 feet. | 5-foot below the proposed invert level. |
| Tunnels and Microtunnels | Minimum distance of 250 feet. | Minimum one tunnel diameter or 15-foot below the proposed invert level (whichever is greater). |

11-11
07-01-2021

CITY OF HOUSTON
Houston Public Works

Geotechnical and Environmental Requirements
Section 2 – Geotechnical Requirements

| Project Type | Approximate Spacing | Minimum Depth |
|---|---|---|
| Shafts for Tunnels | Each Location. | One times the shaft diameter below the bottom of the shaft but not less than 30 feet. |
| Retaining Walls | The TxDOT guidelines should be followed. | |
| Roadway Bridge | The TxDOT guidelines should be followed. | |
| Traffic Signal Foundation | Each location. | 20 feet. |
| **OTHER** | | |
| Discretion of Geotechnical Consultant, Engineer of Record, and the City of Houston. | | |

| | | |
|---|---|---|
| **STREET & BRIDGE** | | |
| Pavement (Street) only along each street | Maximum distance of 250 feet. | 10 feet. |

| | | |
|---|---|---|
| **STREET & BRIDGE** | | |
| Pavement (Street) only along each street | Maximum distance of 250 feet. | 5 feet. |

# PREVIOUSLY

D. Backfilling of Borings.

1. All borings under the existing or proposed pavement shall be backfilled with cement bentonite grout using the tremie method.

2. In unpaved areas where boring depth exceeds 10 feet (or if free water is encountered) boreholes shall be backfilled with cement bentonite grout using the tremie method. For depths of 10 feet or less, soil backfill tamped into the borehole is acceptable.

3. Boreholes in known contaminated areas, or in which contamination otherwise has been detected, shall be backfilled with cement-bentonite or non-shrink grout using tremie method.

E. Restoration of Pavement Cores.

1. Boreholes or cored pavements shall be restored for the full depth of pavement using cold patch in asphalt paved areas and ready-mix concrete in concrete paved areas. Larger penetrations shall be repaired following the current City of Houston guidelines.

2. The pavement shall not be restored until the borehole grout has taken initial set to allow for any settlement or shrinkage of the grout.

11.15 SURVEY REQUIREMENTS

A. The locations and elevations of boreholes and piezometers shall be surveyed by the Engineer of Record or another member of the project team.





B. The elevation and coordinates shall be shown on boring and piezometer logs by the Geotechnical Consultant.

C. The station and offset of boreholes and piezometers may also be shown on boring and piezometer logs (in addition to coordinates) by the Geotechnical Consultant.

11.16 LABORATORY TESTING

A. The purposes of the laboratory testing are to define the soil classification, soil stratigraphy, and the relevant engineering properties of the soils.

B. The laboratory tests shall be performed in general accordance with the latest revision of the ASTM standards.

**Additional requirements for Boring Survey**

# NOW



*11.2.10.E continued*

2. The pavement shall not be restored until the borehole grout has taken initial set to allow for any settlement or shrinkage of the grout.

11.2.11 SURVEY REQUIREMENTS

11.2.11.A The locations and elevations of boreholes and piezometers shall be surveyed by the Engineer of Record or another member of the project team.

11.2.11.B The elevation and coordinates shall be shown on boring and piezometer logs by the Geotechnical Consultant.

11.2.11.C The station and offset of boreholes and piezometers may also be shown on boring and piezometer logs (in addition to coordinates) by the Geotechnical Consultant.

11.2.11.D Boring survey information shall meet the minimum technical standards set forth in the City of Houston Infrastructure Design Manual (IDM), Chapter 13, Section 5 - Geotechnical and Environmental GIS Digital Submission Requirements.

11.2.12 LABORATORY TESTING

11.2.12.A The purposes of the laboratory testing are to define the soil classification, soil stratigraphy, and the relevant engineering properties of the soils.

11.2.12.B The laboratory tests shall be performed in general accordance with the latest revision of the ASTM standards.

11.2.12.C The laboratory tests may include but not limited to the following:

1. ASTM D2487 - Standard Practice for Classification of Soils for Engineering Purposes (Modified Unified Soil Classification System)
2. ASTM D4318 - Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils
3. ASTM D1140 - Standard Test Methods for Amount of Material in Soils Finer Than the No. 200 (75-□m) Sieve
4. ASTM D2216 - Standard Test Methods for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass
5. ASTM D2166 - Standard Test Method for Unconfined Compressive Strength of Cohesive Soil
6. ASTM D2850 - Standard Test Method for Unconsolidated-Undrained Triaxial Compression Test on Cohesive Soils

# PREVIOUSLY

D. Backfilling of Borings.

1. All borings under the existing or proposed pavement shall be backfilled with cement bentonite grout using the tremie method.

2. In unpaved areas where boring depth exceeds 10 feet (or if free water is encountered) boreholes shall be backfilled with cement bentonite grout using the tremie method. For depths of 10 feet or less, soil backfill tamped into the borehole is acceptable.

3. Boreholes in known contaminated areas, or in which contamination otherwise has been detected, shall be backfilled with cement-bentonite or non-shrink grout using tremie method.

E. Restoration of Pavement Cores.

1. Boreholes or cored pavements shall be restored for the full depth of pavement using cold patch in asphalt paved areas and ready-mix concrete in concrete paved areas. Larger penetrations shall be repaired following the current City of Houston guidelines.

2. The pavement shall not be restored until the borehole grout has taken initial set to allow for any settlement or shrinkage of the grout.

11.15 SURVEY REQUIREMENTS

A. The locations and elevations of boreholes and piezometers shall be surveyed by the Engineer of Record or another member of the project team.





B. The elevation and coordinates shall be shown on boring and piezometer logs by the Geotech

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11.16 LABOR

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B. The laboratory tests shall be performed in general accordance with the latest revision of the ASTM standards.

**Additional requirements for Boring Survey**

# NOW



*11.2.10.E continued*

2. The pavement shall not be restored until the borehole grout has taken initial set to allow for any settlement or shrinkage of the grout.

11.2.11 SURVEY REQUIREMENTS

11.2.11.A The locations and elevations of boreholes and piezometers shall be surveyed by the Engineer of Record or another member of the project team.

11.2.11.B The elevation and coordinates shall be shown on boring and piezometer logs by the Geotechnical Consultant.

11.2.11.C The station and offset of boreholes and piezometers may also be shown on boring and piezometer logs (in addition to coordinates) by the Geotechnical Consultant.

11.2.11.D Boring survey information shall meet the minimum technical standards set forth in the City of Houston Infrastructure Design Manual (IDM), Chapter 13, Section 5 - Geotechnical and Environmental GIS Digital Submission Requirements.

11.2.12 LABORATORY TESTING

11.2.12.A The purposes of the laboratory testing are to define the soil classification, soil stratigraphy, and the relevant engineering properties of the soils.

11.2.12.B The laboratory tests shall be performed in general accordance with the latest revision of the ASTM standards.

11.2.12.C The laboratory tests may include but not limited to the following:

1. ASTM D2487 - Standard Practice for Classification of Soils for Engineering Purposes (Modified Unified Soil Classification System)

2. ASTM D4318 - Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils

3. ASTM D1140 - Standard Test Methods for Amount of Material in Soils Finer Than the No. 200 (75-□m) Sieve



11.2.11.D Boring survey information shall meet the minimum technical standards set forth in the City of Houston Infrastructure Design Manual (IDM), Chapter 13, Section 5 - Geotechnical and Environmental GIS Digital Submission Requirements.

# PREVIOUSLY



G. The Unconfined Compression Strength test (ASTM D2166) shall not be performed on a soil sample containing seams or slickensides.

H. If the invert level of the utility is greater than 5 feet, a minimum of one Unconsolidated-Undrained Triaxial test (ASTM D2850) shall be performed on a representative cohesive soil sample in each boring.

I. Aggressivity tests (Sulfates, Chlorides, pH, and Electric Resistivity) shall be performed on soil and/or water samples on projects where metallic pipes are used. Geotechnical Consultant shall not discard soil samples without ensuring from Engineer of Record that corrosion monitoring and/or corrosion control recommendations are made and soil samples are not needed.

J. All the test results shall be summarized in the report in a table format. The Geotechnical Consultant shall include the summary of the test results on the most updated template format (or approved equal), as provided by the City of Houston (as shown on Figure 11.2).

11.17 BORING LOG FORMAT

A. The Geotechnical Consultant shall submit the boring log on the most updated template format (or approved equal), as provided by the City of Houston and shown on Figure 11.3.

B. The City of Houston project number shall be written on all boring logs.

C. Any test data that is not included in boring log shall be reported separately in general accordance with the reporting guidelines mentioned in the ASTM standard of that test.

11.18 BORING LOG PROFILE

A. When more than one borings are drilled for the project, boring log profile(s) along the project alignments(s) shall be included in the Geotechnical Investigation Report as shown on Figure 11.4.

B. If the invert depths of utility line are known, then utility line shall be plotted on the boring log profile(s) as shown on Figure 11.4.

11.19 ENVIRONMENTAL CONCERNS

A. The Geotechnical Consultant shall look for obvious signs of visual staining of the soil samples, note any odors (specifically of hydrocarbon nature) during drilling, and summarize this information in the report.

11.20 GEOTECHNICAL INVESTIGATION REPORT - GENERAL REQUIREMENTS

A. The Geotechnical Investigation Report shall be an in-depth evaluation that entails a review of available pertinent literature, geologic fault information, field subsurface investigation,



**Aggressivity tests have been revised**

# NOW



11.2.12.D The selection of appropriate laboratory tests beyond the above tests is left to the discretion of the Geotechnical Consultant in consultation with the Project Manager.

11.2.12.E To assist in properly classifying the soils in general accordance with ASTM D2487, the laboratory testing program shall include a minimum of one set of Liquid and Plastic Limits (ASTM D4318) and Percent Passing Number 200 Sieve (ASTM D1140) tests on a representative cohesive soil sample in each boring.

11.2.12.F The water content test (ASTM D2216) shall be performed on all cohesive soil samples to determine the moisture profile.

11.2.12.G The Unconfined Compression Strength test (ASTM D2166) shall not be performed on a soil sample containing seams or slickensides.

11.2.12.H If the invert level of the utility is greater than 5 feet, a minimum of one Unconsolidated- Undrained Triaxial test (ASTM D2850) shall be performed on a representative cohesive soil sample in each boring.

11.2.12.I Aggressivity tests (Sulfates, Chlorides, pH, and Electric Resistivity) shall be performed on soil and water samples. Geotechnical Consultant shall not discard soil samples without ensuring from Engineer of Record that corrosion monitoring and/or corrosion control recommendations are made and soil samples are not needed.

11.2.12.J All the test results shall be summarized in the report in a table format. The Geotechnical Consultant shall include the summary of the test results on the most updated template format (or approved equal), as provided by the City of Houston (as shown on Figure 11.2).

11.2.13 BORING LOG FORMAT

11.2.13.A The Geotechnical Consultant shall submit the boring log on the most updated template format (or approved equal), as provided by the City of Houston and shown on Figure 11.3.

11.2.13.B The City of Houston project number shall be written on all boring logs.

11.2.13.C Any test data that is not included in boring log shall be reported separately in general accordance with the reporting guidelines mentioned in the ASTM standard of that test.

# PREVIOUSLY

I. Aggressivity tests (Sulfates, Chlorides, pH, and Electric Resistivity) shall be performed on soil and~~/or~~ water samples ~~on projects where metallic pipes are used.~~ Geotechnical Consultant shall not discard soil samples without ensuring from Engineer of Record that corrosion monitoring and/or corrosion control recommendations are made and soil samples are not needed.

Consultant shall not discard soil samples without ensuring from Engineer of Record that corrosion monitoring and/or corrosion control recommendations are made and soil samples are not needed.

J. All the test results shall be summarized in the report in a table format. The Geotechnical Consultant shall include the summary of the test results on the most updated template format (or approved equal), as provided by the City of Houston (as shown on Figure 11.2).

11.17 BORING LOG FORMAT

A. The Geotechnical Consultant shall submit the boring log on the most updated template format (or approved equal), as provided by the City of Houston and shown on Figure 11.3.

B. The City of Houston project number shall be written on all boring logs.

C. Any test data that is not included in boring log shall be reported separately in general accordance with the reporting guidelines mentioned in the ASTM standard of that test.

11.18 BORING LOG PROFILE

A. When more than one borings are drilled for the project, boring log profile(s) alon alignments(s) shall be included in the Geotechnical Investigation Report as shov 11.4.

B. If the invert depths of utility line are known, then utility line shall be plotted c log profile(s) as shown on Figure 11.4.

11.19 ENVIRONMENTAL CONCERNS

A. The Geotechnical Consultant shall look for obvious signs of visual staining samples, note any odors (specifically of hydrocarbon nature) during drilling, an this information in the report.

11.20 GEOTECHNICAL INVESTIGATION REPORT - GENERAL REQUIREMENTS

A. The Geotechnical Investigation Report shall be an in-depth evaluation that entails a review of available pertinent literature, geologic fault information, field subsurface investigation,



**Aggressivity tests have been revised**

# NOW

CITY OF HOUSTON



propriate laboratory tests beyond the above tests is left to the Geotechnical Consultant in consultation with the Project

rly classifying the soils in general accordance with ASTM ory testing program shall include a minimum of one set of Limits (ASTM D4318) and Percent Passing Number 200 Sieve ts on a representative cohesive soil sample in each

11.2.12.F The water content test (ASTM D2216) shall be performed on all cohesive soil samples to determine the moisture profile.

11.2.12.G The Unconfined Compression Strength test (ASTM D2166) shall not be performed on a soil sample containing seams or slickensides.

11.2.12.H If the invert level of the utility is greater than 5 feet, a minimum of one Unconsolidated- Undrained Triaxial test (ASTM D2850) shall be performed on a representative cohesive soil sample in each boring.

11.2.12.I Aggressivity tests (Sulfates, Chlorides, pH, and Electric Resistivity) shall be performed on soil and water samples. Geotechnical Consultant shall not discard soil samples without ensuring from Engineer of Record that corrosion monitoring and/or corrosion control recommendations are made and soil samples are not needed.

11.2.12.J All the test results shall be summarized in the report in a table format. The Geotechnical Consultant shall include the summary of the test results on the most updated template format (or approved equal), as provided by the City of Houston (as shown on Figure 11.2).

11.2.12.I Aggressivity tests (Sulfates, Chlorides, pH, and Electric Resistivity) shall be performed on soil and water samples. Geotechnical Consultant shall not discard soil samples without ensuring from Engineer of Record that corrosion monitoring and/or corrosion control recommendations are made and soil samples are not needed.

# PREVIOUSLY



laboratory testing, engineering analysis of the data obtained, and recommendations concerning the proposed facilities.

B. The content of the Geotechnical Investigation Report shall be project specific.

C. The Geotechnical Consultant shall review any soil information (provided by the Project Manager) that may be available from the previous project design activities. The summary is to be included in the Subsurface Conditions section of the Geotechnical Investigation Report. The boring logs and the plan of borings shall be included in the appendix of the Geotechnical Investigation Report.

D. Any illustration containing copyright information (e.g., aerial views from the Internet or Key Map for Plan of Borings, Vicinity Map, etc.) shall have proper reproduction permission and credits written on the illustration.

E. All drawings (including drawings for the slope stability analyses) shall be at a scale available on a standard engineering scale.

F. The pavement design shall be in accordance with the latest edition of the AASHTO Guide for Design of Pavement Structures.

G. The Geotechnical Consultant shall perform a quality control review of the Geotechnical Investigation Report before its submittal. The Engineer of Record shall provide a separate review of the Geotechnical Investigation Report prior to its submittal.

H. For the City of Houston projects, the Geotechnical Consultant shall submit a Draft Geotechnical Investigation Report (hard copy) to the City of Houston for review prior to submitting the Final Geotechnical Investigation Report. The title of the report shall identify if the report is a draft or final report.

I. The Final Geotechnical Investigation Report shall be signed and sealed by a Licensed Engineer.

11.21 GEOTECHNICAL INVESTIGATION REPORT - RECOMMENDATIONS

The minimum geotechnical recommendations shall address the following:

| | | |
|---|---|---|
| A. | Open-Cut Installation: | Bedding, backfill, excavation wall and bottom stability, thrust restraint, dewatering, and pipe design parameters. |
| B. | Auger Installation: | Soil design parameters, ground stability, auger pit excavation stability, and dewatering. |
| C. | Tunnels and Shafts: | External pressures on primary and permanent liners, wall and bottom stability, and dewatering. |



**Additional recommendation on Tunnels and Shafts**

# NOW



*11.2.16.H continued* prior to submitting the Final Geotechnical Investigation Report. The title of the report shall identify if the report is a draft or final report.

11.2.16.I The Final Geotechnical Investigation Report shall be signed and sealed by a Licensed Engineer.

11.2.17 GEOTECHNICAL INVESTIGATION REPORT – RECOMMENDATIONS

The minimum geotechnical recommendations shall address the following:

| | | |
|---|---|---|
| 11.2.17.A | Open-Cut Installation: | Bedding, backfill, excavation wall and bottom stability, thrust restraint, dewatering, and pipe design parameters. |
| 11.2.17.B | Auger Installation: | Soil design parameters, ground stability, auger pit excavation stability, and dewatering. |
| 11.2.17.C | Tunnels and Shafts: | External pressures on primary and permanent liners, wall and bottom stability, and dewatering. If the shaft is expected to be within PPCA, then recommendations other than dewatering for the shaft construction shall be included (e.g., sheet piling). |
| 11.2.17.D | Open Channel: | Slope angle or slope ratio, setback distance for structures or appurtenances included in the project, and erosion protection. |
| 11.2.17.E | Detention Pond: | Slope angle or slope ratio, setback distance for structures or appurtenances included in the project, and erosion protection |
| 11.2.17.F | Paving: | |

1. The requirements in Chapter 10 "Street Paving Design Requirements" of the City of Houston Infrastructure Design Manual shall be followed.
2. For rigid paving: At a minimum, the pavement thickness and minimum subgrade treatment shall be included. All the selected design parameters used in obtaining the pavement thickness shall be provided in the report.
3. For flexible paving: At a minimum, the design Structural Number (SN), recommended pavement section and its SN, and subgrade treatment shall be included. All the selected design parameters used in obtaining the pavement thickness shall be provided in the report.

# PREVIOUSLY



laboratory testing, engineering analysis of the data obtained, and recommendations concerning the proposed facilities.

B. The content of the Geotechnical Investigation Report shall be project specific.

C. The Geotechnical Consultant shall review any soil information (provided by the Project Manager) that may be available from the previous project design activities. The summary is to be included in the Subsurface Conditions section of the Geotechnical Investigation Report. The boring logs and the plan of borings shall be included in the appendix of the Geotechnical Investigation Report.

D. Any illustration containing copyright information (e.g., aerial views from the Internet or Key Map for Plan of Borings, Vicinity Map, etc.) shall have proper reproduction permission and credits written on the illustration.

E. All drawings (including drawings for the slope stability analyses) shall be at a scale availat on a standard engineering scale.

F. The pavement design shall be in accordance with the latest edition of the AASHTO Gui for Design of Pavement Structures.

G. The Geotechnical Consultant shall perform a quality control review of the Geotechni Investigation Report before its submittal. The Engineer of Record shall provide a separ review of the Geotechnical Investigation Report prior to its submittal.

H. For the City of Houston projects, the Geotechnical Consultant shall submit a Draft Geotechnical Investigation Report (hard copy) to the City of Houston for review prior to submitting the Final Geotechnical Investigation Report. The title of the report shall identify if the report is a draft or final report.

I. The Final Geotechnical Investigation Report shall be signed and sealed by a Licensed Engineer.

11.21 GEOTECHNICAL INVESTIGATION REPORT - RECOMMENDATIONS

The minimum geotechnical recommendations shall address the following:

A. Open-Cut Installation: Bedding, backfill, excavation wall and bottom stability, thrust

C. Tunnels and Shafts: External pressures on primary and permanent liners, wall and bottom stability, and dewatering.



# NOW



*11.2.16.H continued* prior to submitting the Final Geotechnical Investigation Report. The title of the report shall identify if the report is a draft or final report.

11.2.16.I The Final Geotechnical Investigation Report shall be signed and sealed by a Licensed Engineer.

11.2.17 GEOTECHNICAL INVESTIGATION REPORT – RECOMMENDATIONS

The minimum geotechnical recommendations shall address the following:

11.2.17.A Open-Cut Installation: Bedding, backfill, excavation wall and bottom stability, thrust restraint, dewatering, and pipe design parameters.

11.2.17.C Tunnels and Shafts: External pressures on primary and permanent liners, wall and bottom stability, and dewatering. If the shaft is expected to be within PPCA, then recommendations other than dewatering for the shaft construction shall be included (e.g., sheet piling).

11.2.17.E Detention Pond: Slope angle or slope ratio, setback distance for structures or appurtenances included in the project, and erosion protection

11.2.17.F Paving:

1. The requirements in Chapter 10 "Street Paving Design Requirements" of the City of Houston Infrastructure Design Manual shall be followed.
2. For rigid paving: At a minimum, the pavement thickness and minimum subgrade treatment shall be included. All the selected design parameters used in obtaining the pavement thickness shall be provided in the report.

flexible paving: At a minimum, the design Structural Number (SN), mmended pavement section and its SN, and subgrade treatment shall be ded. All the selected design parameters used in obtaining the pavement ness shall be provided in the report.



**on Tunnels and Shafts**

# PREVIOUSLY



g. Fault Study Report (if applicable)
h. Pavement Design Calculation
i. Information from the Previous Project Design Activities (if applicable)
j. Any other relevant information

B. When required, a separate Trench Safety Report shall be provided for the City of Houston projects. The Trench Safety Report shall satisfy statutory requirements for contracting for trench safety construction.

C. The Geotechnical Consultant shall provide an electronic version (in pdf format) of the entire Final Geotechnical Investigation Report (one file).

D. The Geotechnical Consultant shall also provide electronic files of the final boring logs. The files must be compatible with input files used by "gINT" LogWriter software.

(Continued on next page)



**Additional requirement has been added to the Geotechnical Investigation Report**

# NOW



*11.2.18.A.10 continued*

a. Boring Logs
b. Piezometer Installation Report (Figure 11.1 and report submitted to the TDLR)
c. Piezometer Plugging Report (report submitted to the TDLR)
d. Grain Size Distribution Curves (if applicable)
e. CU, Pinhole, or any other test results (if applicable)
f. Slope Stability Analyses Information (if applicable)
g. Fault Study Report (if applicable)
h. Pavement Design Calculation
i. Information from the Previous Project Design Activities (if applicable)
j. Any other relevant information

11.2.18.B When required, a separate Trench Safety Report shall be provided for the City of Houston projects. The Trench Safety Report shall satisfy statutory requirements for contracting for trench safety construction.

11.2.18.C The Geotechnical Consultant shall provide an electronic version (in pdf format) of the entire Final Geotechnical Investigation Report (one file).

11.2.18.D The Geotechnical Consultant shall also provide electronic files of the final boring logs. The files must be compatible with input files used by "gINT" LogWriter software.

11.2.18.E The "Summary of Laboratory" tables shall also be as specified in the City of Houston IDM, Chapter 13, Section 5 - Geotechnical and Environmental GIS Digital Submission Requirements.

11.2.19 GEOTECHNICAL BASELINE REPORT

11.2.19.A For tunneling and/or Microtunneling projects, a GBR may be required on a case

s in the latest
Reports for



11.2.18.E The "Summary of Laboratory" tables shall also be as specified in the City of Houston IDM, Chapter 13, Section 5 - Geotechnical and Environmental GIS Digital Submission Requirements.

# PREVIOUSLY



g. Fault Study Report (if applicable)
h. Pavement Design Calculation
i. Information from the Previous Project Design Activi
j. Any other relevant information

B. When required, a separate Trench Safety Report shall be provid projects. The Trench Safety Report shall satisfy statutory requi trench safety construction.

C. The Geotechnical Consultant shall provide an electronic version Final Geotechnical Investigation Report (one file).

D. The Geotechnical Consultant shall also provide electronic files o files must be compatible with input files used by "gINT" LogWriter software.

(Continued on next page)



# NOW

**11.2.19 GEOTECHNICAL BASELINE REPORT**

11.2.19.A For tunneling and/or Microtunneling projects, a GBR may be required on a case by case basis (e.g., major structures, major bayous, etc.).

11.2.19.B GBR must be conducted in general accordance with the guidelines in the latest version of the ASCE publication "Geotechnical Baseline Reports for Construction."

**Geotechnical Baseline Report has been added**

h. Pavement Design Calculation

i. Information from the Previous Project Design Activities (if applicable)

j. Any other relevant information

11.2.18.B When required, a separate Trench Safety Report shall be provided for the City of Houston projects. The Trench Safety Report shall satisfy statutory requirements for contracting for trench safety construction.

11.2.18.C The Geotechnical Consultant shall provide an electronic version (in pdf format) of the entire Final Geotechnical Investigation Report (one file).

11.2.18.D The Geotechnical Consultant shall also provide electronic files of the final boring logs. The files must be compatible with input files used by "gINT" LogWriter software.

11.2.18.E The "Summary of Laboratory" tables shall also be as specified in the City of Houston IDM, Chapter 13, Section 5 - Geotechnical and Environmental GIS Digital Submission Requirements.

11.2.19 GEOTECHNICAL BASELINE REPORT

11.2.19.A For tunneling and/or Microtunneling projects, a GBR may be required on a case by case basis (e.g., major structures, major bayous, etc.).

11.2.19.B GBR must be conducted in general accordance with the guidelines in the latest version of the ASCE publication "Geotechnical Baseline Reports for Construction."

# PREVIOUSLY



Chapter 11 (Continued)

SECTION II

11.23 PHASE I ENVIRONMENTAL SITE ASSESSMENT (ESA I) REQUIREMENTS

This section categorizes various types of projects that require an ESA I and sets a minimum scope of work for:

A. Property to be acquired by the City of Houston and property involved in divestitures and inter-departmental transfers; and

B. The City of Houston construction projects.

11.24 PROPERTY TO BE ACQUIRED BY THE CITY OF HOUSTON AND PROPERTY INVOLVED IN DIVESTITURES AND INTER-DEPARTMENTAL TRANSFERS

The ESA I conducted on property to be acquired by the City of Houston shall conform to the latest ASTM Standard Practice E1527 with the following stipulations:

A. The sources of historical data reviewed for a site shall include, at a minimum, historical aerial photographs, fire insurance maps (where available), local city street directories (where available), and United States Geological Survey (USGS) maps. The chain-of-title search is not required as an historical search. Applicable copies of these sources shall be presented in the report. Since City Directories are copyright protected, copies of these should not be presented in the report. One aerial photograph for every five to ten years interval from approximately 1950 to the present shall be obtained of an appropriate scale (1" = 500', or shall not exceed 1" = 700') to clearly indicate site details. Sites inside the IH-610 Loop shall have property usage identified from the present, back a minimum of 100 years (where available), or to the property's obvious first development, whichever is earlier.

B. If regulatory records indicate that Leaking Petroleum Storage Tank (LPST) facilities are located within approximately 500 feet of the site, the latest comprehensive assessment or monitoring report maintained on the facility by the TCEQ (Houston District Office) shall be reviewed and summarized in the ESA I report. Any review of records shall be conducted during the ESA I.

C. If regulatory records indicate that a federal/state superfund facility is located within approximately ¼ mile of the site, the files maintained on that facility by the TCEQ shall be reviewed and summarized in the ESA I report.

D. The TCEQ's Voluntary Cleanup Program (VCP) database shall be searched for facilities that are located within approximately 500 feet of the site.

E. If the project includes demolition/renovation of buildings/structures, the ESA I report shall include recommendation for asbestos survey.



**Revised requirements for ESA I**

# NOW



SECTION 3 - ENVIRONMENTAL REQUIREMENTS

11.3.01 PHASE I ENVIRONMENTAL SITE ASSESSMENT (ESA I) REQUIREMENTS

This section categorizes various types of projects that require an ESA I and sets a minimum scope of work for:

11.3.01.A Property to be acquired by the City of Houston and property involved in divestitures and inter-departmental transfers; and

11.3.01.B The City of Houston construction projects.

11.3.02 PROPERTY TO BE ACQUIRED BY THE CITY OF HOUSTON AND PROPERTY INVOLVED IN DIVESTITURES AND INTER-DEPARTMENTAL TRANSFERS

The ESA I/ESA I Update conducted on a property to be acquired by the City of Houston shall conform to the latest ASTM Standard Practice E1527 with the following stipulations:

11.3.02.A The sources of historical data reviewed for a property shall include, at a minimum, historical aerial photographs, Sanborn fire insurance maps (where available), local city street directories (where available), and United States Geological Survey (USGS) maps. The chain-of-title search is not required as an historical search. Applicable copies of these sources shall be presented in the report. Since City Directories are copyright protected, copies of these should not be presented in the report. One aerial photograph for every five to ten years interval from approximately 1950 to the present shall be obtained of an appropriate scale between1" = 500' and 1" = 700', to clearly indicate property details. Properties inside the IH-610 Loop shall have property usage identified from the present, back a minimum of 100 years (where available), or to the property's obvious first development, whichever is earlier.

11.3.02.B If regulatory records indicate that Leaking Petroleum Storage Tank (LPST) facilities are located within approximately 500 feet of the property, the latest comprehensive assessment or monitoring report maintained on the facility by the TCEQ (Houston District Office) shall be reviewed and summarized in the report. All record reviews shall be conducted during the ESA I process.

11.3.02.C If regulatory records indicate that a federal superfund facility, or Texas Hazardous Waste Sites (HWS)/Texas State Superfund Sites is located within approximately ¼ mile of the site, the files maintained on that facility by the TCEQ shall be reviewed and summarized in the report.

11.3.02.D The TCEQ's Voluntary Cleanup Program (VCP) governmental regulatory database shall be searched for facilities that are located within approximately 500 feet of the property.

11.3.02.E If the project includes demolition/renovation of buildings/structures, the report

# PREVIOUSLY

CITY OF HOUSTON
Houston Public Works

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Geotechnical and Environmental Requirements

Chapter 11 (Continued)

SECTION II

11.23 PHASE I ENVIRONMENTAL SITE ASSESSMENT (ESA I) REQUIREMENTS

This section categorizes various types of projects that require an ESA I and sets a minimum scope of work for:

A. Property to be acquired by the City of Houston and property involved in divestitures and inter-departmental transfers; and

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11.24 PROPERTY TO BE ACQUIRED BY THE CITY OF HOUSTON AND PROPERTY INVOLVED IN DIVESTITURES AND INTER-DEPARTMENTAL TRANSFERS

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A. The sources of historical data reviewed for a site shall include, at a minimum, historical aerial photographs, fire insurance maps (where available), local city street directories (where available), and United States Geological Survey (USGS) maps. The chain-of-title search is not required as an historical search. Applicable copies of these sources shall be presented in the report. Since City Directories are copyright protected, copies of these should not be presented in the report. One aerial photograph for every five to ten years interval from approximately 1950 to the present shall be obtained of an appropriate scale (1" = 500', or shall not exceed 1" = 700') to clearly indicate site details. Sites inside the IH-610 Loop shall

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A. The sources of historical data reviewed for a site shall include, at a minimum, historical aerial photographs, fire insurance maps (where available), local city street directories (where available), and United States Geological Survey (USGS) maps. The chain-of-title search is not required as an historical search. Applicable copies of these sources shall be presented in the report. Since City Directories are copyright protected, copies of these should not be presented in the report. One aerial photograph for every five to ten years interval from approximately 1950 to the present shall be obtained of an appropriate scale (1" = 500', ~~or shall not exceed~~ 1" = 700') to clearly indicate site details. Sites inside the IH-610 Loop shall have property usage identified from the present, back a minimum of 100 years (where available), or to the property's obvious first development, whichever is earlier.

11.3.02.A The sources of historical data reviewed for a property shall include, at a minimum, historical aerial photographs, Sanborn fire insurance maps (where available), local city street directories (where available), and United States Geological Survey (USGS) maps. The chain-of-title search is not required as an historical search. Applicable copies of these sources shall be presented in the report. Since City Directories are copyright protected, copies of these should not be presented in the report. One aerial photograph for every five to ten years interval from approximately 1950 to the present shall be obtained of an appropriate scale between1" = 500' and 1" = 700', to clearly indicate property details. Properties inside the IH-610 Loop shall have property usage identified from the present, back a minimum of 100 years (where available), or to the property's obvious first development, whichever is earlier.

**Revised requirements for ESA I**

# NOW

11.3.02.A The sources of historical data reviewed for a property shall include, at a minimum, historical aerial photographs, Sanborn fire insurance maps (where available), local city street directories (where available), and United States Geological Survey (USGS) maps. The chain-of-title search is not required as an historical search. Applicable copies of these sources shall be presented in the report. Since City Directories are copyright protected, copies of these should not be presented in the report. One aerial photograph for every five to ten years interval from approximately 1950 to the present shall be obtained of an appropriate scale between1" = 500' and 1" = 700', to clearly indicate property details. Properties inside the IH-610 Loop shall have property usage identified from the present, back a minimum of 100 years (where available), or to the property's obvious first development, whichever is earlier.

If regulatory records indicate that Leaking Petroleum Storage Tank (LPST) facilities are located within approximately 500 feet of the property, the latest comprehensive assessment or monitoring report maintained on the facility by the TCEQ (Houston District Office) shall be reviewed and summarized in the report. All record reviews shall be conducted during the ESA I process.

If regulatory records indicate that a federal superfund facility, or Texas Hazardous Waste Sites (HWS)/Texas State Superfund Sites is located within approximately ¼ mile of the site, the files maintained on that facility by the TCEQ shall be reviewed and summarized in the report.

The TCEQ's Voluntary Cleanup Program (VCP) governmental regulatory database shall be searched for facilities that are located within approximately 500 feet of the property.

If the project includes demolition/renovation of buildings/structures, the report

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Chapter 11 (Continued)

SECTION II

11.23 PHASE I ENVIRONMENTAL SITE ASSESSMENT (ESA I) REQUIREMENTS

This section categorizes various types of projects that require an ESA I and sets a minimum scope of work for:

A. Property to be acquired by the City of Houston and property involved in divestitures and inter-departmental transfers; and

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11.24 PROPERTY TO BE ACQUIRED BY THE CITY OF HOUSTON AND PROPERTY INVOLVED IN DIVESTITURES AND INTER-DEPARTMENTAL TRANSFERS

The ESA I conducted on property to be acquired by the City of Houston shall conform to the latest ASTM Standard Practice E1527 with the following stipulations:

A. The sources of historical data reviewed for a site shall include, at a minimum, historical aerial photographs, fire insurance maps (where available), local city street directories (where available), and United States Geological Survey (USGS) maps. The chain-of-title search is not required as an historical search. Applicable copies of these sources shall be presented in the report. Since City Directories are copyright protected, copies of these should not be presented in the report. One aerial photograph for every five to ten years interval from approximately 1950 to the present shall be obtained of an appropriate scale (1" = 500', or shall not exceed 1" = 700') to clearly indicate site details. Sites inside the IH-610 Loop shall have property usage identified from the present, back a minimum of 100 years (where available), or to the property's obvious first development, whichever is earlier.

B. If regulatory records indicate that Leaking Petroleum Storage Tank (LPST) facilities are

C. If regulatory records indicate that a federal/state superfund facility is located within approximately ¼ mile of the site, the files maintained on that facility by the TCEQ shall be reviewed and summarized in the ESA I report.

D. The TCEQ's Voluntary Cleanup Program (VCP) database shall be searched for facilities that are located within approximately 500 feet of the site.

E. If the project includes demolition/renovation of buildings/structures, the ESA I report shall include recommendation for asbestos survey.



# NOW



**SECTION 3 - ENVIRONMENTAL REQUIREMENTS**

11.3.01 PHASE I ENVIRONMENTAL SITE ASSESSMENT (ESA I) REQUIREMENTS

This section categorizes various types of projects that require an ESA I and sets a minimum scope of work for:

11.3.01.A Property to be acquired by the City of Houston and property involved in divestitures and inter-departmental transfers; and

11.3.01.B The City of Houston construction projects.

11.3.02 PROPERTY TO BE ACQUIRED BY THE CITY OF HOUSTON AND PROPERTY INVOLVED IN DIVESTITURES AND INTER-DEPARTMENTAL TRANSFERS

The ESA I/ESA I Update conducted on a property to be acquired by the City of Houston shall conform to the latest ASTM Standard Practice E1527 with the following stipulations:

11.3.02.A The sources of historical data reviewed for a property shall include, at a minimum, historical aerial photographs, Sanborn fire insurance maps (where available), local city street directories (where available), and United States Geological Survey (USGS) maps. The chain-of-title search is not required as an historical search. Applicable copies of these sources shall be presented in the report. Since City

**Revised**

11.3.02.C If regulatory records indicate that a federal superfund facility, or Texas Hazardous Waste Sites (HWS)/Texas State Superfund Sites is located within approximately ¼ mile of the site, the files maintained on that facility by the TCEQ shall be reviewed and summarized in the report.

facilities are located within approximately 500 feet of the property, the latest comprehensive assessment or monitoring report maintained on the facility by the TCEQ (Houston District Office) shall be reviewed and summarized in the report. All record reviews shall be conducted during the ESA I process.

If regulatory records indicate that a federal superfund facility, or Texas Hazardous Waste Sites (HWS)/Texas State Superfund Sites is located within approximately ¼ mile of the site, the files maintained on that facility by the TCEQ shall be reviewed and summarized in the report.

11.3.02.D The TCEQ's Voluntary Cleanup Program (VCP) governmental regulatory database shall be searched for facilities that are located within approximately 500 feet of the property.

11.3.02.E If the project includes demolition/renovation of buildings/structures, the report

# PREVIOUSLY



L. The Environmental Consultant shall submit a Draft Environmental Site Assessment Report (hard and an electronic copies) to the City of Houston for review prior to submitting the Final Environmental Site Assessment Report. The title of the report shall identify if the report is a draft or final report. At minimum, hard copies of the executive summary section of the database including radius map and pages pertinent to the sites of recognized environmental conditions (REC) discussed shall be included in the ESA I report. The ESA I report and the complete set of the database should be in the enclosed electronic copy.

M. The Environmental Consultant shall provide an electronic version (in pdf format) of the entire Final Environmental Site Assessment Report (one file).

(Continued on next page)



**Revised requirements for ESA I, continues**

# NOW



11.3.03.K The environmental professional who conducted the ESA I shall make recommendations for an ESA II, as appropriate, which shall be thorough enough to support an ESA II.

1. A regulated site listed in the governmental regulatory database with impacted soil and/or groundwater shall be considered for ESA II provided it is located adjacent to the alignment/parcel.

2. A historical site (gasoline, filling, and service stations, and dry cleaners) not currently listed in the governmental regulatory database shall be considered for ESA II provided it is located adjacent to the alignment/parcel.

3. A regulated site distant from the alignment/parcel can be considered for ESA II provided TCEQ (Houston office) has documents indicating that regulated site has impacted a large area including the alignment/parcel.

11.3.03.L The Environmental Consultant shall submit an Environmental Site Assessment Draft Report (hard and an electronic copies) to the City of Houston for review prior to submitting the Environmental Site Assessment Final Report. The title of the report shall identify if the report is a draft or final report. At minimum, hard copies of the executive summary section of the governmental regulatory database including radius maps and pages pertinent to the sites of recognized environmental conditions (REC) discussed shall be included in the report. The report and the complete governmental regulatory database should be included in the attached electronic copy. The electronic copy of the report shall be in the pdf format.

11.3.03.M The Phase I ESA report shall be formatted according to the latest ASTM E1527, Section 12.

11.3.04 PHASE II ENVIRONMENTAL SITE ASSESSMENT (ESA II) REQUIREMENTS

The primary objective for performing an ESA II is to evaluate the Recognized Environmental Conditions (REC) sites identified in the ESA I for the purpose of providing information regarding the nature and extent of contamination to assist in engineering design process. The ESA II shall conform to the latest ASTM Standard Practice E1903 with the following stipulations.

11.3.05 FIELD INVESTIGATION NOTIFICATIONS

The Environmental Consultant or Engineer of Record shall inform Houston Public Works' Technical Services (via email) 48 hours prior to drilling and sampling.

# PREVIOUSLY

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L. The Environmental Consultant shall submit a Draft Environmental Site Assessment Report (hard and an electronic copies) to the City of Houston for review prior to submitting the Final Environmental Site Assessment Report. The title of the report shall identify if the report is a draft or final report. At minimum, hard copies of the executive summary section of the database including radius map and pages pertinent to the sites of recognized environmental conditions (REC) discussed shall be included in the ESA I report. The ESA I report and the complete set of the database should be in the enclosed electronic copy.

M. The Environmental Consultant shall provide an electronic version (in pdf format) of the entire Final Environmental Site Assessment Report (one file).

(Continued on next page)



# NOW

11.3.03.L The Environmental Consultant shall submit an Environmental Site Assessment Draft Report (hard and an electronic copies) to the City of Houston for review prior to submitting the Environmental Site Assessment Final Report. The title of the report shall identify if the report is a draft or final report. At minimum, hard copies of the executive summary section of the governmental regulatory database including radius maps and pages pertinent to the sites of recognized environmental conditions (REC) discussed shall be included in the report. The report and the complete governmental regulatory database should be included in the attached electronic copy. The electronic copy of the report shall be in the pdf format.

**Revised requirements for ESA I, continues**

provided TCEQ (Houston office) has documents indicating that regulated site has impacted a large area including the alignment/parcel.

11.3.03.L The Environmental Consultant shall submit an Environmental Site Assessment Draft Report (hard and an electronic copies) to the City of Houston for review prior to submitting the Environmental Site Assessment Final Report. The title of the report shall identify if the report is a draft or final report. At minimum, hard copies of the executive summary section of the governmental regulatory database including radius maps and pages pertinent to the sites of recognized environmental conditions (REC) discussed shall be included in the report. The report and the complete governmental regulatory database should be included in the attached electronic copy. The electronic copy of the report shall be in the pdf format.

11.3.03.M The Phase I ESA report shall be formatted according to the latest ASTM E1527, Section 12.

11.3.04 PHASE II ENVIRONMENTAL SITE ASSESSMENT (ESA II) REQUIREMENTS

The primary objective for performing an ESA II is to evaluate the Recognized Environmental Conditions (REC) sites identified in the ESA I for the purpose of providing information regarding the nature and extent of contamination to assist in engineering design process. The ESA II shall conform to the latest ASTM Standard Practice E1903 with the following stipulations.

11.3.05 FIELD INVESTIGATION NOTIFICATIONS

The Environmental Consultant or Engineer of Record shall inform Houston Public Works' Technical Services (via email) 48 hours prior to drilling and sampling.

11.3.03.M The Phase I ESA report shall be formatted according to the latest ASTM E1527, Section 12.

# PREVIOUSLY



Chapter 11 (Continued)

11.26 PHASE II ENVIRONMENTAL SITE ASSESSMENT (ESA II) REQUIREMENTS

The primary objective for performing an ESA II is to evaluate the recognized environmental conditions (REC) identified in the ESA I for the purpose of providing information regarding the nature and extent of contamination to assist in engineering design process. The ESA II shall conform to the latest ASTM Standard Practice E1903 with the following stipulations.

11.27 FIELD INVESTIGATION NOTIFICATIONS

The Environmental Consultant or Engineer of Record shall inform the Project Manager (via email) about the start date of drilling approximately 48 hours prior to beginning drilling.

11.28 PROCEDURES

The following are the minimum requirements for an ESA II to be conducted for the City of Houston projects, land acquisitions, and inter-departmental transfers.

A. Field Activities

The location and depth of borings shall be based on the proposed construction activities, and any previous environmental reports pertaining to the project location, if reasonably available.

1. *Frequency of samples* -
   a. For linear project, the boring shall be advanced incrementally (every one foot) to allow continuous sampling. Three (3) or more borings (approximately 150 feet apart for a rough delineation) shall be drilled along the proposed excavation at each REC location.
   b. For non-linear project, the frequency and spacing of the borings should be determined by the environmental consultant in consultation with the Project Manager.
2. *Termination of boring* - Borings shall be advanced to a maximum depth of five (5) feet below the planned excavation. Borings may be advanced to greater depths if warranted by site-specific circumstances. If borings are terminated due to field conditions (e.g., obstructions), borings should be relocated at the discretion of the environmental professional.
3. *Cross-contamination* - To prevent cross-contamination, sampling and boring equipment shall be decontaminated prior to drilling each soil boring /collecting samples. Environmental consultant shall follow applicable federal, state, and local regulations to prevent cross-contamination between soil samples.



**Field Activities for ESA II have been revised**

# NOW



11.3.06 PROCEDURES

The following are the minimum requirements for an ESA II conducted on City of Houston construction projects, land acquisitions, and inter-departmental transfers.

11.3.06.A Field Activities

The location of the environmental borings shall be based on the judgement of the environmental professional.

1. *Frequency of samples* –
   a. For linear project, the borings shall be advanced incrementally (every one foot) to allow continuous sampling and screening. Three (3) or more borings (approximately 150 feet apart for a rough delineation) shall be drilled along the proposed excavation at each REC location.
   b. For non-linear project, the frequency and spacing of the borings should be determined by the environmental professional in consultation with Houston Public Works' Technical Services.
2. *Termination of boring* - Borings shall be advanced to a maximum depth of five (5) feet below the planned excavation. Borings may be advanced to greater depths if warranted by site-specific circumstances. If borings are terminated due to field conditions (e.g., obstructions), borings should be relocated at the discretion of the environmental professional.
3. *Cross-contamination* - To prevent cross-contamination, sampling and boring equipment shall be decontaminated prior to drilling each soil boring /collecting samples. Environmental professional shall follow applicable federal, state, and local regulations to prevent cross-contamination.

1. *Frequency of samples* –

a. For linear project, the borings shall be advanced incrementally (every one foot) to allow continuous sampling and screening. Three (3) or more borings (approximately 150 feet apart for a rough delineation) shall be drilled along the proposed excavation at each REC location.

from the soil-groundwater interface. If no saturated zone exists, then the sample shall be collected from the bottom of the boring.

# PREVIOUSLY



4. *Sampling procedure*:

a. Soil

i. Obtain a minimum of one soil sample from each boring for laboratory analysis. Additional soil samples may be collected as deemed necessary by the environmental professional.

ii. Perform field screening of all soil samples collected from borings.

iii. The sample for laboratory analysis shall be collected from the zone exhibiting the highest Photoionization Detector/Organic Vapor Analyzer (PID/OVA) reading. If the PID/OVA readings are non-detected, the sample shall be collected from the soil-groundwater interface. If no saturated zone exists, then the sample shall be collected from the bottom of the boring.

iv. Place all samples in clean pre-labeled containers composed of materials with the appropriate preservatives as required by the respective analytical method. To prevent volatilization, place samples on ice in an insulated cooler prior to and during transportation to the analytical laboratory for analysis.

b. Groundwater

If groundwater is encountered during drilling, one (1) groundwater sample shall be collected from each REC location. The groundwater sample shall be collected from a temporary installed sampling well.

c. Each boring log shall include the following:

i. Soil classification according to ASTM D2488.
ii. Detection of hydrocarbon or other odors.
iii. Visible hydrocarbon or other contamination (if present, including degree, location, and extent of staining).
iv. PID/OVA readings.
v. Other field screening as required by the type of contaminations.
vi. The depth at which groundwater was first encountered.
vii. Location of boring based on GPS X,Y coordination. The coordinates shall be as per Texas South Central Zone No. 4204 State Plane Grid (not surface) Coordinates (NAD83).
viii. Boring identification.
ix. City project number.

5. *Site Clean up and Restoration* - The environmental professional is responsible for the site clean up upon completion of field operations, commensurate with site conditions.



**Revised requirements for boring logs locations**

# NOW



*11.3.06.A.4.a*
*continued*

(4) Place all samples in clean pre-labeled containers composed of materials with the appropriate preservatives as required by the respective analytical method. To prevent volatilization, place samples on ice in an insulated cooler prior to and during transportation to the analytical laboratory.

b. Groundwater

If groundwater is encountered during drilling, one (1) groundwater sample shall
be collected from each REC location. The groundwater sample shall be collected from a temporary installed sampling well.

c. Each boring log shall include the following:

(1) Soil classification according to ASTM D2488.

(2) Detection of hydrocarbon or other odors.

(3) Visible hydrocarbon or other contamination (if present, including degree, location, and extent of staining).

(4) PID readings.

(5) Other field screening as required by the type of contaminations.

(6) The depth at which groundwater was first encountered.

(7) Boring locations and log information shall be delivered in a digital format that meets the minimum technical standards set forth in the City of Houston IDM, Chapter 13, Section 5 - Geotechnical and Environmental GIS Digital Submission Requirements.

(8) Boring identification.

(9) City project number.

5. *Site Clean up and Restoration* - The environmental professional is responsible for the site clean up upon completion of field operations, commensurate with site conditions.

a. Generation of Waste

c. Each boring log shall include the following:

i. Soil classification according to ASTM D2488.
ii. Detection of hydrocarbon or other odors.
iii. Visible hydrocarbon or other contamination (if present, including degree, location, and extent of staining).
iv. PID/OVA readings.
v. Other field screening as required by the type of contaminations.
vi. The depth at which groundwater was first encountered.
vii. ~~Location of boring based on GPS X,Y coordination. The coordinates s~~ ~~be as per Texas South Central Zone No. 4204 State Plane Grid (not surface) Coordinates (NAD83).~~
viii. Boring identification.
ix. City project number.

with the appropriate preservatives as required by the respective analytical method. To prevent volatilization, place samples on ice in an insulated cooler prior to and during transportation to the analytical laboratory for analysis.

b. Groundwater

If groundwater is encountered during drilling, one (1) groundwater sample shall be collected from each REC location. The groundwater sample shall be collected from a temporary installed sampling well.

c. Each boring log shall include the following:

i. Soil classification according to ASTM D2488.
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iii. Visible hydrocarbon or other contamination (if present, including degree, location, and extent of staining).
iv. PID/OVA readings.
v. Other field screening as required by the type of contaminations.
vi. The depth at which groundwater was first encountered.
vii. Location of boring based on GPS X,Y coordination. The coordinates shall be as per Texas South Central Zone No. 4204 State Plane Grid (not surface) Coordinates (NAD83).
viii. Boring identification.
ix. City project number.

5. *Site Clean up and Restoration* - The environmental professional is responsible for the site clean up upon completion of field operations, commensurate with site conditions.



**Revised requireme for boring locations**

**NOW**



*11.3.06.A.4.a continued*

(4) Place all samples in clean pre-labeled containers composed of materials with the appropriate preservatives as required by the respective analytical method. To prevent volatilization, place samples on ice in an insulated cooler prior to and during transportation to the analytical laboratory.

c. Each boring log shall include the following:

(1) Soil classification according to ASTM D2488.

(2) Detection of hydrocarbon or other odors.

(3) Visible hydrocarbon or other contamination (if present, including degree, location, and extent of staining).

(4) PID readings.

(5) Other field screening as required by the type of contaminations.

(6) The depth at which groundwater was first encountered.

(7) Boring locations and log information shall be delivered in a digital format that meets the minimum technical standards set forth in the City of Houston IDM, Chapter 13, Section 5 - Geotechnical and Environmental GIS Digital Submission Requirements.

(8) Boring identification.

(9) City project number.

# PREVIOUSLY

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DESIGN MANUAL
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4. Recommendations

The report shall provide recommendations for construction phase monitoring which should take into account:

a. Vertical extent and Lineal extend (station-to-station) of PPCA and action plan.
b. Worker protection and general health and safety.
c. Potential contaminated media screening, testing, handling, and disposal consistent with Federal, State, and City Regulations and Specifications.

5. Exhibits

a. Site plan identifying the location of the REC's and boring locations.
b. Boring logs for each boring with GPS X,Y coordination. The coordinates shall be as per Texas South Central Zone No. 4204 State Plane Grid (not surface) Coordinates (NAD83).
c. Analytical results including tables summarizing analytical results.
d. Photographs of drilling activities.

6. The Environmental Consultant shall submit a Draft Environmental Site Assessment Report (hard and electronic copy) to the City of Houston for review prior to submitting the Final Environmental Site Assessment Report. The title of the report shall identify if the report is a draft or final report.

7. The Environmental Consultant shall provide an electronic version (in pdf format) of the entire Final Environmental Site Assessment Report (one file).

(Continued on next page)



**Additional requirements for ESA II report**

# NOW

CITY OF HOUSTON
Houston Public Works

Geotechnical and Environmental Requirements
Section 3 – Environmental Requirements

*11.3.06.C continued*

4. Recommendations

The report shall provide recommendations for construction phase monitoring which should take into account:

a. Vertical extent and Lineal extend (station-to-station) of PPCA.

b. Worker protection and general health and safety.

c. Potential contaminated media screening, testing, handling, and disposal consistent with Federal, State, and City Regulations and Specifications.

d. PPCA investigation along the alignment shall begin and end at a clean boring. If the laboratory test results indicate that the PPCA cannot be determined (station-to-station) by the number of borings sampled at a REC site, the Environmental Professional shall inform the Engineer of Record and project manager for additional work.

5. Exhibits

a. Site plan identifying the location of the REC's and boring locations.

b. Boring locations and log information shall be delivered in a digital format that meets the minimum technical standards set forth in the City of Houston IDM, Chapter 13, Section 5 - Geotechnical and Environmental GIS Digital Submission Requirements.

c. Analytical results including tables summarizing analytical results.

d. Photographs of drilling activities.



d. PPCA investigation along the alignment shall begin and end at a clean boring. If the laboratory test results indicate that the PPCA cannot be determined (station-to-station) by the number of borings sampled at a REC site, the Environmental Professional shall inform the Engineer of Record and project manager for additional work.

# PREVIOUSLY



4. Recommendations

The report shall provide recommendations for construction phase monitoring which should take into account:

a. Vertical extent and Lineal extend (station-to-station) of PPCA and action plan.
b. Worker protection and general health and safety.
c. Potential contaminated media screening, testing, handling, and disposal consistent with Federal, State, and City Regulations and Specifications.

5. Exhibits

a. Site plan identifying the location of the REC's and boring locations.
b. Boring logs for each boring with GPS X,Y coordination. The coordinates shall be as per Texas South Central Zone No. 4204 State Plane Grid (not surface) Coordinates (NAD83).
c. Analytical results including tables summarizing analytical results.
d. Photographs of drilling activities.

6. The Environmental Consultant shall submit a Draft Environmental Site Assessment Report (hard and electronic copy) to the City of Houston for review prior to submitting the Final Environmental Site Assessment Report. The title of the report shall identify if the report is a draft or final report.

7. The Environmental Consultant shall provide an electronic version (in pdf format) of the entire Final Environmental Site Assessment Report (one file).

(Continued on next page)



**Revised requirements for Exhibits**

# NOW



*11.3.06.C*
*continued*

4. Recommendations

The report shall provide recommendations for construction phase monitoring which should take into account:

a. Vertical extent and Lineal extend (station-to-station) of PPCA.

b. Worker protection and general health and safety.

c. Potential contaminated media screening, testing, handling, and disposal consistent with Federal, State, and City Regulations and Specifications.

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c. Analytical results including tables summarizing analytical results.

d. Photographs of drilling activities.

6. The Environmental Consultant shall submit an Environmental Site Assessment Draft Report (hard and electronic copy) to Houston Public Works for review prior to submitting the Environmental Site Assessment Final Report. The title of the report shall identify if the report is a draft or final report. The electronic copy of the report shall be in .pdf format.

(Contiued on next page)

PREVIOUSLY

NOW

Exhibits

a. Site plan identifying the location of the REC's and boring locations.
b. ~~Boring logs for each boring with GPS X,Y coordination. The coordinates shall be as per Texas South Central Zone No. 4204 State Plane Grid (not surface) Coordinates (NAD83).~~
c. Analytical results including tables summarizing analytical results.
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7. The Environmental Consultant shall provide an electronic version (in pdf format) of the entire Final Environmental Site Assessment Report (one file).

(Continued on next page)





4. Recommendations

The report shall provide recommendations for construction phase monitoring which should take into account:

a. Vertical extent and Lineal extend (station-to-station) of PPCA.

b. Worker protection and general health and safety.

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Exhibits

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c. Analytical results including tables summarizing analytical results.
d. Photographs of drilling activities.

# PREVIOUSLY



E. These Geotechnical Requirements are not applicable when another agency (like the HCFCD) will maintain the facility, or the funding source (like the TxDOT) has specific requirements that must be met in order to receive funding for the project. In which case, another agency's requirements shall be applicable.

F. Not all of the information in this chapter will be applicable to every project, but the investigative scope should be consistent with the sensitivity of the intended use and the physical constraints of the project.

11.05 ENGINEER OF RECORD'S EFFORTS

A. The Engineer of Record, at the proposal stage of the project, shall work with the Geotechnical Consultant to develop the proper scope of the project.

B. The Engineer of Record shall inform the Geotechnical Consultant for any changes in the project related to Geotechnical Investigation as soon as possible.

C. The Engineer of Record shall assist the Geotechnical Consultant in obtaining required permits for drilling, if requested by the Geotechnical Consultant.

D. The Engineer of Record shall provide survey information of the borings (after drilling) to the Geotechnical Consultant to be used in the Geotechnical Investigation Report.

E. The Engineer of Record shall provide a base map using engineering scale (showing the alignments and/or structures) of the project to the Geotechnical Consultant that can be used as a Plan of Borings.

F. The Engineer of Record shall verify the Geotechnical Investigation performed by the Geotechnical Consultant for the conformance with the Geotechnical Requirements and for conformance with project specific conditions and design requirements.

G. The Engineer of Record shall review the Geotechnical Investigation Report and attach their review comments with the Geotechnical Investigation Report prior to submittal to the City of Houston.

11.06 GEOTECHNICAL CONSULTANT'S EFFORTS

A. The Geotechnical Consultant shall confirm with the Engineer of Record that the proper scope of the project is proposed in the proposal.

B. The Geotechnical Consultant shall include the project description, location, and Key Map Number(s) in the geotechnical proposal. Also, a proposed Plan of Boring(s) may be included in the geotechnical proposal, if available.



**Requirements for Engineer Of Record (EOR) have been revised**

# NOW



**SECTION 4 – ENGINEER OF RECORD'S EFFORTS**

11.4.01 ENGINEER OF RECORD'S EFFORTS

11.4.01.A The Engineer of Record, at the proposal stage of the project, shall work with the Geotechnical Consultant to develop the proper scope of the project.

11.4.01.B The Engineer of Record shall inform the Geotechnical Consultant of any changes in the project related to Geotechnical Investigation as soon as possible.

11.4.01.C The Engineer of Record shall assist the Geotechnical Consultant in obtaining required permits for drilling, if requested by the Geotechnical Consultant.

11.4.01.D The Engineer of Record shall provide survey information of the borings (after drilling) to the Geotechnical Consultant to be used in the Geotechnical Investigation Report. Boring survey information shall meet the minimum technical standards set forth in the City of Houston IDM, Chapter 13, Section 5 - Geotechnical and Environmental GIS Digital Submission Requirements.

11.4.01.E The Engineer of Record shall provide a base map using engineering scale (showing the alignments and/or structures) of the project to the Geotechnical Consultant that can be used as a Plan of Borings.

11.4.01.F The Engineer of Record shall verify the Geotechnical Investigation performed by the Geotechnical Consultant for conformance with the Geotechnical Requirements, project specific conditions, and design requirements.

11.4.01.G The Engineer of Record shall review the Geotechnical Investigation Report and attach their review comments with the Geotechnical Investigation Report prior to submittal to the City of Houston.

11.4.02 DRAWING REQUIREMENTS

11.4.02.A Bore Holes

The Engineer of Record shall include geotechnical boring information in the Drawings if both the project scope requires construction of tunnel shafts greater than 30 feet deep and the contract documents utilize City of Houston Standard Specification 02400-Tunnel Shafts. See IDM Chapter 3 for graphic requirements and example plan sheets.

11.4.02.B Precast Storm Manhole Foundations

The engineer of record shall select the foundation type and provide this information to the contractor in the contract documents.

END OF CHAPTER

# PREVIOUSLY



D. The Engineer of Record shall provide survey information of the borings (after drilling) to the Geotechnical Consultant to be used in the Geotechnical Investigation Report.

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**Geotechnical Drawing Requirements have been added to "Engineer of Record's Efforts"**

# NOW



SECTION 4 – ENGINEER OF RECORD'S EFFORTS

11.4.01 ENGINEER OF RECORD'S EFFORTS

11.4.01.A The Engineer of Record, at the proposal stage of the project, shall work with the Geotechnical Consultant to develop the proper scope of the project.

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11.4.02 DRAWING REQUIREMENTS

11.4.02.A Bore Holes

The Engineer of Record shall include geotechnical boring information in the Drawings if both the project scope requires construction of tunnel shafts greater than 30 feet deep and the contract documents utilize City of Houston Standard Specification 02400-Tunnel Shafts. See IDM Chapter 3 for graphic requirements and example plan sheets.

11.4.02.B Precast Storm Manhole Foundations

The engineer of record shall select the foundation type and provide this information to the contractor in the contract documents.

END OF CHAPTER

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### 11.4.02.B Precast Storm Manhole Foundations

The engineer of record shall select the foundation type and provide this information to the contractor in the contract documents.

END OF CHAPTER

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F. The Engineer of Record shall verify the Geotechnical Investigation performed by the Geotechnical Consultant for the conformance with the Geotechnical Requirements and for conformance with project specific conditions and design requirements.

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11.06 GEOTECHNICAL CONSULTANT'S EFFORTS

A. The Geotechnical Consultant shall confirm with the Engineer of Record that the proper scope of the project is proposed in the proposal.

B. The Geotechnical Consultant shall include the project description, location, and Key Map Number(s) in the geotechnical proposal. Also, a proposed Plan of Boring(s) may be included in the geotechnical proposal, if available.



**Drawing Requirements have been added to "Engineer of Record's Efforts"**

**NOW**



RD'S EFFORTS

EFFORTS

d, at the proposal stage of the project, shall work with the
t to develop the proper scope of the project.

d shall inform the Geotechnical Consultant of any changes
Geotechnical Investigation as soon as possible.

rd shall assist the Geotechnical Consultant in obtaining
lling, if requested by the Geotechnical Consultant.

rd shall provide survey information of the borings (after
echnical Consultant to be used in the Geotechnical
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onmental GIS Digital Submission Requirements.

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tructures) of the project to the Geotechnical Consultant that
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The Engineer of Record shall include geotechnical boring information in the Drawings if both the project scope requires construction of tunnel shafts greater than 30 feet deep and the contract documents utilize City of Houston Standard Specification 02400-Tunnel Shafts. See IDM Chapter 3 for graphic requirements and example plan sheets.

11.4.02.B Precast Storm Manhole Foundations

The engineer of record shall select the foundation type and provide this information to the contractor in the contract documents.

END OF CHAPTER

# QUESTIONS?

Enter it into the chat.

Note the chapter or topic in your question.

We will respond to unanswered questions on our website after this event.

# CHAPTER 13 – GIS DATA DIGITIZATION STANDARDS

## EKATERINA FITOS, GISP
### HOUSTON WATER - PLANNING

# INFRASTRUCTURE DESIGN MANUAL CHAPTER 13

## Summary of changes:

- Addition of Section 5 – Geotechnical and Environmental GIS Digital Submission Requirements

# ELECTRONIC SUBMITTAL OF GEOTECHNICAL & ENVIRONMENTAL DIGITAL DATA

## Required data submissions:

- Boring Points
- Boring Log Test Results Table

The preference is to deliver this data in a file geodatabase. However, data may be delivered in a comma delimited (.CSV) text file, or Excel spreadsheet.

## Accuracy – submeter 2-feet horizontal RMS

# GEODATABASE SUBMISSION REQUIREMENTS

## Feature Class with a related table of test results

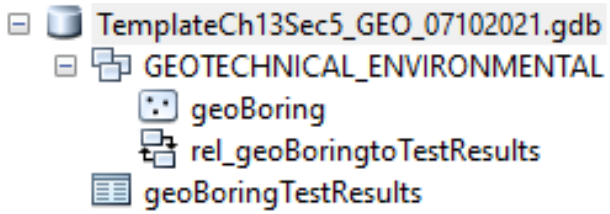


Table 13-46 geoBoring Feature Class Attribute Fields for Geotechnical Borings

| FieldName | Type | Length | Description | AliasName | DomainName |
|---|---|---|---|---|---|
| PROJECTID | Text | 50 | Unique ID for the project populated by the consultant based on report type, year, the project WBS number, and bore ID. Format is: ReportTypeYear_WBSNumber_BoreID | Project ID | |
| WBSNUMBER | Text | 25 | City of Houston assigned number for the project | WBS Number | |
| PROJECTNAME | Text | 250 | City of Houston assigned project name | Project Name | |
| REPORTTYPE | Text | 5 | The report classification content either geotechnical or environmental | Report Type | geoReportType |
| REPORTSIGNEDDATE | Date | | Date the report was signed | Report Signed Date | |
| CONSULTANTNAME | Text | 250 | Name of the firm who produced the report | Consultant Name | |
| BOREID | Text | 25 | Alphanumeric unique identification number assigned to the boring location | Bore ID | |
| X* | Double | | Horizontal coordinate | X | |
| Y* | Double | | Vertical coordinate | Y | |
| LATITUDE** | Double | | Geographic coordinate in decimal degrees format measured North and South of the equator. | Latitude | |
| LONGITUDE** | Double | | Geographic coordinate in decimal degrees format measured East and West of the prime meridian. | Longitude | |
| SURFACEELEV | Double | | Vertical measurement of the height of the land surface (Feet) | Surface Elevation | |
| DEPTH | Double | | Total distance from the top of the surface elevation to the bottom of the boring (Feet) | Depth | |
| WATERENCOUNTERED | Text | 50 | Measurement in Feet at which water was first encountered at the time of drilling | Water Encountered | |
| WATERLEVEL | Text | 50 | Measurement in Feet of the water level 15-20 minutes after water was first encountered | Water Level | |
| READINGDATE | Date | | Date at which the water level measurement in Feet was read 24 hours or more after drilling completed | Reading Date | |
| WATERLEVELREADING | Text | 50 | The water level measurement in Feet read 24 hours or more after drilling completed | Water Level Reading | |
| CONTAMINATION | Short | | Yes/No Field to flag whether or not contamination was detected | Contamination | dYesNo |
| DRILLEDDATE | Date | | Date the boring was drilled | Drilled Date | |

*The field is only required for geotechnical borings and is not a requirement for environmental borings.
**The field is only required for environmental borings and/or test results and is not a requirement for geotechnical borings.

# GEODATABASE SUBMISSION REQUIREMENTS

## Feature Class with a related table of test results

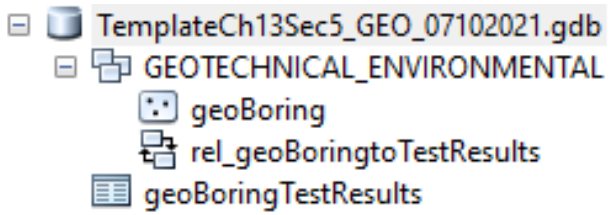


Table 13-47 geoBoringTestResults Table Attribute Fields for Geotechnical Borings

| FieldName | Type | Length | Description | AliasName | DomainName |
|---|---|---|---|---|---|
| PROJECTID | Text | 50 | Unique ID for the project populated by the consultant based on report type, year, the project WBS number, and bore ID. Format is: ReportTypeYear_WBSNumber_BoreID | Project ID | |
| WBSNUMBER | Text | 25 | City of Houston assigned number for the project | WBS Number | |
| PROJECTNAME | Text | 250 | City of Houston assigned project name | Project Name | |
| CONSULTANTPROJECTNO | Text | 50 | Consultant assigned number for the project | Consultant Project Number | |
| REPORTSIGNEDDATE | Date | | Date the report was signed | Report Signed Date | |
| BOREID | Text | 25 | Alphanumeric unique identification number assigned to the boring location | Bore ID | |
| SAMPLENO | Text | 25 | The unique identification number for the sample | Sample Number | |
| SAMPLEDEPTHTOP | Double | | Top depth of the boring in Feet | Sample Depth Top | |
| SAMPLEDEPTHBTM | Double | | Bottom depth of the boring in Feet | Sample Depth Bottom | |
| SAMPLETYPE | Text | 5 | Type of sample taken | Sample Type | geoSampleType |
| SPT | Double | | Standard penetration test (SPT) measurement in blows/Feet | SPT | |
| WATERCONTENT | Double | | Percent water content in sample | Water Content | |
| DRYDENSITY | Double | | Dry density of sample measured in pounds per cubic foot (pcf) | Dry Density | |
| ATTERBERGLIMITSLL | Double | | Atterberg limits – Liquid Limit (%) | Atterberg Limits LL | |
| ATTERBERGLIMITSPL | Double | | Atterberg limits – Plastic Limit (%) | Atterberg Limits PL | |
| ATTERBERGLIMITSPI | Double | | Atterberg limits – Plasticity Index (%) | Atterberg Limits PI | |
| PERPASSSIEVE200 | Double | | Percent passing sieve 200 (%) | Percent Passing Sieve 200 | |
| TSFUNCONFCOMPTEST | Double | | Shear strength (TSF) unconfined compression test | TSF UC Test | |
| TSFUUTEST | Double | | Shear strength (TSF) triaxial compression (UU) test | TSF UU Test | |
| TSFCONFININGPRESS | Double | | Shear strength (TSF) Confining pressure TSF | TSF Confining Pressure | |
| TSFTORVANE | Double | | Shear strength (TSF) torvane | TSF Torvane | |
| TSFPOCKETPENETROMETER | Double | | Shear strength (TSF) pocket penetrometer | TSF Pocket Penetrometer | |
| TYPEOFMATERIAL | Text | 250 | Type of soil material.<br>For geotechnical borings refer to ASTM D2487.<br>For environmental borings refer to ASTM D2488. | Type of Material | |
| PID* | Double | | Photoionization Detector (PID) value (ppm) | PID | |

*The field is only required for environmental borings and/or test results and is not a requirement for geotechnical borings.

# FEATURE CLASS CODES

## Coded Values

Table 13-48 geoYesNo Domain

| Code | Description |
|---|---|
| 0 | No |
| 1 | Yes |

Table 13-49 geoSampleType Domain

| Code | Description |
|---|---|
| UD | Undisturbed Sample |
| SS | Split Spoon Sample |
| AG | Auger Cuttings |
| SPT | Standard Penetration Test |

Table 13-50 geoReportType Domain

| Code | Description |
|---|---|
| GEO | Geotechnical |
| ENV | Environmental |

# GEODATABASE SUBMISSION REQUIREMENTS

## Tabular Data

| | |
|---|---|
| WBS Number | |
| Project Name | |
| Report Type (Geo or Env) | |
| Report Signed Date | |
| Consultant Name | |
| | |

| Bore ID | X | Y | Depth | Water First Encountered at Time of Drilling | Water Level 15-20 minutes after Water was First Encountered | Water Level Measured 24 hours or more After Drilling Completed | | Contamination (Y/N) | Drilled Date |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Reading Date | Water Level Reading | | |

# GEODATABASE SUBMISSION REQUIREMENTS

## Tabular Data

| Field Name | Type | Description | List Values |
|---|---|---|---|
| PROJECTID | Text | Unique ID for the project populated by the consultant based on report type, year, the project WBS number, and bore ID. Format is: ReportTypeYear_WBSNumber_BoreID | |
| WBSNUMBER | Text | City of Houston assigned number for the project | |
| PROJECTNAME | Text | City of Houston assigned project name | |
| REPORTTYPE | Text | The report classification content either geotechnical or environmental | geoReportType |
| REPORTSIGNEDDATE | Date | Date the report was signed | |
| CONSULTANTNAME | Text | Name of the firm who produced the report | |
| BOREID | Text | Alphanumeric unique identification number assigned to the boring location | |
| X* | Numeric | Horizontal coordinate | |
| Y* | Numeric | Vertical coordinate | |
| LATITUDE** | Numeric | Geographic coordinate in decimal degrees format measured North and South of the equator. | |
| LONGITUDE** | Numeric | Geographic coordinate in decimal degrees format measured East and West of the prime meridian. | |
| SURFACEELEV | Numeric | Vertical measurement of the height of the land surface (Feet) | |
| DEPTH | Numeric | Total distance from the top of the surface elevation to the bottom of the boring (Feet) | |
| WATERENCOUNTERED | Text | Measurement in Feet at which water was first encountered at the time of drilling | |
| WATERLEVEL | Text | Measurement in Feet of the water level 15-20 minutes after water was first encountered | |
| READINGDATE | Date | Date at which the water level measurement in Feet was read 24 hours or more after drilling completed | |
| WATERLEVELREADING | Text | The water level measurement in Feet read 24 hours or more after drilling completed | |
| CONTAMINATION | Numeric | Yes/No Field to flag whether or not contamination was detected | dYesNo |
| DRILLEDDATE | Date | Date the boring was drilled | |

The field is only required for geotechnical borings and is not a requirement for environmental borings.

HOUSTON PUBLIC WORKS

# GEODATABASE SUBMISSION REQUIREMENTS

## Tabular Data

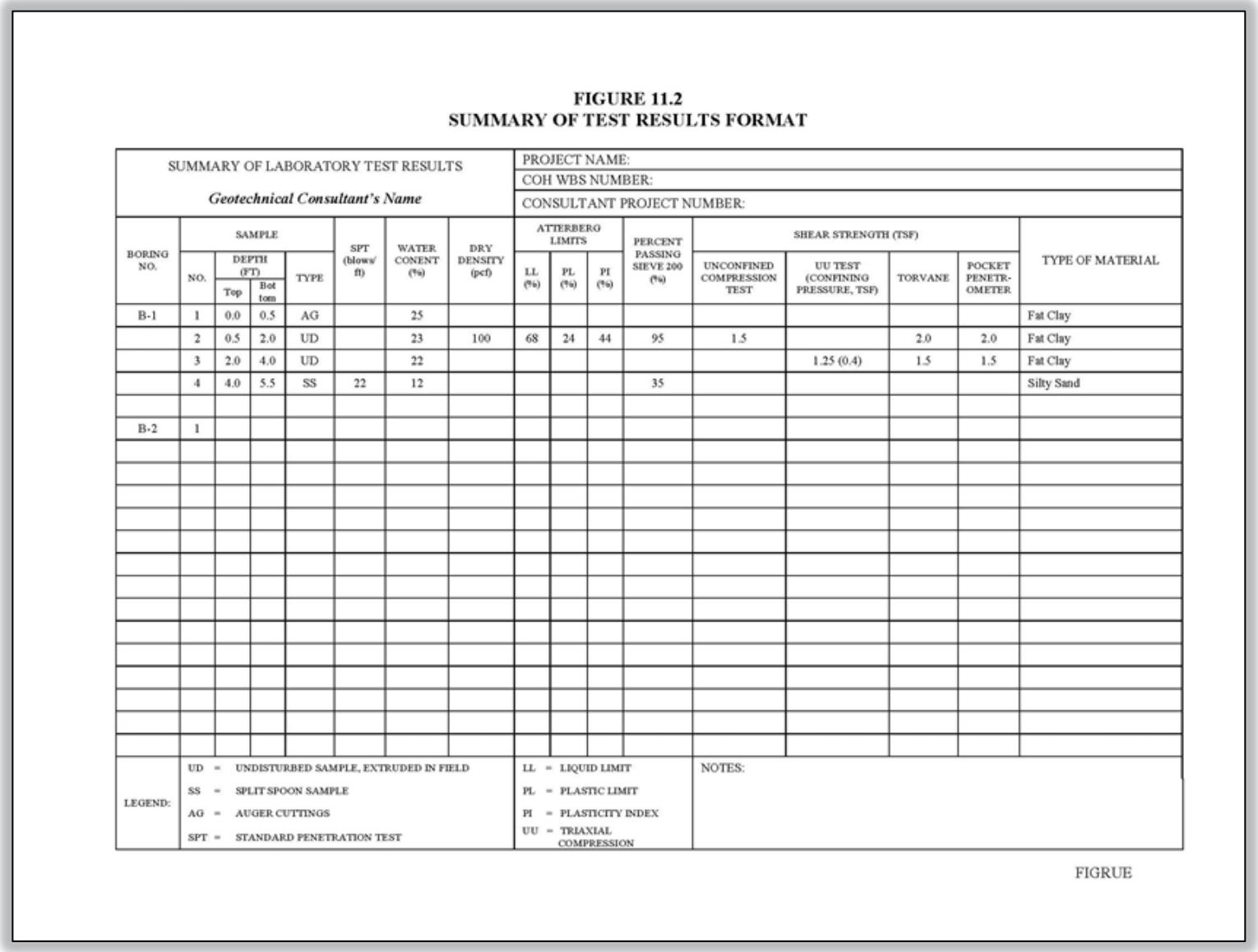

**FIGURE 11.2**
**SUMMARY OF TEST RESULTS FORMAT**

| SUMMARY OF LABORATORY TEST RESULTS<br>*Geotechnical Consultant's Name* | | | | | | | | PROJECT NAME:<br>COH WBS NUMBER:<br>CONSULTANT PROJECT NUMBER: | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BORING NO. | SAMPLE | | | | SPT (blows/ ft) | WATER CONENT (%) | DRY DENSITY (pcf) | ATTERBERG LIMITS | | | PERCENT PASSING SIEVE 200 (%) | SHEAR STRENGTH (TSF) | | | | TYPE OF MATERIAL |
| | NO. | DEPTH (FT) | | TYPE | | | | LL (%) | PL (%) | PI (%) | | UNCONFINED COMPRESSION TEST | UU TEST (CONFINING PRESSURE, TSF) | TORVANE | POCKET PENETR-OMETER | |
| | | Top | Bot tom | | | | | | | | | | | | | |
| B-1 | 1 | 0.0 | 0.5 | AG | | 25 | | | | | | | | | | Fat Clay |
| | 2 | 0.5 | 2.0 | UD | | 23 | 100 | 68 | 24 | 44 | 95 | 1.5 | | 2.0 | 2.0 | Fat Clay |
| | 3 | 2.0 | 4.0 | UD | | 22 | | | | | | | 1.25 (0.4) | 1.5 | 1.5 | Fat Clay |
| | 4 | 4.0 | 5.5 | SS | 22 | 12 | | | | | 35 | | | | | Silty Sand |
| | | | | | | | | | | | | | | | | |
| B-2 | 1 | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |
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| | | | | | | | | | | | | | | | | |
| LEGEND: | UD = UNDISTURBED SAMPLE, EXTRUDED IN FIELD<br>SS = SPLIT SPOON SAMPLE<br>AG = AUGER CUTTINGS<br>SPT = STANDARD PENETRATION TEST | | | | | | | LL = LIQUID LIMIT<br>PL = PLASTIC LIMIT<br>PI = PLASTICITY INDEX<br>UU = TRIAXIAL COMPRESSION | | | | NOTES: | | | | |

FIGRUE

# GEODATABASE SUBMISSION REQUIREMENTS

## Tabular Data

| Field Name | Type | Description | List Values |
|---|---|---|---|
| PROJECTID | Text | Unique ID for the project populated by the consultant based on report type, year, the project WBS number, and bore ID. Format is: ReportTypeYear_WBSNumber_BoreID | |
| WBSNUMBER | Text | City of Houston assigned number for the project | |
| PROJECTNAME | Text | City of Houston assigned project name | |
| CONSULTANTPROJECTNO | Text | Consultant assigned number for the project | |
| REPORTSIGNEDDATE | Date | Date the report was signed | |
| BOREID | Text | Alphanumeric unique identification number assigned to the boring location | |
| SAMPLENO | Text | The unique identification number for the sample | |
| SAMPLEDEPTHTOP | Numeric | Top depth of the boring in Feet | |
| SAMPLEDEPTHBTM | Numeric | Bottom depth of the boring in Feet | |
| SAMPLETYPE | Text | Type of sample taken | geoSampleType |
| SPT | Numeric | Standard penetration test (SPT) measurement in blows/Feet | |
| WATERCONTENT | Numeric | Percent water content in sample | |
| DRYDENSITY | Numeric | Dry density of sample measured in pounds per cubic foot (pcf) | |
| ATTERBERGLIMITSLL | Numeric | Atterberg limits – Liquid Limit (%) | |
| ATTERBERGLIMITSPL | Numeric | Atterberg limits – Plastic Limit (%) | |
| ATTERBERGLIMITSPI | Numeric | Atterberg limits – Plasticity Index (%) | |
| PERPASSSIEVE200 | Numeric | Percent passing sieve 200 (%) | |
| TSFUNCONFCOMPTEST | Numeric | Shear strength (TSF) unconfined compression test | |
| TSFUUTEST | Numeric | Shear strength (TSF) triaxial compression (UU) test | |
| TSFCONFININGPRESS | Numeric | Shear strength (TSF) Confining pressure TSF | |
| TSFTORVANE | Numeric | Shear strength (TSF) torvane | |
| TSFPOCKETPENETROMETER | Numeric | Shear strength (TSF) pocket penetrometer | |
| TYPEOFMATERIAL | Text | Type of soil material. For geotechnical borings refer to ASTM D2487. For environmental borings refer to ASTM D2488. | |
| PID* | Numeric | Photoionization Detector (PID) value (ppm) | |

*The field is only required for environmental borings and/or test results and is not a requirement for geotechnical borings.

# GEOTECHNICAL & ENVIRONMENTAL GIS DEFINITIONS

### 13.5.04 DELIVERABLE FORMATS

The geotechnical and environmental data products may be delivered in one of the following formats:

- Boring Locations (geoBoring) - file geodatabase feature class, comma delimited text file (.CSV), or Excel Spreadsheet; and
- Boring Log Test Results (geoBoringTestResults) - file geodatabase table, comma delimited text file (.CSV), or Excel Spreadsheet.

The preferred delivery format is to submit both the boring locations and the test results within one file geodatabase. Shapefiles will not be accepted as a submission format.

The City will specify the delivery method during project planning.

Table 13-56 Fields Required Feature Class and Table

| FIELD / FEATURECLASS | geoBoring | geoBoringTestResults |
|---|---|---|
| PROJECTID | X | X |
| WBSNUMBER | X | |
| PROJECTNAME | X | |
| REPORTTYPE | X | |
| CONSULTANTPROJECTNO | | X |
| REPORTSIGNEDDATE | X | |
| CONSULTANTNAME | X | |
| BOREID | X | |
| X* | X | |
| Y* | X | |
| LATITUDE** | X | |
| LONGITUDE** | X | |
| SURFACEELEV | X | |
| DEPTH | X | |
| WATERENCOUNTERED | X | |
| WATERLEVEL | X | |
| READINGDATE | X | |
| WATERLEVELREADING | X | |
| CONTAMINATION | X | |
| DRILLEDDATE | X | |
| SAMPLENO | | X |
| SAMPLEDEPTHTOP | | X |
| SAMPLEDEPTHBTM | | X |
| SAMPLETYPE | | X |
| SPT | | X |
| WATERCONTENT | | X |
| DRYDENSITY | | X |
| ATTERBERGLIMITSLL | | X |
| ATTERBERGLIMITSPL | | X |
| ATTERBERGLIMITSPI | | X |
| PERPASSSIEVE200 | | X |
| TSFUNCONFCOMPTEST | | X |
| TSFUUTEST | | X |
| TSFCONFININGPRESS | | X |
| TSFTORVANE | | X |
| TSFPOCKETPENETROMETER | | X |
| TYPEOFMATERIAL | | X |
| PID** | | X |

*The field is only required for geotechnical borings and is not a requirement for environmental borings.

**The field is only required for environmental borings and/or test results and is not a requirement for geotechnical borings.

# QUESTIONS?

Enter it into the chat.

Note the chapter or topic in your question.

We will respond to unanswered questions on our website after this event.

# CHAPTER 9 – STORM WATER DESIGN AND WATER QUALITY REQUIREMENTS

**DR. KATHLIE S. JENG-BULLOCH, PE, D.WRE,CFM**
**HOUSTON PERMITTING CENTER**
**OFFICE OF THE CITY ENGINEER**

HOUSTON PUBLIC WORKS

# TABLE 9.1 – RAINFALL INTENSITY PARAMETERS

| Rainfall Frequency | b (in) | d (min) | e |
|---|---|---|---|
| 2-year | 48.35 | 9.07 | 0.7244 |
| 5-year | 52.32 | 7.88 | 0.6900 |
| 10-year | 54.68 | 6.96 | 0.6623 |
| 25-year | 57.79 | 5.89 | 0.6294 |
| 50-year | 61.00 | 5.46 | 0.6096 |
| 100-year | 60.66 | 4.44 | 0.5797 |
| 500-year | 62.17 | 2.95 | 0.5196 |

The intensity calculation is based on duration equal to the time of concentration.

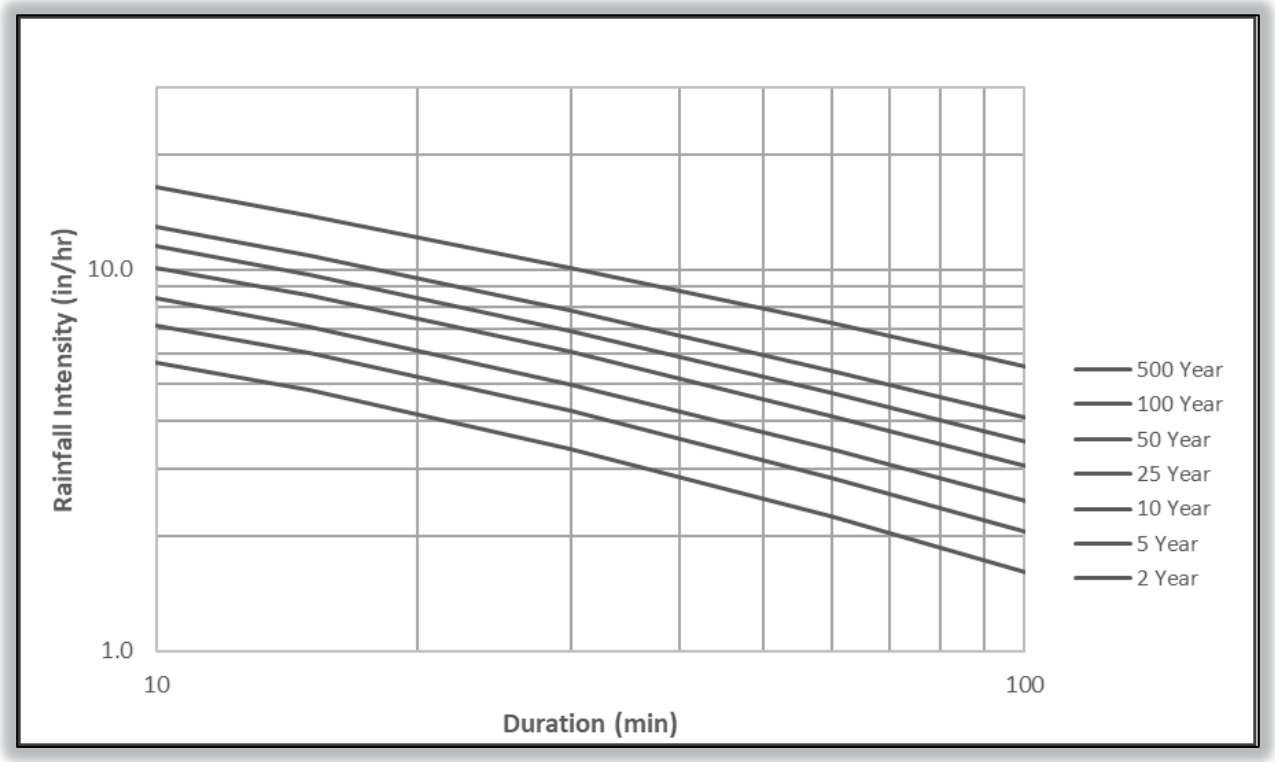
The intensity is calculated as $\mathbf{I = b / (d + Tc)^e}$ ; $T_C = 10\,A^{0.1761} + 15$

A is the area in acres

HOUSTON PUBLIC WORKS

# FIGURE 9.1 – IDF CURVES

## Intensity vs Time of concentration vs Rainfall Frequency (Source: Atlas 14)




The City of Houston requires the rainfall intensity for storm sewer design be determined using the Region 3 data

# 9.2.01.C4.a. PIPE SIZES AND PLACEMENT

a. Use storm sewer and inlet leads with at least 24 inches inside diameter or equivalent cross section. ~~Single Family Residential projects, without sharing storm outfall with others, shall be permitted to use the point of connection through a curb via a 4 inch schedule 40 pipe or to connect to the ditch with 12 inch schedule 40 pipe within the R.O.W.~~ Box culverts shall be at least 3 feet by 2 feet. Closed conduits; circular, elliptical, arch pipe, or box, shall be selected based on hydraulic principles and economy of size and shape.

(1) Only single-family residential projects, without sharing storm outfall with others, shall be permitted to use the point of connection through a curb via a 4-inch schedule 40 pipe OR to connect to the roadside ditch with 12-inch schedule 40 pipe within the R.O.W. This option is only available if curb or ditch is directly fronting the single-family residential lot.

# 9.2.01.C7.I. CONNECTION

l. Only the ~~For~~ private development ~~with internal site drainage,~~ directly behind the inlet shall be permitted to make ~~only~~ one connection ~~is permitted~~ to ~~any one~~ that inlet~~,~~ and that connection (lead) shall be made to the back of the inlet. All other private developments must connect directly to the storm sewer trunkline even if the trunkline must be extended to the front of such development. The extension is to be designed and constructed in accordance with Section 9.2.01.C.4 Pipe Sizes and Placement. Connection shall not be made to the front face ~~and~~ or to the short sides of the inlet ~~unless approved by the City~~. Design the connection not to exceed the pipe capacity minus either the capacity listed in Table 9.2, Standard Storm Sewer Inlets, or calculated inlet inflow.

Note: Development not directly behind the inlet, trying to connect to the inlet some lots away.

# TABLE 9.2- STANDARD STORM SEWER INLETS CAPACITY CHANGES

| COH Std. Inlets | Flow (cfs) |
|---|---|
| TYPE A | ~~5.00~~ 2.5 |
| TYPE C | ~~2.50~~ 5.0 |
| TYPE C-1 | ~~5.00~~ 10.0 |
| TYPE C-2 | ~~10.00~~ 15.0 |
| TYPE C-2A | ~~10.00~~ 20.0 |
| TYPE D | ~~4.00~~ 2.0 |
| TYPE D-1 | ~~3.00~~ 2.5 |
| TYPE E | ~~10.00~~ 20.0 |

# 9.2.01.G DESIGN OF OUTFALLS, AND 9.2.01.H STORMWATER DETENTION

## Design of Outfalls:

- If the criteria conflicts with City of Houston, the more restrictive criteria shall govern.

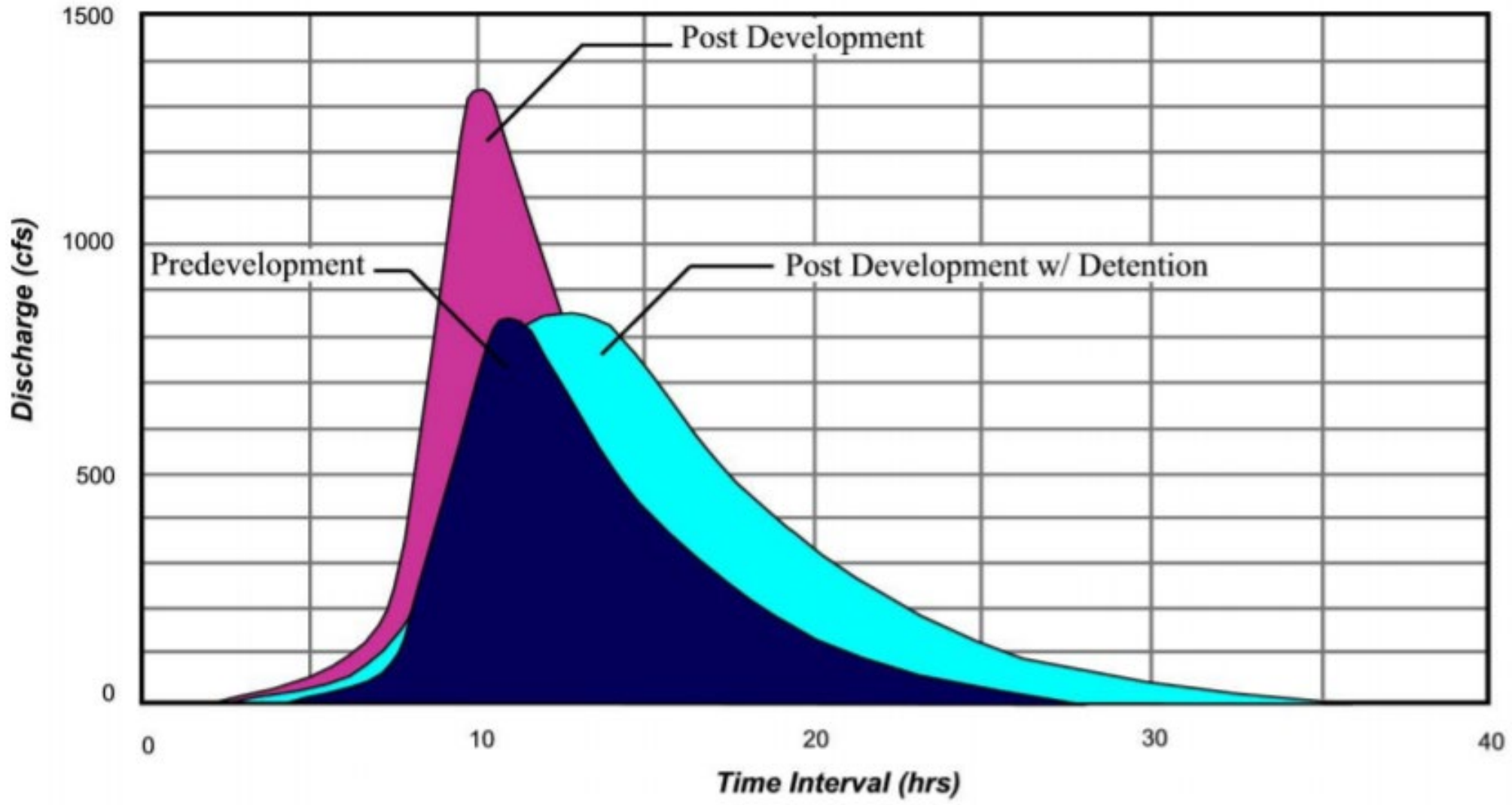
## Stormwater Detention:

- If the detention criteria conflicts with HCFCD, HC, or TxDOT, the more restrictive criteria shall govern
- City no longer allows timing analysis to avoid detention requirements

# STORM WATER REVIEW: KEY POINTS

- "No Detention Required" does not equate to "No Storm Discipline Review"
- Storm Water Discipline Reviews: Grading, Elevations, Sheet Flow within Private Property, Roof Drain, Swale, Detention, etc.
- Engineer must ensure that there is no Sheet Flow to Neighboring Properties.

# CALCULATING DETENTION VOLUME



# DETENTION REQUIREMENTS

- intended to mitigate the effect of new development or redevelopment or site modifications on the existing drainage system
- based on the acreage of the ***disturbed area that results in impervious surface***

# DESIGN CONDITION

- **Condition 1:** Plat, Replat, Change the Use, or Subdividing any Tract to Reduce Stormwater Detention Requirements will not be Permitted.  Original Tract Size on Plat, Replat, Change in use, or Subdividing will be Used to Determine Stormwater Detention Requirements

- **Condition 2:** The Area of: Common/Shared Driveway, Access Easement, 28’ PAE, Alleys, or any Accessway.

**(Min 0.75 acre-ft per acre) X  (Entire Disturbed Area, No 65% Exemption).**

# DETENTION REQUIREMENT FOR SINGLE FAMILY RESIDENTIAL

**(NOT UNDER CONDITION 1, CONDITION 2 WILL BE CALCULATED SEPARATELY)**

| development type | % impervious | lot size | pre-2021 rate | current rate |
|---|---|---|---|---|
| Single family residential | <=65% | 15,000 SF or less | 0 acre-ft/acre | 0 acre-ft/acre |
| Single family residential | > 65% | 15,000 SF or less | 0.20 acre-ft/acre exceeding 65% | 0.75 acre-ft/acre exceeding 65% |
| Single family residential | any | over 15,000 SF less than one acre | 0.20 acre-ft/acre | 0.75 acre-ft/acre |
| Single family residential | any | greater than or equal to one acre + less than 20 acres (previously 50 acres) | 0.50 acre-ft/acre | use Detention Rate Curve |
| Single family residential | any | greater than or equal to 20 acres (previously 50 acres) | HCFCD Policy Criteria and Procedures Manual | **HCFCD Policy Criteria and Procedures Manual |

# DETENTION REQUIREMENT FOR OTHER TYPES OF DEVELOPMENT

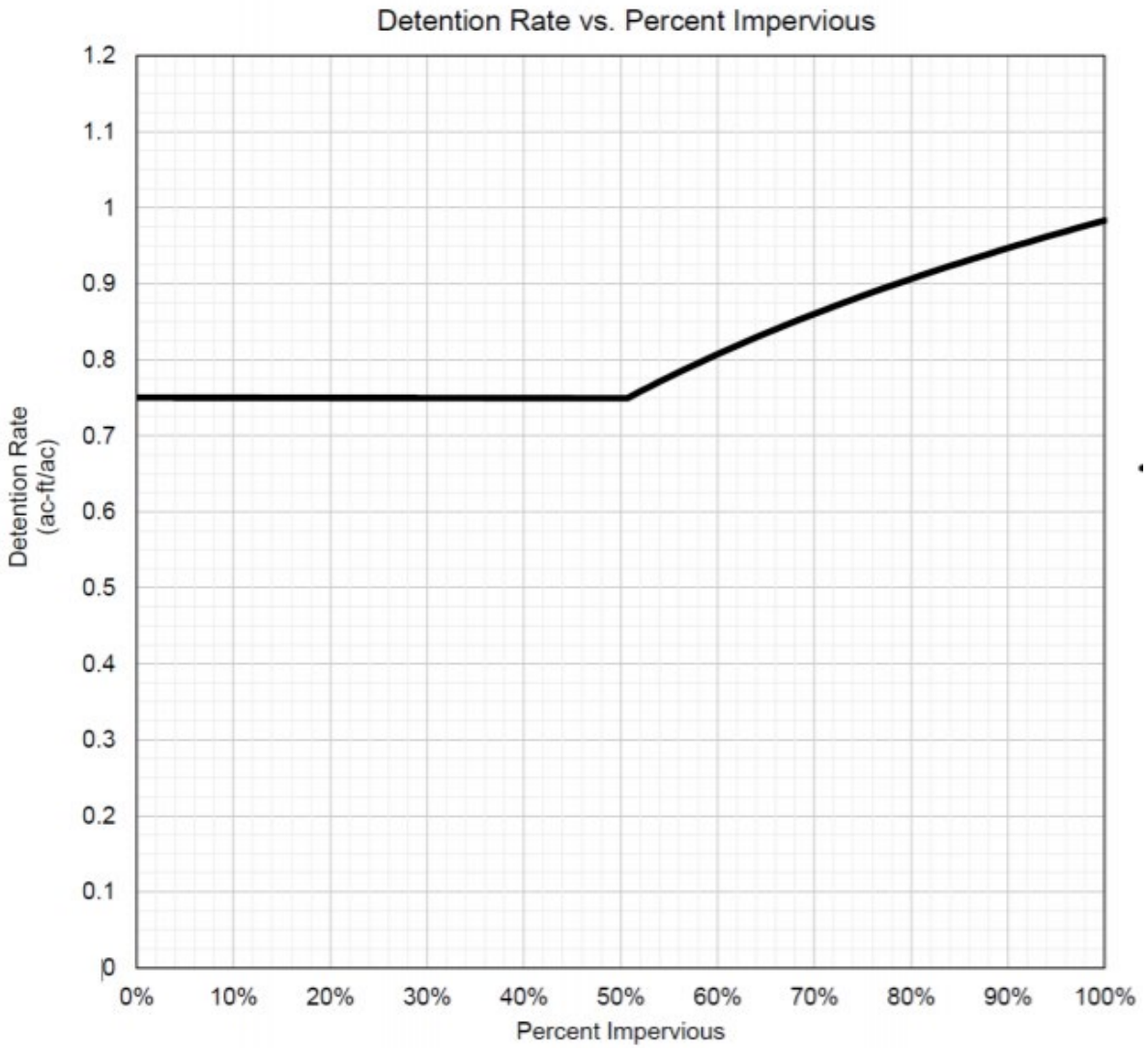
**(NOT UNDER CONDITION 1, CONDITION 2 WILL BE CALCULATED SEPARATELY)**

| development type | % impervious | lot size | pre-2021 rate | current rate |
|---|---|---|---|---|
| Not single family residential | any | < 1acre | 0.50 acre-ft/acre | 0.75 acre-ft/acre |
| Not single family residential | any | greater than or equal to 1 acre + less than or equal to 20 acres (previously 50 acres) | 0.50 acre-ft/acre | use Detention Rate Curve |
| Not single family residential | any | greater than 20 acres (previously 50 acres) | HCFCD Policy Criteria and Procedures Manual | **HCFCD Policy Criteria and Procedures Manual |

** Projects inside City Limits, the min Detention Rate = 0.75 acre-ft/acre; outside City Limits the more restrictive criteria shall govern.

# DETENTION RATE CURVE

| Proposed Percent Impervious | Minimum Detention Rate acre-foot/acre |
|---|---|
| 0% - 51% | 0.75 |
| 55% | 0.78 |
| 60% | 0.81 |
| 65% | 0.83 |
| 70% | 0.86 |
| 75% | 0.88 |
| 80% | 0.91 |
| 85% | 0.93 |
| 90% | 0.95 |
| 95% | 0.97 |
| 100% | 0.98 |

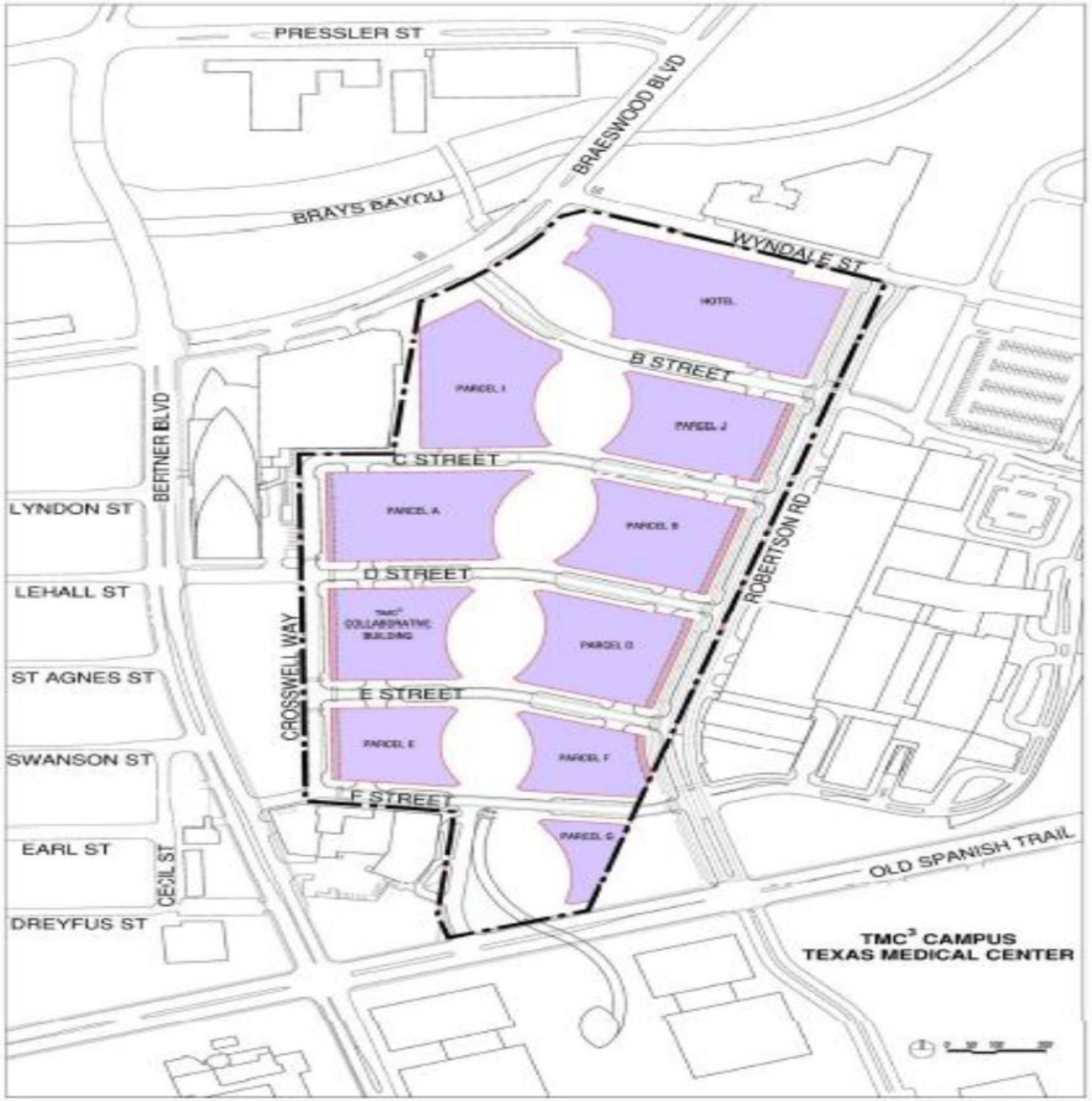


# REDEVELOPMENT

| location | area requiring detention |
|---|---|
| Central Business District (within Interstate Highways 10, 45 and 59) | ~~increased impervious cover~~ No detention required. It is required, where applicable, to include LID techniques for any development. |
| Medical Center TMC3 | 0.65 ac-ft/ac proposed (Dec 30, 2020) to provide for 100% of the tract. |
| All other areas | Disturbed area resulting in impervious cover |

# TMC 3

Exhibit



# QUESTIONS?

Enter it into the chat.

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# CHAPTER 17 – BICYCLE, TRANSIT & PEDESTRIAN DESIGN REQUIREMENTS


## IAN HLAVACEK, P.E.
## TRANSPORTATION & DRAINAGE OPERATIONS
## TRANSPORTATION ENGINEERING

# WALKABLE PLACES & TRANSIT-ORIENTED DEVELOPMENT (TOD)

Passed by City Council on 8/5/2020

- Primarily aimed at development
- Sidewalk standards tied to IDM

https://www.houstontx.gov/planning/Commissions/committee_walkable-places.html

# PEDESTRIAN REALM

Pedestrian realm =

- Sidewalk
- Safety buffer (next to street)
- Frontage buffer (next to ROW)

**NOT always the same as the "S" dimension in Ch 10**

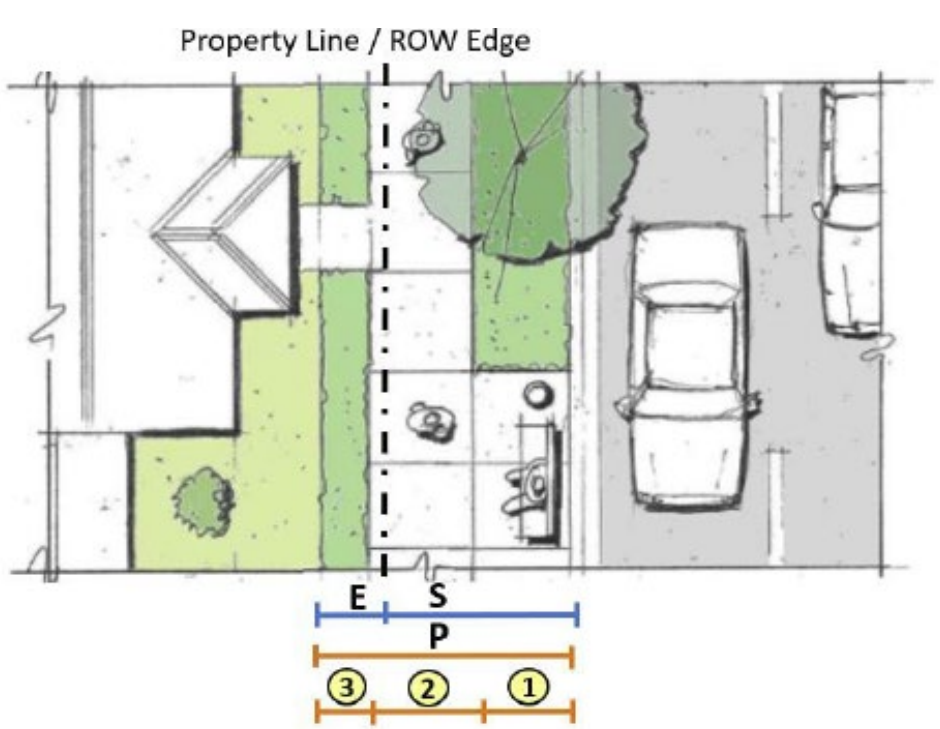
# PEDESTRIAN REALM - EASEMENTS

**Sidewalk**
Free and unobstructed

**Safety/Frontage Buffers**
Acceptable Components

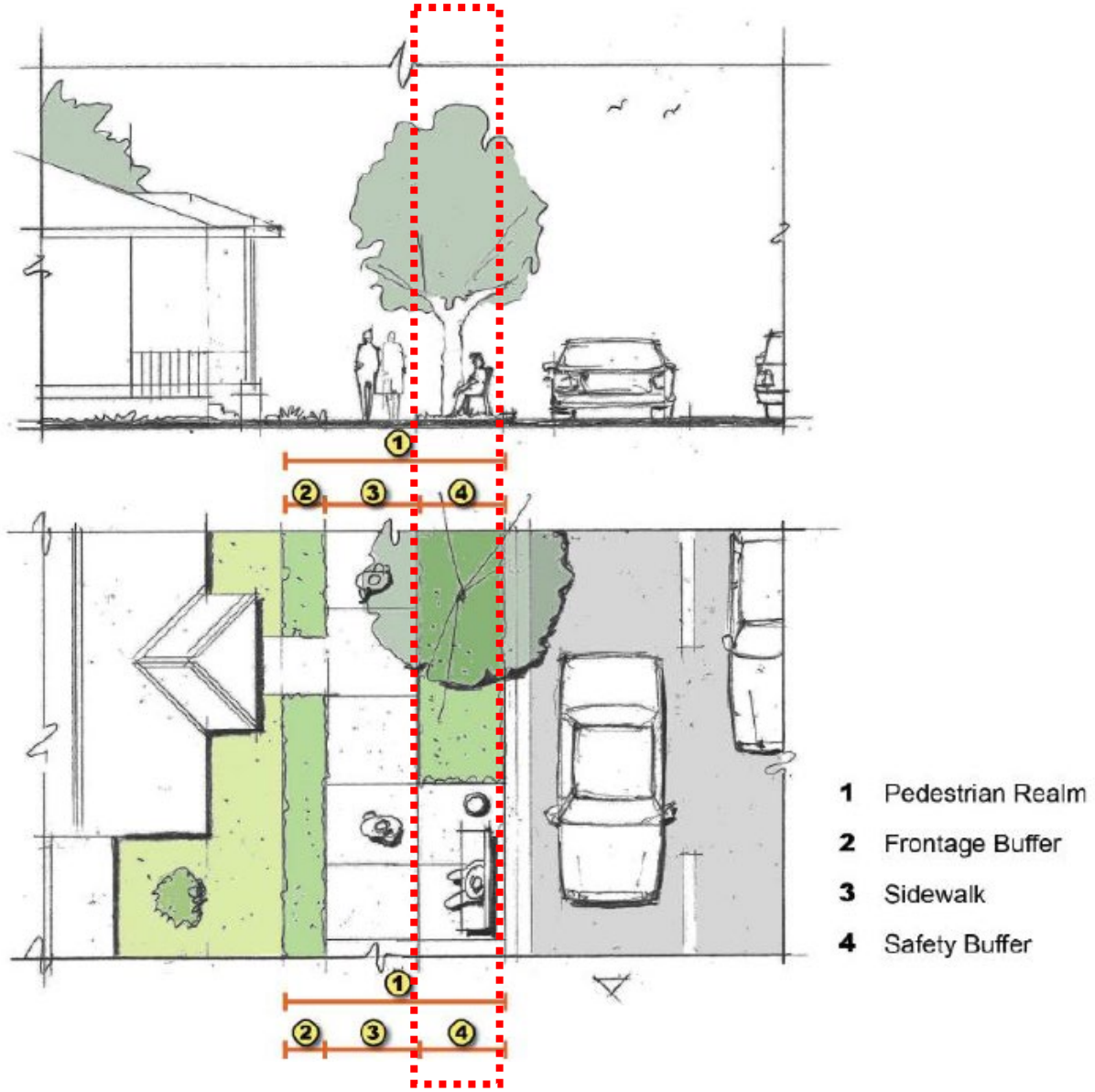
# PEDESTRIAN REALM - EASEMENTS

**Ped Realm 100% In Public ROW**




**Ped Realm Partially in Easement**

S "S" dimension
E Public Easement
P Pedestrian Realm
1 Safety Buffer
2 Sidewalk
3 Frontage Buffer




# SAFETY BUFFER

Acceptable:

- Paved or grass
- Utilities, poles, signs
- Trees

**NO VEHICLE USES (e.g. cut-back parking)**

# SAFETY & FRONTAGE BUFFERS

## 2020

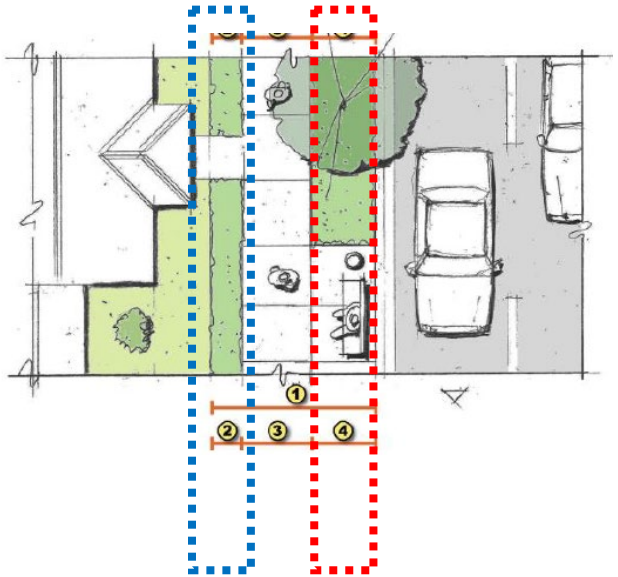
Table 17.2 - Minimum Sidewalk Widths

| | Desirable Minimum (ft) | Absolute Minimum (ft) |
|---|---|---|
| Pedestrian Realm Width | 15 | 10 |
| Sidewalk Width (Major Thoroughfare, Collector, Transit Street, Type A Street) | 6-10+ | 6 |
| Sidewalk Width (Local) | 5+ | 5 |
| Frontage Buffer | 3 | 0 |
| Safety Buffer | 4 | 2 |

## 2021

Table 17.2 – Frontage Buffer and Safety Buffer Width Standards

| Classification | Optimal | Minimum |
|---|---|---|
| Safety Buffer | 6 feet or more | 4 feet |
| Frontage Buffer | 3 feet or more | 1 foot |

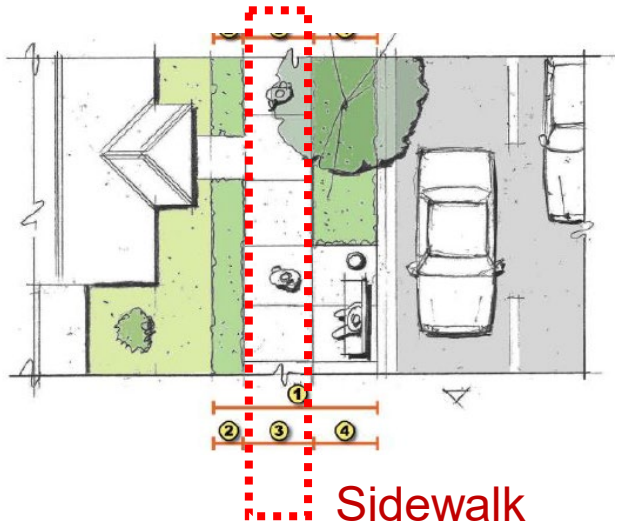


# SIDEWALK WIDTH

## 2020

Table 17.2 - Minimum Sidewalk Widths

| | Desirable Minimum (ft) | Absolute Minimum (ft) |
|---|---|---|
| Pedestrian Realm Width | 15 | 10 |
| Sidewalk Width (Major Thoroughfare, Collector, Transit Street, Type A Street) | 6-10+ | 6 |
| Sidewalk Width (Local) | 5+ | 5 |
| Frontage Buffer | 3 | 0 |
| Safety Buffer | 4 | 2 |




## 2021

Table 17.3 – Minimum Sidewalk Width Standards

| Street Type | Type | Minimum Width |
|---|---|---|
| Within Central Business District[4] | All | 8 feet |
| Major Thoroughfare | Walkable Places Street | As designated by the Walkable Places Plan |
| | TOD Street | 8 feet |
| | All Others | 6 feet |
| All Other Public Streets | Walkable Places Street | As designated by the Walkable Places Plan |
| | TOD Street | 6 feet |
| | All Others | 5 feet |

# SAFETY & VISIBILITY BUFFER

Sec. 40-32. - Pedestrian safety and visibility buffer.

(a) It shall be unlawful for any person without an approved application to build, construct, plant, place, or otherwise cause a visual obstruction within the pedestrian safety and visibility buffer adjacent to a driveway where vehicular traffic exits onto a public street and crosses a sidewalk required by article XXII of this chapter.

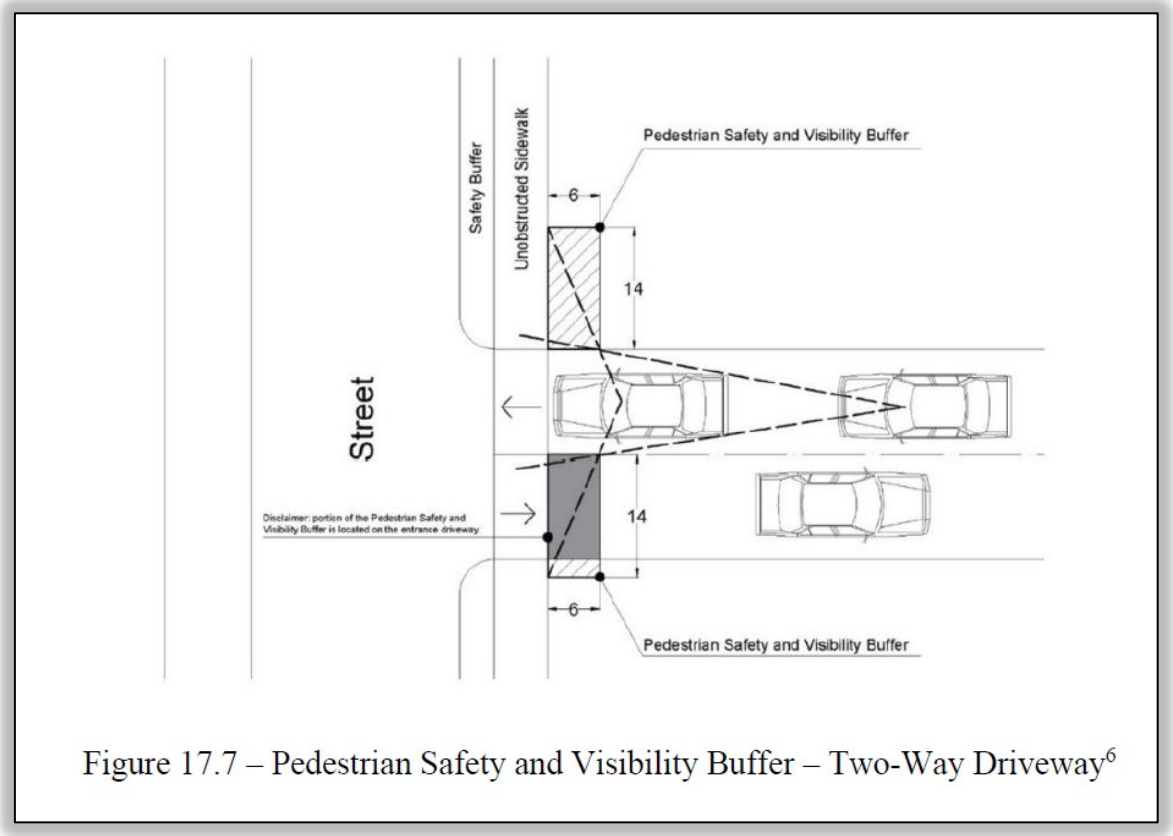



Figure 17.7 – Pedestrian Safety and Visibility Buffer – Two-Way Driveway[6]

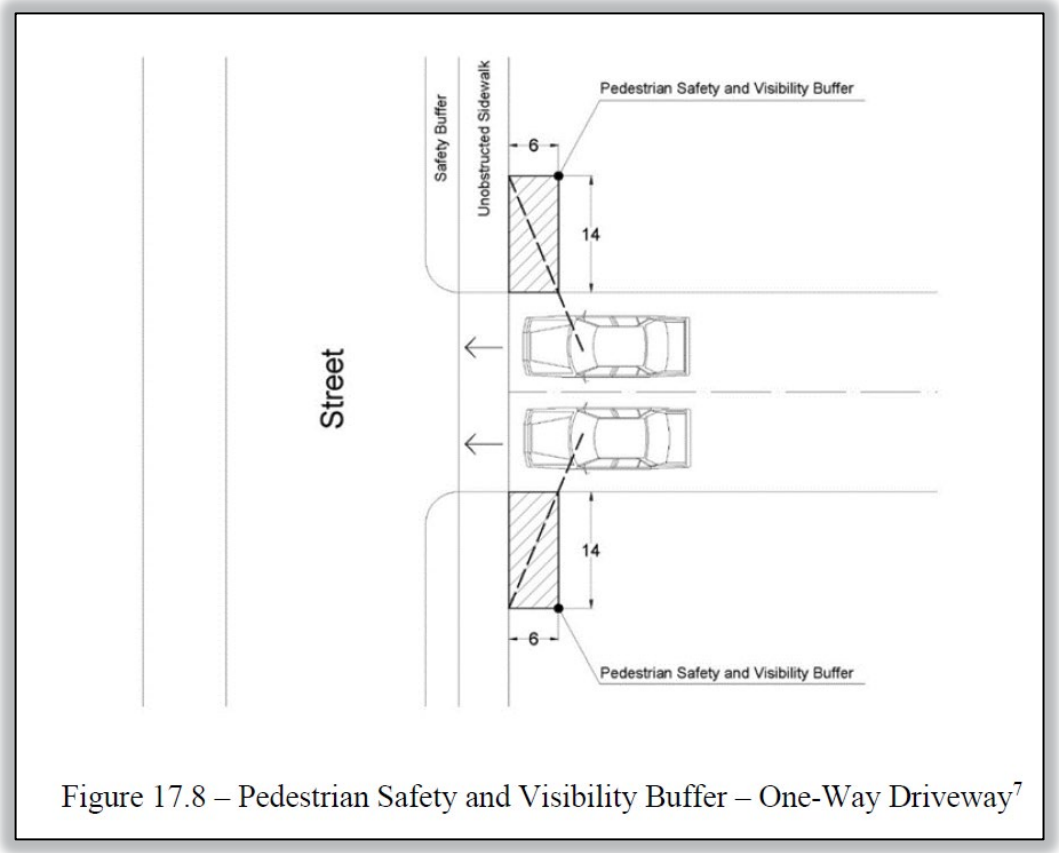



Figure 17.8 – Pedestrian Safety and Visibility Buffer – One-Way Driveway[7]

# PEDESTRIAN REALM DIMENSIONS

## 2020

Standards for:

- Pedestrian Realm
- Sidewalk
- Safety Buffer
- Frontage Buffer

## 2021

Standards for:

- ~~Pedestrian Realm~~
- Sidewalk
- Safety Buffer
- Frontage Buffer

# WALKABLE PLACES / TOD

**Sec. 42-621. - Pedestrian realm standards.**

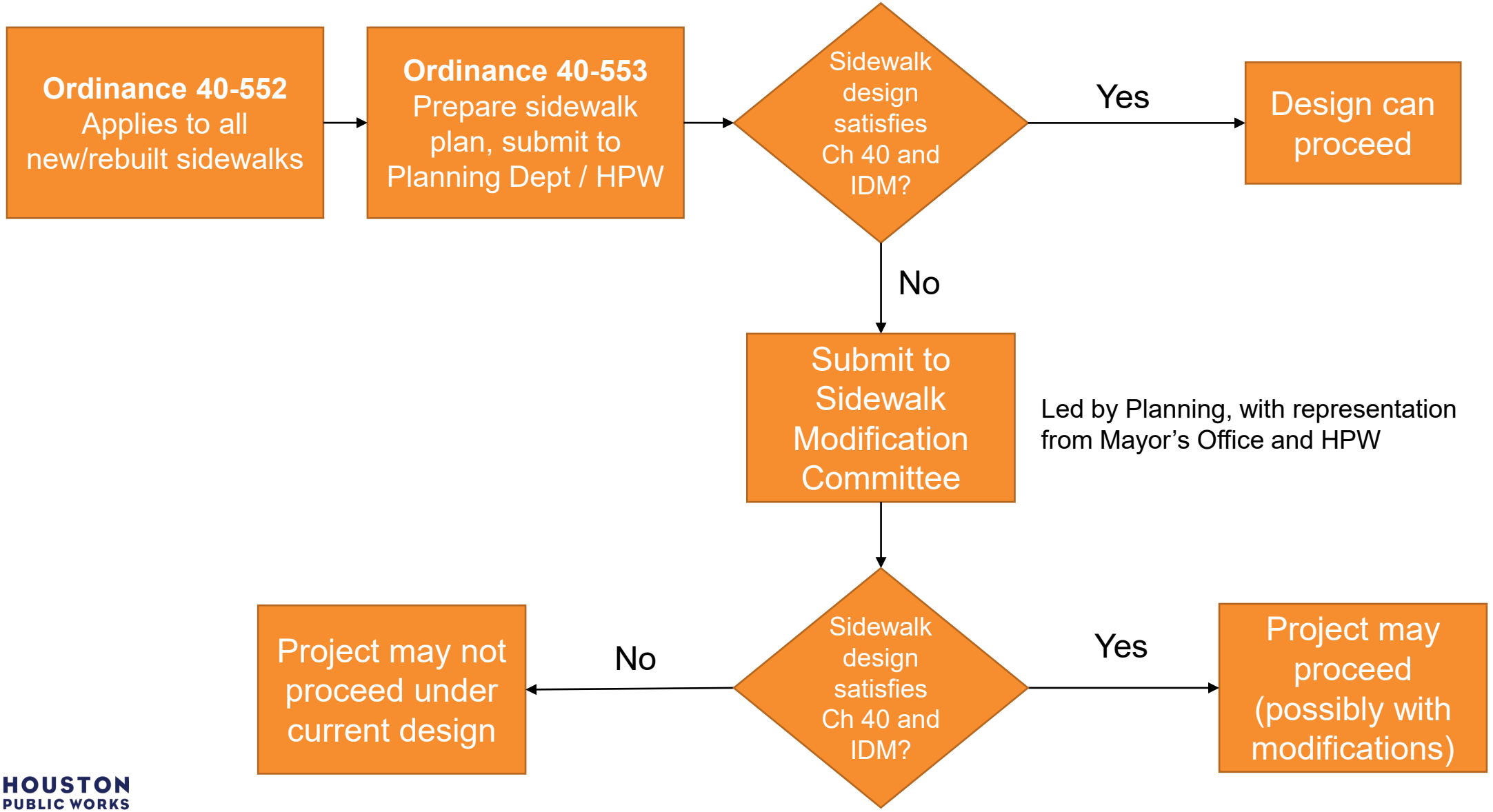
(a) The pedestrian realm shall comply with all the following standards, unless a modification is granted under section 42-604 of this Code:

(1) Meet the minimum width standards shown below:

"P"

| Classification | Street Type | Minimum Width of the Pedestrian Realm |
|---|---|---|
| WP Street | All | As established by the walkable places plan |
| Transit Corridor Street | Only one vehicular through traffic lane in each direction | 15 feet |
| | All others | 20 feet |
| TOD Street | Major thoroughfare with a right-of-way width of 80 feet or less as designated by the MTFP | 15 feet |
| | All other major thoroughfares | 20 feet |
| | Any street that is not curb and gutter | 10 feet measured from the functional edge furthest from the roadway of an adequate drainage facility, as approved by the city engineer |
| | All others | 15 feet |

# SIDEWALK APPROVALS & MODIFICATIONS




HOUSTON PUBLIC WORKS

# CH 40/42 SIDEWALK REQUIREMENTS

**Contact:**

Muxian Fang
Principal Planner
Planning & Development Department
muxian.fang@houstontx.gov
(832) 393-6537

# QUESTIONS?

Enter it into the chat.

Note the chapter or topic in your question.

We will respond to unanswered questions on our website after this event.

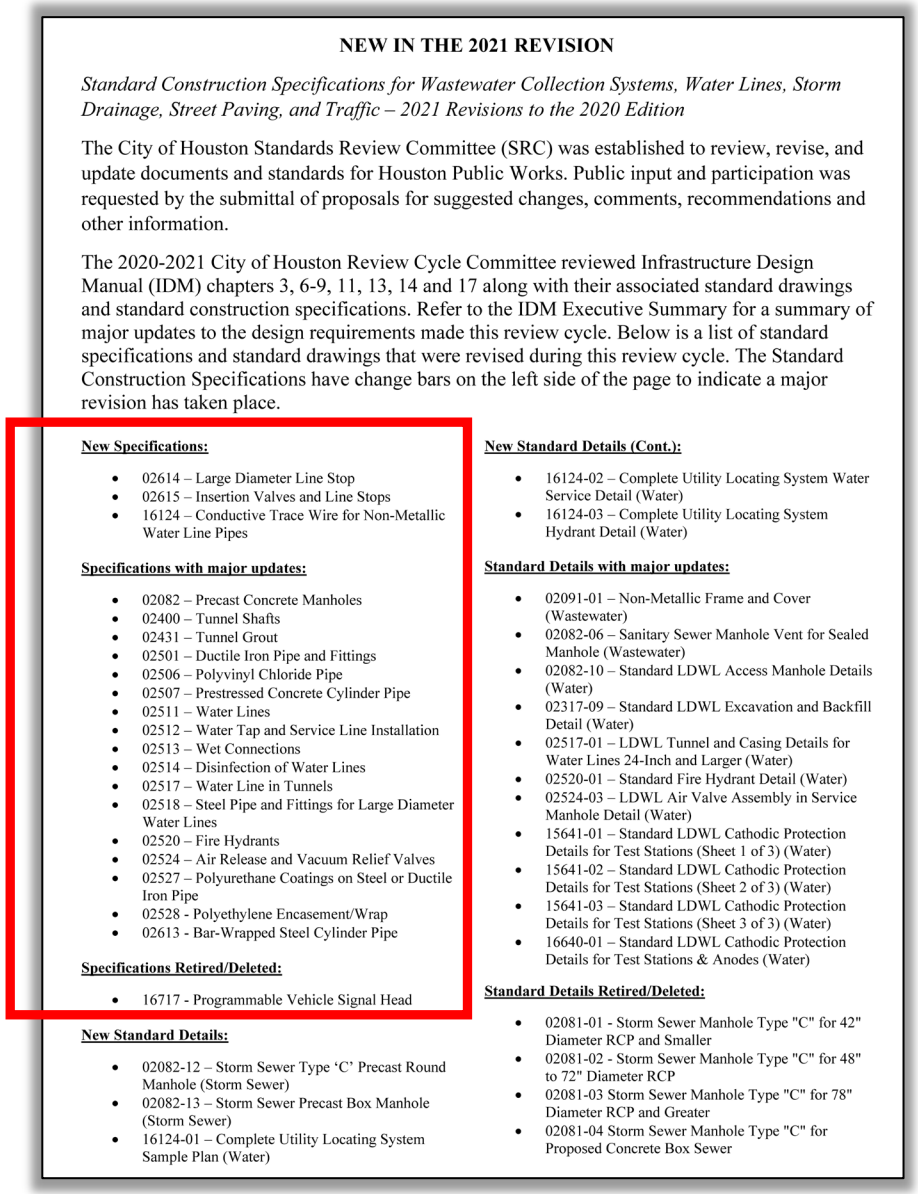
# CONSTRUCTION SPECIFICATIONS


## LUIS GARZA, P.E.
## OFFICE OF THE CITY ENGINEER
## STANDARDS AND SPECIFICATIONS

# DIVISION 01 – GENERAL REQUIREMENTS

**The specification year of release was updated in the header**

# DIVISION 2-16 - STANDARD CONSTRUCTION SPECS



**NEW IN THE 2021 REVISION**

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- 02615 – Insertion Valves and Line Stops
- 16124 – Conductive Trace Wire for Non-Metallic Water Line Pipes

**Specifications with major updates:**

- 02082 – Precast Concrete Manholes
- 02400 – Tunnel Shafts
- 02431 – Tunnel Grout
- 02501 – Ductile Iron Pipe and Fittings
- 02506 – Polyvinyl Chloride Pipe
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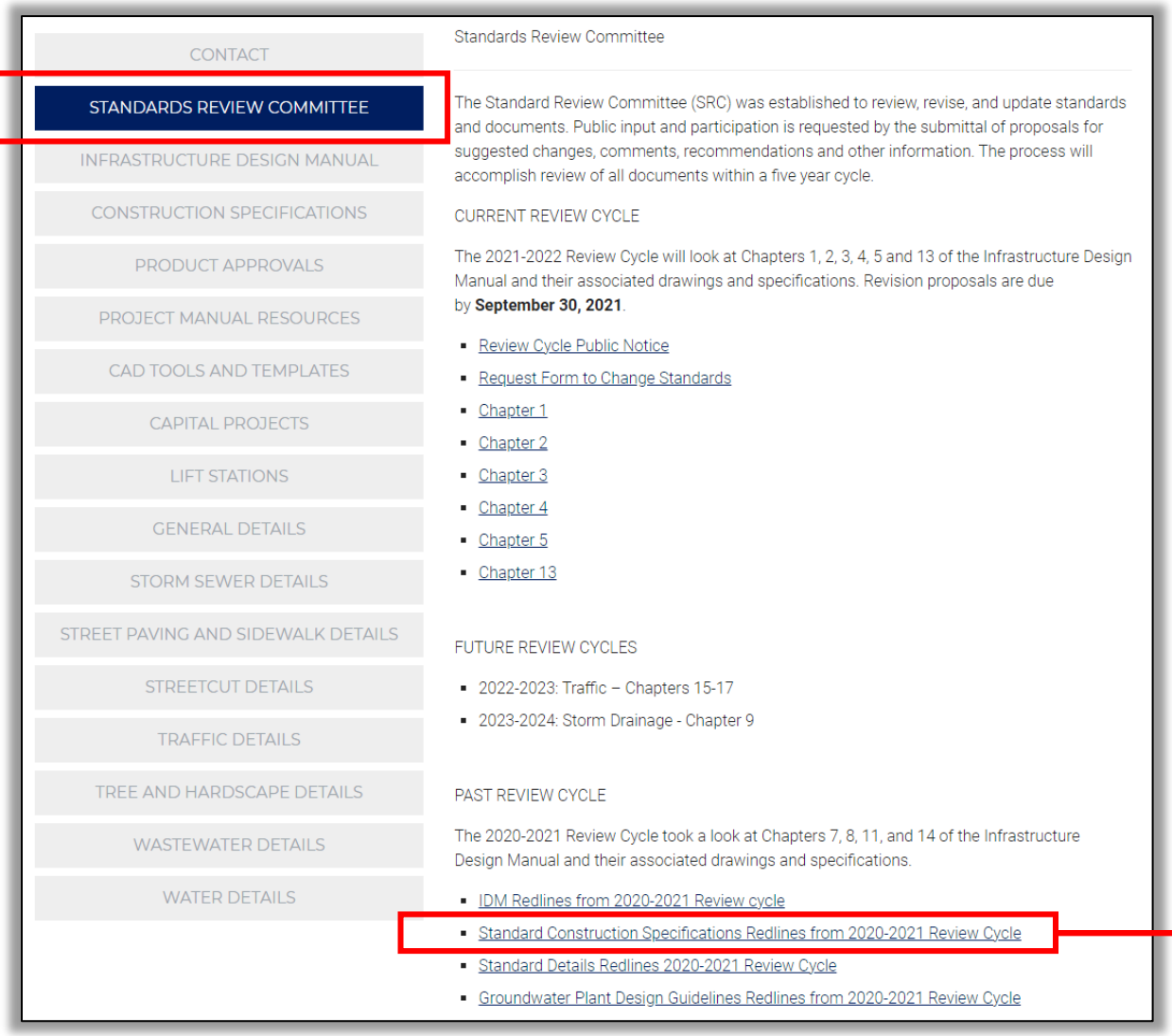
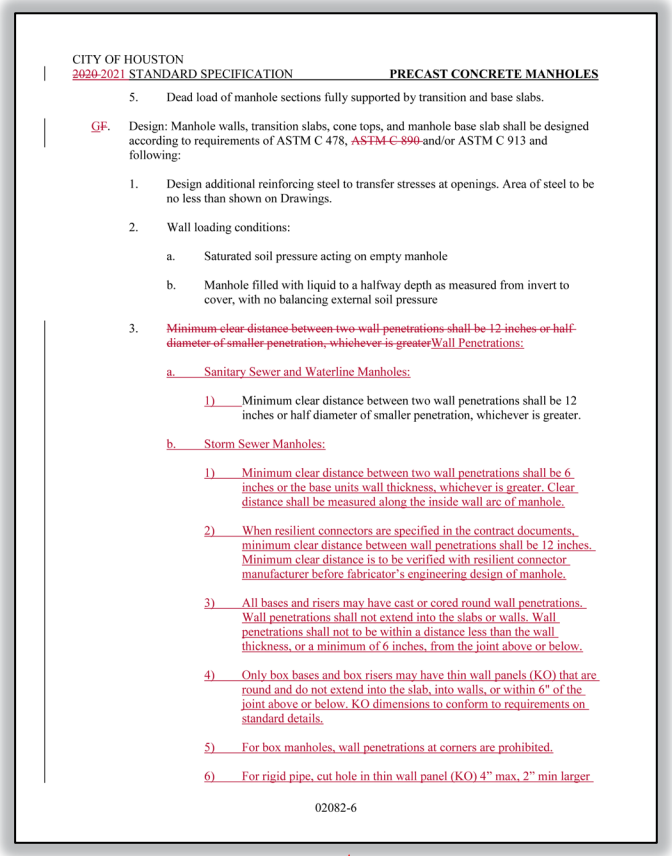
# SPECIFICATION REDLINES



CITY OF HOUSTON
~~2020~~-2021 STANDARD SPECIFICATION **PRECAST CONCRETE MANHOLES**

5. Dead load of manhole sections fully supported by transition and base slabs.

~~G~~F. Design: Manhole walls, transition slabs, cone tops, and manhole base slab shall be designed according to requirements of ASTM C 478, ~~ASTM C 890~~ and/or ASTM C 913 and following:

1. Design additional reinforcing steel to transfer stresses at openings. Area of steel to be no less than shown on Drawings.

2. Wall loading conditions:

   a. Saturated soil pressure acting on empty manhole

   b. Manhole filled with liquid to a halfway depth as measured from invert to cover, with no balancing external soil pressure

3. ~~Minimum clear distance between two wall penetrations shall be 12 inches or half diameter of smaller penetration, whichever is greater~~Wall Penetrations:

   a. Sanitary Sewer and Waterline Manholes:

      1) Minimum clear distance between two wall penetrations shall be 12 inches or half diameter of smaller penetration, whichever is greater.

   b. Storm Sewer Manholes:

      1) Minimum clear distance between two wall penetrations shall be 6 inches or the base units wall thickness, whichever is greater. Clear distance shall be measured along the inside wall arc of manhole.

      2) When resilient connectors are specified in the contract documents, minimum clear distance between wall penetrations shall be 12 inches. Minimum clear distance is to be verified with resilient connector manufacturer before fabricator's engineering design of manhole.

      3) All bases and risers may have cast or cored round wall penetrations. Wall penetrations shall not extend into the slabs or walls. Wall penetrations shall not to be within a distance less than the wall thickness, or a minimum of 6 inches, from the joint above or below.

      4) Only box bases and box risers may have thin wall panels (KO) that are round and do not extend into the slab, into walls, or within 6" of the joint above or below. KO dimensions to conform to requirements on standard details.

      5) For box manholes, wall penetrations at corners are prohibited.

      6) For rigid pipe, cut hole in thin wall panel (KO) 4" max, 2" min larger

02082-6

# HS-20 TO LRFD HL-93 UPDATE



for critical structures located within radius of shaft center equal to shaft depth plus shaft radius, measured in plan. Include photographs or video of any existing damage to structures in vicinity of shafts in assessment reports.

F. Submit shaft surface settlement monitoring plan for review prior to construction. Identify location of settlement monitoring points, reference benchmarks, survey frequency and procedures, and reporting formats on plan.

G. Submit readings of monitoring plans to Project Manager as soon as readings have been taken.

H. Submit shaft temporary deck drawings and calculations to Project Manager, signed and sealed by Contractor's Professional Engineer in event that shaft is not needed for immediate construction activity, in conformance with Paragraph 3.03, Shaft Construction.

1.05 PERFORMANCE REQUIREMENTS

A. Shaft design must include allowance for contractor's equipment and stored material and spoil stockpile as appropriate. Design must also allow for HL-93 highway loading if located in the vicinity of a paved area.

# 02514 – DISINFECTION OF WATERLINES UPDATE

E. Chlorine Disinfection for Connections and/or Repairs to Existing Mains less than or equal to 20-feet in length. When directed by Project Manager, follow procedures for disinfection by swabbing as listed below.

1. Comply with requirements of AWWA C 651 – Standard for Disinfecting Water Mains.

2. Minimize entry of contaminants into existing pipe by using temporary caps or other means. Dewater excavation and prevent entry of dirty water into pipe. Examine interior of existing pipe and remove pieces of pipe, scale, and other debris.

3. Coordinate with Project Manager for operation of valves and flushing line as necessary to complete disinfection procedures.

4. Prior to isolation of water line, take chlorine residual test upstream of repair location, record results.

~~1.~~5. Use appropriate personal protective equipment including rubber gloves and goggles. When necessary, use respiratory protection.

6. Mix a solution of 2 oz. of calcium hypochlorite (65% available chlorine) and 1 gallons of water, or 1 gallon of 5 percent bleach and 4 gallons of water.

7. Thoroughly swab new pieces of pipe, couplings, clamps, sleeves, and other components of pipe connection or repair using clean rags saturated with mixture or sprayer. A clean mop saturated with mixture may be used for longer pieces of pipe. Swab existing pipe exposed inside excavation.

8. After repair or connection is complete in place, coordinate with Project Manager to flush area of repair until water is clear. Obtain chlorine residual from downstream source. Compare results with previous chlorine residual standard.

9. If downstream chlorine results are higher than the upstream results, continue flushing until the downstream results equals the initial upstream result.

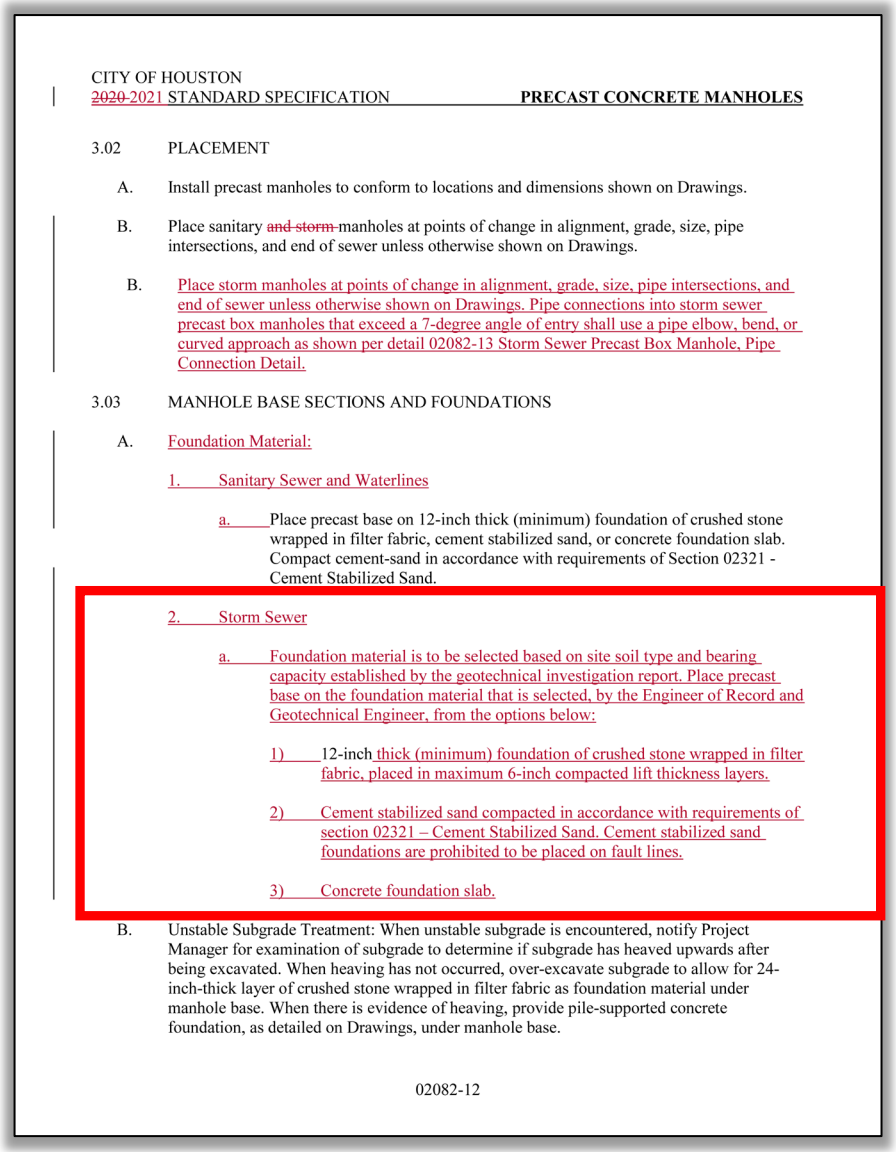
10. If downstream residuals are equal to or lower than upstream results, co-ordinate with Project Manager to re-isolate line segment and re-swab newly installed pipe and fittings. Return to step 8.

~~D.~~11. When chlorine residual downstream of repair equals the initial upstream results, slowly and fully open all valves isolated and proceed to backfill per Section 02317 - Excavation and Backfill for Utilities.

# 02082 – PRE-CAST CONCRETE MANHOLES

## PC Manhole Spec Additions:

- Various additions made to improve performance of PC manholes
- Updates are tailored to Storm Water(SW) Manholes
- Storm water manholes prohibit mortar use for connections to pipes
- Foundation material to be selected by the Engineer of Record & Geotech. Engineer from available options



CITY OF HOUSTON
~~2020~~ 2021 STANDARD SPECIFICATION **PRECAST CONCRETE MANHOLES**

3.02 PLACEMENT

A. Install precast manholes to conform to locations and dimensions shown on Drawings.

B. Place sanitary ~~and storm~~ manholes at points of change in alignment, grade, size, pipe intersections, and end of sewer unless otherwise shown on Drawings.

B. Place storm manholes at points of change in alignment, grade, size, pipe intersections, and end of sewer unless otherwise shown on Drawings. Pipe connections into storm sewer precast box manholes that exceed a 7-degree angle of entry shall use a pipe elbow, bend, or curved approach as shown per detail 02082-13 Storm Sewer Precast Box Manhole, Pipe Connection Detail.

3.03 MANHOLE BASE SECTIONS AND FOUNDATIONS

A. Foundation Material:

1. Sanitary Sewer and Waterlines

a. Place precast base on 12-inch thick (minimum) foundation of crushed stone wrapped in filter fabric, cement stabilized sand, or concrete foundation slab. Compact cement-sand in accordance with requirements of Section 02321 - Cement Stabilized Sand.

2. Storm Sewer

a. Foundation material is to be selected based on site soil type and bearing capacity established by the geotechnical investigation report. Place precast base on the foundation material that is selected, by the Engineer of Record and Geotechnical Engineer, from the options below:

1) 12-inch thick (minimum) foundation of crushed stone wrapped in filter fabric, placed in maximum 6-inch compacted lift thickness layers.

2) Cement stabilized sand compacted in accordance with requirements of section 02321 – Cement Stabilized Sand. Cement stabilized sand foundations are prohibited to be placed on fault lines.

3) Concrete foundation slab.

B. Unstable Subgrade Treatment: When unstable subgrade is encountered, notify Project Manager for examination of subgrade to determine if subgrade has heaved upwards after being excavated. When heaving has not occurred, over-excavate subgrade to allow for 24-inch-thick layer of crushed stone wrapped in filter fabric as foundation material under manhole base. When there is evidence of heaving, provide pile-supported concrete foundation, as detailed on Drawings, under manhole base.

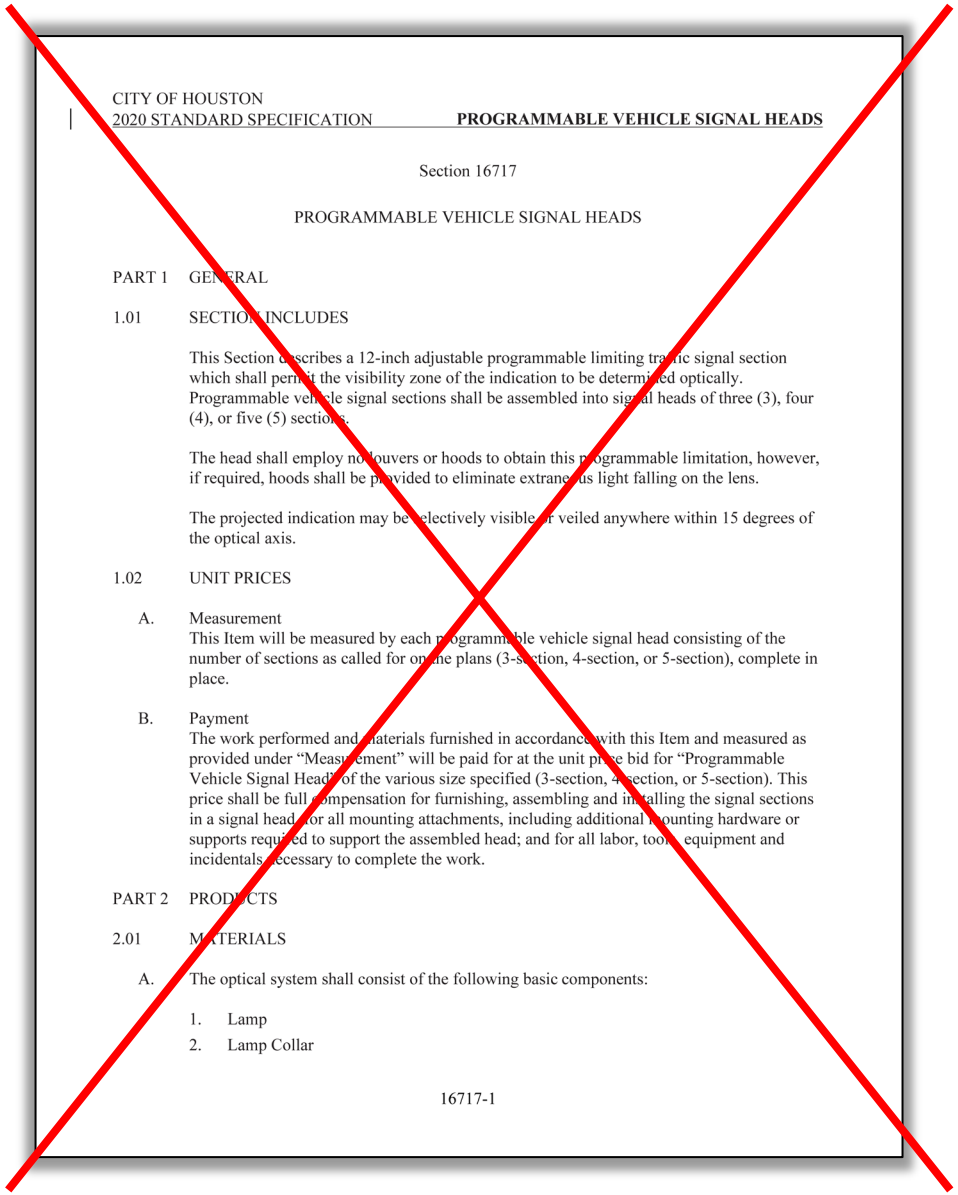
02082-12

HOUSTON PUBLIC WORKS

# RETIRED SPEC: SECTION 16717

## Retired Spec Summary:

- Standards and Specs reviewed 4 years of data to identify unused specs
- 16717 – Programmable Vehicle Signal Heads
- Specification is retired



CITY OF HOUSTON
2020 STANDARD SPECIFICATION **PROGRAMMABLE VEHICLE SIGNAL HEADS**

Section 16717

PROGRAMMABLE VEHICLE SIGNAL HEADS

PART 1 GENERAL

1.01 SECTION INCLUDES

This Section describes a 12-inch adjustable programmable limiting traffic signal section which shall permit the visibility zone of the indication to be determined optically. Programmable vehicle signal sections shall be assembled into signal heads of three (3), four (4), or five (5) sections.

The head shall employ no louvers or hoods to obtain this programmable limitation, however, if required, hoods shall be provided to eliminate extraneous light falling on the lens.

The projected indication may be selectively visible or veiled anywhere within 15 degrees of the optical axis.

1.02 UNIT PRICES

A. Measurement
This Item will be measured by each programmable vehicle signal head consisting of the number of sections as called for on the plans (3-section, 4-section, or 5-section), complete in place.

B. Payment
The work performed and materials furnished in accordance with this Item and measured as provided under "Measurement" will be paid for at the unit price bid for "Programmable Vehicle Signal Head" of the various size specified (3-section, 4-section, or 5-section). This price shall be full compensation for furnishing, assembling and installing the signal sections in a signal head, for all mounting attachments, including additional mounting hardware or supports required to support the assembled head; and for all labor, tools, equipment and incidentals necessary to complete the work.

PART 2 PRODUCTS

2.01 MATERIALS

A. The optical system shall consist of the following basic components:

1. Lamp
2. Lamp Collar

16717-1

# QUESTIONS?

Enter it into the chat.

Note the chapter or topic in your question.

We will respond to unanswered questions on our website after this event.

# STORM SEWER, WASTEWATER & WATER STANDARD DETAIL UPDATES

ROSS OZUNA, P.E.
OFFICE OF THE CITY ENGINEER,
STANDARDS AND SPECIFICATIONS

HOUSTON PUBLIC WORKS

# STANDARD DETAIL REDLINES

CONTACT

STANDARDS REVIEW COMMITTEE

INFRASTRUCTURE DESIGN MANUAL

CONSTRUCTION SPECIFICATIONS

PRODUCT APPROVALS

PROJECT MANUAL RESOURCES

CAD TOOLS AND TEMPLATES

CAPITAL PROJECTS

LIFT STATIONS

GENERAL DETAILS

STORM SEWER DETAILS

STREET PAVING AND SIDEWALK DETAILS

STREETCUT DETAILS

TRAFFIC DETAILS

TREE AND HARDSCAPE DETAILS

WASTEWATER DETAILS

WATER DETAILS

Standards Review Committee

The Standard Review Committee (SRC) was established to review, revise, and update standards and documents. Public input and participation is requested by the submittal of proposals for suggested changes, comments, recommendations and other information. The process will accomplish review of all documents within a five year cycle.

CURRENT REVIEW CYCLE

The 2021-2022 Review Cycle will look at Chapters 1, 2, 3, 4, and 5 of the Infrastructure Design Manual and their associated drawings and specifications. Revision proposals are due by **September 30, 2021**.

- Review Cycle Public Notice
- Request Form to Change Standards
- Chapter 1
- Chapter 2
- Chapter 3
- Chapter 4
- Chapter 5

FUTURE REVIEW CYCLES

- 2022-2023: Traffic – Chapters 15-17
- 2023-2024: Storm Drainage - Chapters 9 and 13

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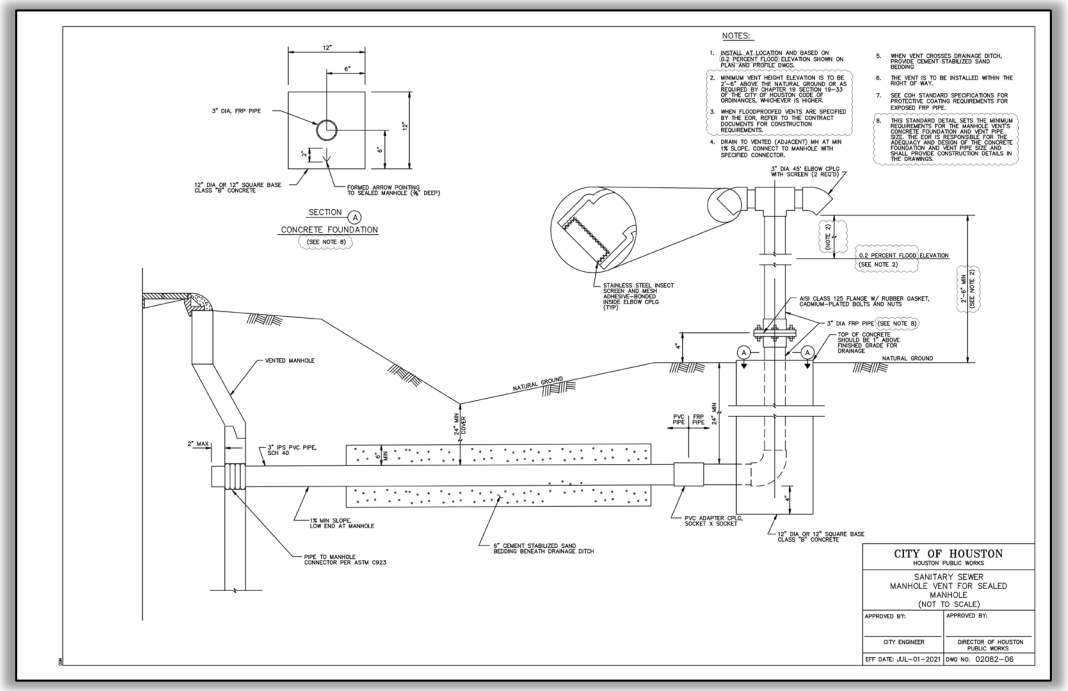
- Standard Construction Specifications Redlines from 2020-2021 Review Cycle
- Standard Details Redlines 2020-2021 Review Cycle
- Groundwater Plant Design Guidelines Redlines from 2020-2021 Review Cycle



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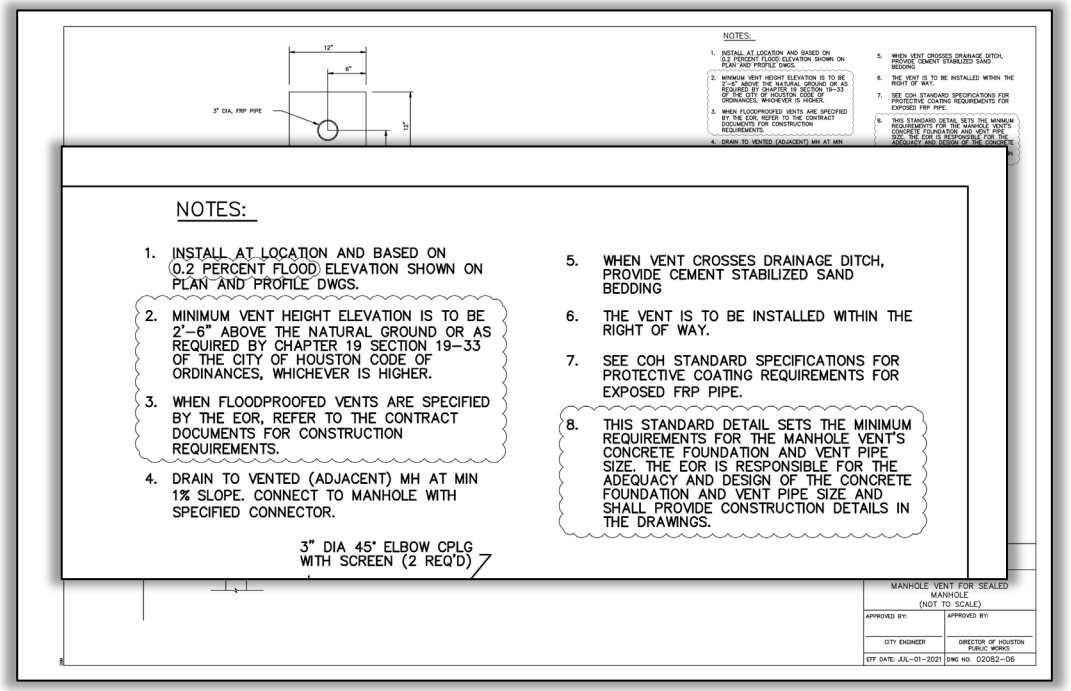



HOUSTON PUBLIC WORKS

# SUMMARY OF STANDARD DETAIL UPDATES

## Water Details

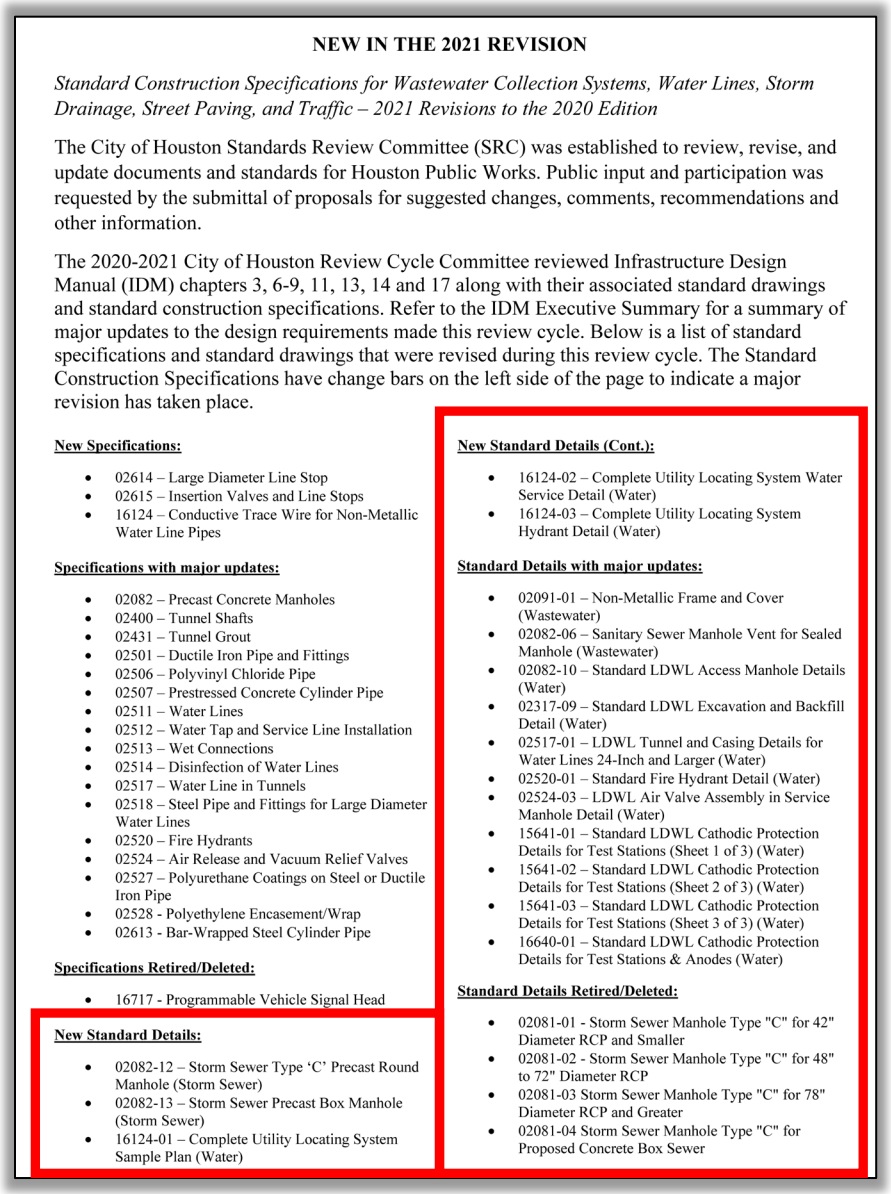
- 9 revised
- 3 new

## Wastewater Details

- 2 revised

## Stormwater Details

- 2 New Details
- 4 Details Phased Out



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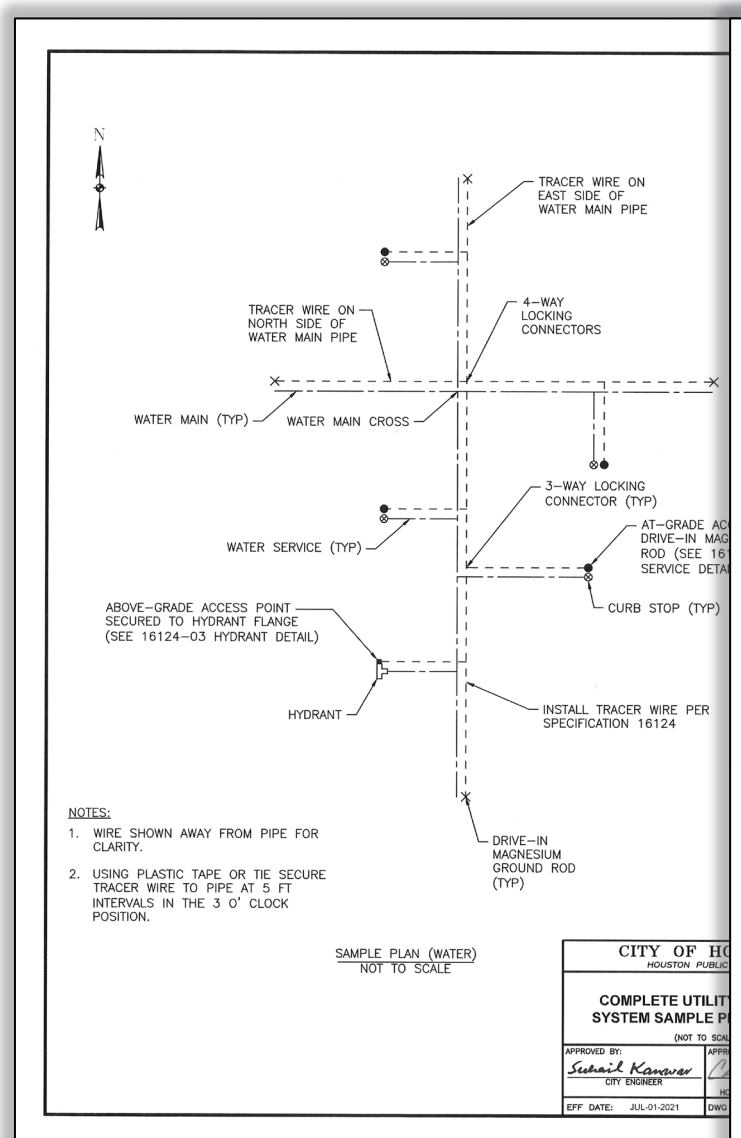
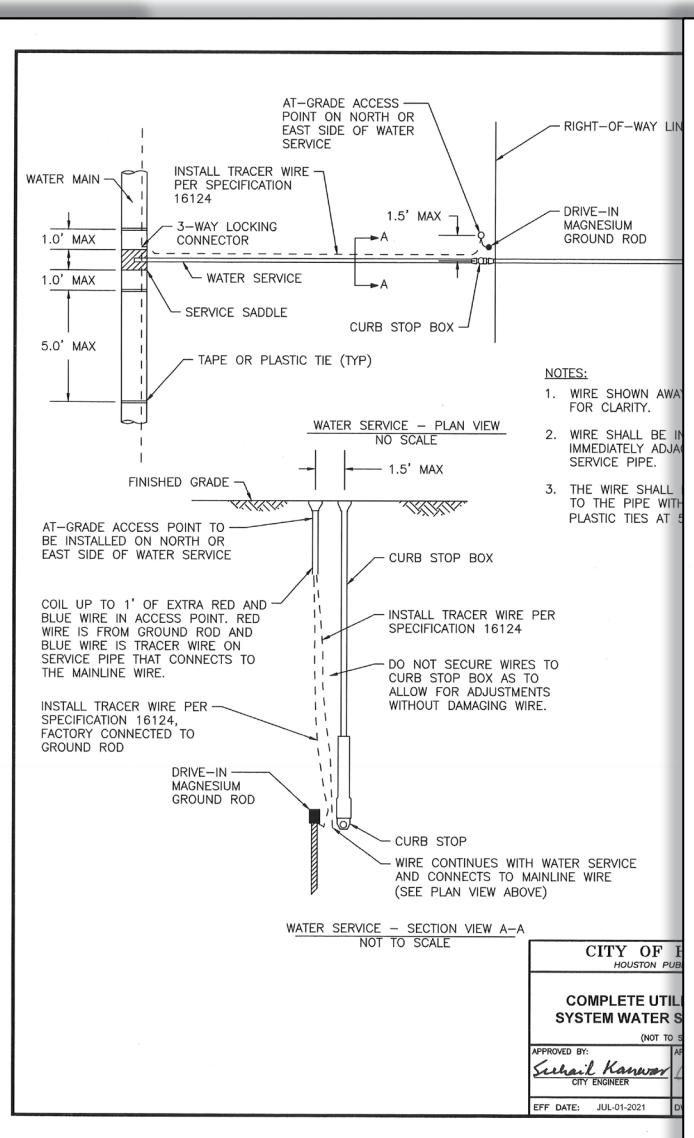
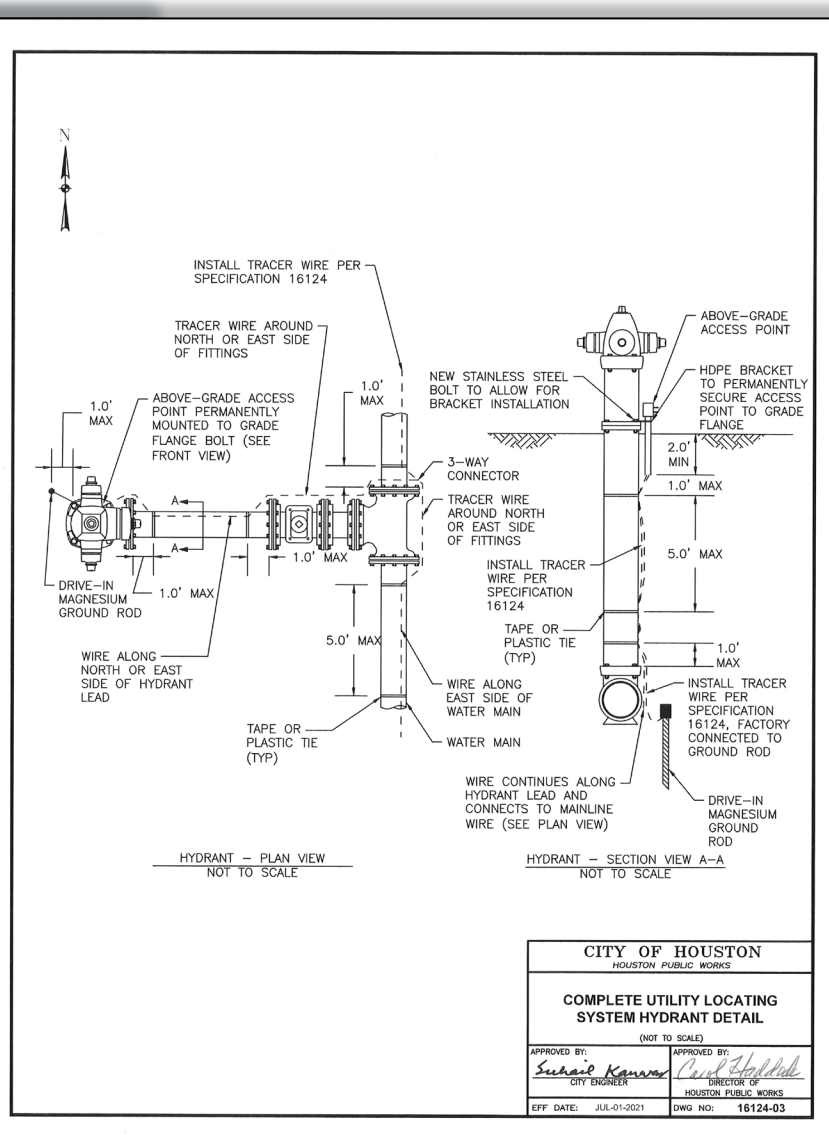
# NEW WATERLINE TRACE WIRE DETAILS




CITY OF HOUSTON
HOUSTON PUBLIC WORKS

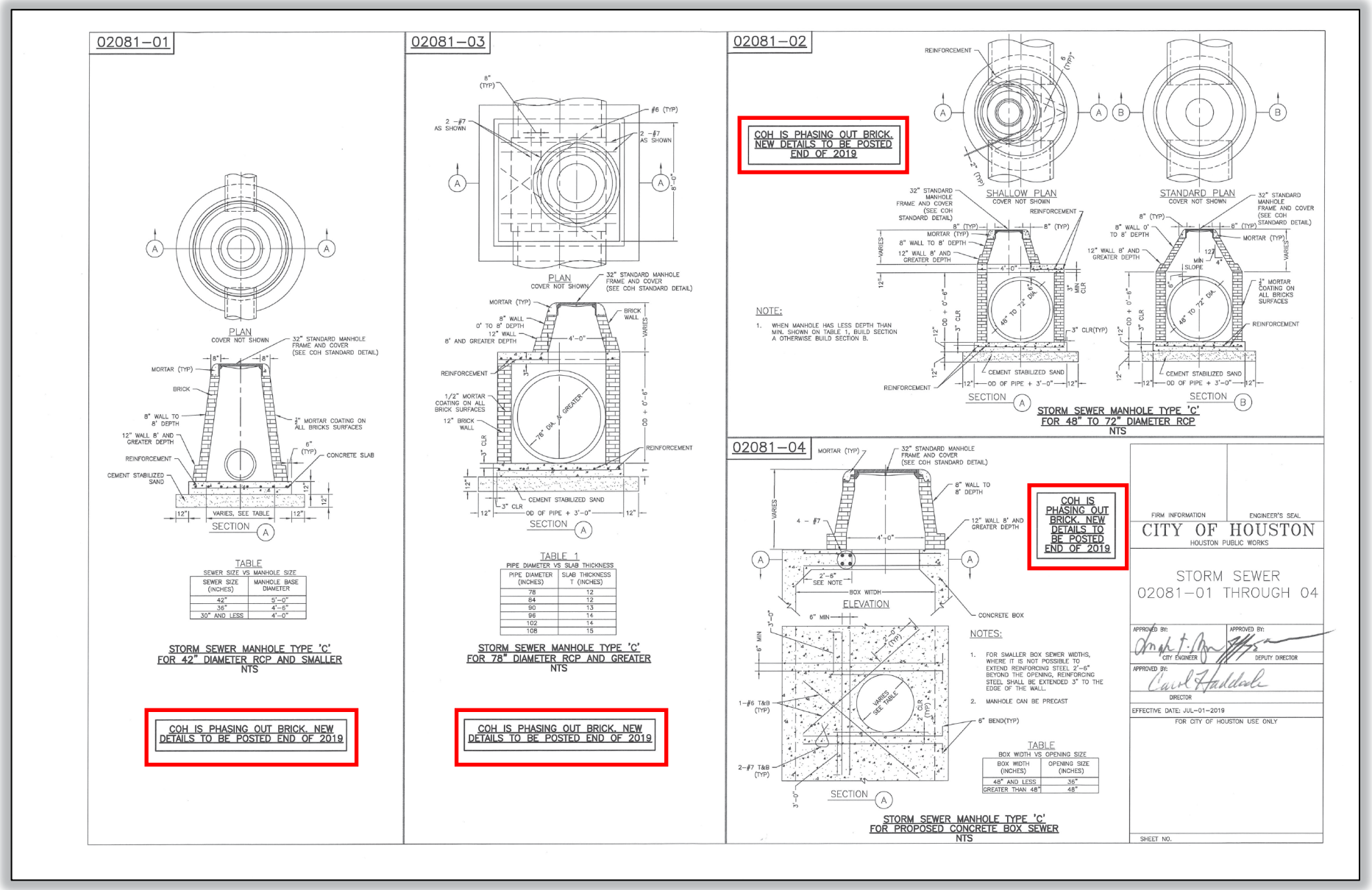
**COMPLETE UTILITY LOCATING SYSTEM HYDRANT DETAIL**

(NOT TO SCALE)

| APPROVED BY: | APPROVED BY: |
|---|---|
| Suhail Kanwar, CITY ENGINEER | DIRECTOR OF HOUSTON PUBLIC WORKS |
| EFF DATE: JUL-01-2021 | DWG NO: 16124-03 |

HOUSTON PUBLIC WORKS

# NEW PRECAST STORM MANHOLE DETAILS




HOUSTON PUBLIC WORKS

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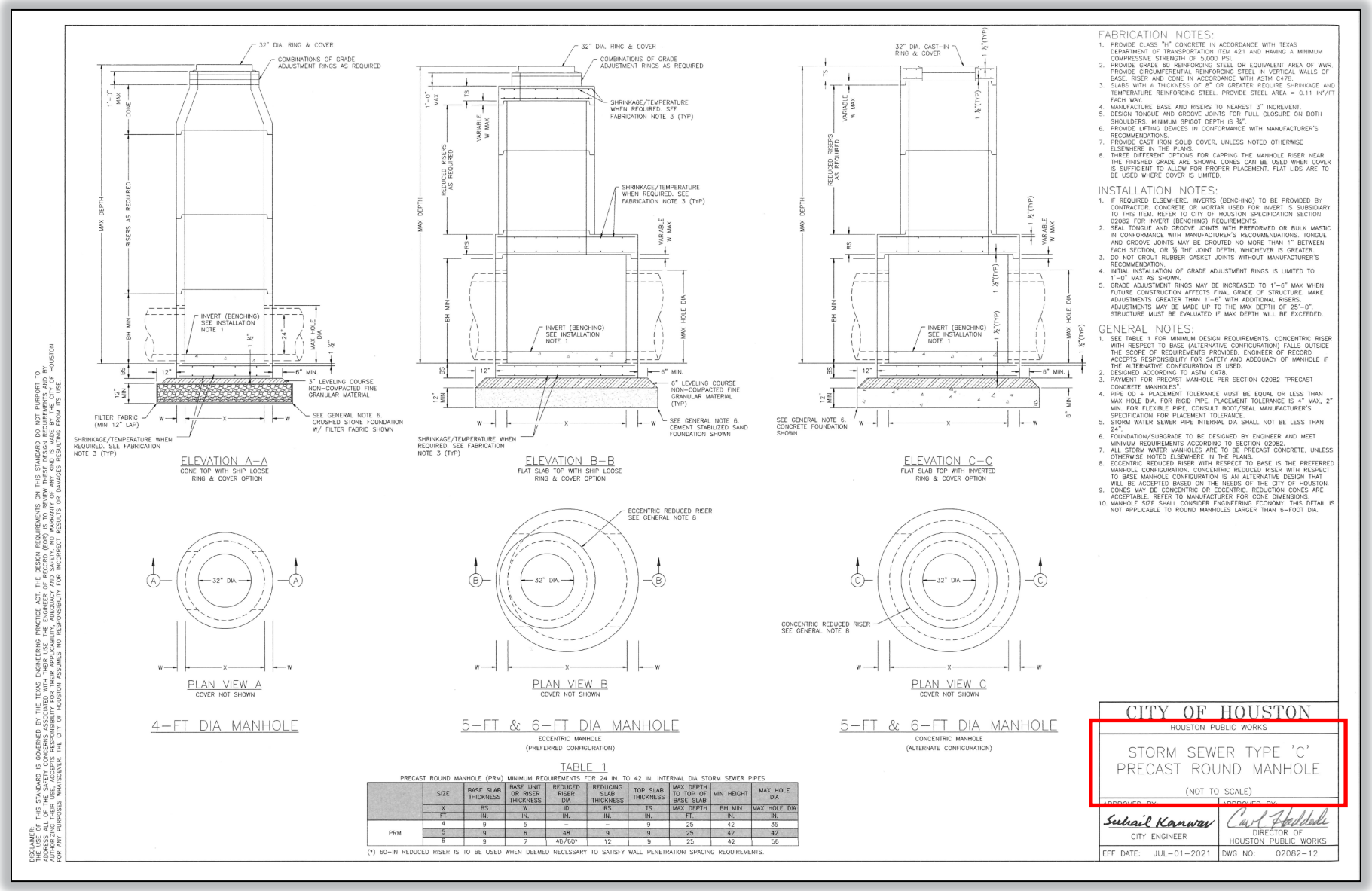


DISCLAIMER:
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## FABRICATION NOTES:

1. PROVIDE CLASS "H" CONCRETE IN ACCORDANCE WITH TEXAS DEPARTMENT OF TRANSPORTATION ITEM 421 AND HAVING A MINIMUM COMPRESSIVE STRENGTH OF 5,000 PSI.
2. PROVIDE GRADE 60 REINFORCING STEEL OR EQUIVALENT AREA OF WWR. PROVIDE CIRCUMFERENTIAL REINFORCING STEEL IN VERTICAL WALLS OF BASE, RISER AND CONE IN ACCORDANCE WITH ASTM C478.
3. SLABS WITH A THICKNESS OF 8" OR GREATER REQUIRE SHRINKAGE AND TEMPERATURE REINFORCING STEEL. PROVIDE STEEL AREA = 0.11 $IN^2$/FT EACH WAY.
4. MANUFACTURE BASE AND RISERS TO NEAREST 3" INCREMENT.
5. DESIGN TONGUE AND GROOVE JOINTS FOR FULL CLOSURE ON BOTH SHOULDERS. MINIMUM SPIGOT DEPTH IS ¾".
6. PROVIDE LIFTING DEVICES IN CONFORMANCE WITH MANUFACTURER'S RECOMMENDATIONS.
7. PROVIDE CAST IRON SOLID COVER, UNLESS NOTED OTHERWISE ELSEWHERE IN THE PLANS.
8. THREE DIFFERENT OPTIONS FOR CAPPING THE MANHOLE RISER NEAR THE FINISHED GRADE ARE SHOWN. CONES CAN BE USED WHEN COVER IS SUFFICIENT TO ALLOW FOR PROPER PLACEMENT. FLAT LIDS ARE TO BE USED WHERE COVER IS LIMITED.

## INSTALLATION NOTES:

1. IF REQUIRED ELSEWHERE, INVERTS (BENCHING) TO BE PROVIDED BY CONTRACTOR. CONCRETE OR MORTAR USED FOR INVERT IS SUBSIDIARY TO THIS ITEM. REFER TO CITY OF HOUSTON SPECIFICATION SECTION 02082 FOR INVERT (BENCHING) REQUIREMENTS.
2. SEAL TONGUE AND GROOVE JOINTS WITH PREFORMED OR BULK MASTIC IN CONFORMANCE WITH MANUFACTURER'S RECOMMENDATIONS. TONGUE AND GROOVE JOINTS MAY BE GROUTED NO MORE THAN ½" BETWEEN EACH SECTION, OR ½ THE JOINT DEPTH, WHICHEVER IS GREATER.
3. DO NOT GROUT RUBBER GASKET JOINTS WITHOUT MANUFACTURER'S RECOMMENDATION.
4. INITIAL INSTALLATION OF GRADE ADJUSTMENT RINGS IS LIMITED TO 1'–0" MAX AS SHOWN.
5. GRADE ADJUSTMENT RINGS MAY BE INCREASED TO 1'–6" MAX WHEN FUTURE CONSTRUCTION AFFECTS FINAL GRADE OF STRUCTURE. MAKE ADJUSTMENTS GREATER THAN 1'–6" WITH ADDITIONAL RISERS. ADJUSTMENTS MAY BE MADE UP TO THE MAX DEPTH OF 25'–0". STRUCTURE MUST BE EVALUATED IF MAX DEPTH WILL BE EXCEEDED.

## GENERAL NOTES:

1. SEE TABLE 1 FOR MINIMUM DESIGN REQUIREMENTS. CONCENTRIC RISER WITH RESPECT TO BASE (ALTERNATIVE CONFIGURATION) FALLS OUTSIDE THE SCOPE OF REQUIREMENTS PROVIDED. ENGINEER OF RECORD ACCEPTS RESPONSIBILITY FOR SAFETY AND ADEQUACY OF MANHOLE IF THE ALTERNATIVE CONFIGURATION IS USED.
2. DESIGNED ACCORDING TO ASTM C478.
3. PAYMENT FOR PRECAST MANHOLE PER SECTION 02082 "PRECAST CONCRETE MANHOLES".
4. PIPE OD + PLACEMENT TOLERANCE MUST BE EQUAL OR LESS THAN MAX HOLE DIA. FOR RIGID PIPE, PLACEMENT TOLERANCE IS 4" MAX, 2" MIN. FOR FLEXIBLE PIPE, CONSULT BOOT/SEAL MANUFACTURER'S SPECIFICATION FOR PLACEMENT TOLERANCE.
5. STORM WATER SEWER PIPE INTERNAL DIA SHALL NOT BE LESS THAN 24".
6. FOUNDATION/SUBGRADE TO BE DESIGNED BY ENGINEER AND MEET MINIMUM REQUIREMENTS ACCORDING TO SECTION 02082.
7. ALL STORM WATER MANHOLES ARE TO BE PRECAST CONCRETE, UNLESS OTHERWISE NOTED ELSEWHERE IN THE PLANS.
8. ECCENTRIC REDUCED RISER WITH RESPECT TO BASE IS THE PREFERRED MANHOLE CONFIGURATION. CONCENTRIC REDUCED RISER WITH RESPECT TO BASE MANHOLE CONFIGURATION IS AN ALTERNATIVE DESIGN THAT WILL BE ACCEPTED BASED ON THE NEEDS OF THE CITY OF HOUSTON.
9. CONES MAY BE CONCENTRIC OR ECCENTRIC. REDUCTION CONES ARE ACCEPTABLE. REFER TO MANUFACTURER FOR CONE DIMENSIONS.
10. MANHOLE SIZE SHALL CONSIDER ENGINEERING ECONOMY. THIS DETAIL IS NOT APPLICABLE TO ROUND MANHOLES LARGER THAN 6–FOOT DIA.

## TABLE 1

PRECAST ROUND MANHOLE (PRM) MINIMUM REQUIREMENTS FOR 24 IN. TO 42 IN. INTERNAL DIA STORM SEWER PIPES

| | SIZE | BASE SLAB THICKNESS | BASE UNIT OR RISER THICKNESS | REDUCED RISER DIA | REDUCING SLAB THICKNESS | TOP SLAB THICKNESS | MAX DEPTH TO TOP OF BASE SLAB | MIN HEIGHT | MAX HOLE DIA |
|---|---|---|---|---|---|---|---|---|---|
| | X | BS | W | ID | RS | TS | MAX DEPTH | BH MIN | MAX HOLE DIA |
| | FT | IN. | IN. | IN. | IN. | IN. | FT. | IN. | IN. |
| PRM | 4 | 9 | 5 | -- | -- | 9 | 25 | 42 | 35 |
| | 5 | 9 | 6 | 48 | 9 | 9 | 25 | 42 | 42 |
| | 6 | 9 | 7 | 48/60* | 12 | 9 | 25 | 42 | 56 |

(*) 60–IN REDUCED RISER IS TO BE USED WHEN DEEMED NECESSARY TO SATISFY WALL PENETRATION SPACING REQUIREMENTS.

CITY OF HOUSTON
HOUSTON PUBLIC WORKS

STORM SEWER TYPE 'C'
PRECAST ROUND MANHOLE
(NOT TO SCALE)

APPROVED BY: Suhail Kanwar, CITY ENGINEER
APPROVED BY: Carol Haddock, DIRECTOR OF HOUSTON PUBLIC WORKS
EFF DATE: JUL–01–2021
DWG NO: 02082–12

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# NEW PRECAST STORM MANHOLE DETAILS

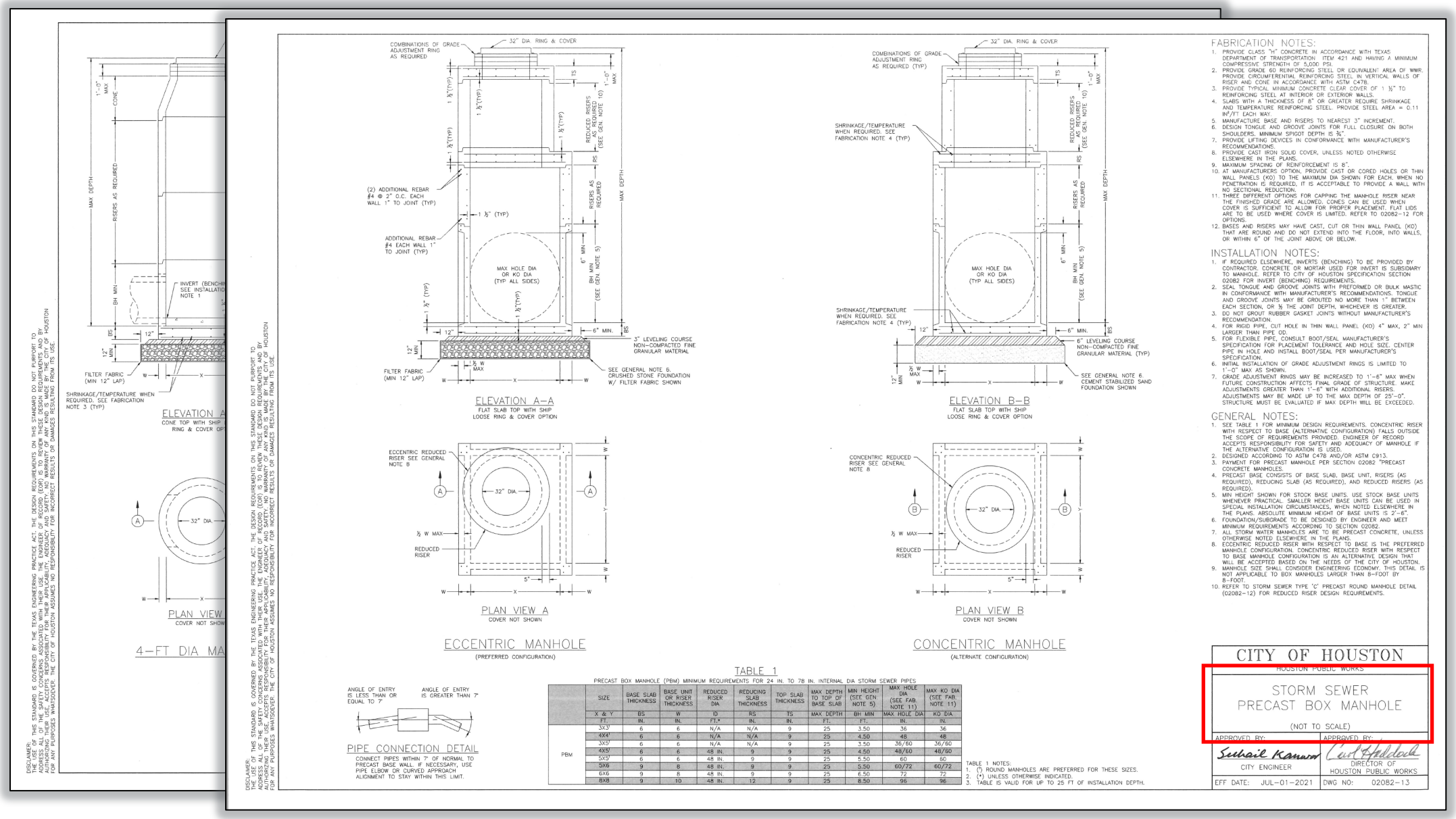


TABLE 1

PRECAST BOX MANHOLE (PBM) MINIMUM REQUIREMENTS FOR 24 IN. TO 78 IN. INTERNAL DIA STORM SEWER PIPES

| | SIZE | BASE SLAB THICKNESS | BASE UNIT OR RISER THICKNESS | REDUCED RISER DIA | REDUCING SLAB THICKNESS | TOP SLAB THICKNESS | MAX DEPTH TO TOP OF BASE SLAB | MIN HEIGHT (SEE GEN. NOTE 5) | MAX HOLE DIA (SEE FAB. NOTE 11) | MAX KO DIA (SEE FAB. NOTE 11) |
|---|---|---|---|---|---|---|---|---|---|---|
| | X & Y | BS | W | ID | RS | TS | MAX DEPTH | BH MIN | MAX HOLE DIA | KO DIA |
| | FT. | IN. | IN. | FT.* | IN. | IN. | FT. | FT. | IN. | IN. |
| PBM | 3X3' | 6 | 6 | N/A | N/A | 9 | 25 | 3.50 | 36 | 36 |
| | 4X4' | 6 | 6 | N/A | N/A | 9 | 25 | 4.50 | 48 | 48 |
| | 3X5' | 6 | 6 | N/A | N/A | 9 | 25 | 3.50 | 36/60 | 36/60 |
| | 4X5' | 6 | 6 | 48 IN. | 9 | 9 | 25 | 4.50 | 48/60 | 48/60 |
| | 5X5' | 6 | 6 | 48 IN. | 9 | 9 | 25 | 5.50 | 60 | 60 |
| | 5X6 | 9 | 8 | 48 IN. | 9 | 9 | 25 | 5.50 | 60/72 | 60/72 |
| | 6X6 | 9 | 8 | 48 IN. | 9 | 9 | 25 | 6.50 | 72 | 72 |
| | 8X8 | 9 | 10 | 48 IN. | 12 | 9 | 25 | 8.50 | 96 | 96 |

TABLE 1 NOTES:
1. (*) ROUND MANHOLES ARE PREFERRED FOR THESE SIZES.
2. (*) UNLESS OTHERWISE INDICATED.
3. TABLE IS VALID FOR UP TO 25 FT OF INSTALLATION DEPTH.

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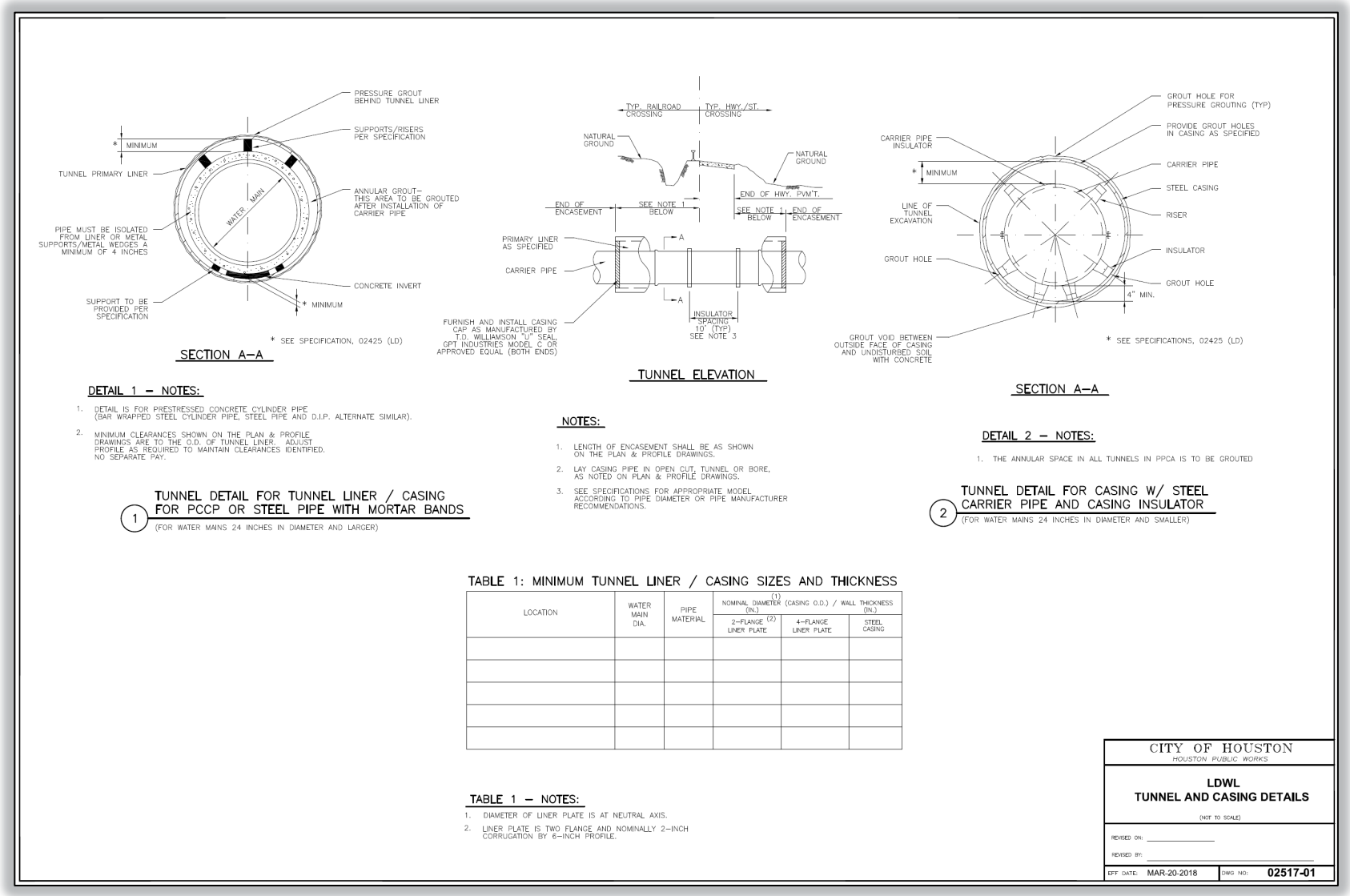
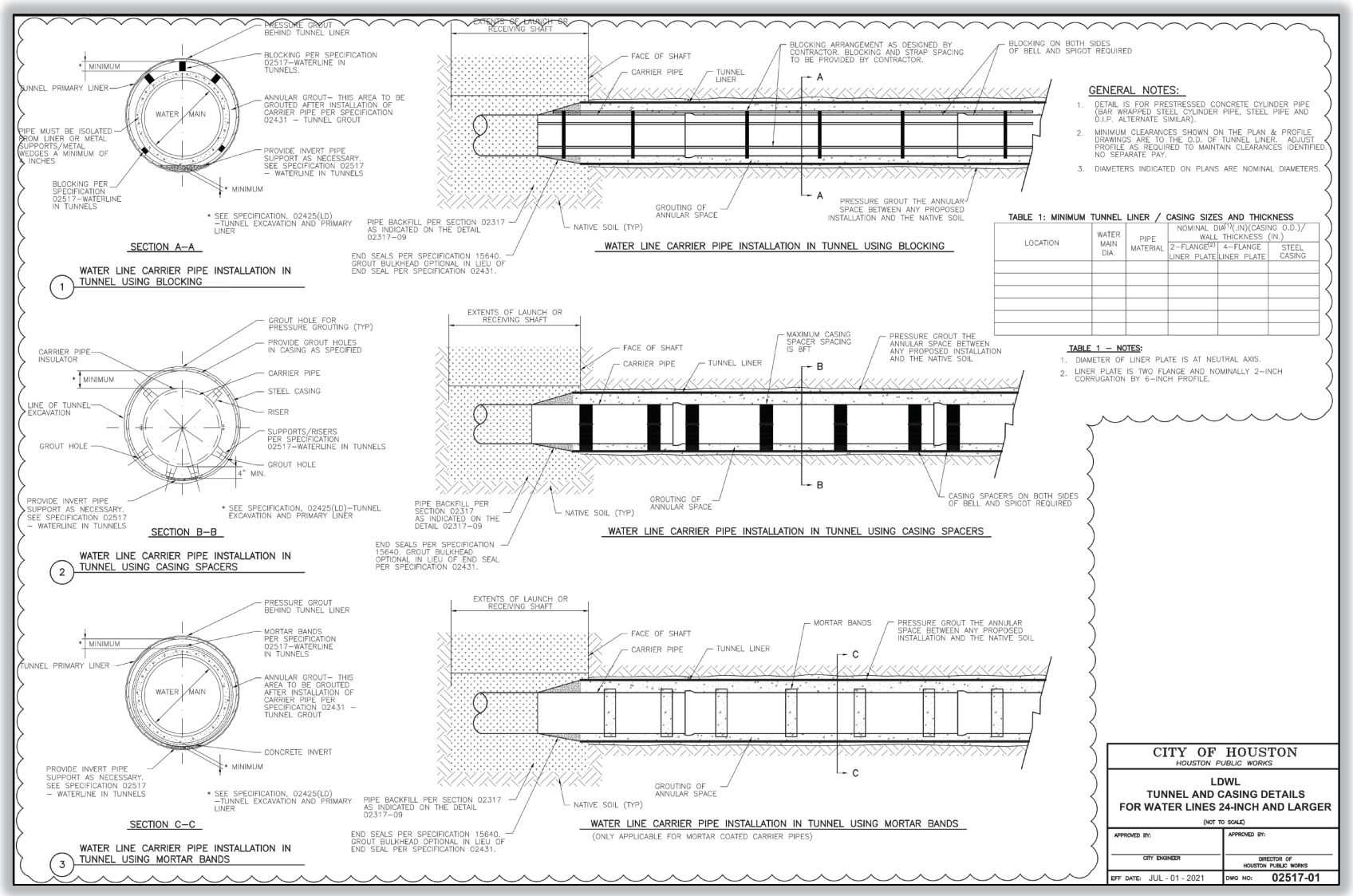
# LDWL TUNNEL AND CASING DETAIL UPDATES

## 2020



# LDWL TUNNEL AND CASING DETAIL UPDATES

## 2021

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# QUESTIONS?

Enter it into the chat.

Note the chapter or topic in your question.

We will respond to unanswered questions on our website after this event.

# CLOSING

**LUIS GARZA, P.E.**
**OFFICE OF THE CITY ENGINEER**
**STANDARDS AND SPECIFICATIONS**

# CHANGES ARE EFFECTIVE OCTOBER 1, 2021

# IMPLEMENTATION: MORE INFO

## 2021 IDM Announcement & Executive Summary

### 2021 Infrastructure Design Manual Announcement

Houston Public Works (HPW) has completed the 2020-2021 Review Cycle. As a result, the Infrastructure Design Manual (IDM), Ground Water Plant Design Guidelines, General Requirements, Standard Construction Specifications, and Standard Details have been updated.

A 90-day design grace period for implementation of the City of Houston IDM is instituted for the 2021 edition. For Houston Public Works capital improvement projects managed by the Capital Projects service line, Phase II final designs that have not been submitted for a required review prior to October 1, 2021, must comply with all standards in the 2021 IDM.

For projects in the public or private sector, plans submitted for initial review after October 1, 2021, must comply with all standards in the 2021 IDM. The City must receive substantially complete plans before October 1, 2021, to be grandfathered under the 2020 standards.

The Houston Public Works Director signed the IDM Cover Letter & Executive Summary on July 1, 2021. The executive summary provides more background on when the 2021 design requirements and standards will be implemented. It also provides a summary of updates made to all documents during the review cycle. The IDM Redlines, Groundwater Plant Design Guidelines Redlines, Construction Specifications Redlines, and Standard Detail Redlines are also available for additional background.

A public IDM Webinar will be conducted by Microsoft Teams Live Event and held on Thursday, August 19, 2021, from 12 p.m. to 3 p.m. CDT. The IDM webinar will present a high-level view of the changes implemented during the 2020-2021 Review Cycle.

All of the content described here is accessible on the Design and Construction Standards webpage.

For additional questions about the changes, please contact the Office of the City Engineer at 832.394.9164 or HPWStandards@houstontx.gov.

HOUSTON PUBLIC WORKS

**EXECUTIVE SUMMARY**

2020-2021 Review Cycle

**Chapter 17 Bicycle, Transit and Pedestrian Design Requirements**

Chapter 17 – *Bicycle, Transit and Pedestrian Design Requirements* was not officially part of the 2020-2021 review cycle. This chapter was updated to conform to City Code of Ordinances published in 2020.

**IDM Supplements**

The City creates supplements for the IDM when there is a need to revise a current IDM chapter that is outside of its normal review cycle period. At the time when a new IDM is to be released, any active supplements are incorporated into the new IDM and those supplements subsequentially deactivated.

Prior to the completion of the 2020-2021 review cycle, there were four active IDM supplements (chapter 9.2.01, chapter 9.2.01H and the Frequently Asked Questions, and chapter 17.06). Those IDM supplements have now been officially incorporated into the IDM for the 2021 release.

**Infrastructure Design Manual Implementation**

- *Capital Improvement Projects*
  A 90-day design grace period will be given for Houston Public Works capital improvement projects managed by the Capital Projects service line. Phase II final designs that have not been submitted for a required review prior to October 1, 2021, will be required to completely comply with the new Infrastructure Design Manual.
- *Private Sector*
  A 90-day design grace period will be given for projects in the public/private sector. Plans submitted for initial review after October 01, 2021 will be required to comply with the new Infrastructure Design Manual.
- *IDM Supplements for Private and Capital Improvement Projects*
  IDM supplements were effective upon signature. There is no design grace period for Chapter 9 of the IDM. Therefore, Chapter 9 updates were effective April 01, 2021.

**CONSTRUCTION SPECIFICATIONS**

**Revised Specifications**

Various specifications, that are associated with the IDM chapters reviewed during the 2020-2021 review cycle, were reviewed and updated. A total of 17 specifications were revised and 3 new specifications were created, and one specification was retired. 02082 "Precast Concrete Manholes" was updated in coordination with the creation of new standard details for precast concrete manhole. The three new specifications created are 02614 "Large Diameter Line Stop", 02615 "Insertion Valves and Line Stop", and 16124 Trace Wire for Water Lines". The 16717 "Programmable Vehicle Signal Head" standard specification was retired since it is not in use by the City. A list of all specifications created or updated is provided at the end of this executive summary.

Page 3 of 5

# ITEMS IN WORKS & NEW REVIEW CYCLE

# ITEMS IN WORKS

## Completed Development:

- City CAD Tools

## Under Development:

- Parking Lot Details
- Historic Blue Tiles

## On the Horizon:

- Precast Inlets

# 2021 – 2022 REVIEW CYCLE

## ANCILLARY CHAPTERS

- Chapter 1 – General Requirements
- Chapter 2 – Survey Requirements
- Chapter 3 – Graphic Requirements
- Chapter 4 – Platting Requirements
- Chapter 5 – Easement Requirements
- Chapter 13 – GIS Data Digitization Standards

***Along with all related specifications and standard details***

# 2021 – 2022 REVIEW CYCLE

**Public Notice has been posted**

**Comment Period:**

**August 5, 2021 – September 30, 2021**

**2022 IDM Publication: Estimated July 1, 2022**

# QUESTIONS ON TODAY'S WEBINAR?

Enter it into the chat.

Note the chapter or topic in your question.

We will respond to unanswered questions on our website after this event.

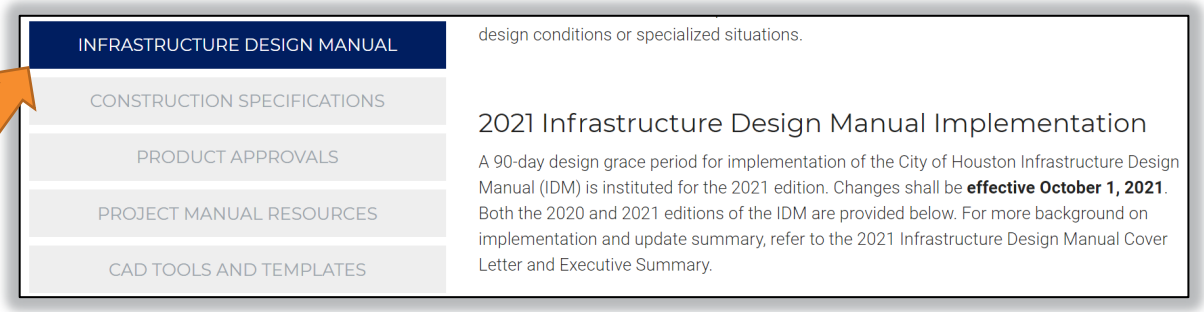
# ADDITIONAL QUESTIONS?

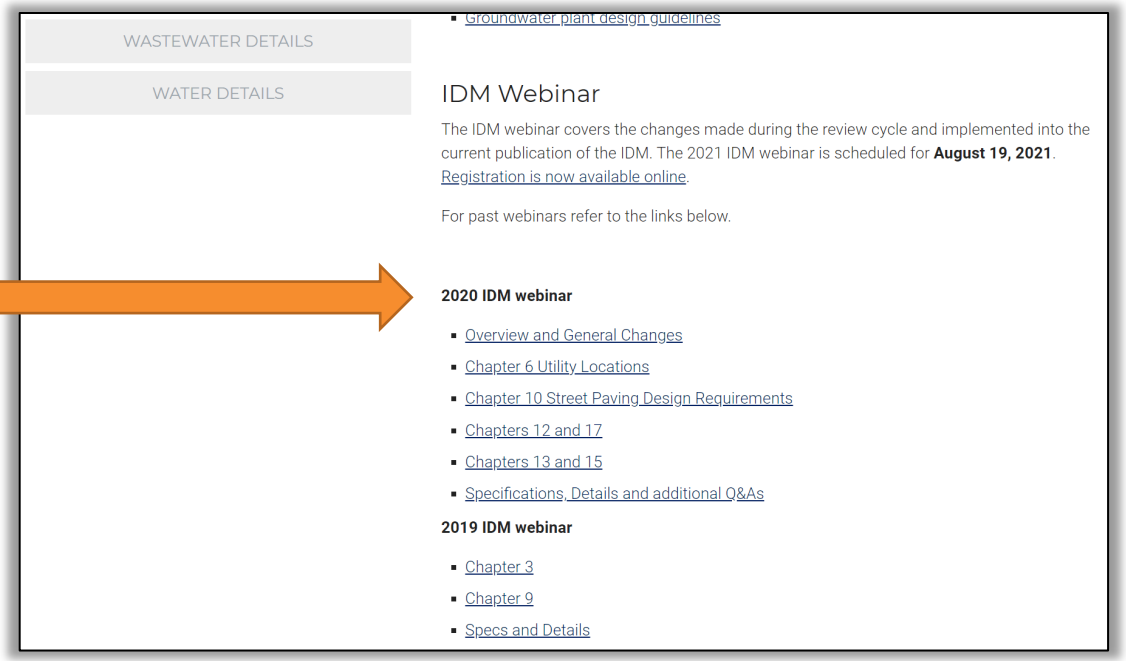
**SEND THEM TO:**

**HPWSTANDARDS@HOUSTONTX.GOV**

# WEBINAR AND FAQ'S AFTER THIS EVENT

1. Go to https://houstonpermittingcenter.org/office-city-engineer/design-and-construction-standards
2. Select "Infrastructure Design Manual" tab.
3. This webinar presentation and FAQ's will be posted under "IDM Webinar"



# Thank you!

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