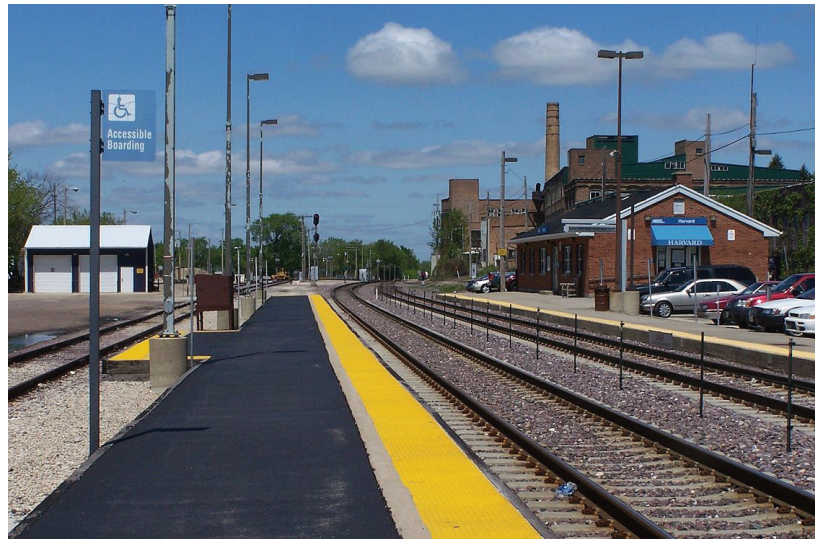


MARCH 2019

# CITY OF HARVARD ENGINEERING DESIGN DETAILS





# LIST OF STANDARD ENGINEERING DETAILS

## ROADWAY/SIDEWALK/MISCELLANEOUS

- R-0 Miscellaneous Roadway Standards/Notes
- R-1 Industrial, Commercial, Driveway Detail
- R-2 Residential Driveway Approach Detail
- R-3 Parking Lot Pavement Section
- R-4 Public Street Pavement Section
- R-5 Roadway Widths and Centerline Radii Widths
- R-6 Sidewalk Detail
- R-7 Pavement Removal and Replacement
- R-8 Residential Cul-de-sac Design
- R-9 Frame Adjustment when Milling
- R-10 Manhole Ramping Detail
- R-11 Harvard Street Sign Standards
- R-12 Standard Mailbox Details

## SANITARY SEWER

- SAN-0 Miscellaneous Sanitary Standards/Notes
- SAN-1 Sanitary Manhole Detail
- SAN-2 Building Service Riser Detail
- SAN-3 Typical Sanitary Trench Section
- SAN-4 External Chimney Seal
- SAN-5 Drop Manhole Detail (Outside Type)
- SAN-6 Air Release Manhole Detail
- SAN-7 Service Cleanout
- SAN-8 Pipe Entry Detail
- SAN-9 Manhole Self Sealing Lid

## STORM SEWER

- SS-1 Storm Inlet - Type A
- SS-2 Storm Manhole - Type A
- SS-3 Catch Basin - Type A
- SS-4 Catch Basin - Type C



# LIST OF STANDARD ENGINEERING DETAILS

- SS-5 Restrictor Detail
- SS-6 Temporary Siltation Basket
- SS-7 Rear Yard Inlet
- SS-8 Typical Storm Sewer Trench Section

## UTILITY LOCATIONS

- U-0 Miscellaneous Utility Notes
- U-1 Street and Utility Locations (Typical Cross-Section)
- U-2 Common Trench for Water and Sanitary Sewer Services
- U-3 Water Service and Sanitary Sewer Lot Location Detail
- U-4 Utility Location Plan for Cul-de-sacs

## WATER MAINS AND SERVICES

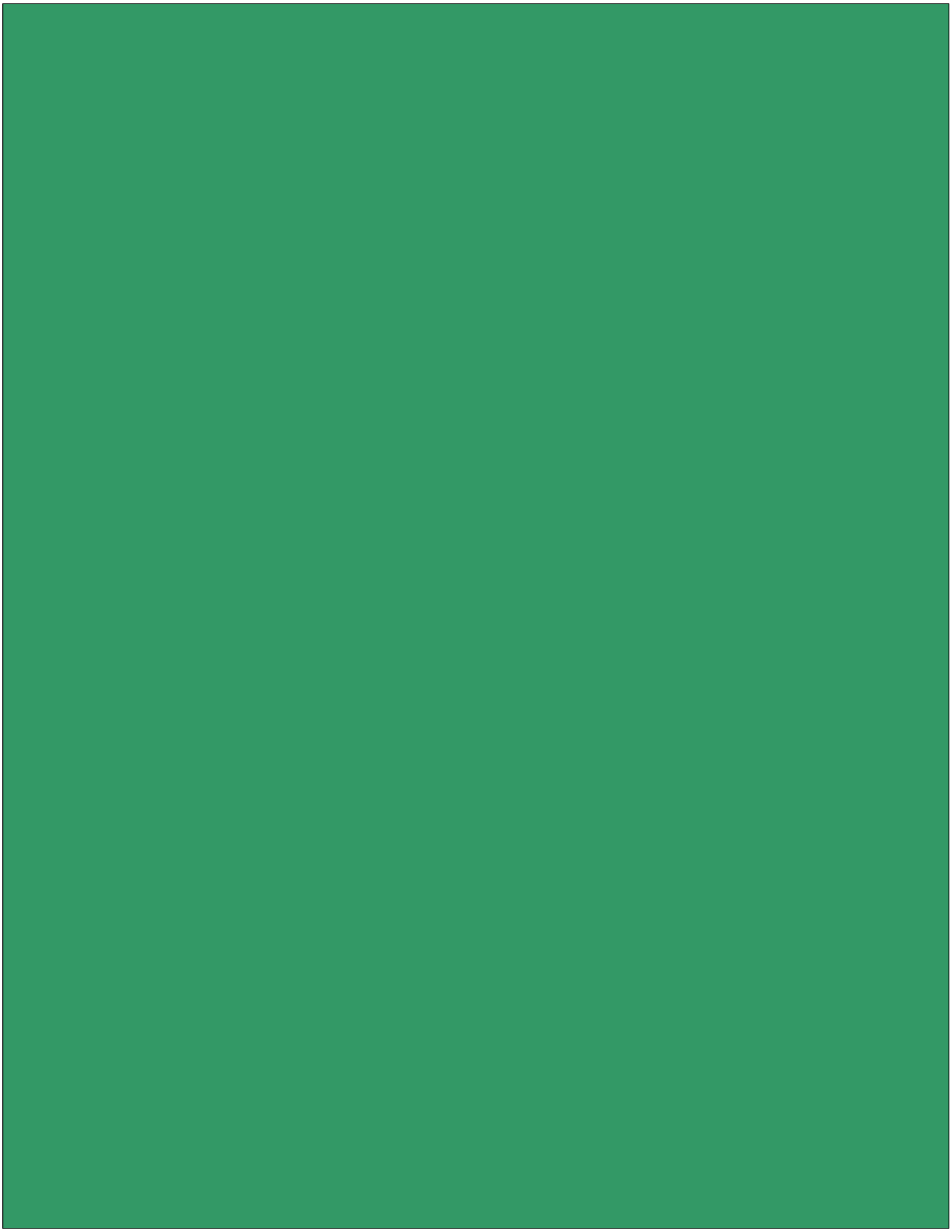
- W-0 Miscellaneous Water Main Standards/Notes
- W-1 Water Main Pressure Connection Detail
- W-2 Thrust Block Detail
- W-3 Water Service Connection
- W-4 Chloride Insertion
- W-5 Fire Hydrant Installation Detail
- W-6 Water Main Lowering Detail
- W-7 Typical Valve Vault
- W-8 Typical Water Main Trench Section

## INSPECTION

- I-0 Miscellaneous Inspection Notes
- I-1 Field Quality Control Procedures for Pavement Area Subgrade
- I-2 Sanitary Sewer Testing Specifications
- I-3 Water Main Testing Specifications

## STREET LIGHTING

- L-0 Miscellaneous Street Lighting Standards/Notes



## Miscellaneous Roadway Standards/Notes

1. All connecting roadway gradients with an algebraic difference of greater than 1 percent shall be connected with a vertical curve. All standards contained in AASHTO's "A Policy on Geometric Design of Highways and Streets," latest edition, regarding vertical curves shall be followed. A design speed of 40 mph shall be used on collector roads and a design speed of 35 mph shall be used on local streets.
2. Street jogs with centerline offsets of less than 150' are not allowed on local roads. Offsets on collector roads are not allowed and spacing between two cross streets on collector roads shall be no closer than 500'.
3. Gradients of streets shall be at least 0.6 percent and shall not exceed on:
  - a. Collector commercial/industrial streets, three (3) percent;
  - b. Minor streets, eight (8) percent.
4. All Plats of Subdivision shall be submitted to the City on a 24" x 36" mylars for recording purposed. It shall be submitted to the City in electronic format on a CD in a format that is compatible with the City GIS (ArcGIS).

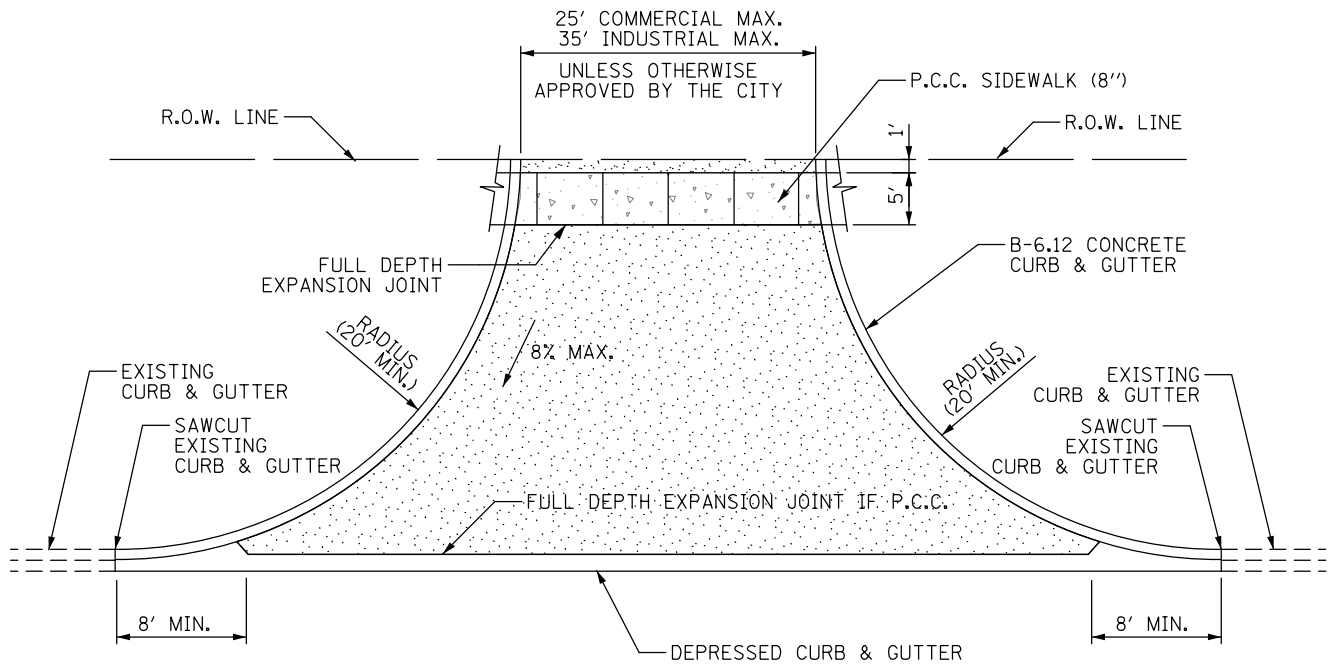


City of Harvard  
**ENGINEERING DETAILS**  
201 W. Diggins Street, Harvard IL 60033

### MISCELLANEOUS ROADWAY NOTES

DATE:	9/19/2018
REV 1:	
REV 2:	

**R-0**



	BITUMINOUS	CONCRETE
COMMERCIAL	2" BIT. SURFACE COURSE 6" BIT. BASE COURSE 4" AGGREGATE	7" CONCRETE 4" AGGREGATE
INDUSTRIAL	2" BIT. SURFACE COURSE 2" BIT. BINDER COURSE 6" BIT. BASE COURSE 4" AGGREGATE	8" CONCRETE 4" AGGREGATE

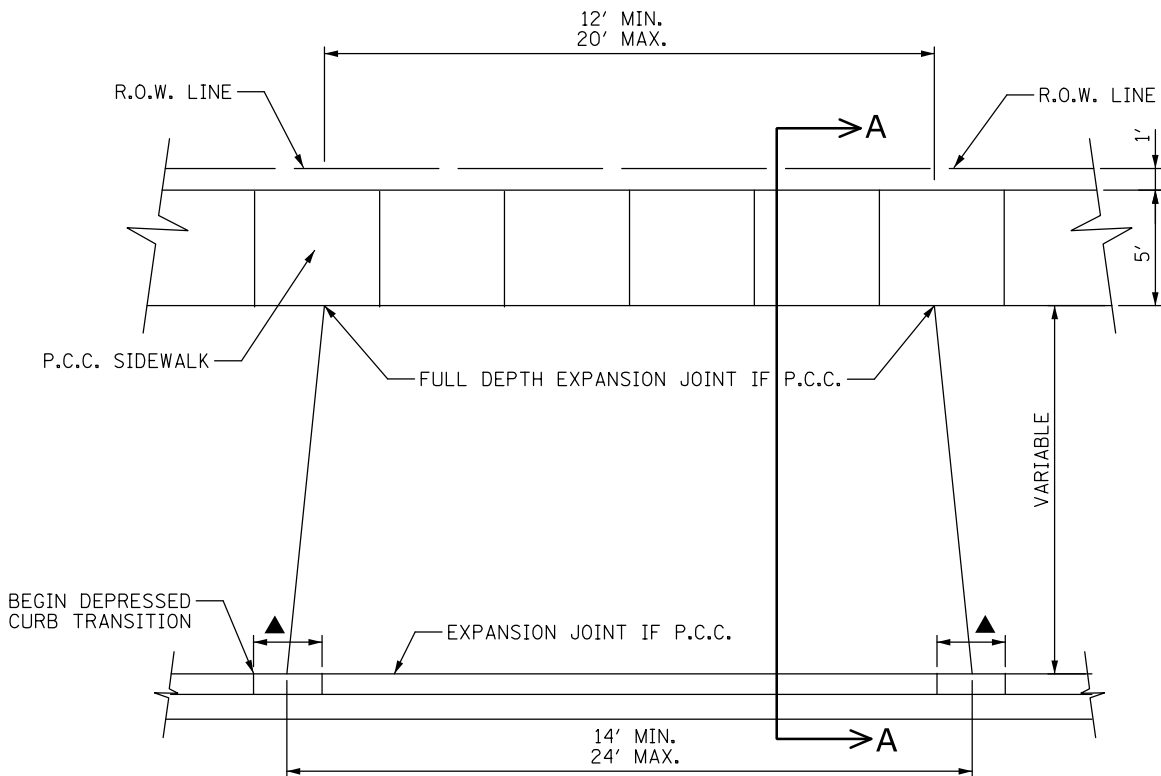


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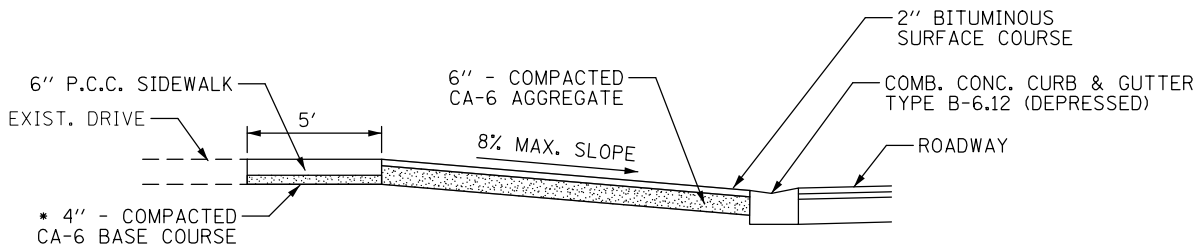
**INDUSTRIAL / COMMERCIAL  
 DRIVEWAY DETAIL**

DATE: 9/19/2018  
 REV 1:  
 REV 2:

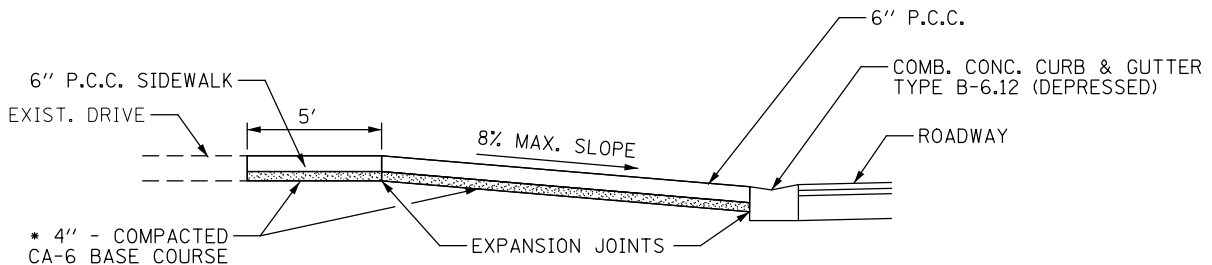
**R-1**



- ▲ - TRANSITION FROM FULL CURB IN 2 LINEAL FEET
- DRIVEWAY APPROACH SHALL MEET CURB AND GUTTER AT A POINT BETWEEN FULL CURB AND ONE-HALF CURB HEIGHT.
- DRIVEWAY FLARE SHALL BE SYMMETRIC ABOUT THE DRIVEWAY CENTERLINE UNLESS OTHERWISE APPROVED BY THE CITY.



**SECTION A - A  
BITUMINOUS DRIVEWAY**



**SECTION A - A  
P.C.C. DRIVEWAY**

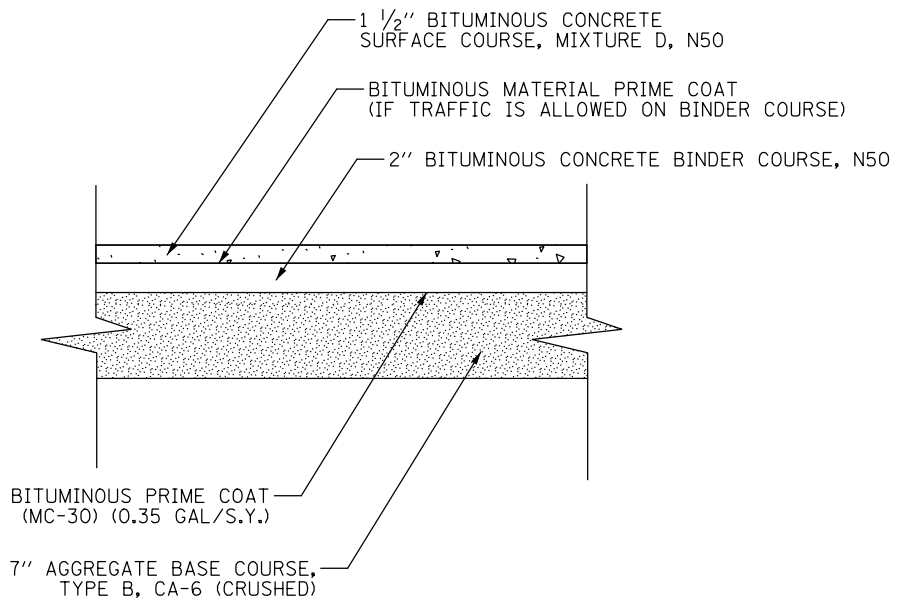


City of Harvard  
**ENGINEERING DETAILS**  
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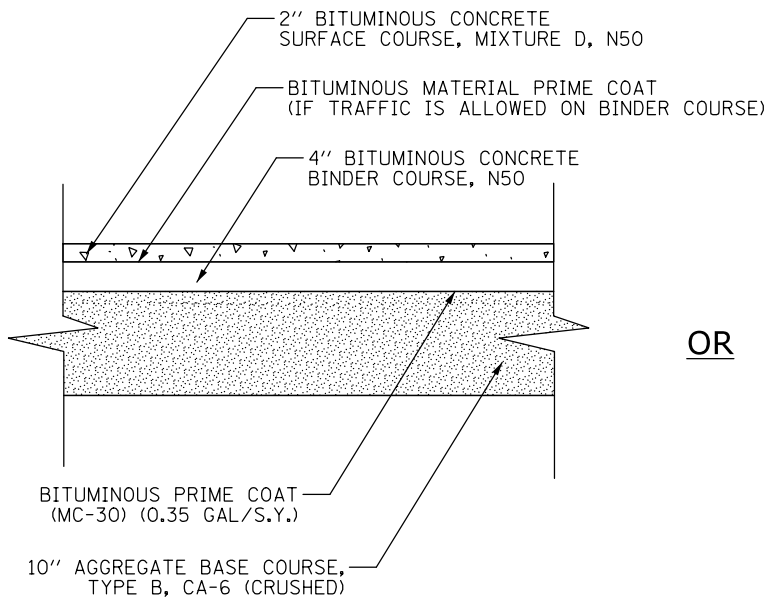
**SINGLE FAMILY  
 RESIDENTIAL DRIVEWAY  
 APPROACH DETAIL**

DATE: 9/19/2018  
 REV 1:  
 REV 2:

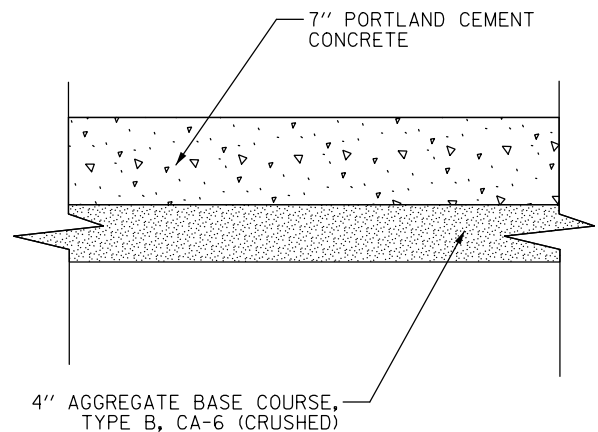
**R-2**



**MINIMUM  
TYPICAL PARKING LOT  
PAVEMENT SECTION**



OR



**MINIMUM  
HEAVY DUTY- PARKING LOT  
PAVEMENT SECTION**



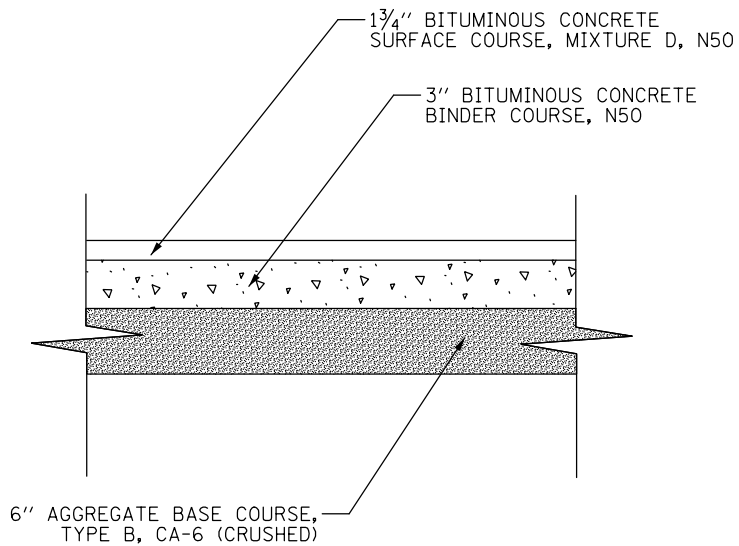
City of Harvard  
**ENGINEERING DETAILS**  
201 W. Diggins Street, Harvard IL 60033

**PARKING LOT  
PAVEMENT SECTIONS**

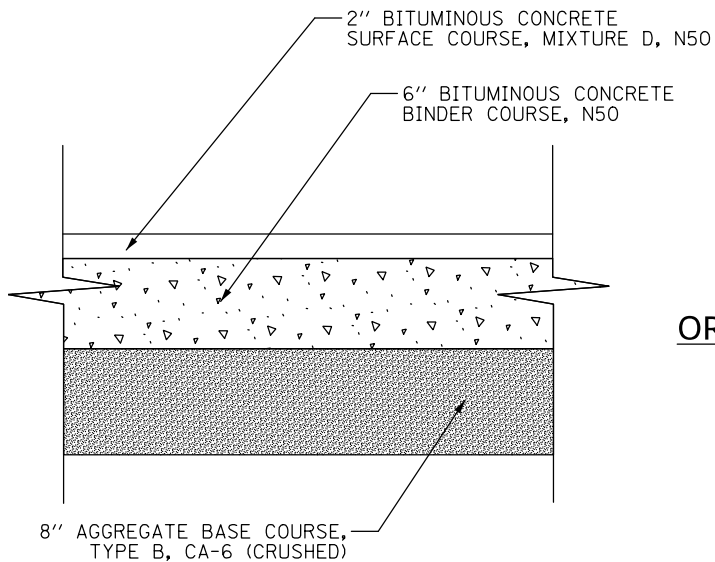
DATE: 9/19/2018  
REV 1:  
REV 2:

**R-3**

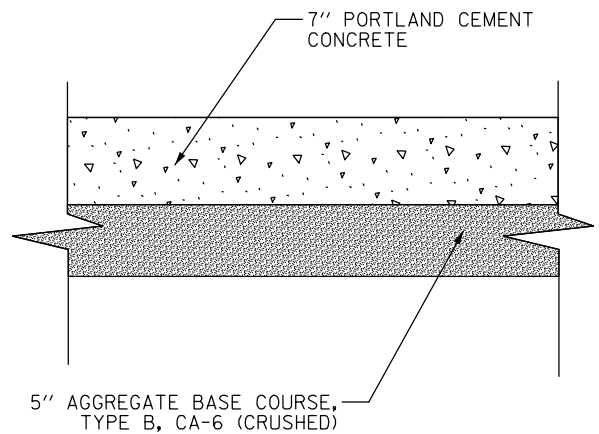




LOCAL STREETS



OR



COLLECTOR / MULTI-FAMILY STREETS



City of Harvard  
**ENGINEERING DETAILS**  
 201 W. Diggins Street, Harvard IL 60033

**PUBLIC STREETS PAVEMENT SECTION**

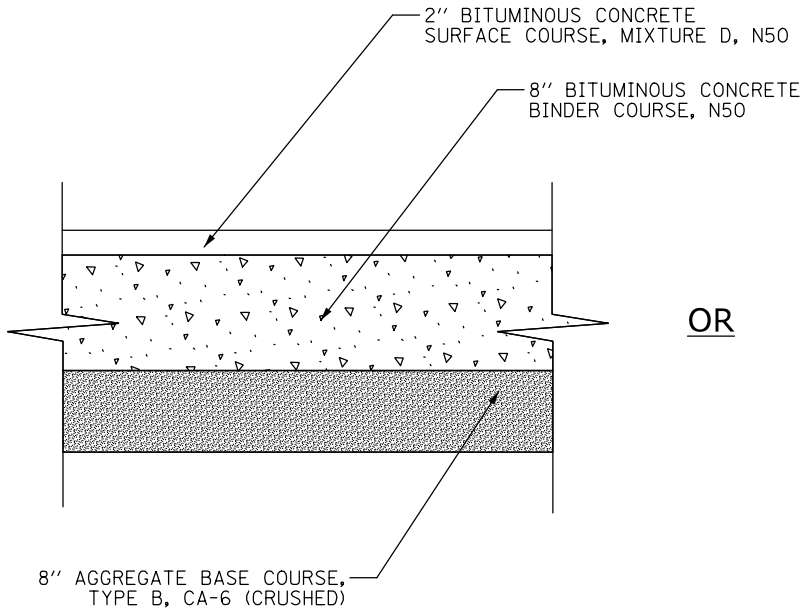
DATE: 9/19/2018

REV 1:

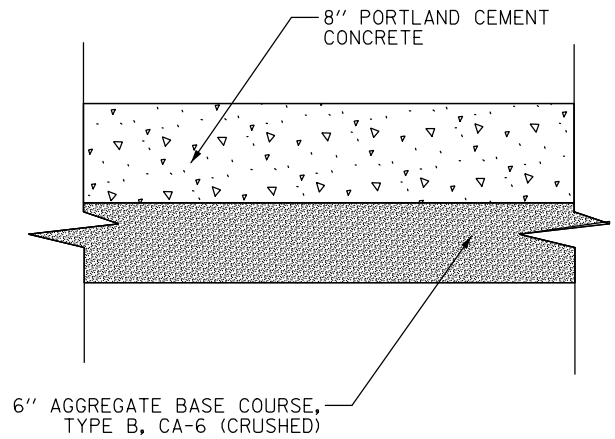
REV 2:

**R-4**

1 OF 2



OR



MAJOR / INDUSTRIAL

NOTES:

1. BITUMINOUS MATERIALS PRIME COAT MUST BE USED.
2. PRIVATE STREETS SHALL CONFORM TO LOCAL PAVEMENT SECTION.



City of Harvard  
**ENGINEERING DETAILS**  
 201 W. Diggins Street, Harvard IL 60033

**LOCAL / COLLECTOR / INDUSTRIAL / MAJOR  
 STREETS PAVEMENT SECTION**

DATE: 9/19/2018

REV 1:

REV 2:

**R-4**

2 OF 2

**REQUIRED ROADWAY WIDTHS**  
(edge to edge widths)

Type of Street	Residential Subdivisions	Industrial/Commercial Subdivisions
Major Street	4-12' lanes with median	
Collector	36'	39'
Local	28'	31'
Cul-de-sac	55' Radius	60' Radius

**Minimum Centerline Radius**  
(Horizontal Alignment)

Type of Street	Residential Subdivision	Industrial/Commercial Subdivision
Collector Street	300'	350'
Local Street	250'	300'



City of Harvard  
**ENGINEERING DETAILS**  
 201 W. Diggins Street, Harvard IL 60033

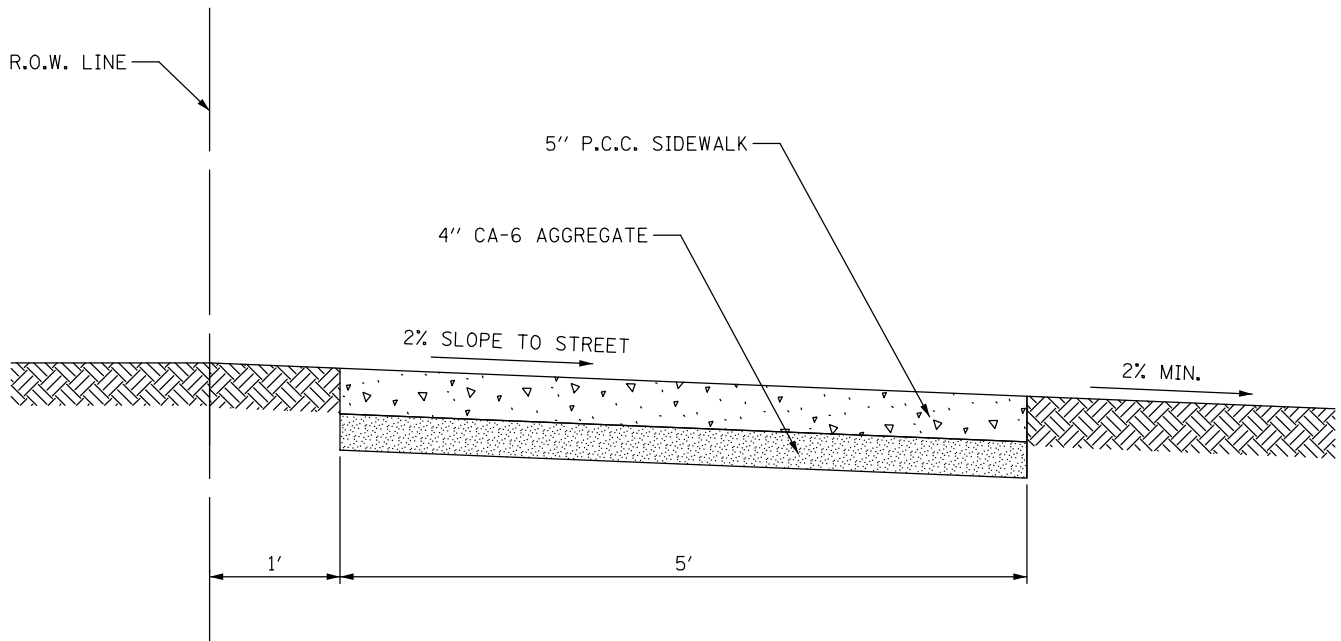
**ROADWAY WIDTHS AND  
CENTERLINE RADIUS**

DATE: 9/19/2018

REV 1:

REV 2:

**R-5**



**NOTES:**

SIDEWALK THROUGH DRIVEWAYS SHALL BE CONSTRUCTED IN ACCORDANCE WITH CITY OF HARVARD DETAIL R-1 OR R-2 AS APPROPRIATE. ALL SIDEWALKS SHALL HAVE CONTRACTION JOINTS AT 5' INTERVALS AND EXPANSION JOINTS AT 25' INTERVALS.

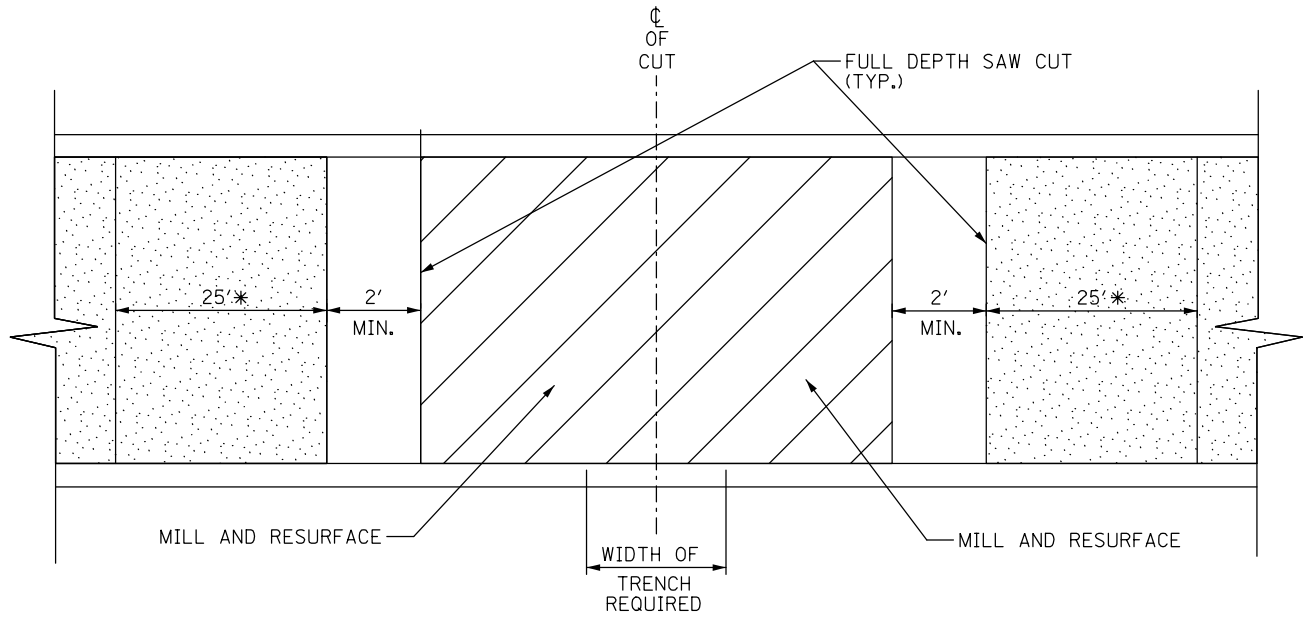


City of Harvard  
**ENGINEERING DETAILS**  
 201 W. Diggins Street, Harvard IL 60033

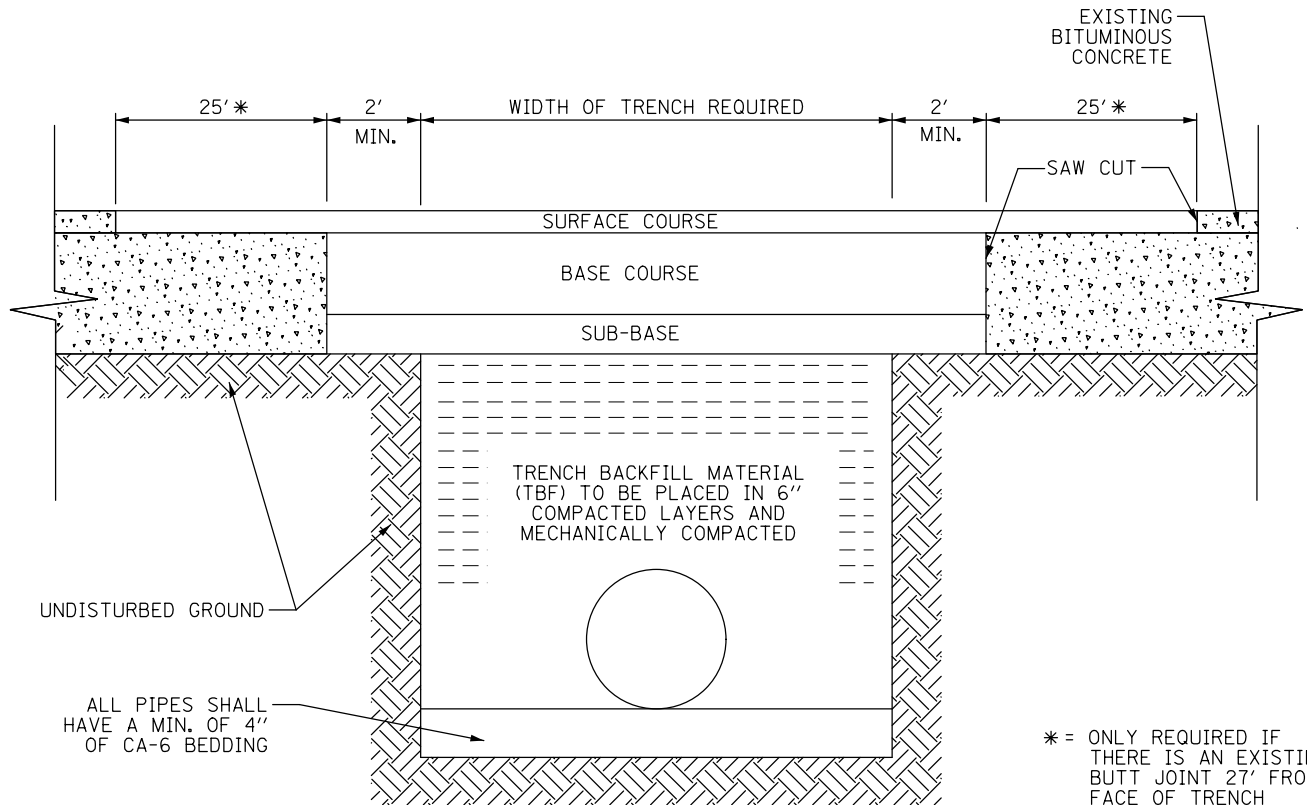
**SIDEWALK DETAIL**

DATE: 9/19/2018  
 REV 1:  
 REV 2:

**R-6**



**PLAN VIEW**



\* = ONLY REQUIRED IF THERE IS AN EXISTING BUTT JOINT 27' FROM FACE OF TRENCH

**CROSS SECTION VIEW**

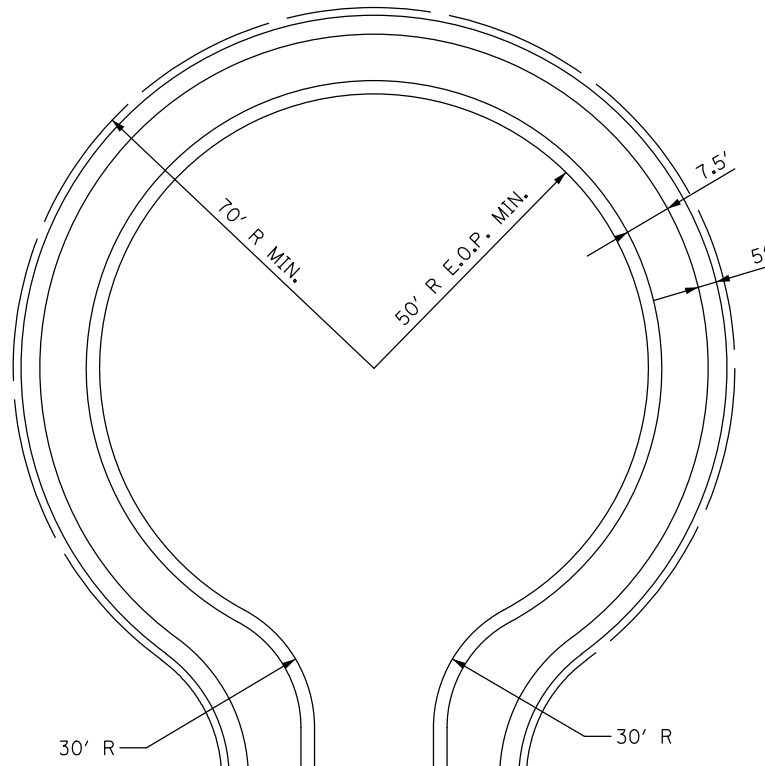


City of Harvard  
**ENGINEERING DETAILS**  
 201 W. Diggins Street, Harvard IL 60033

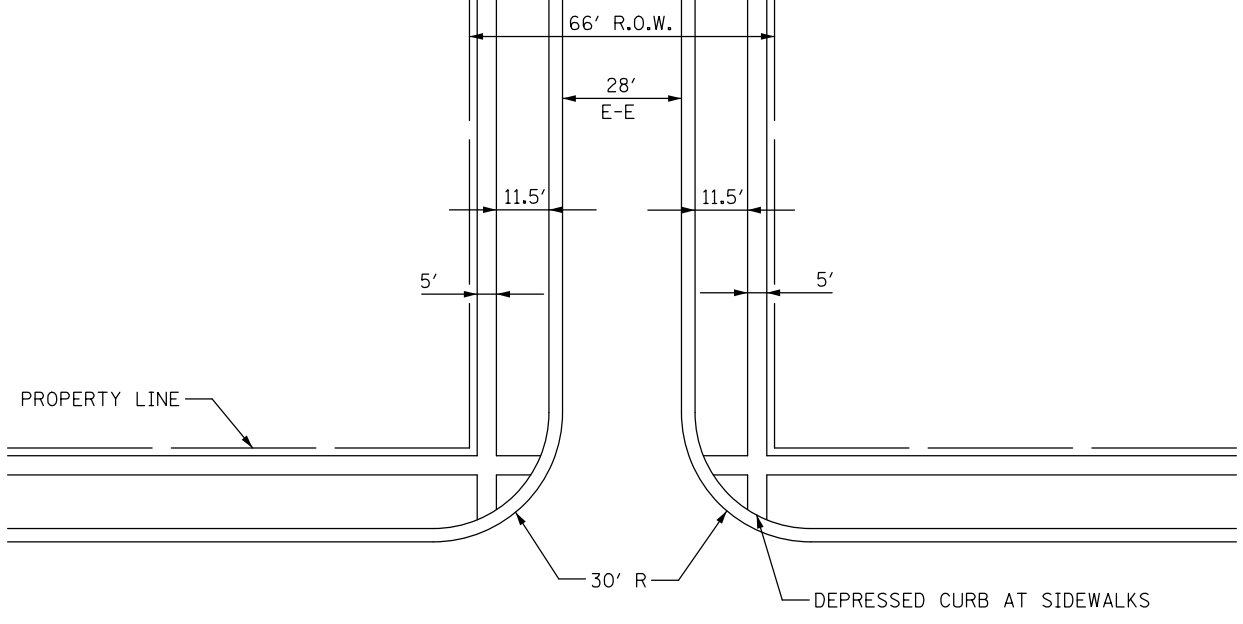
**PAVEMENT REMOVAL AND REPLACEMENT**

DATE: 9/19/2018  
 REV 1:  
 REV 2:

**R-7**



**NOTES:**  
 MAXIMUM LENGTH OF  
 CUL-DE-SAC IS 600 FT.



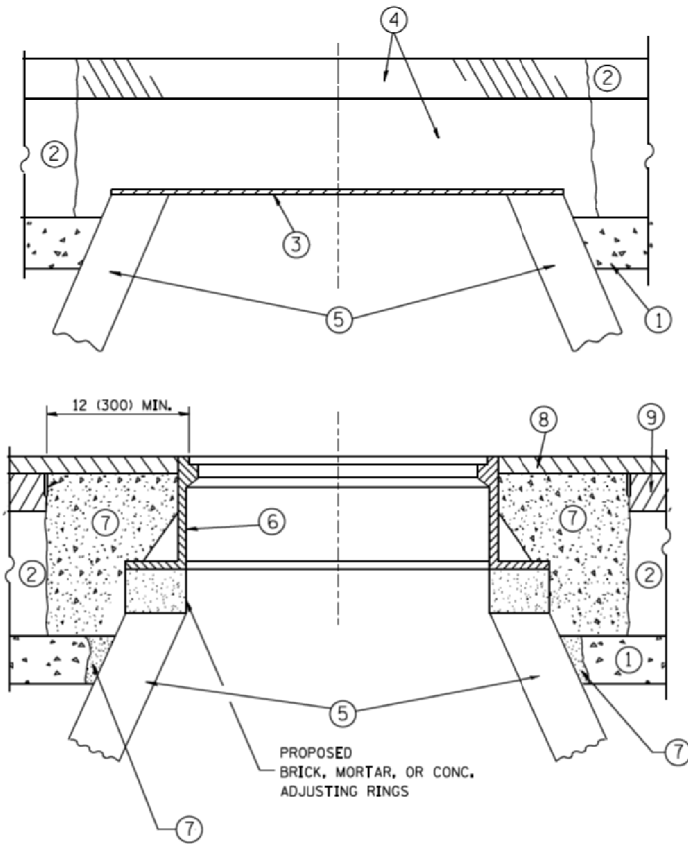
City of Harvard  
**ENGINEERING DETAILS**  
 201 W. Diggins Street, Harvard IL 60033

**RESIDENTIAL  
 CUL-DE-SAC DESIGN**

DATE:	9/19/2018
REV 1:	
REV 2:	

**R-8**

## DETAILS FOR FRAMES AND LIDS ADJUSTMENT WHEN MILLING



- STAGE 1 (BEFORE PAVEMENT MILLING)
- A) REMOVE A MINIMUM OF 12" OF THE PAVEMENT FROM AROUND THE STRUCTURE.
  - B) REMOVE THE EXISTING FRAME AND LID FROM THE STRUCTURE
  - C) COVER THE STRUCTURE OPENING WITH A 36" DIAMETER METAL PLATE.
  - D) BACKFILL WITH CRUSHED STONE AND A MINIMUM 1 1/2" THICK HMA SURFACE MIX APPROVED BY THE ENGINEER.

- STAGE 2 (AFTER PAVEMENT MILLING)
- A) REMOVE THE HMA SURFACE MIX AND CRUSHED STONE.
  - B) INSTALL THE FRAME AND LID; ADJUST THE FRAME TO ITS FINAL SURFACE ELEVATION.
  - C) THE SURROUNDING SPACE SHALL BE FILLED WITH CLASS PP-1 CONCRETE TO THE ELEVATION OF THE SURFACE OF THE EXISTING BASE COURSE OR THE BINDER COURSE.

\*UNLESS OTHERWISE SPECIFIED IN THE PLANS.

THE PROCEDURE EXPLAINED ABOVE SHALL CONFORM TO THE APPLICABLE PORTIONS OF SECTIONS 353, 406, 602, AND 603 OF THE STANDARD SPECIFICATIONS EXCEPT THAT "THE CONTRACTOR SHALL ADJUST THE STRUCTURES TO THE FINISHED PAVEMENT ELEVATION NO MORE THAN 5 CALENDAR DAYS PRIOR TO PLACEMENT OF THE FINAL LIFT OF SURFACE UNLESS APPROVED BY THE ENGINEER."

### LEGEND:

- |  |                               |
|--|-------------------------------|
| ① SUB-BASE GRANULAR MATERIAL                 | ⑥ FRAME AND LID (SEE NOTES)   |
| ② EXISTING PAVEMENT                          | ⑦ CLASS PP-1 CONCRETE         |
| ③ 36" DIAMETER METAL PLATE                   | ⑧ PROPOSED HMA SURFACE COURSE |
| ④ PROPOSED CRUSHED STONE AND HMA SURFACE MIX | ⑨ PROPOSED HMA BINDER COURSE  |
| ⑤ EXISTING STRUCTURE                         |                               |

### NOTES:

EXISTING BROKEN FRAMES AND LIDS SHALL BE REMOVED AND DISPOSED OF BY THE CONTRACTOR AND SHALL BE REPLACED AS DIRECTED BY THE ENGINEER. REPLACEMENT FRAMES AND LIDS WILL BE PAID FOR IN ACCORDANCE WITH ARTICLE 109.04 OF THE STANDARD SPECIFICATIONS UNLESS A SEPARATE PAY ITEM HAS BEEN PROVIDED.

IF THE EXISTING LIDS ARE OPEN, THE FRAME WILL BE ADJUSTED TO THE ELEVATION OF THE MILLED PAVEMENT SURFACE PRIOR TO THE MILLING OPERATION. THE FRAME WILL NOT BE REMOVED AND COVERED BY THE METAL PLATE.

THE METAL PLATE USED TO COVER THE STRUCTURE SHALL REMAIN THE PROPERTY OF THE CONTRACTOR.

WHEN STRUCTURES ARE TO BE ADJUSTED OR RECONSTRUCTED, THE LOWERING AND RAISING OF THE FRAMES AND LIDS WILL NOT BE PAID FOR SEPARATELY BUT WILL BE INCLUDED IN THE COST OF THE CORRESPONDING PAY ITEM.

### LOCATION OF STRUCTURES:

THE CONTRACTOR WILL BE REQUIRED TO KEEP A RECORD OF THE LOCATIONS OF THE BURIED STRUCTURES ACCORDING TO THE STATION AND DISTANCE LEFT OR RIGHT OF THE CENTERLINE OF PAVEMENT. UPON COMPLETION OF THE WORK, THE CONTRACTOR WILL DELIVER THE RECORD TO THE ENGINEER .

### BASIS OF PAYMENT:

REMOVING FRAMES AND LIDS ON DRAINAGE AND UTILITY STRUCTURES IN THE PAVEMENT PRIOR TO MILLING, AND ADJUSTING TO FINAL GRADE PRIOR TO PLACING THE SURFACE COURSE, WILL BE PAID FOR AT THE CONTRACT UNIT PRICE EACH FOR "FRAMES AND LIDS TO BE ADJUSTED (SPECIAL)."

THIS WORK WILL NOT BE PAID FOR WHEN DRAINAGE AND UTILITY STRUCTURES ARE SPECIFIED FOR PAYMENT AS STRUCTURE RECONSTRUCTION.

NEW FRAMES AND LIDS, WHEN SPECIFIED, WILL BE PAID FOR SEPARATELY.



City of Harvard

### **ENGINEERING DETAILS**

201 W. Diggins Street, Harvard IL 60033

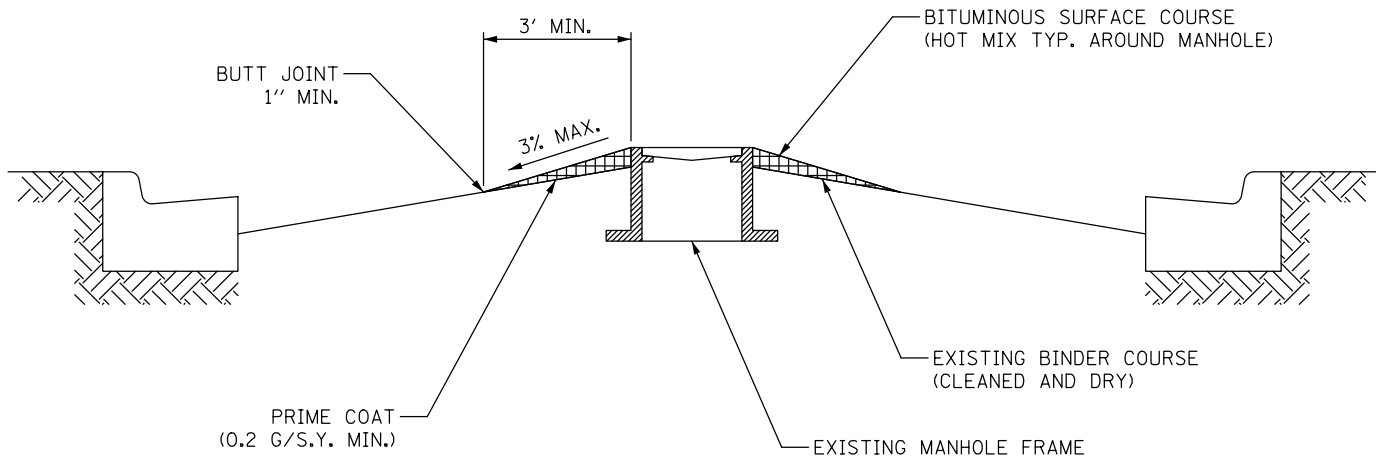
## **FRAME ADJUSTMENT WHEN MILLING**

DATE: 9/19/2018

REV 1:

REV 2:

**R-9**



**NOTES:**

1. TO BE USED WHEN PLATING PROCEDURE OF R-5 NOT POSSIBLE.
2. RAMP TO BE MAINTAINED THROUGHOUT THE WINTER BY DEVELOPER.
3. RAMP MATERIAL TO BE REMOVED BY MILLING OR OTHERWISE REMOVED BEFORE PLACEMENT OF FINAL SURFACE COURSE.



City of Harvard  
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 201 W. Diggins Street, Harvard IL 60033

**MANHOLE RAMPING  
 DETAIL**

DATE: 9/19/2018  
 REV 1:  
 REV 2:

**R-10**



### SIGN PANEL

- ALL TRAFFIC CONTROL SIGNS SHALL BE PRIZMATIC 3M REFLECTIVE MATERIAL W/1150 CLEAR OVERLAY
- ALL SIGNS SHALL BE 0.08 GAL ALUMINUM 1.5 RC
- INSTALLATION OF SIGNS SHALL BE IN ACCORDANCE WITH LATEST VERSION OF ILLINOIS MUTCD
- ALL STOP SIGN SHALL BE 30" x 30"

### METAL POST

- POSTS SHALL BE GREEN O-CHANNEL, 12-GAUGE GALVANIZED, WITH 3' ANCHORS.
- POSTS SHALL BE 3 LBS/FT FOR ALL TRAFFIC CONTROL SIGNS



City of Harvard  
**ENGINEERING DETAILS**  
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### **STREET SIGN AND POST STANDARDS**

DATE: 9/19/2018

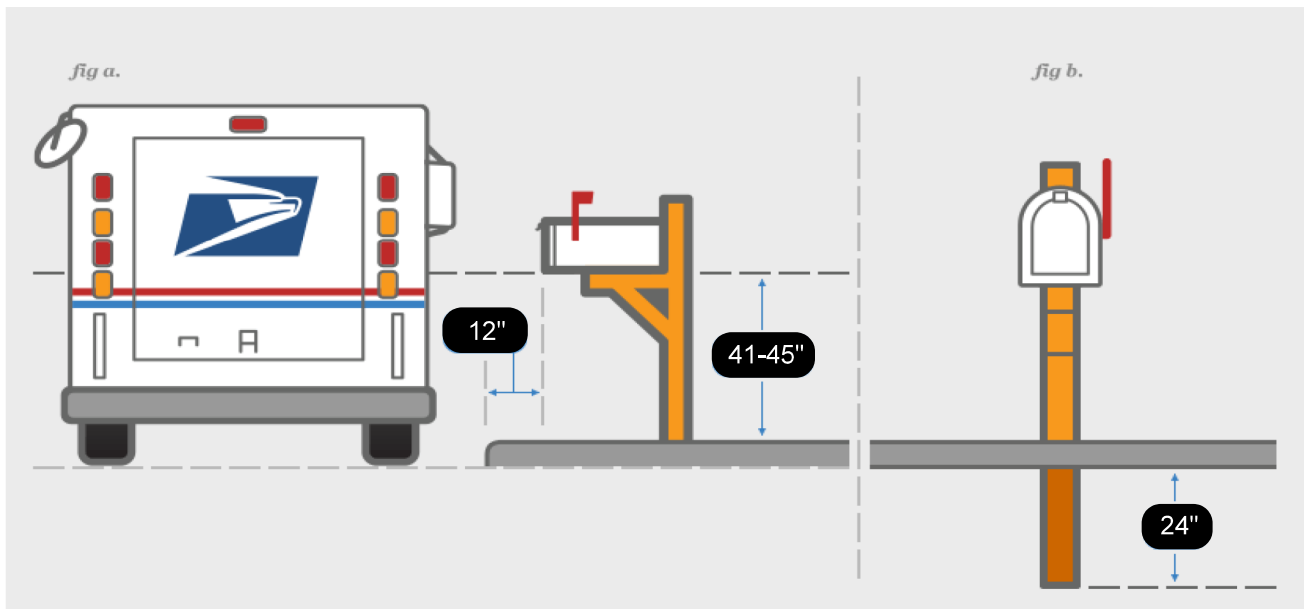
REV 1:

REV 2:

**R-11**

## GUIDELINES FOR THE INSTALLATION OF CURBSIDE MAILBOXES

1. THE HEIGHT OF THE MAILBOX MUST BE BETWEEN FORTY-ONE INCHES AND FORTY-FIVE INCHES (41"-45"). FROM THE TOP OF THE STREET TO THE BOTTOM OF THE MAILBOX.
2. HOUSE NUMBERS OF NOT LESS THAN ONE INCH (1") HIGH ARE REQUIRED ON ALL MAILBOXES, NAMES ARE OPTIONAL.
3. THE FACE OF THE MAILBOX SHOULD BE TWELVE INCHES (12") FROM THE BACK OF THE CURB, OR EDGE OF THE PAVEMENT IF NO CURB IS PRESENT.
4. SUPPORT POST SHOULD BE INSTALLED TWENTY-FOUR INCHES (24") BELOW GRADE.
5. ALL POSTS USED TO SUPPORT MAILBOXES MUST BE NEAT AND OF ADEQUATE STRENGTH.
6. MAILBOX SUPPORT STRUCTURES SHOULD BE PAINTED WITH A PRESERVATIVE TO PREVENT RUST OR DECAY.
7. THE CITY OF HARVARD PROHIBITS THE USE OF BRICKS AND/OR OTHER MASONRY STRUCTURES TO BE USED AS MAILBOX SUPPORTS.



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### STANDARD MAILBOX GUIDELINES

DATE: 9/19/2018

REV 1:

REV 2:

**R-12**

The first part of the document discusses the importance of maintaining accurate records in a business setting. It highlights how proper record-keeping can help in decision-making, legal compliance, and financial management. The text emphasizes that records should be organized, up-to-date, and easily accessible to all relevant personnel.

Next, the document addresses the challenges of data management in the digital age. With the increasing volume of data generated by various systems, businesses face the task of storing, securing, and analyzing this information effectively. The text suggests implementing robust data management strategies, including regular backups, security protocols, and the use of data analytics tools to gain insights from the collected data.

The third section focuses on the role of technology in streamlining business operations. It explores how automation and digital tools can reduce manual tasks, improve efficiency, and minimize errors. Examples of such technologies include accounting software, project management tools, and customer relationship management (CRM) systems. The text encourages businesses to invest in technology that aligns with their specific needs and goals.

Finally, the document discusses the importance of employee training and development. In a rapidly changing business environment, it is crucial for employees to have the necessary skills and knowledge to perform their roles effectively. The text suggests implementing a comprehensive training program that covers both technical and soft skills, and encourages a culture of continuous learning and professional growth.

## Miscellaneous Sanitary Sewer Notes

1. Sanitary sewers, main, and services and their fittings shall be constructed of one (1) or more of the following materials:
  - a. PVC pipe, ASTM D-3034, SDR26 with elastomeric gasket joints conforming to ASTM D-3212.
  - b. Ductile iron pipe Class 52 with joints conforming to ANSI A21.11. Only when approved for structural purposes by the City Engineer or Director of Public Works or designated representative.
  
2. Sanitary sewer manholes shall be five (5)-feet zero (0)-inches diameter precast structures. Frames shall be East Jordan 1020, or 1050 HD with self-sealing application lids with concealed pick holes. Lids shall be imprinted with the word "sanitary."
  
3. Sanitary sewer manholes and inspection manholes shall have eccentric cones. All manhole sections and adjusting rings shall be securely sealed to each other using pre-formed bituminous mastic such as "RAM-NEK." This mastic shall be applied in such a manner that ground water inflow cannot enter the manhole through gaps between barrel sections or cone sections and adjusting rings. Double "TAR STICK" may be required in areas with high water tables. External "CRETEX" brand chimney seals shall be installed in all manholes. "MAC RAP" is to be used at all manhole section joints. All sanitary structures to be tar-coated including cones.
  
4. All pipe connections in/out of a sanitary manhole shall be cored and booted with gasket type water stop gaskets, with stainless steel bands per ASTM C923.
  
5. Sanitary sewer service risers shall be used when sewer main exceeds 12-feet in depth. The bedding under the riser tee shall thoroughly compacted. The engineer reserves the right to require concrete encasement of the riser or a concrete thrust block under the tee.
  
6. All sanitary sewers including service stubs shall be subject to an air test Section 31 of the Standard Specifications. Applicable portions of main line sewer including main with riser sections shall be subjected to a deflection test conducted by the contractor. All testing shall be observed by a City of Harvard Public Works Department Representative.
  
7. The main sanitary sewer shall be televised prior to acceptance. A videotape, CD, or DVD along with a paper report shall be submitted to the City of Harvard Public Works Department. All sewer televising must be performed by NASSCO certified operators using current NASSCO standards and coding system that can be found in current NASSCO documents. The contractor, without delay, shall preform all necessary corrective work.
  
8. All sump pumps must discharge outside of the home or to the storm sewer system. All interior floor drains and waste ejector pits must connect to the sanitary sewer system.



City of Harvard  
**ENGINEERING DETAILS**  
 201 W. Diggins Street, Harvard IL 60033

### MISCELLANEOUS SANITARY SEWER NOTES

DATE: 9/19/2018  
 REV 1:  
 REV 2:

SAN-0

9. All sanitary sewer stubs shall be marked with 4x4 post painted green.
10. Structures, manholes, inlets, catch basin sumps, and valve vaults shall be cleaned prior to any inspection at the end of the project and prior to City acceptance. Sanitary and storm sewer main shall be jet cleaned if evidence of debris build-up is present at the time of City acceptance.
11. When existing stubs are not available, all service connections to mainline sewer shall consist of the following:
  - a. The mainline sewer shall be cut and a tee section installed with non-sheer mission couplings placed over connection points, or an Inserta Tee connection can be used.
  - b. If existing sewer is clay pipe and new tee section is being installed, then a min of two feet of PVC is required on each side of tee.
  - c. Existing stubs or services planned for use must be televised and verified by the City of Harvard to be in acceptable condition prior to use or reuse; and
  - d. Break in connections are not permitted.
  - e. Sanitary Services must be a minimum of 4" and have an outside clean out access.



City of Harvard  
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**MISCELLANEOUS SANITARY SEWER  
 NOTES**

DATE: 9/19/2018  
 REV 1:  
 REV 2:

**SAN-0**

EAST JORDAN 1050 HEAVY DUTY FRAME  
IN ROADWAY, 1020/ IN GRASSED  
AREAS IMPRINTED W/  
"SANITARY". GASKETED SEAL  
TIGHT COVER, 22<sup>3</sup>/<sub>4</sub>"

TWO (2) ADJUSTING RINGS  
MAXIMUM ALLOWABLE. MAXIMUM  
HEIGHT ON ADJUSTMENT IS 8"

PLASTIC BUTYL  
SEALANT

EXTERNAL MANHOLE CHIMNEY SEAL,  
CRETEX MFG. CONFORMING TO ASTM C-923

24"  
MIN.

NON-CORROSIVE PLASTIC  
COATED CAST IRON MANHOLE  
STEPS

ECCENTRIC CONE SECTION ONLY

TAR COATED PRECAST  
SECTIONS

60" DIA.  
MIN. 5"  
MIN.

EXTERNAL JOINT SEALS  
CONFORMING TO ASTM C-877,  
TYPE II MAR-MAC MFG. OR  
APPROVED EQUAL

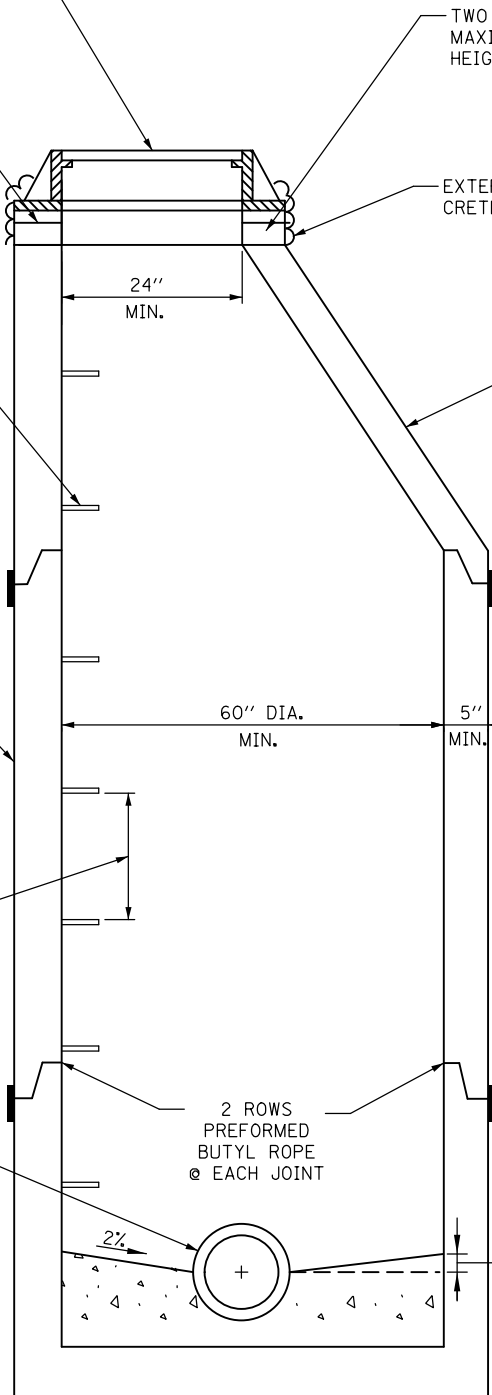
STEEL CORE PLASTIC  
STEPS @ 16" O.C. NOT  
BE POSITIONED OVER INVERTS

FLEXIBLE RUBBER CONNECTOR  
CONFORMING TO ASTM C-923

2 ROWS  
PREFORMED  
BUTYL ROPE  
@ EACH JOINT

FIRST SECTION MONOLITHIC  
W/BASE

3" MIN.



City of Harvard  
**ENGINEERING DETAILS**  
201 W. Diggins Street, Harvard IL 60033

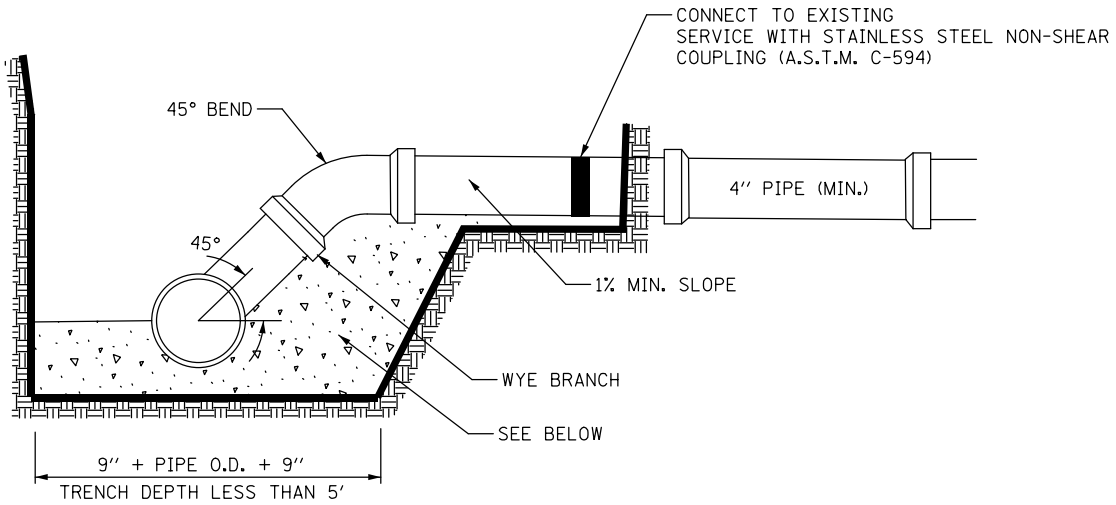
**SANITARY MANHOLE  
TYPE I**

DATE: 9/19/2018

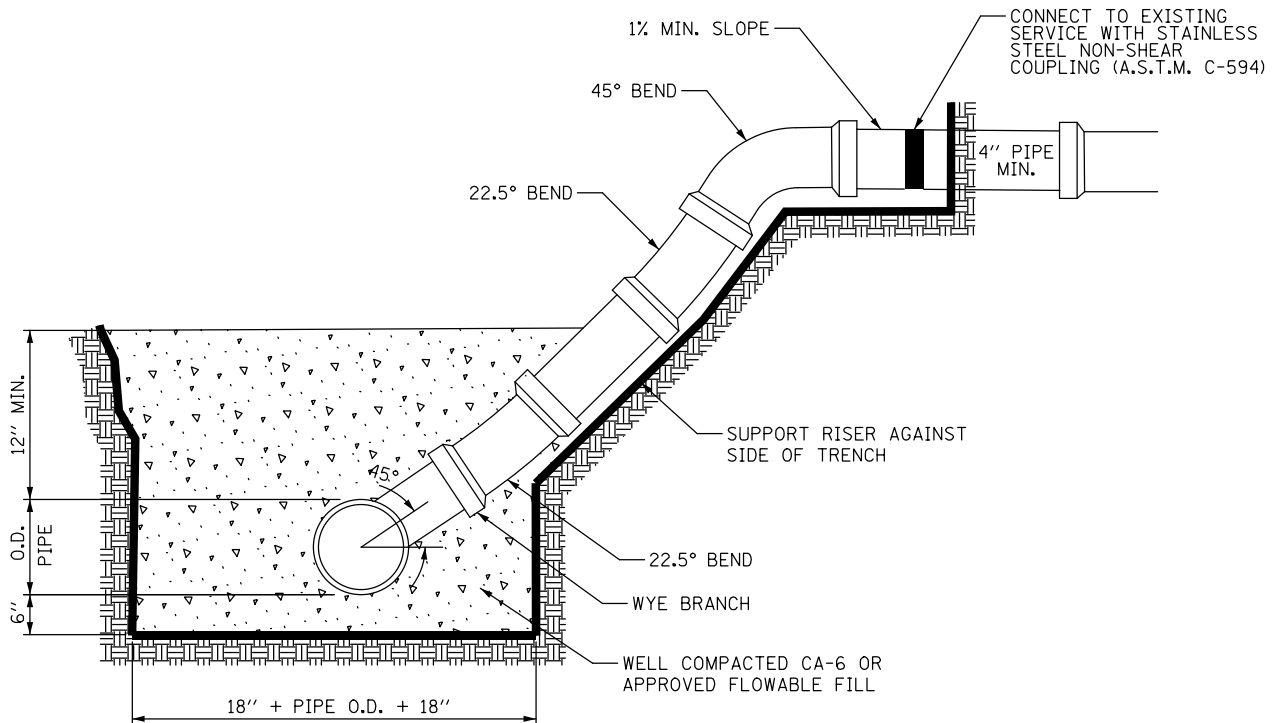
REV 1:

REV 2:

**SAN-1**



### BUILDING SERVICE DETAIL UNDER 5 FEET



### TRENCH DEPTH 5' AND GREATER

**NOTES:**

1. DEPTHS, 10' SDR 26 PVC SEWER PIPE PER ASTM D-3034 CELL CLASS 12454B
2. NEW SERVICES TO BE PVC OR CAST IRON ONLY CLAY NOT PERMITTED
3. SEE SAN-3 FOR BEDDING AND BACKFILL
4. WATER MAIN QUALITY PVC C909 PIPE IF OVER EXISTING UTILITY



City of Harvard  
**ENGINEERING DETAILS**  
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## **BUILDING SERVICE RISER**

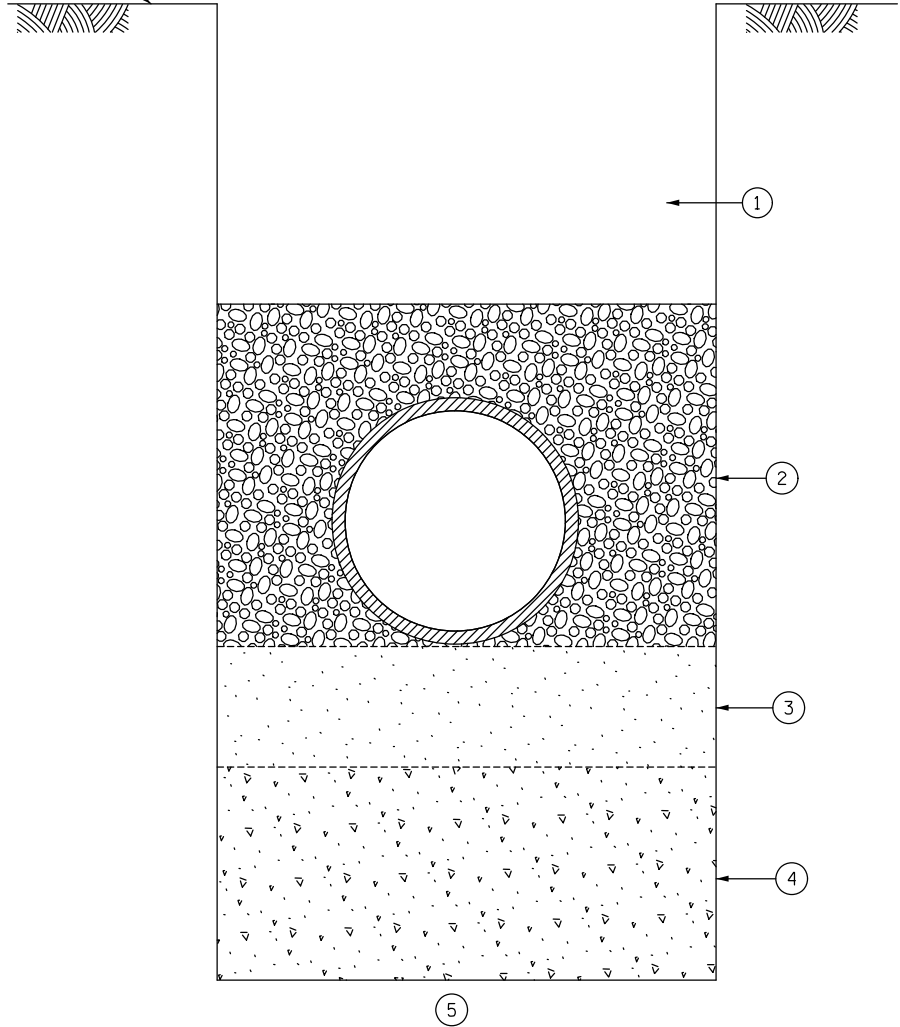
DATE: 9/19/2018

REV 1:

REV 2:

## **SAN-2**

FINISHED GRADE



- ① TRENCH BACKFILL UNDER PAVEMENT, CURB AND GUTTER AS INDICATED IN ROAD SUBGRADES AND WITHIN 2' OF ANY PROPOSED CURB AND GUTTER OR SIDEWALK. MECHANICALLY COMPACTED BACKFILL OF EXCAVATED MATERIALS IN OTHER LOCATIONS IF APPROVED BY THE PROVISIONS FOR MATERIALS AND COMPACTION REQUIREMENTS.
- ② FOR SANITARY SEWER PVC: COMPACTED GRANULAR MATERIAL CA-6 TO 12" ABOVE TOP PIPE. (ALSO SEE NOTE #1 BELOW)
- ③ 6" COMPACTED BEDDING, CA-6 GRADATION
- ④ UNSUITABLE MATERIAL TO BE REMOVED WHERE DIRECTED BY THE ENGINEER AND REPLACED WITH SUITABLE AND COMPACTED MATERIAL
- ⑤ TRENCH WIDTH - PIPE O.D. + 12" MINIMUM PIPE O.D. + 18" MAXIMUM

**NOTES:**

- 1. PVC PIPE CONFORMING TO THE SDR SPECIFIED IN THE PLANS SHALL BE INSTALLED TO THE LATEST REVISED SPECIFICATION REQUIREMENTS OF ASTM D2321 USING EITHER COMPACTED CLASS I OR CLASS II GRANULAR MATERIALS FOR BEDDING, HAUNCHING AND INITIAL BACKFILL OF 12" OVER THE TOP OF PIPE TO PROVIDE THE NECESSARY SUPPORT FOR THE PIPE SO THAT THE MAXIMUM DEFLECTION DOES NOT EXCEED 5% OF THE PIPE'S ORIGINAL INTERNAL DIAMETER.
- 2. ALL CA-6 MATERIAL TO BE IDOT APPROVED

**SANITARY SEWER AND SERVICES**



City of Harvard  
**ENGINEERING DETAILS**  
 201 W. Diggins Street, Harvard IL 60033

**TYPICAL SANITARY TRENCH  
 CROSS SECTION**

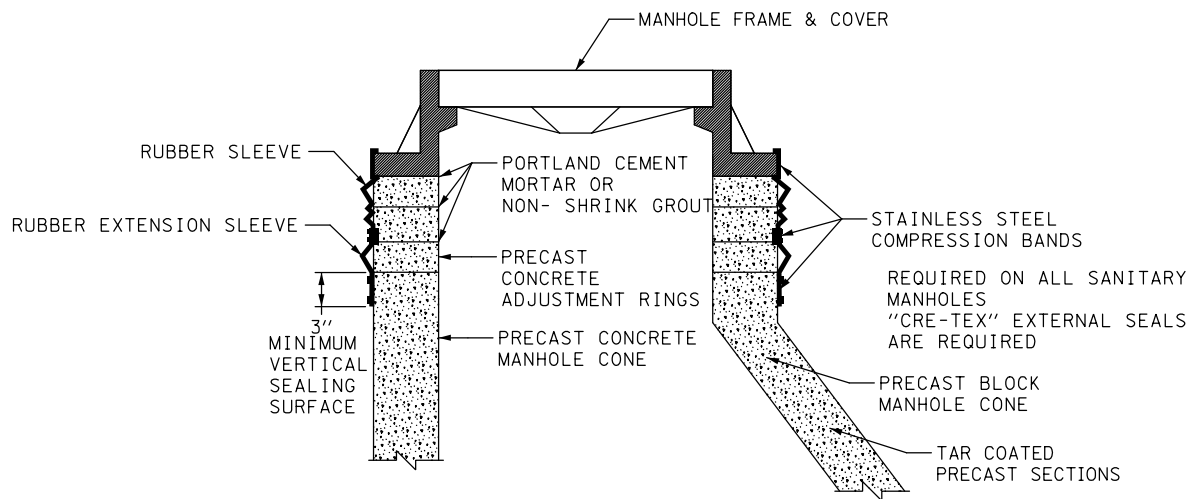
DATE: 9/19/2018

REV 1:

REV 2:

**SAN-3**





**NOTE:**

MANHOLE FRAME - CHIMNEY SEAL SHALL BE INSTALLED ON SANITARY MANHOLES. THE SEAL AND SEAL EXTENSIONS SHALL BE AS MANUFACTURED BY CRETEX SPECIALTY PRODUCTS. THE SLEEVES AND EXTENSIONS SHALL HAVE A MINIMUM THICKNESS OF 3/16 INCHES AND SHALL BE EXTRUDED OR MOLDED FROM A HIGH-GRADE RUBBER COMPOUND CONFORMING TO THE APPLICABLE REQUIREMENTS OF ASTM C923, WITH A MINIMUM 1500 PSI TENSILE STRENGTH, MAXIMUM 18% COMPRESSION SET AND A HARDNESS (DUROMETER) OF 48±5. THE BANDS USED FOR COMPRESSING THE SLEEVE AND EXTENSION AGAINST THE MANHOLE SHALL BE FABRICATED FROM 16 GAUGE STAINLESS STEEL CONFORMING TO ASTM C-923 TYPE 304. ANY SCREW BOLTS OR NUTS USED ON THIS BAND SHALL BE STAINLESS STEEL CONFORMING TO ASTM F593 AND 594, TYPE 304. DETAILED INSTALLATION PROCEDURES SHALL BE IN ACCORDANCE WITH THE MANUFACTURER'S INSTRUCTIONS. ALL COSTS FOR THE FURNISHING AND INSTALLATION OF THE INTERNAL RUBBER SEAL AND EXTENSION SHALL BE INCLUDED IN THE UNIT PRICE BID FOR SANITARY MANHOLES. NO INTERNAL CHIMNEY SEALS PERMITTED.

**PRECAST MANHOLE WITH EXTERNAL SEAL**

- 1) THE RUBBER SLEEVE IS AVAILABLE IN A 9" HEIGHT (STANDARD).
- 2) SEE THE CHIMNEY HEIGHT TABLE BELOW FOR SEAL AND EXTENSION COMBINATIONS NEEDED TO SPAN FROM THE FRAME TO THE TOP OF THE CONE ON MANHOLES WITH VARIOUS CHIMNEY HEIGHTS. FRAME OFFSETS OR DIAMETER DIFFERENCES WILL REDUCE THESE SPAN HEIGHTS.
- 3) THE TOP OF THE CONE SHALL HAVE A MINIMUM OF 3" HIGH VERTICAL SEALING SURFACE THAT IS SMOOTH AND FREE OF ANY FORM OFFSETS OR EXCESSIVE HONEYCOMB.

**CHIMNEY HEIGHT TABLE**

COMBINATIONS OF SEALS AND EXTENSIONS	TO SPAN HEIGHTS OF:
STANDARD 9" ONLY	OVER 3" - 6.5"
STANDARD SEAL + EXTENSION	OVER 6.5" - 13.5"
STANDARD SEAL + MULTI EXTENSIONS	OVER 13.5"
ADD 7" OF COVERAGE FOR EACH ADDITIONAL EXTENSION.	

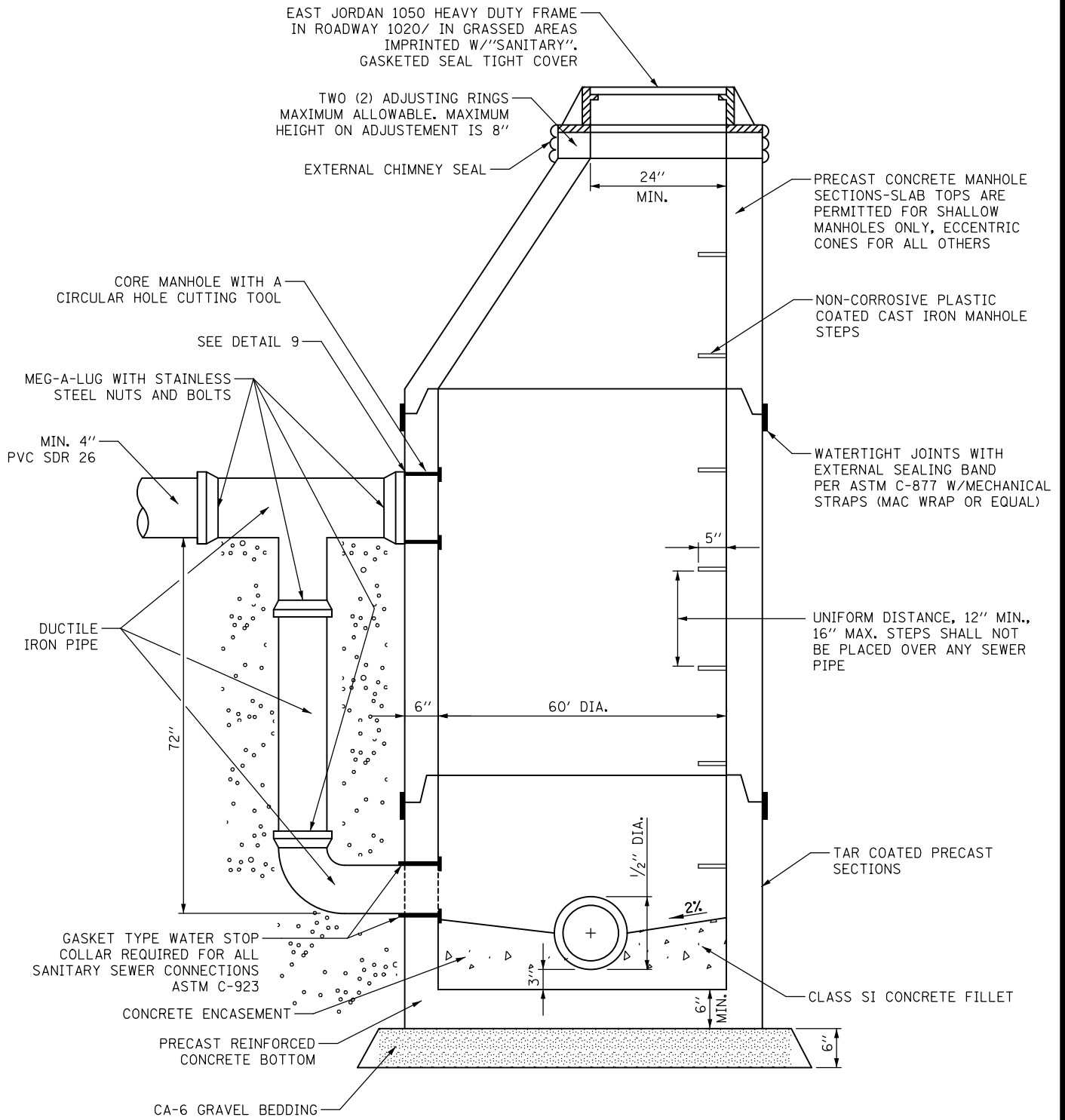


City of Harvard  
**ENGINEERING DETAILS**  
 201 W. Diggins Street, Harvard IL 60033

**SANITARY SEWER  
 EXTERNAL CHIMNEY  
 SEAL DETAIL**

DATE: 9/19/2018  
 REV 1:  
 REV 2:

**SAN-4**



**NOTES:**

USE DROP CONNECTIONS FOR ANY SANITARY SEWER PIPE ENTERING TWO (2) FEET OR MORE ABOVE THE LOWEST PIPE INVERT.

ALL PRECAST CONCRETE STRUCTURES MUST CONFORM TO AASHTO M199

1. ALL PIPE CONNECTIONS OPENINGS SHALL BE PRECAST WITH RESILIENT RUBBER WATER TIGHT PIPE SLEEVES.
2. MANHOLE FRAME, ADJ. RINGS & ALL CONCRETE SECTIONS SHALL BE SET ON A PREFORMED BIT. PLASTIC GASKET (RUB-R-NEK OR EZ STIK)
3. FILL LUG HOLES WITH BITUMINOUS MASTIC JOINT MATERIAL AND NON-SHRINKING GROUT.

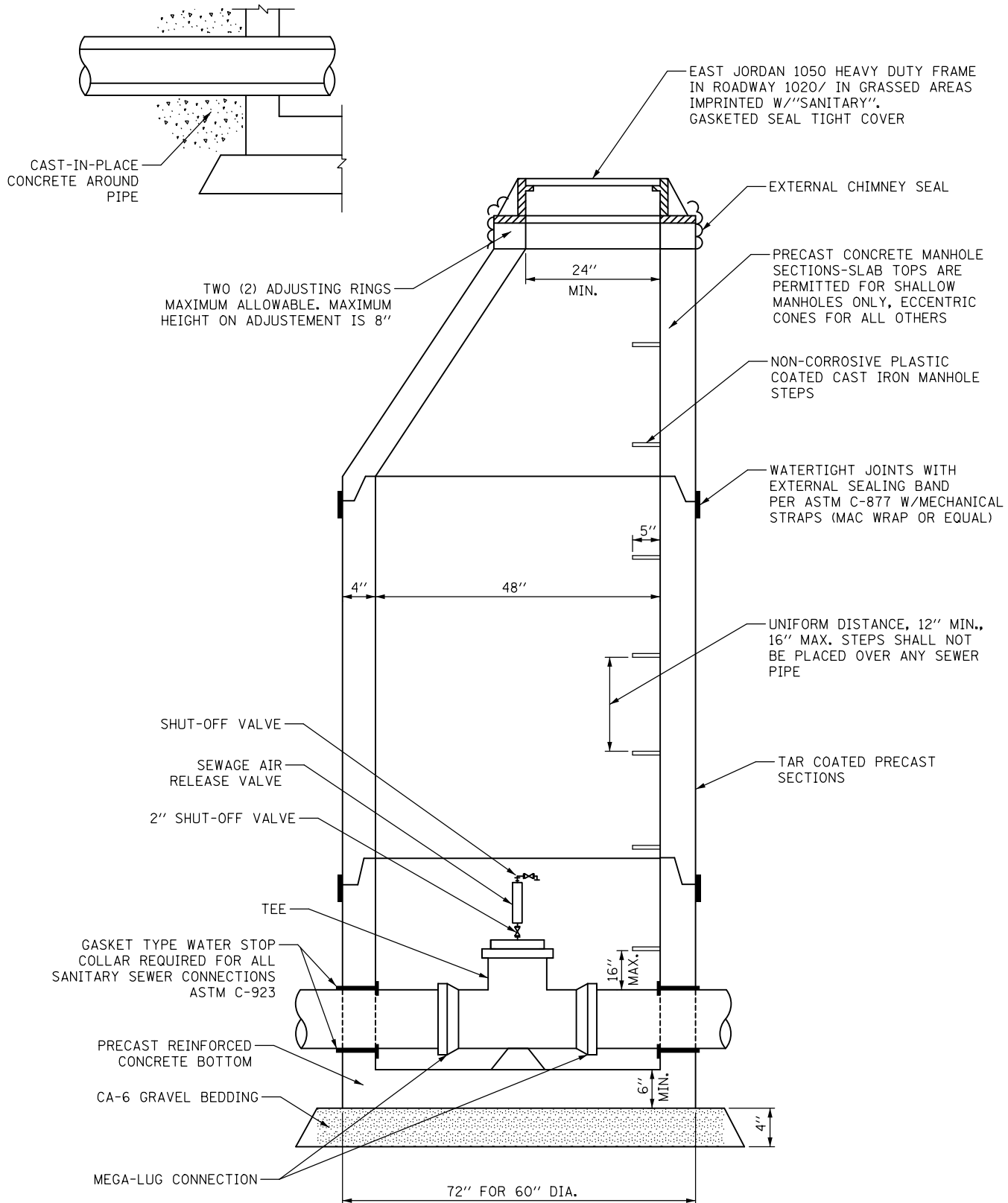


City of Harvard  
**ENGINEERING DETAILS**  
 201 W. Diggins Street, Harvard IL 60033

**DROP MANHOLE  
 DETAIL OUTSIDE TYPE**

DATE: 9/19/2018  
 REV 1:  
 REV 2:

**SAN-5**



ALL PRECAST CONCRETE STRUCTURES MUST CONFORM TO AASHTO M199

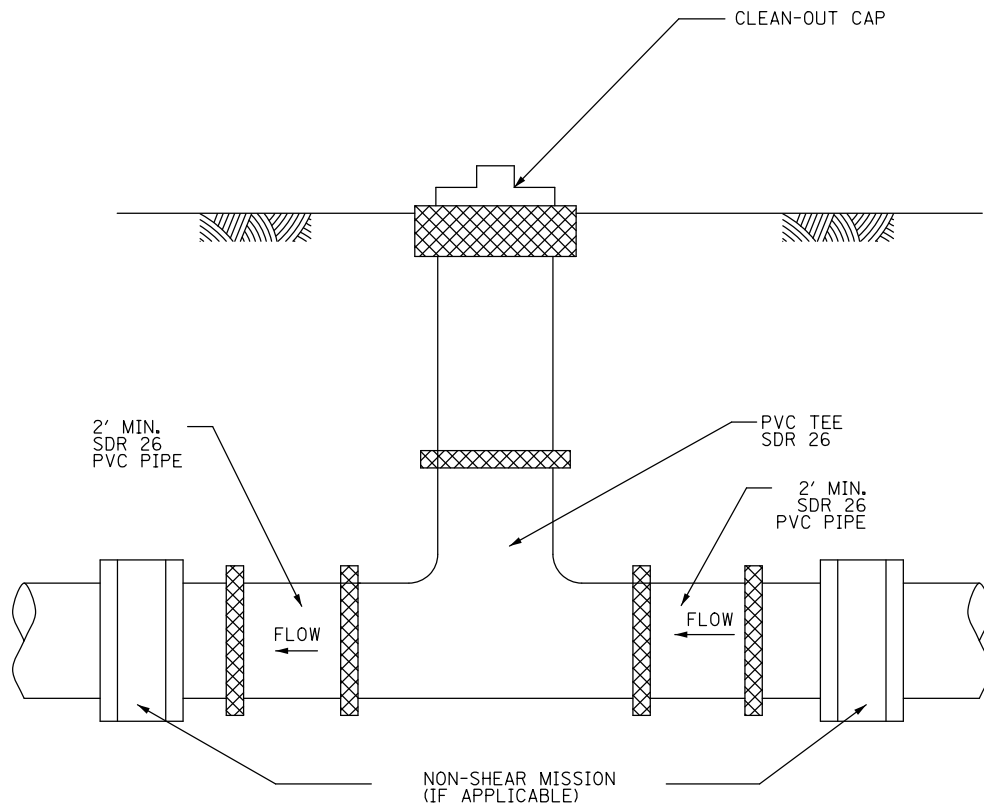


City of Harvard  
**ENGINEERING DETAILS**  
 201 W. Diggins Street, Harvard IL 60033

**SANITARY SEWER  
 AIR RELEASE  
 MANHOLE DETAIL**

DATE:	9/19/2018
REV 1:	
REV 2:	

**SAN-6**



**CLEAN OUT**

**NOTE:**

EXTERIOR CLEAN-OUTS CANNOT BE INSTALLED FURTHER THAN 5 FEET FROM THE FOUNDATION. EXCEPTION: WHEN EXISTING CONDITIONS PREVENT THE INSTALLATION AS SPECIFIED, THE CLEAN-OUT MAY BE INSTALLED IN A LOCATION AS DETERMINED BY THE DIRECTOR OF PUBLIC WORKS.



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**ENGINEERING DETAILS**  
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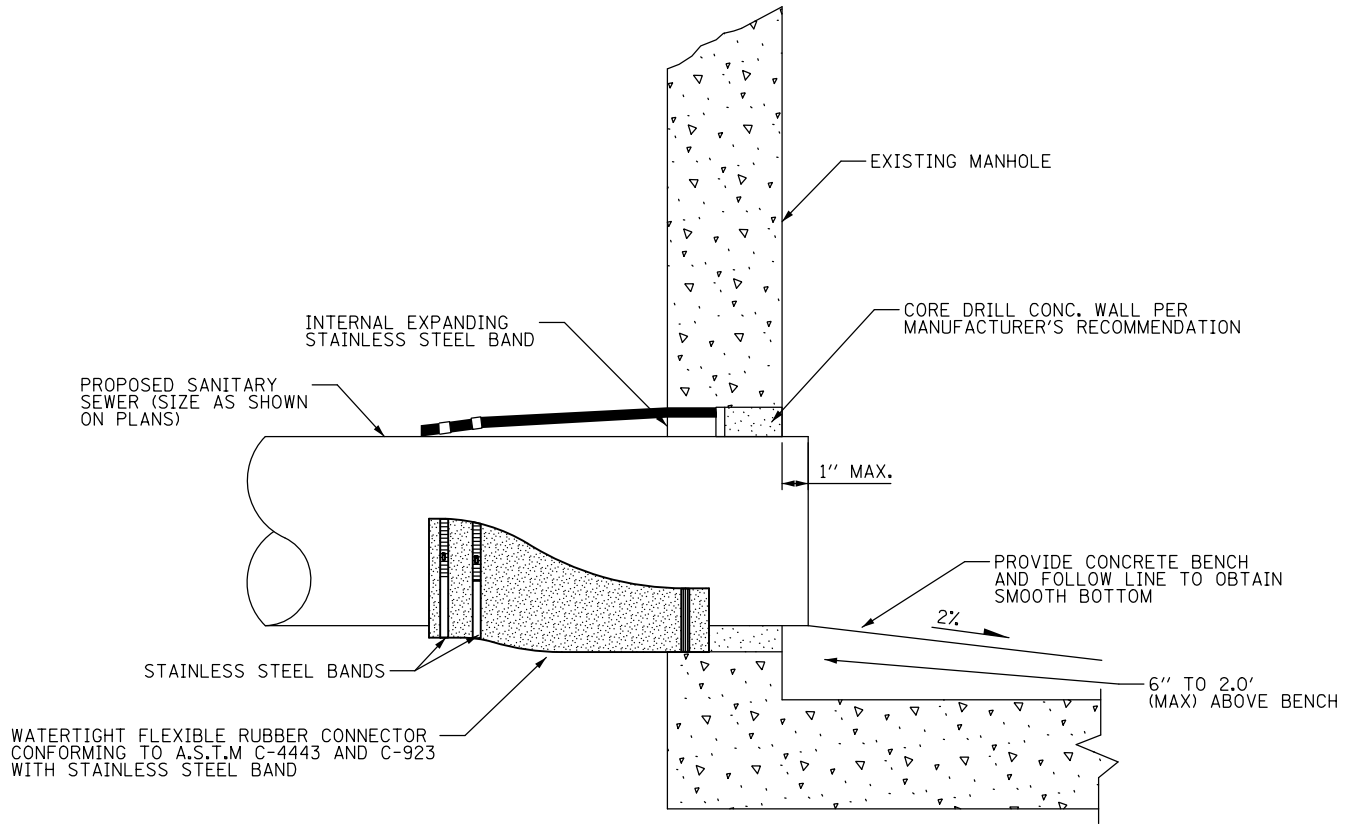
**SANITARY SEWER SERVICE  
 CLEANOUT DETAIL**

DATE: 9/19/2018

REV 1:

REV 2:

**SAN-7**



City of Harvard  
**ENGINEERING DETAILS**  
 201 W. Diggins Street, Harvard IL 60033

**EXISTING SANITARY MANHOLE  
 PIPE ENTRY DETAIL**

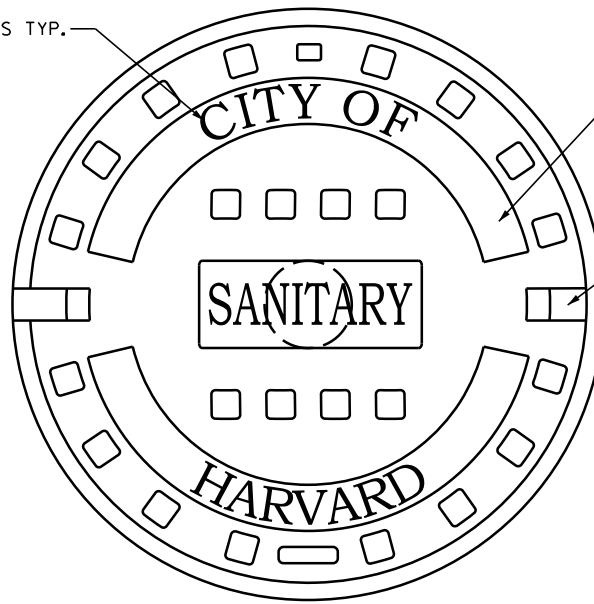
DATE: 9/19/2018

REV 1:

REV 2:

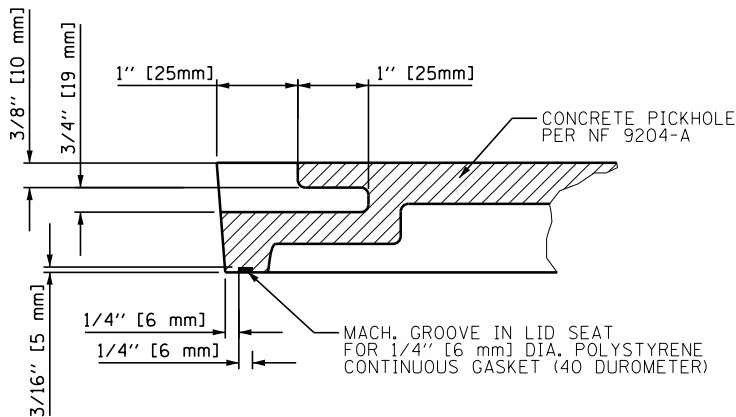
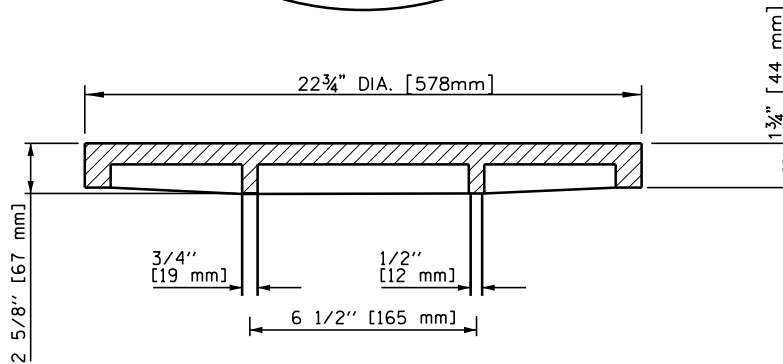
**SAN-8**

2" [51mm] RAISED LETTERS TYP.  
FLUSH WITH SURFACE



TYPE "B" RECESSED POCKETS

(2) CONCEALED TYPE PICK HOLE  
PER NF - 9204 - A



**EAST JORDAN GASKETED SEAL TIGHT COVER 1020**



City of Harvard  
**ENGINEERING DETAILS**  
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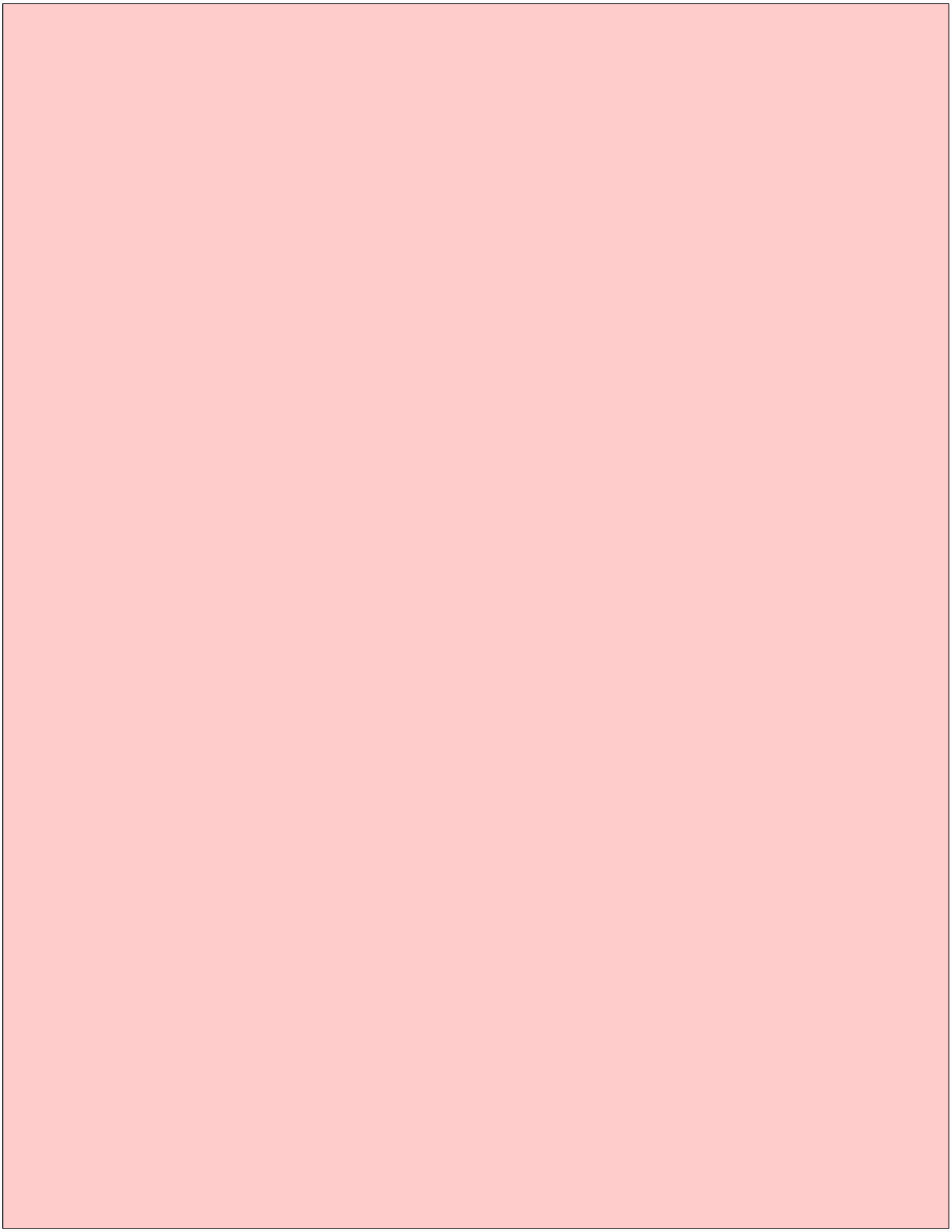
**SANITARY MANHOLE SELF SEALING LID**

DATE: 9/19/2018

REV 1:

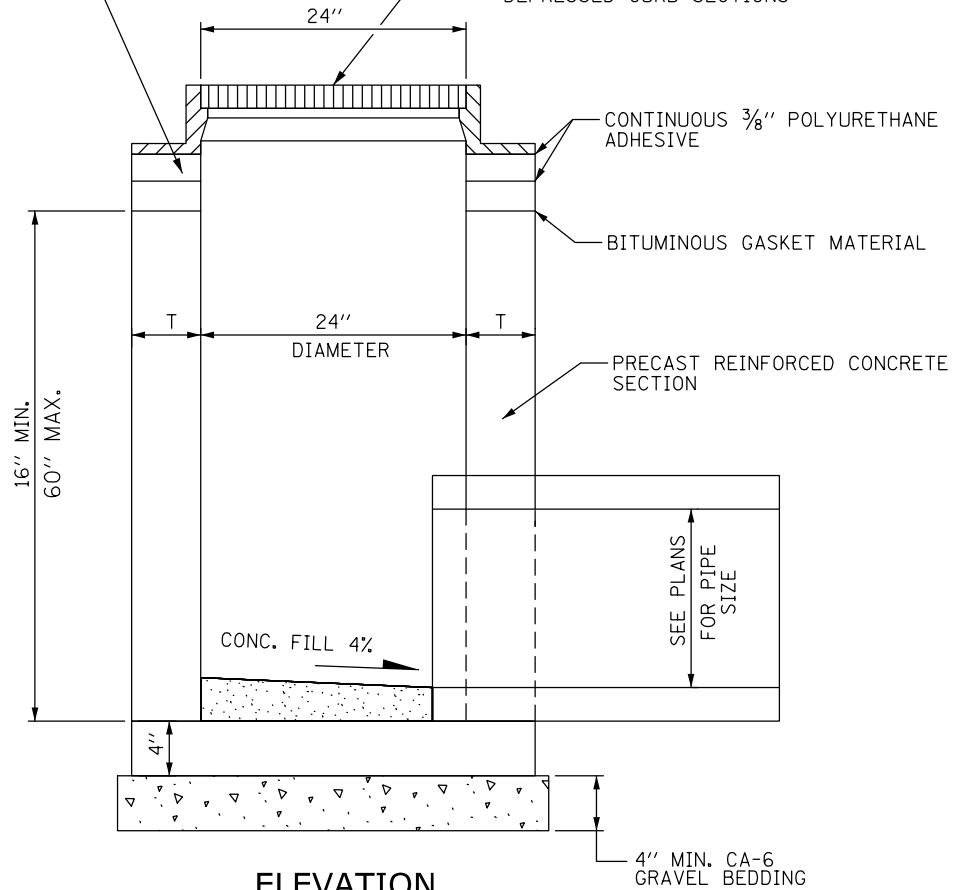
REV 2:

**SAN-9**



PRECAST CONCRETE ADJUSTING RINGS  
(IF NEEDED) - (NO MORE THAN 2)  
MAX. ALLOWABLE ADJUSTMENT  
UTILIZING RINGS IS 8".

EAST JORDAN 7210 FRAME WITH  
M1 GRATE, T1, BACK IN FULL CURB  
SECTIONS, EAST JORDAN WORKS 7210  
FRAME W/ M3 SINUSOIDAL GRATE IN  
DEPRESSED CURB SECTIONS



**ELEVATION**

MATERIALS FOR WALLS	T
PRECAST REINFORCED CONCRETE SECTION	3"

**NOTES:**

- UNLESS OTHERWISE SPECIFIED CONSTRUCTION AND MATERIALS SHALL CONFORM TO IDOT STANDARD SPECIAL ARTICLE 602.



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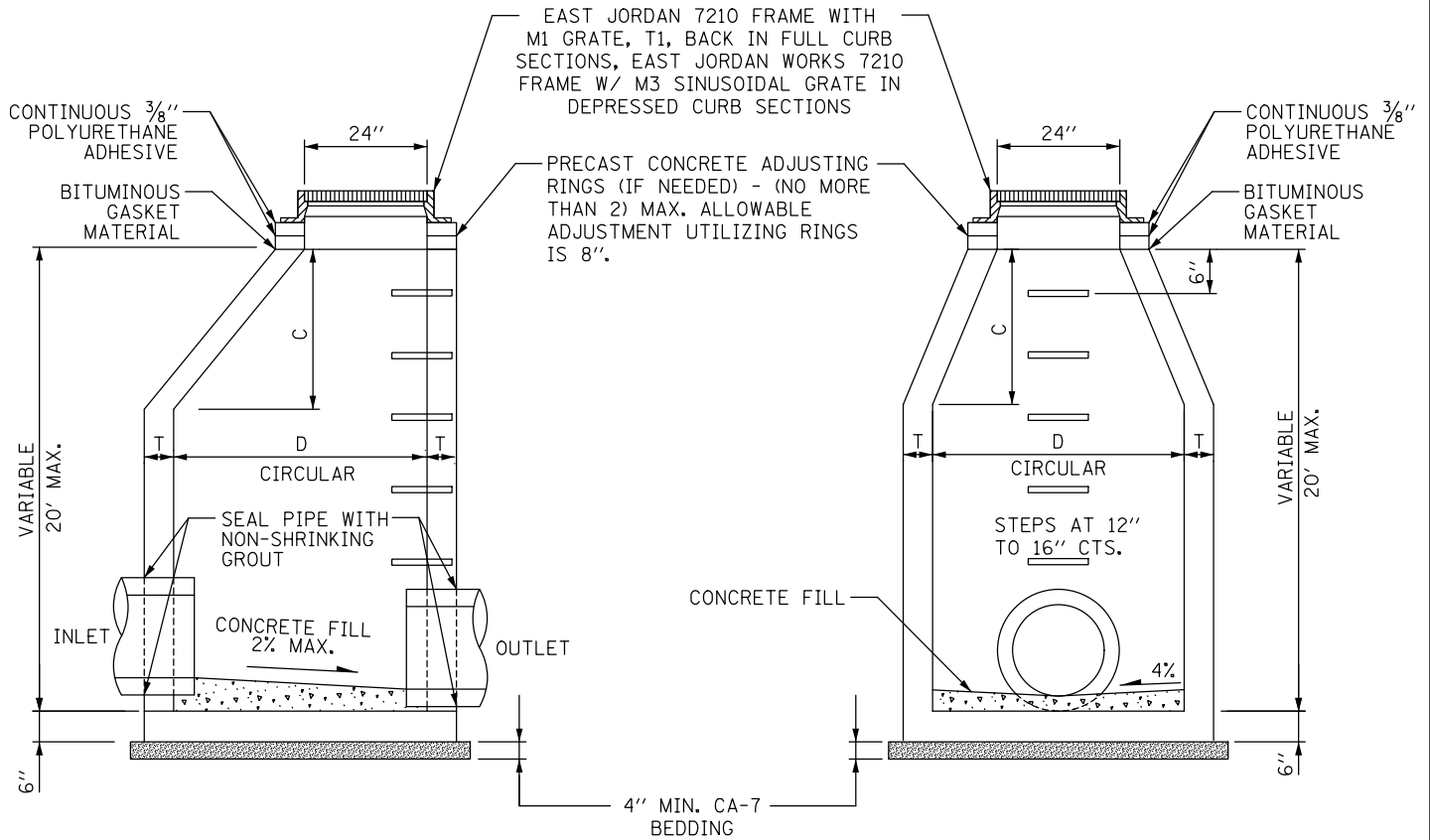
**ENGINEERING DETAILS**

**CURB INLET TYPE A**

DATE:	3/15/2019
REV 1:	
REV 2:	
REV 3:	

DETAIL NO.  
**SS-1**





**ELEVATION - ECCENTRIC**

**ELEVATION - CONCENTRIC**

MATERIALS FOR WALLS	D	C*	T (MIN.)
PRECAST REINFORCED CONCRETE SECTION	4'-0"	2'-6"	4"
	5'-0"	3'-9"	5"
	6'-0"	5'-0"	6"

\*DIMENSION "C" MAY VARY FROM THE DIMENSION GIVEN TO PLUS 6".

**NOTES:**

1. USE ECCENTRIC CONES UNLESS OTHERWISE INDICATED ON THE DRAWING. FLAT TOP SLABS PERMITTED ONLY FOR MANHOLES TOO SHALLOW FOR CONES.
2. USE 4'-0" DIAMETER FOR SEWER SIZES THRU 21", 5'-0" DIAMETER FOR SEWER SIZES 24" THRU 30", 6'-0" DIAMETER FOR SEWER SIZES GREATER THAN 30", UNLESS OTHERWISE NOTED.
3. UNLESS OTHERWISE SPECIFIED, CONSTRUCTION AND MATERIALS SHALL CONFORM IDOT STANDARD SPECIAL ARTICLE 602.
4. REMOVE TOP TWO MANHOLE STEPS PRIOR TO FINAL INSPECTION.



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**ENGINEERING DETAILS**

**STORM MANHOLE TYPE A**

DATE:	3/15/2019
REV 1:	
REV 2:	
REV 3:	

DETAIL NO.

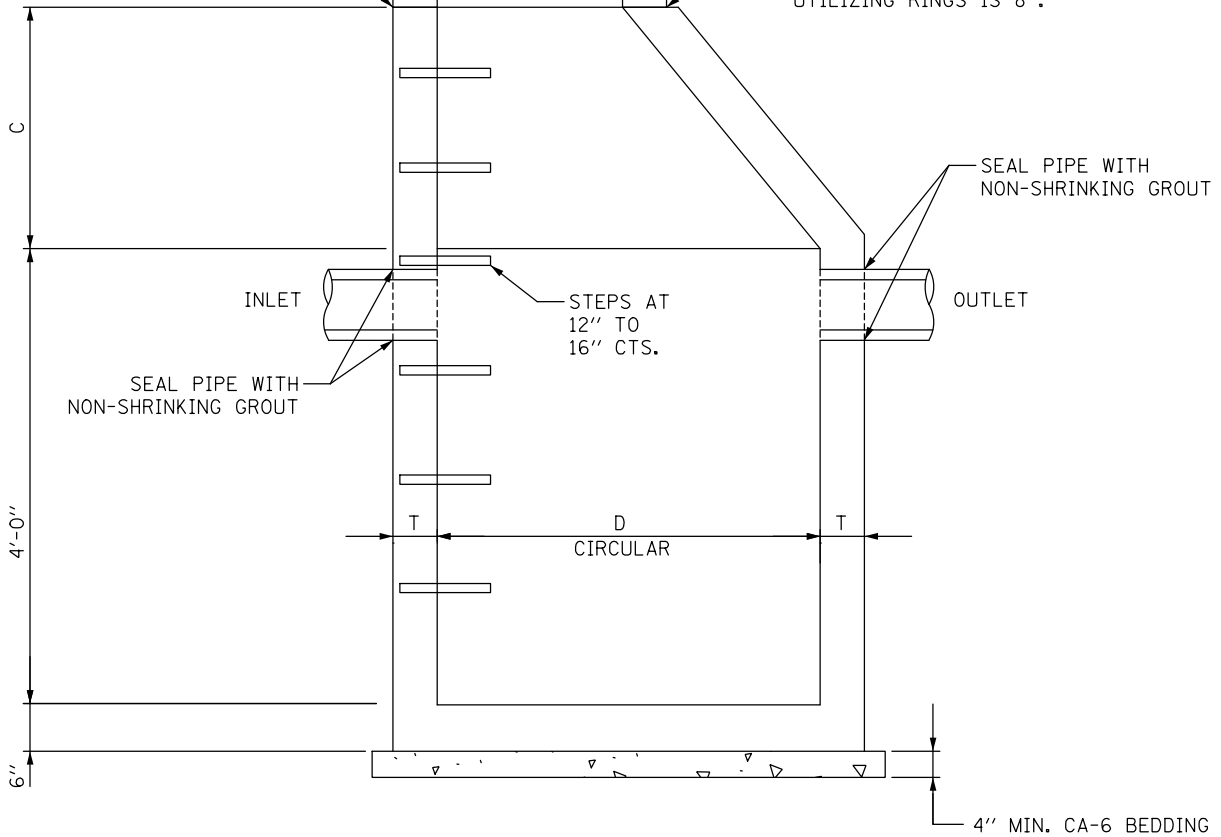
**SS-2**

EAST JORDAN 7210 FRAME WITH M1 GRATE, T1, BACK IN FULL CURB SECTIONS, EAST JORDAN WORKS 7210 FRAME W/ M3 SINUSOIDAL GRATE IN DEPRESSED CURB SECTIONS

BITUMINOUS GASKETED JOINTS

24"

PRECAST CONCRETE ADJUSTING RINGS (IF NEEDED) - (NO MORE THAN 2) MAX. ALLOWABLE ADJUSTMENT UTILIZING RINGS IS 8".



**ELEVATION**

MATERIALS FOR WALLS	D	C*	T (MIN.)
PRECAST REINFORCED CONCRETE SECTION	4'-0"	2'-6"	4"
	5'-0"	3'-9"	5"
	6'-0"	5'-0"	6"

\* DIMENSION "C" MAY VARY FROM THE DIMENSION GIVEN TO PLUS 6".

**NOTES:**

1. USE ECCENTRIC CONES UNLESS OTHERWISE INDICATED ON THE DRAWING. FLAT TOP SLABS PERMITTED ONLY FOR MANHOLES TOO SHALLOW FOR CONES.
2. USE 4'-0" DIAMETER FOR SEWER SIZES THRU 21", 5'-0" DIAMETER FOR SEWER SIZES 24" THRU 30", 6'-0" DIAMETER FOR SEWER SIZES GREATER THAN 30", UNLESS OTHERWISE NOTED.
3. UNLESS OTHERWISE SPECIFIED, CONSTRUCTION AND MATERIALS SHALL CONFORM IDOT STANDARD SPECIAL ARTICLE 602.
4. REMOVE TOP TWO MANHOLE STEPS PRIOR TO FINAL INSPECTION.

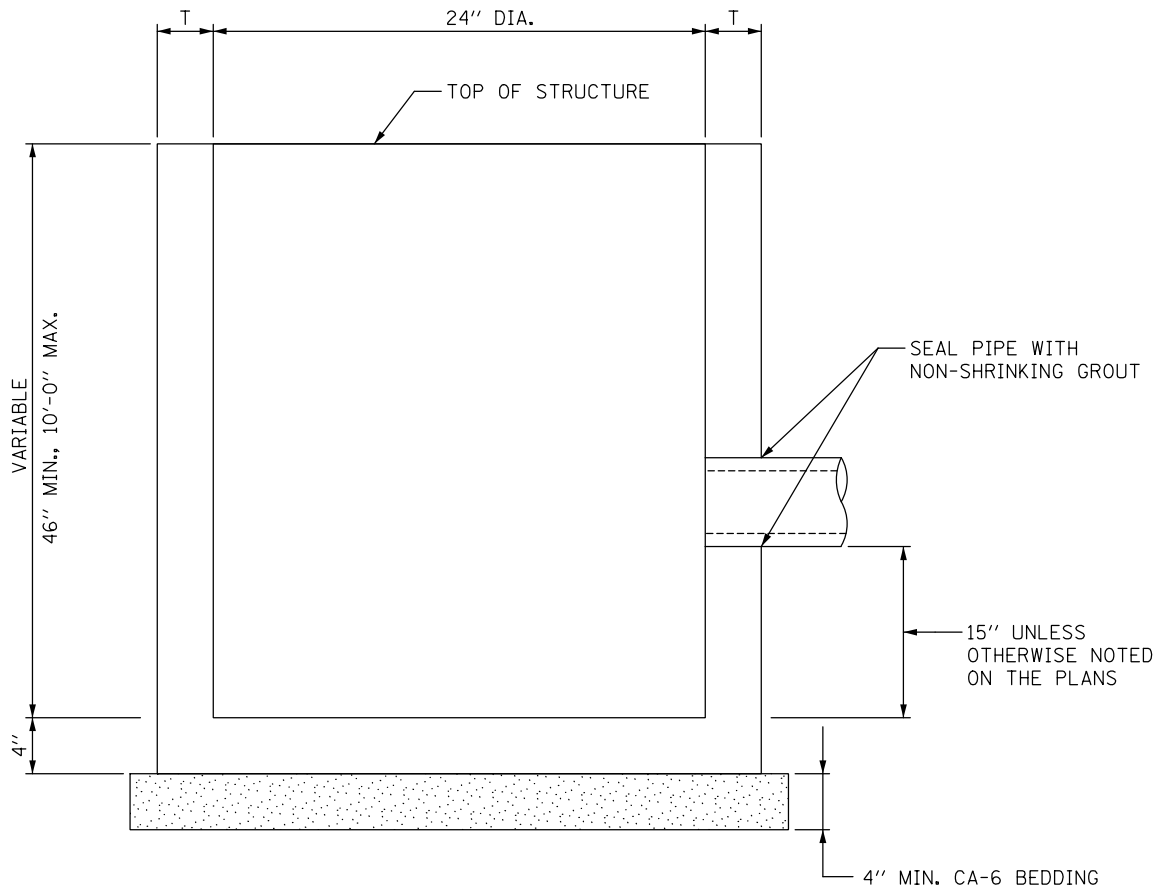


City of Harvard  
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**ENGINEERING DETAILS**

**CATCH BASIN TYPE A**

DATE: 3/15/2019	DETAIL NO.
REV 1:	SS-3
REV 2:	
REV 3:	



### ELEVATION

MATERIALS FOR WALLS	T (MIN.)
PRECAST REINFORCED CONCRETE SECTION	3"

### NOTES:

- UNLESS OTHERWISE SPECIFIED, CONSTRUCTION AND MATERIALS SHALL CONFORM TO IDOT STANDARD SPECIAL ARTICLE 602.



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## ENGINEERING DETAILS

## CATCH BASIN TYPE C

DATE: 3/15/2019

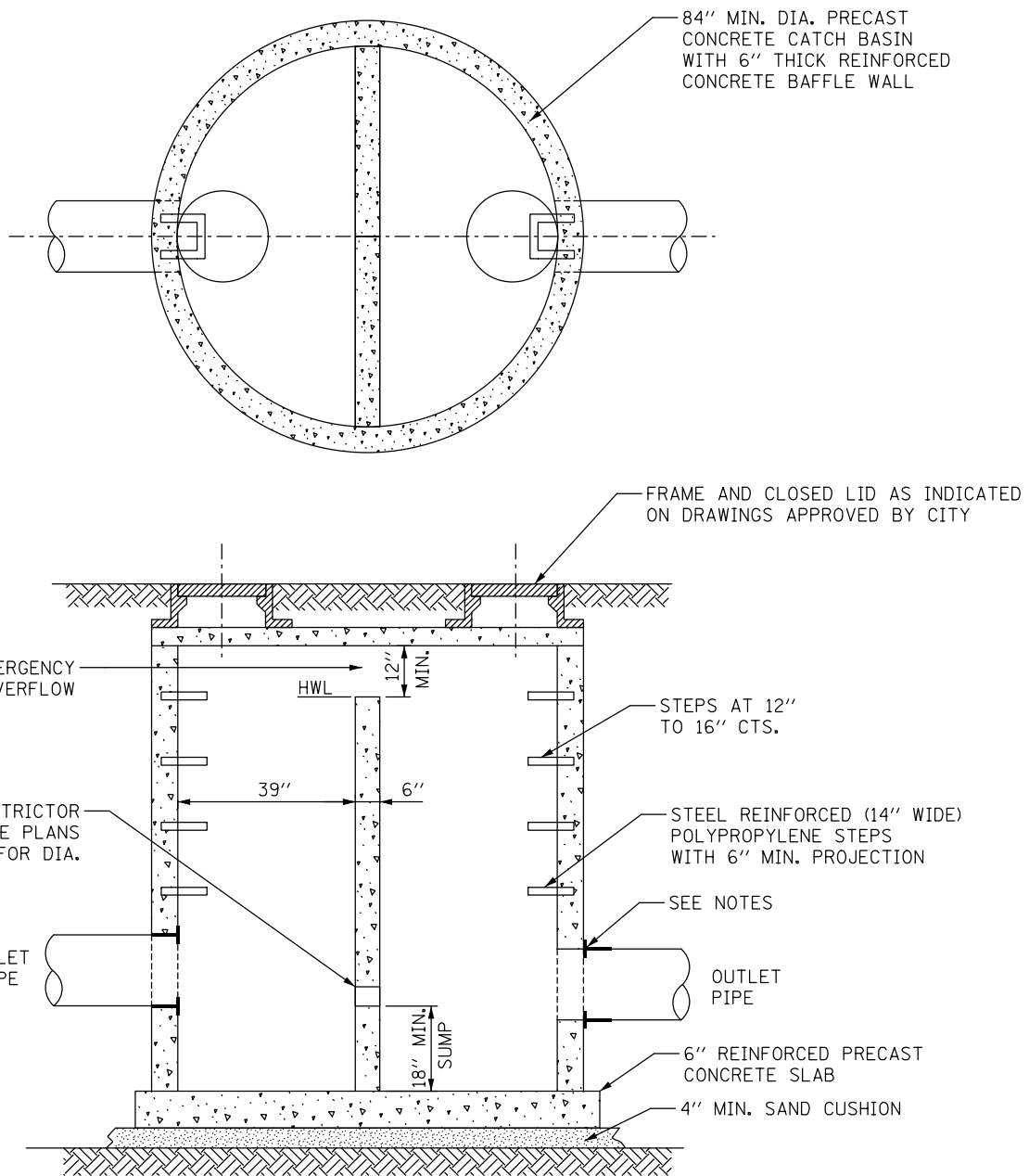
REV 1:

REV 2:

REV 3:

DETAIL NO.

**SS-4**



**NOTES:**

1. MINIMUM RESTRICTOR SIZE IS 4".
2. UNLESS OTHERWISE SPECIFIED, CONSTRUCTION AND MATERIALS SHALL CONFORM TO IDOT STANDARD SPECIAL ARTICLE 602.
3. PRECAST STRUCTURE SECTIONS TO BE TONGUE AND GROOVED.
4. NON-PRECAST OPENINGS SHALL BE CORED AND RUBBER BOOTED WITH WATERTIGHT FLEXIBLE RUBBER CONNECTOR (SEE DETAIL SAN-8).
5. MORTAR ALL PIPE PENETRATIONS INSIDE AND OUTSIDE OF STRUCTURE.
6. IN "SUBMERGED" CONDITIONS, ALL PIPE PENETRATIONS TO BE CORED, RUBBER BOOTED, AND INTERIOR MORTARED.



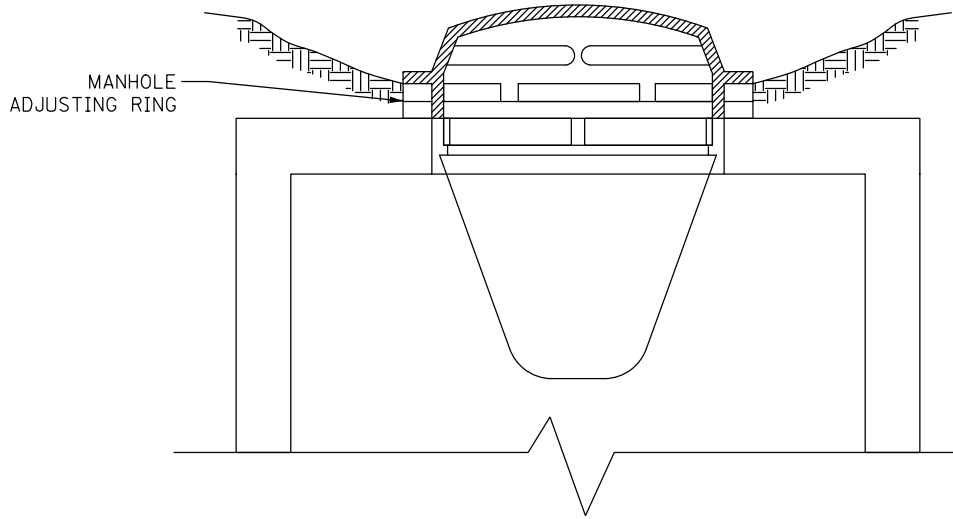
City of Harvard  
201 W. Diggins Street, Harvard IL 60033

**ENGINEERING DETAILS**

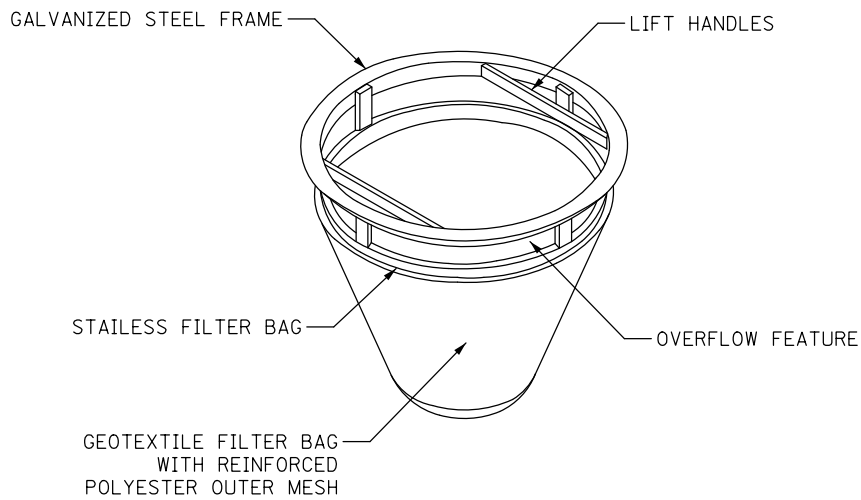
**STORM WATER RESTRICTOR STRUCTURE**

DATE:	3/15/2019
REV 1:	
REV 2:	
REV 3:	

DETAIL NO.	<b>SS-5</b>



SECTION THROUGH MANHOLE



FILTER INSERT

RECTANGULAR BASKETS REQUIRED FOR CURB INLETS



City of Harvard  
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**ENGINEERING DETAILS**

**TEMPORARY SILTATION BASKET  
INSTALLATION BETWEEN  
INLET FRAME AND GRATE**

DATE:	3/15/2019
REV 1:	
REV 2:	
REV 3:	

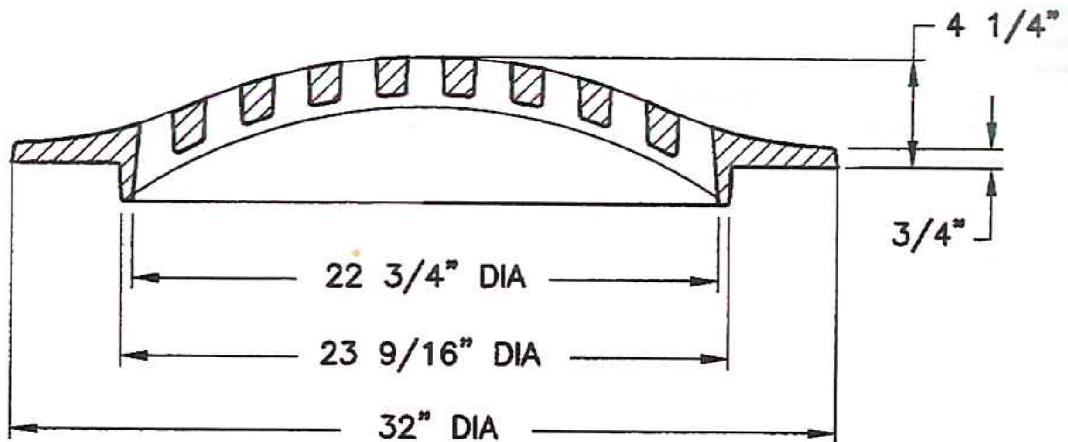
DETAIL NO.

**SS-6**

TYPICAL REAR YARD/SWALE INLET: EAST JORDAN 6517 BEEHIVE GRATE  
"DUMP NO WASTE"

## 6517 DITCH GRATE

Heavy duty  
Approximate 190 sq. in. open area



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### ENGINEERING DETAILS

### TYPICAL REAR YARD INLETS

DATE: 3/15/2019

REV 1:

REV 2:

REV 3:

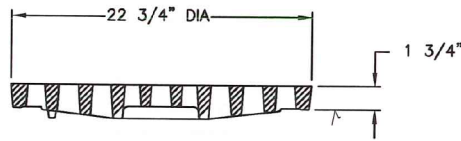
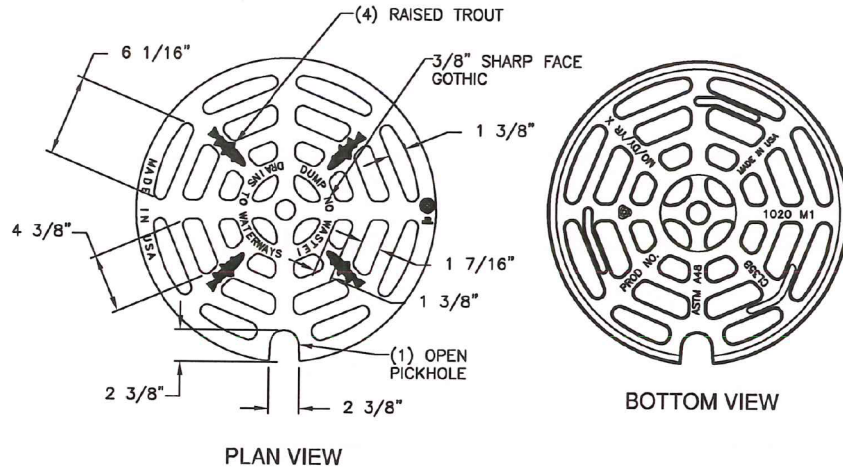
DETAIL NO.

**SS-7A**

PAGE 1 OF 2

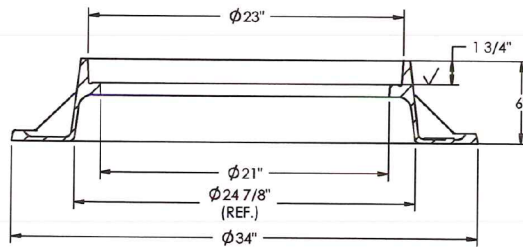
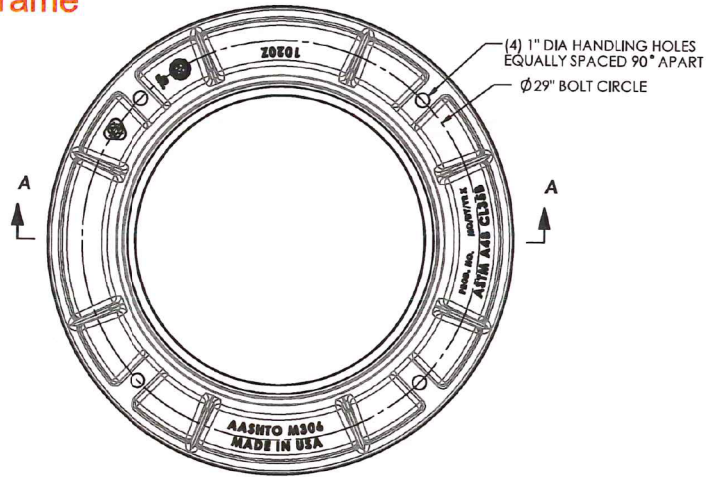
ALTERNATE REAR YARD INLET: EAST JORDAN 1020 OR 1022 MT TYPE GRATE  
 "DUMP NO WASTE"

1020M1 Grate



GRATE SECTION

1020Z Frame



SECTION A-A



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ENGINEERING DETAILS

TYPICAL REAR YARD INLETS

DATE:	3/15/2019
REV 1:	
REV 2:	
REV 3:	

DETAIL NO.

SS-7B

FINISHED GRADE



**① SELECT TRENCH BACKFILL**

GRANULAR TRENCH BACKFILL TO BE USED UNDER EXISTING OR PROPOSED PAVEMENT, CURB AND GUTTER, SIDEWALK OR WITHIN 2' OF ANY EXISTING OR PROPOSED CURB AND GUTTER OR SIDEWALK, SHALL BE MECHANICALLY COMPACTED CA-6, GRADE #9

MECHANICALLY COMPACTED BACKFILL OF EXCAVATED MATERIALS IN OTHER LOCATIONS IF APPROVED BY THE ENGINEER. REFER TO TRENCH BACKFILL SPECIAL PROVISIONS FOR MATERIALS AND COMPACT REQUIREMENTS.

**② PIPE BEDDING & INITIAL TRENCH BACKFILL**

\*6 WASHED STONE FROM 6" BELOW TO SPRING LINE OF PIPE.

**③ UNSUITABLE MATERIALS**

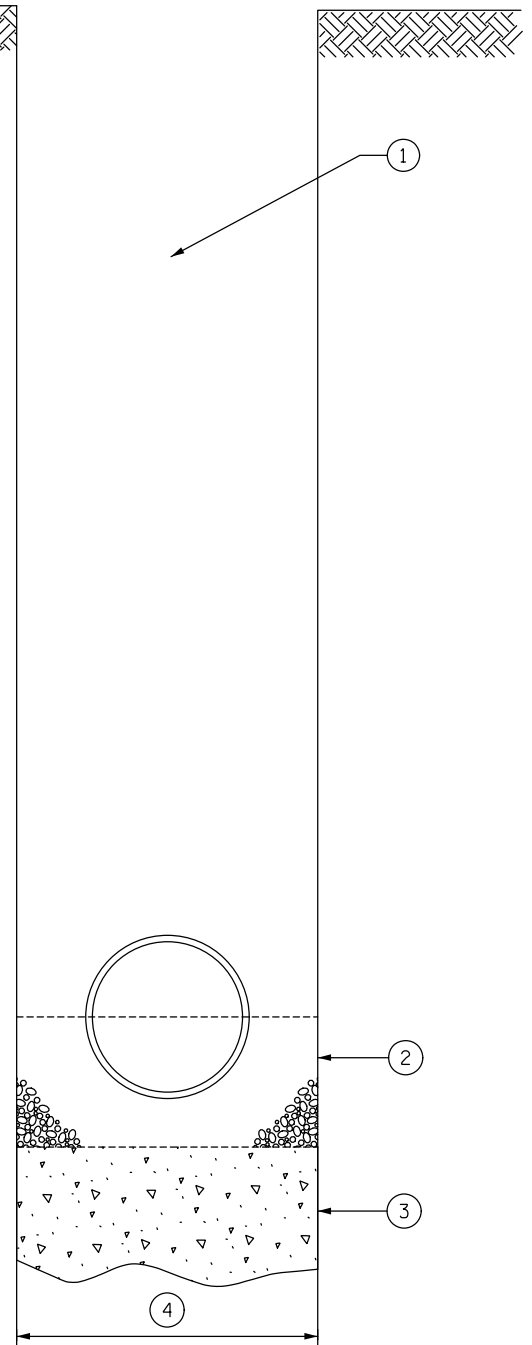
IF ENCOUNTERED - SHALL BE REMOVED WHERE DIRECTED BY THE ENGINEER AND REPLACED WITH SUITABLE GRANULAR BACKFILL AND COMPACTED.

**④ TRENCH WIDTH**

MINIMUM = PIPE O.D. + 18" WHEN DEPTH IS < 5'  
 MAXIMUM = PIPE O.D. + 36" WHEN DEPTH IS ≥ 5'  
 DEPTH = PROPOSED SUBGRADE TO PROPOSED INVERT

**NOTES:**

1. ALL CA-6 MATERIAL TO BE IDOT APPROVED.



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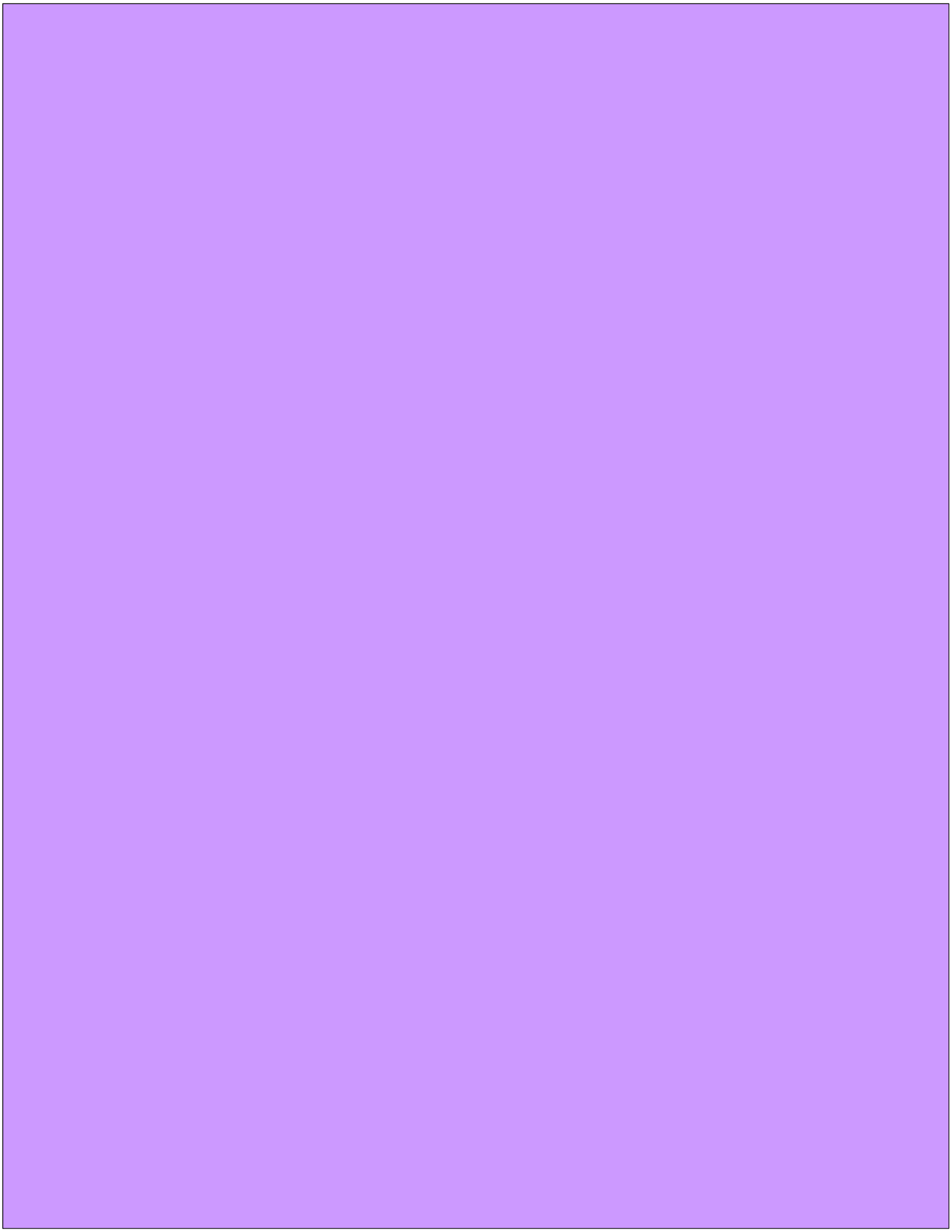
**ENGINEERING DETAILS**

**TYPICAL STORM SEWER TRENCH CROSS SECTION**

DATE:	3/15/2019
REV 1:	
REV 2:	
REV 3:	

DETAIL NO.  
**SS-8**





## Miscellaneous Utility Notes

1. All vertical & horizontal water and sewer separation requirements must adhere to the latest IEPA guidelines.



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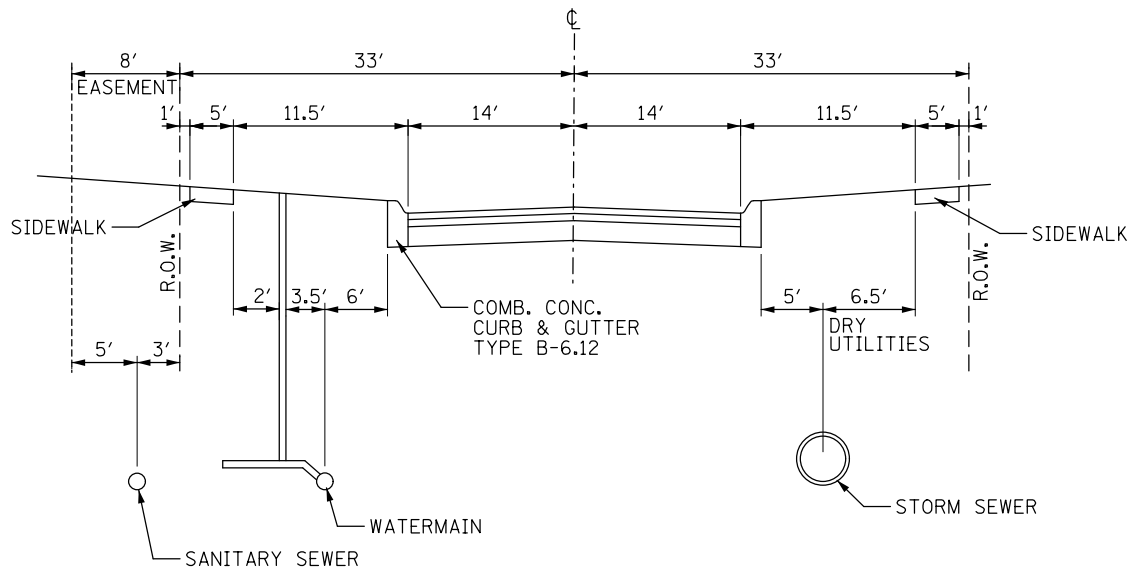
### ENGINEERING DETAILS

### MISCELLANEOUS UTILITY NOTES

DATE:	3/15/2019
REV 1:	
REV 2:	
REV 3:	

DETAIL NO.

**U-0**



**NOTES:**

1. GRANULAR TRENCH BACKFILL (CA-5) TO BE USED UNDER ALL PAVED AREAS AND WITHIN 2' OF ALL PAVED AREAS, INCLUDING SIDEWALKS AND DRIVEWAYS.
2. SEE THE APPLICABLE SPECIFICATION OR STANDARD FOR EACH ITEM SHOWN IN THIS STANDARD.
3. NO SIDEWALK/DRIVEWAY SHALL BE LOCATED WITHIN 2' OF BUFFALO BOX FOR WATERMAIN.



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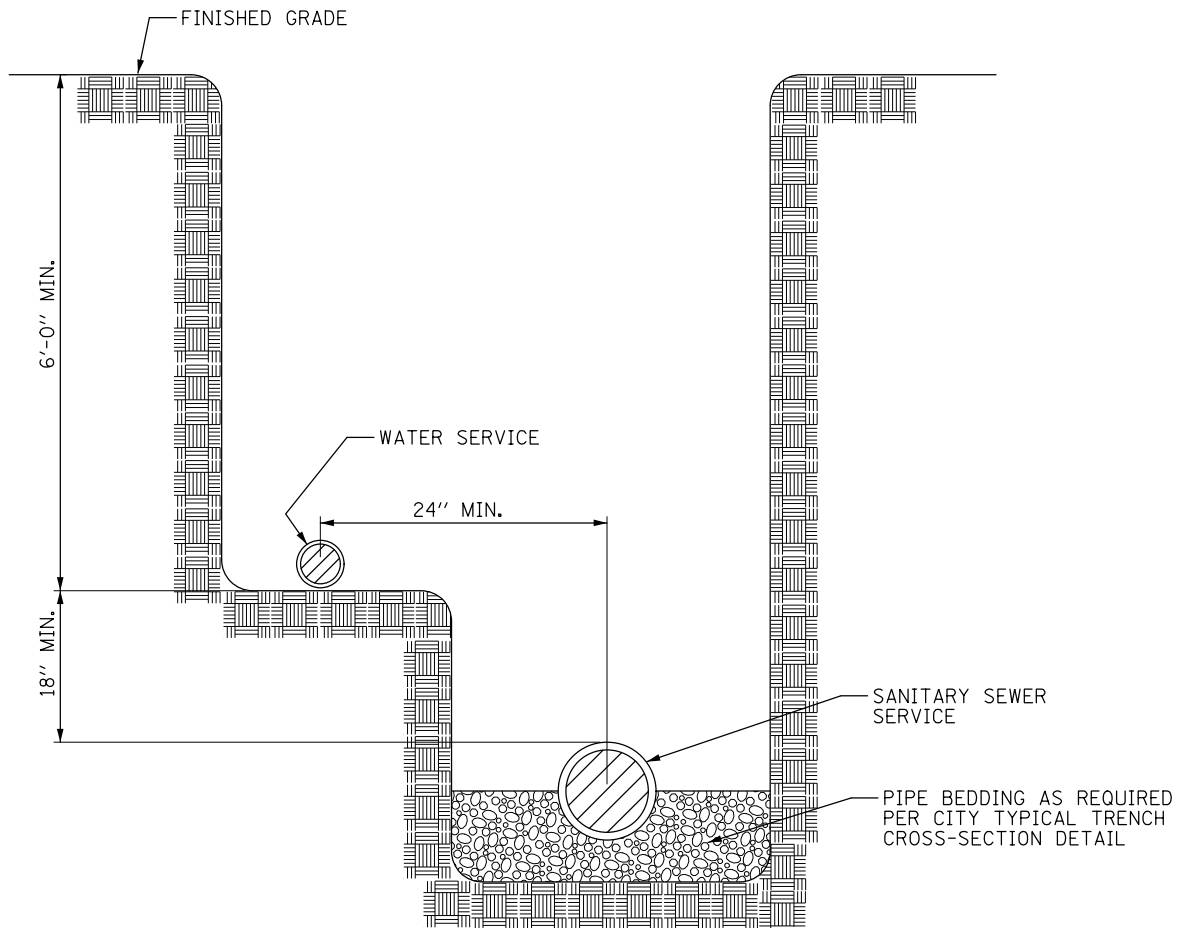
**ENGINEERING DETAILS**

**STREET AND UTILITY LOCATIONS  
(TYPICAL SECTION)**

DATE:	3/15/2019
REV 1:	
REV 2:	
REV 3:	

DETAIL NO.

**U-1**



NOTE:  
 THE WATER SERVICE PIPING AND BUILDING SEWER PIPING MAY BE  
 INSTALLED IN A COMMON TRENCH PROVIDED THAT THE WATER  
 SERVICE PIPE IS PLACED ON A SHELF A MINIMUM OF EIGHTEEN  
 (18") INCHES ABOVE AND TWENTY-FOUR (24") INCHES HORIZONTALLY  
 FROM THE BUILDING SEWER PIPING.



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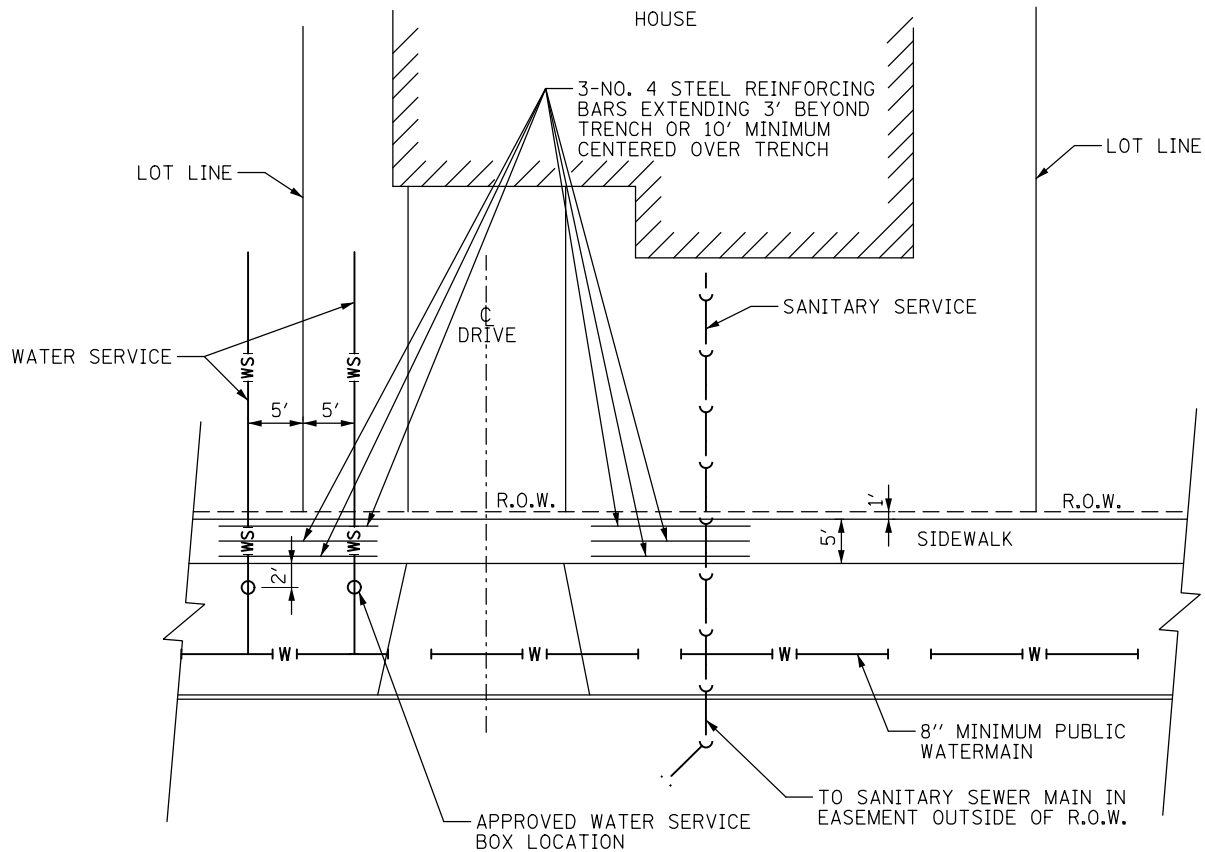
**ENGINEERING DETAILS**

**STREET AND UTILITY LOCATIONS  
 (TYPICAL SECTION)**

DATE:	3/15/2019
REV 1:	
REV 2:	
REV 3:	

DETAIL NO.

**U-2**



**NOTES:**

1. WATER SHUTOFF BOX MAY NOT BE LOCATED IN PROPOSED DRIVEWAY. THE RELOCATED BOX SHALL BE LOCATED 5' OFF OF PROPERTY LINE PER DETAIL ABOVE.
2. IF WATER SHUTOFF BOX RELOCATION IS REQUIRED IT SHALL BE DONE AS FOLLOWS. WATERMAIN SHALL BE RE-TAPPED OUT OF PROPOSED DRIVEWAY LOCATION. A CONTINUOUS LENGTH OF COPPER (NO COUPLINGS) SHALL BE RUN FROM THE NEW CORPORATION STOP TO THE RELOCATED SHUTOFF BOX. THE ABANDONED CORPORATION STOP SHALL BE CAPPED ACCORDING TO WATER DEPARTMENT STANDARDS.
3. FOR FAR SIDE SERVICE CONNECTIONS, CONSULT THE PUBLIC WORKS DEPARTMENT.
4. NO SANITARY SEWER SERVICE CONNECTIONS DIRECTLY INTO MANHOLES.



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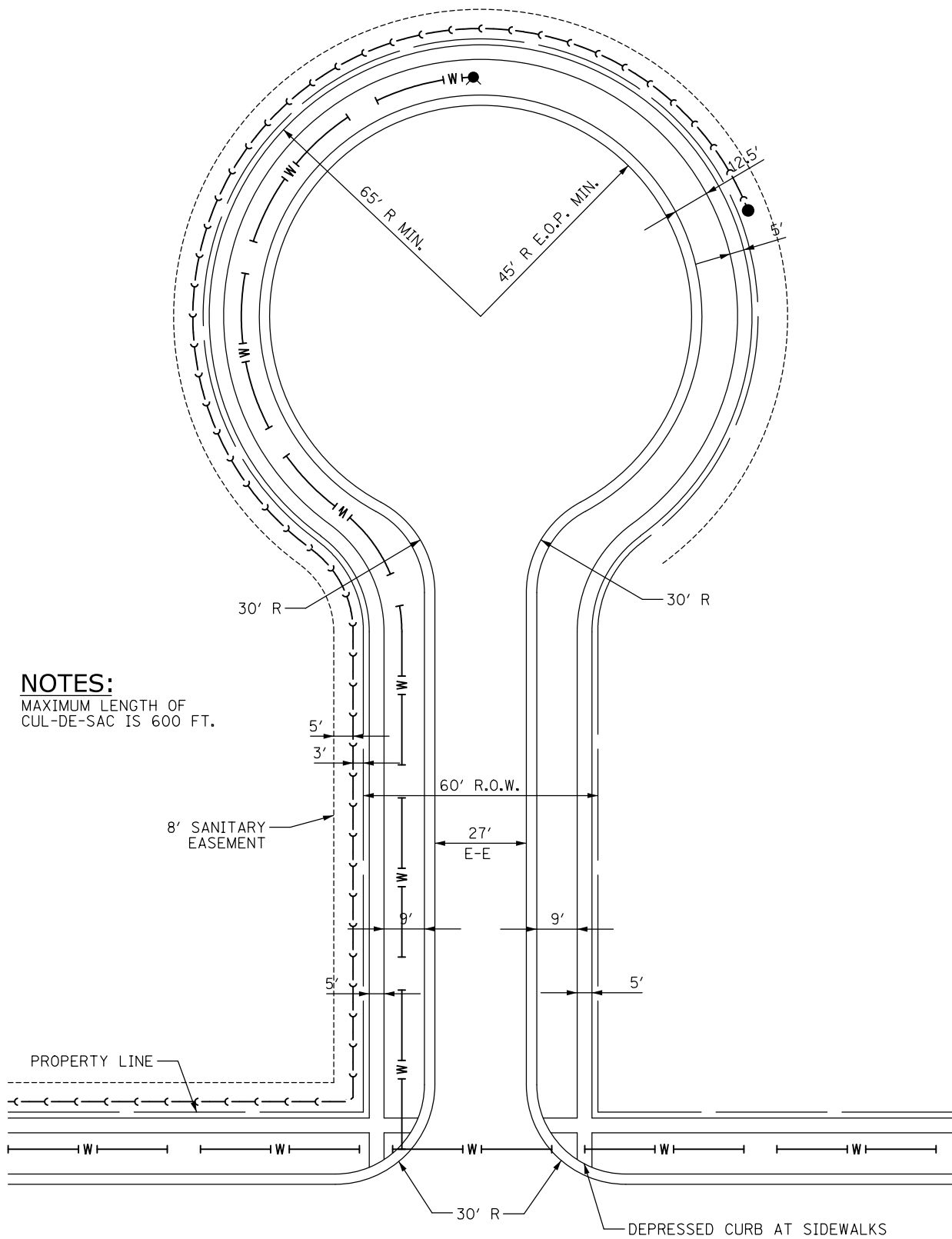
**ENGINEERING DETAILS**

**WATER SERVICE AND SANITARY SEWER LOT LOCATION DETAIL**

DATE:	3/15/2019
REV 1:	
REV 2:	
REV 3:	

DETAIL NO.

**U-3**



**NOTES:**  
 MAXIMUM LENGTH OF  
 CUL-DE-SAC IS 600 FT.

8' SANITARY  
 EASEMENT

PROPERTY LINE

DEPRESSED CURB AT SIDEWALKS



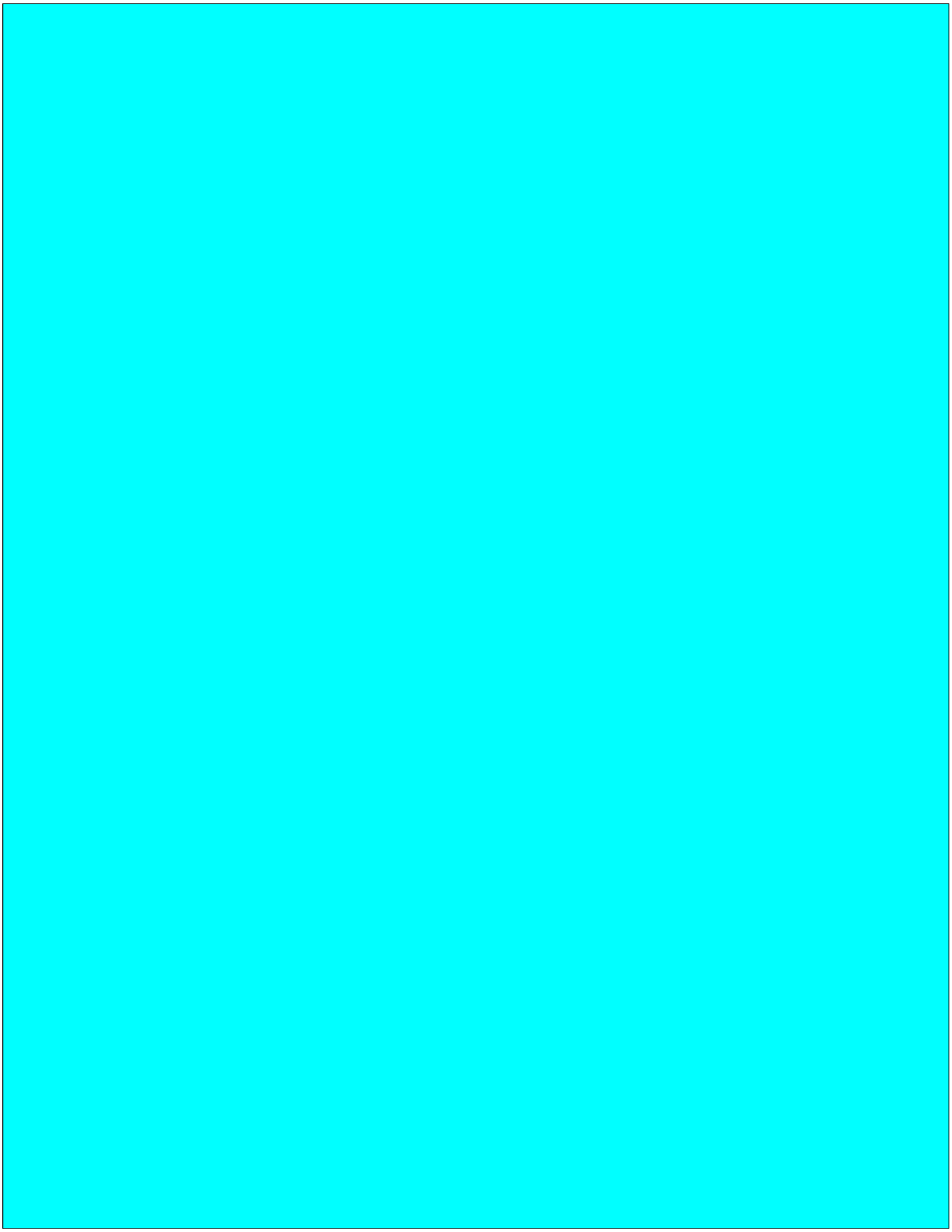
City of Harvard  
 201 W. Diggins Street, Harvard IL 60033

**ENGINEERING DETAILS**

**UTILITY LOCATION PLAN  
 FOR CUL-DE-SAC**

DATE:	3/15/2019
REV 1:	
REV 2:	
REV 3:	

DETAIL NO.  
**U-4**



### Miscellaneous Water Standards/Notes

1. Water transmission shall be a minimum of 8" in diameter, shall include installation of shutoff valves and fire hydrants, and shall be free from dead-end mains, unless authorized by the City.
2. Any water service line replacement/up-sizing must include replacing the service within the City right-of-way up to the water main trunk line. Also, complete restoration of the parkway, including topsoil, seed, and any sidewalk repair, must be completed to the satisfaction of the City.
3. For any water service line repairs, the homeowner is responsible from the ROW to the house. The City will make repairs from ROW to the trunk line.
4. Water mains and fittings shall be ductile cast iron, cement lined, with push on joints class 52 conforming to latest ANSI/ AWWA C151 / A21.51-86, C111, and C104 OR C909 PVC. All plastic pipe require tracer wire with tracer boxes as directed by the Director of Public Works.
5. Fire hydrant leads shall be 6" diameter.
6. A Building permit is required for all water main/service installations.
7. After completion of all watermains and installation of all fire hydrants within a subdivision, a flow test shall be performed at the point in the subdivisions farthest away from the existing City watermain. The flow test shall provide information regarding static pressure, residual pressure and flow rate, and the information shall be supplied to the City.



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### ENGINEERING DETAILS

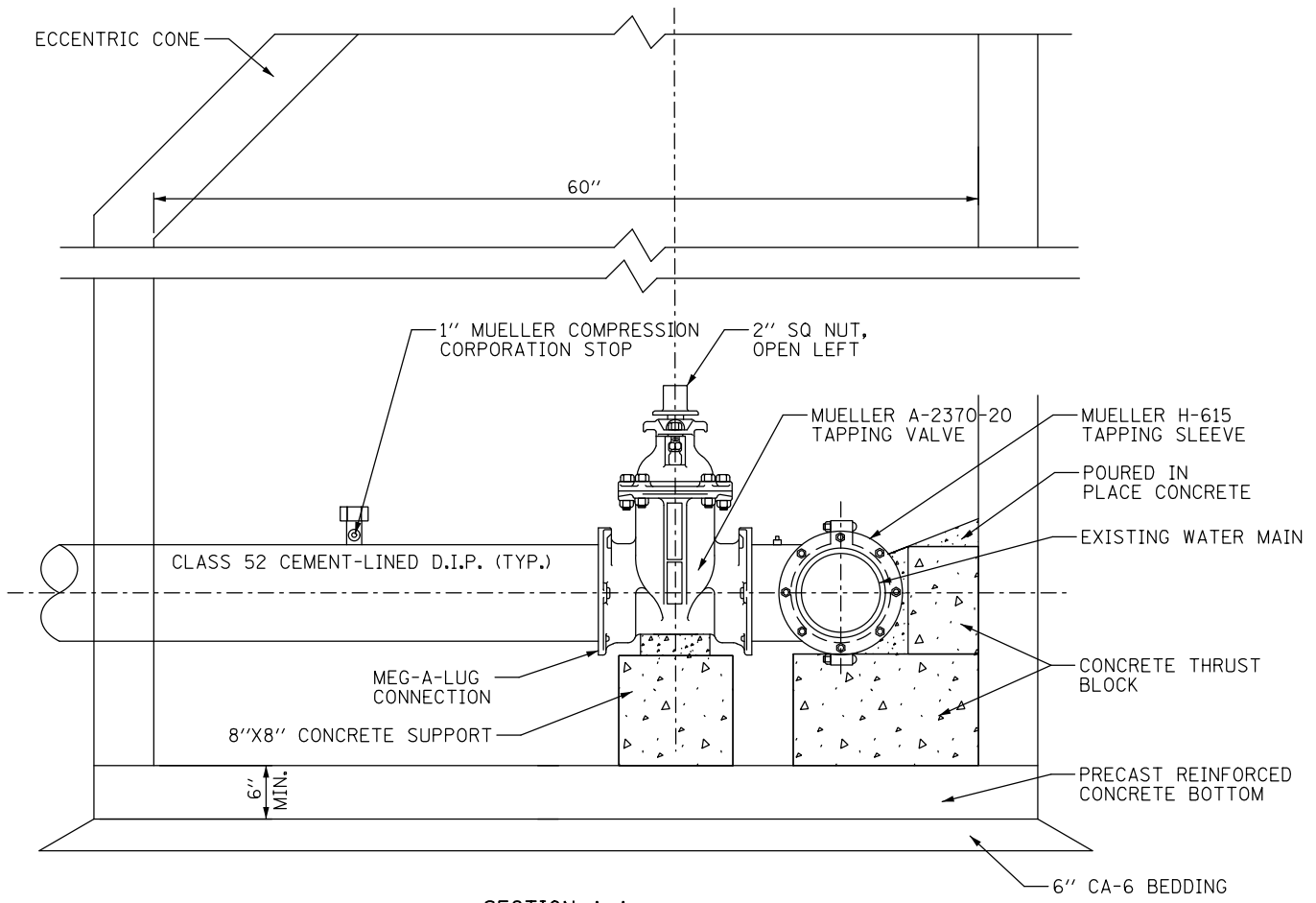
### MISCELLANEOUS WATER NOTES

DATE: 3/15/2019
REV 1:
REV 2:
REV 3:

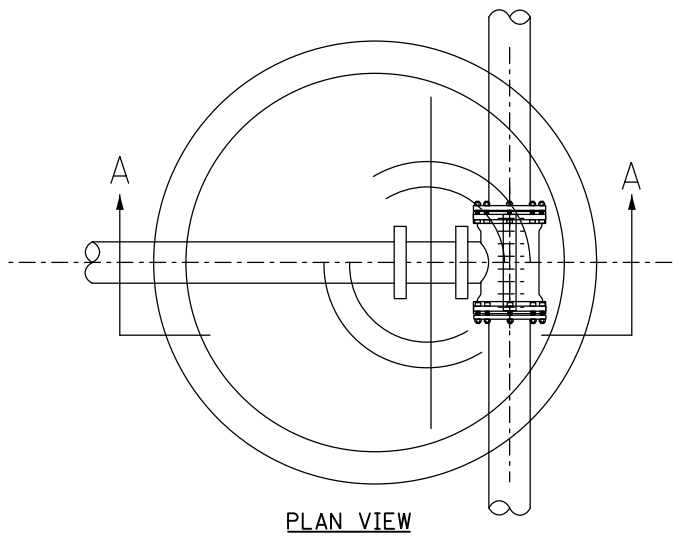
DETAIL NO.

W-0





SECTION A-A



PLAN VIEW

NOTES:  
 C.I. MANHOLE FRAME AND COVER EAST JORDAN 1050 WITH STANDARD DUTY, NON-ROCKING TYPE LIDS (EAST JORDAN 1020 MAY BE USED IN GRASSY AREAS). ADJUSTING RING HEIGHT NOT TO EXCEED 8". ALL JOINTS ARE TO BE MADE WATERTIGHT WITH EXTERNAL SEALING BANDS PER ASTM C-877 WITH MECHANICAL STRAPS (MAC WRAP OR EQUAL). STANDARD VALVE VAULT SPECIFICATIONS REQUIRE ECCENTRIC CONES (SEE SEPARATE DETAIL).

ALL PRECAST CONCRETE STRUCTURES MUST CONFORM TO AASHTO M199.



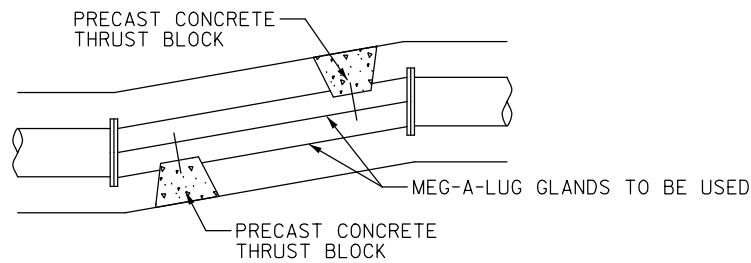
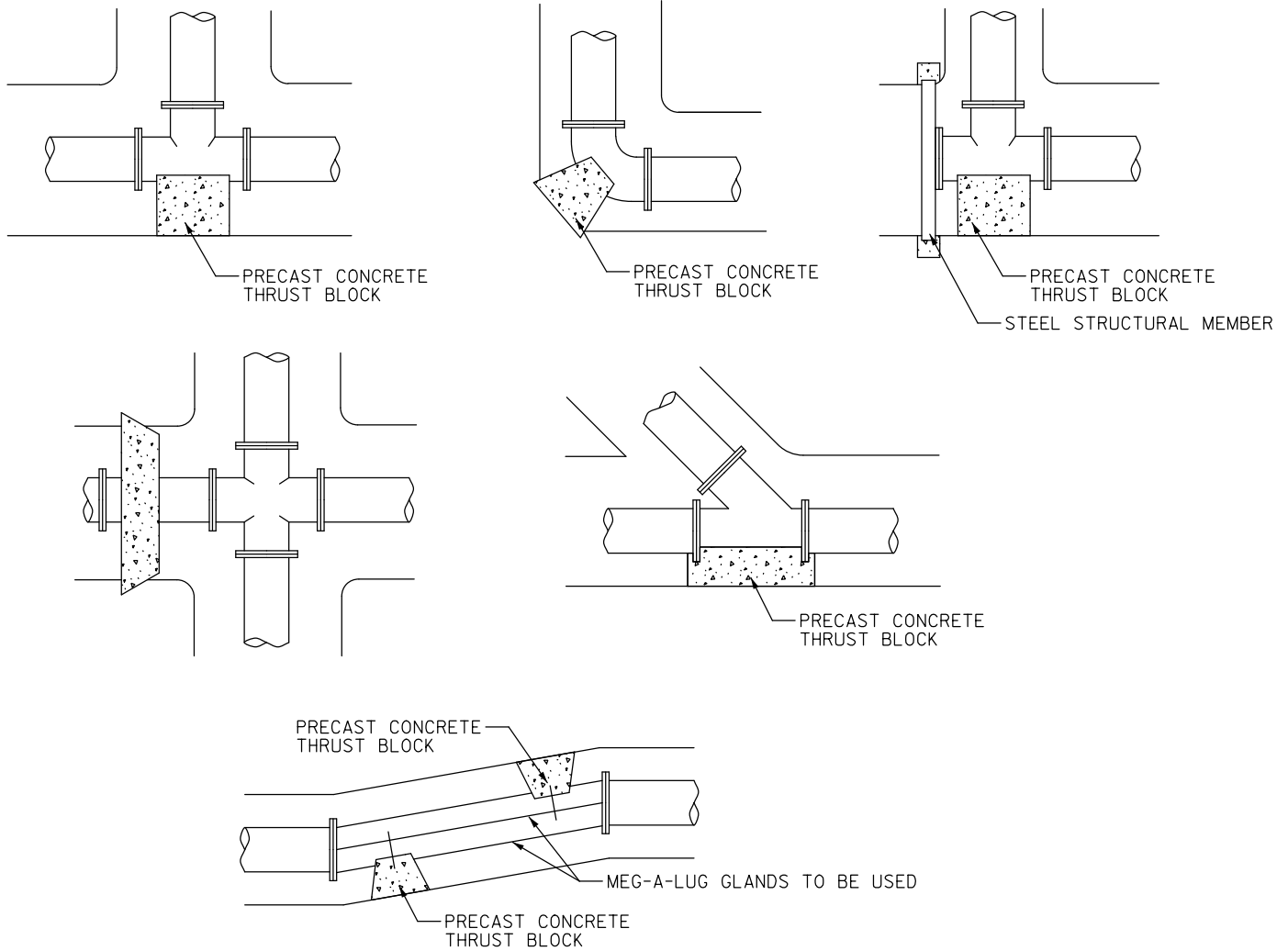
City of Harvard  
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**ENGINEERING DETAILS**

**WATER MAIN PRESSURE CONNECTION DETAIL**

DATE:	3/15/2019
REV 1:	
REV 2:	
REV 3:	

DETAIL NO.	<b>W-1</b>



BEARING AREA (SQ. FT.)

PIPE SIZE	TEE/PLUG	90 DEG.	45 DEG.	22 1/2°	11.25°
6	4	2	1	1	1
8	6	4	3	1	1
10	7	5	3	2	1
12	8	6	4	3	2
14	12	9	6	4	3
16	15	12	7	5	3
18	18	15	9	5	4
24	40	30	15	10	5

ALL BLOCKING MUST BEAR ON UNDISTURBED EARTH.

ALL BENDS OR ELBOWS GREATER THAN AND INCLUDING 11.25° SHALL HAVE THRUST BLOCKING.

WOOD SHIMS NOT ALLOWED.



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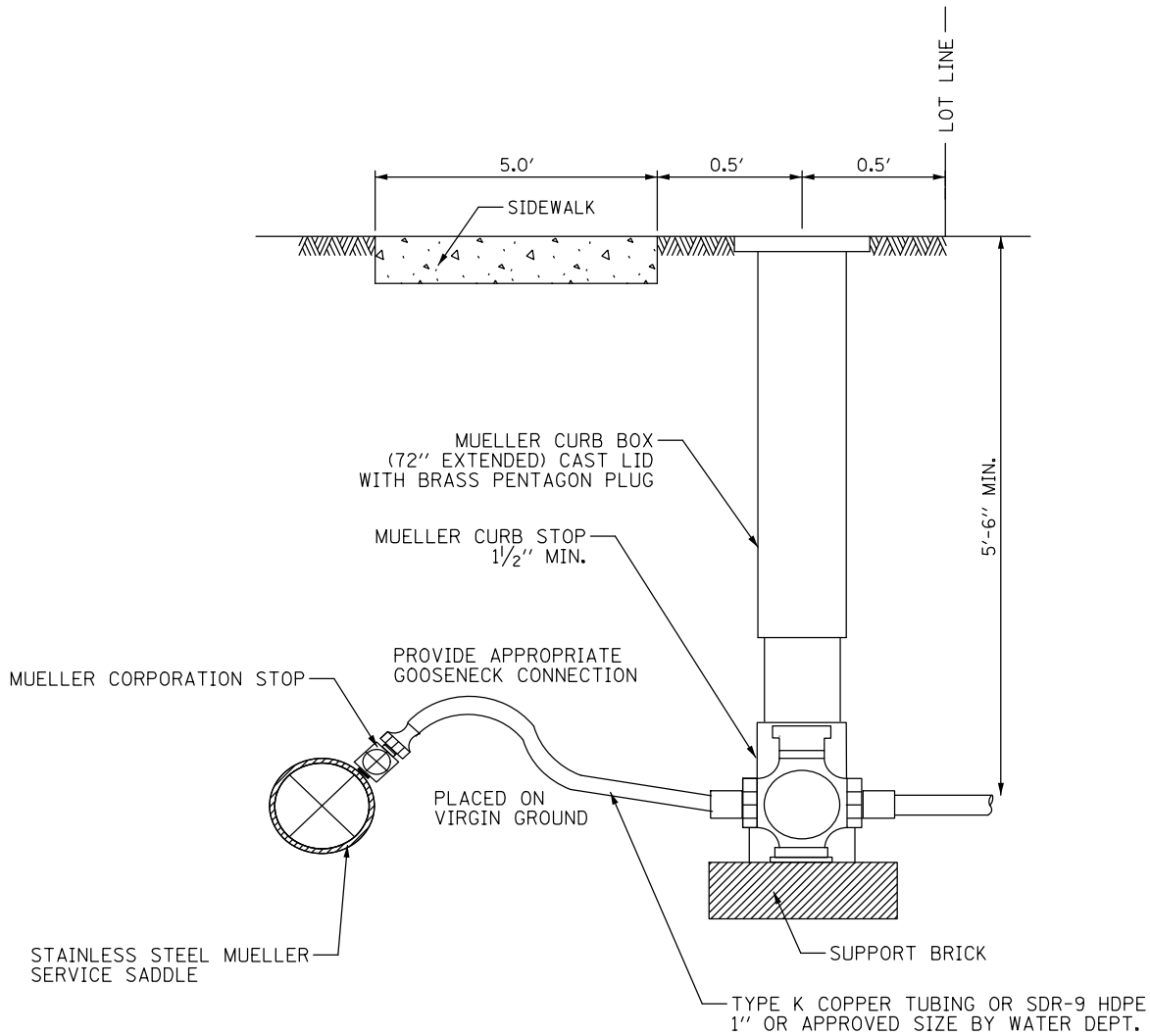
**ENGINEERING DETAILS**

**THRUST BLOCK DETAIL**

DATE:	3/15/2019
REV 1:	
REV 2:	
REV 3:	

DETAIL NO.

**W-2**



- NOTES:
1. NO COUPLINGS PERMITTED BETWEEN CORPORATION AND CURB STOP.
  2. NO COUPLINGS PERMITTED BETWEEN CURB STOP AND BUILDING.
  3. NO LIMESTONE BACKFILL SHALL COME IN CONTACT WITH COPPER OR BRASS.
  4. B-BOXES MUST BE LOCATED IN A GRASSY NON-PAVED AREA.
  5. TAP MUST BE 3' FROM ANY OTHER CONNECTION OR FITTING.



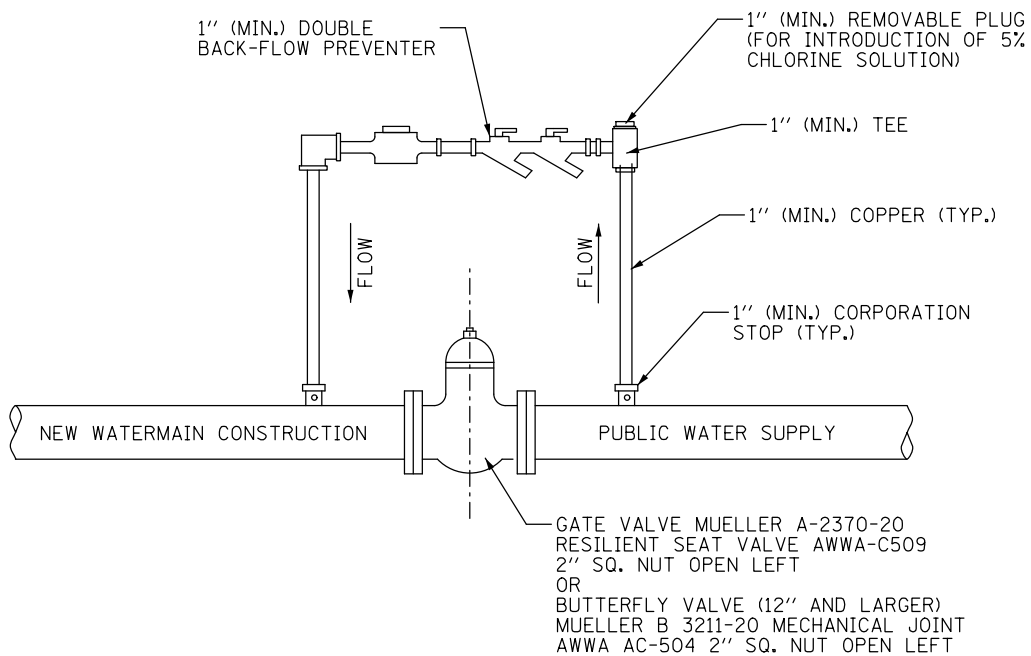
City of Harvard  
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**ENGINEERING DETAILS**

**WATER SERVICE CONNECTION**

DATE:	3/15/2019
REV 1:	
REV 2:	
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DETAIL NO.  
**W-3**



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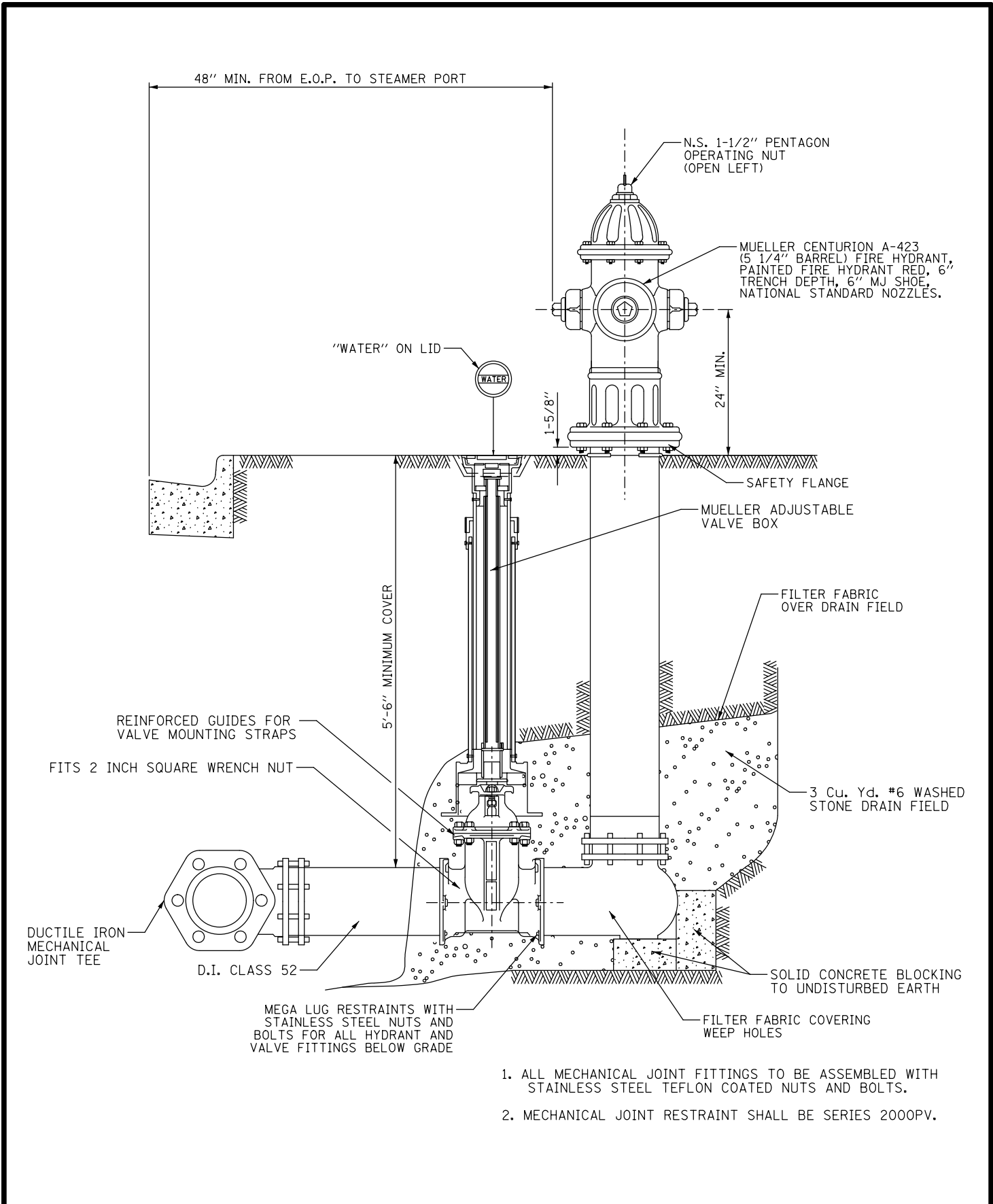
**ENGINEERING DETAILS**

**CHLORIDE INSERTION DETAIL**

DATE:	3/15/2019
REV 1:	
REV 2:	
REV 3:	

DETAIL NO.

**W-4**



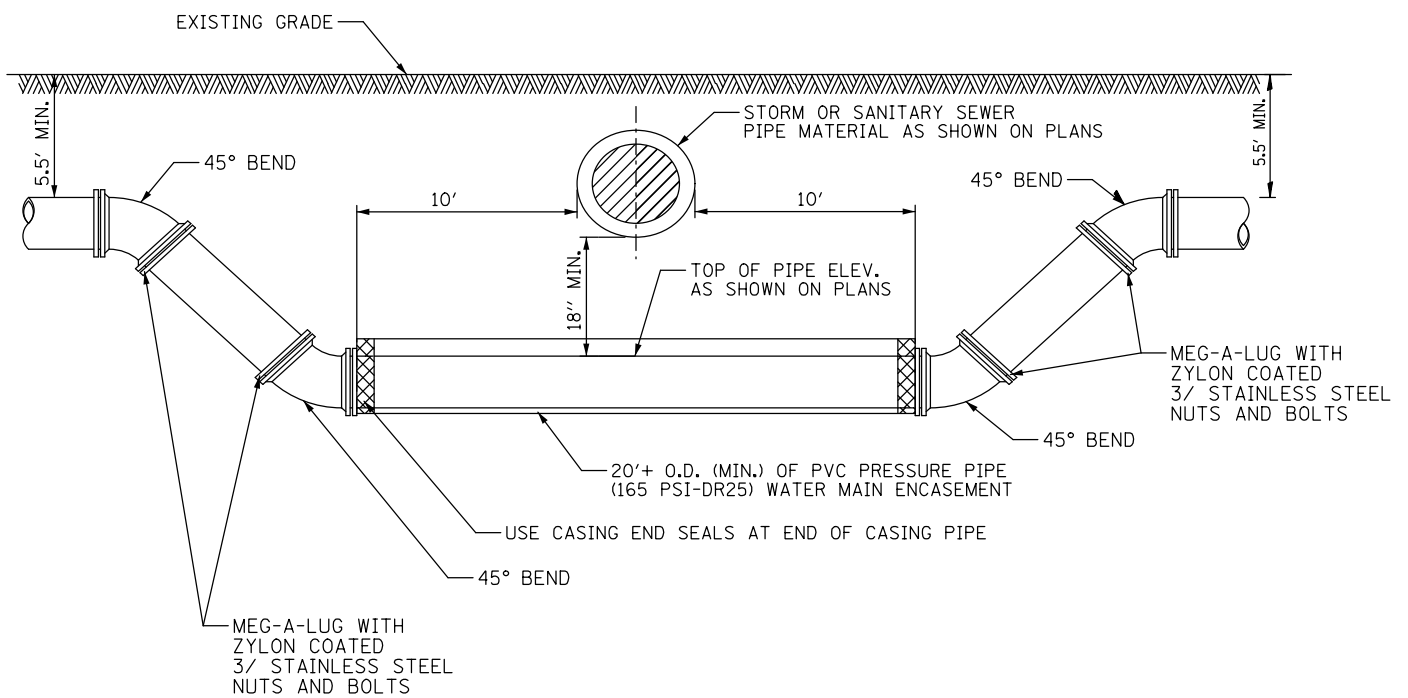
City of Harvard  
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**ENGINEERING DETAILS**

**TYPICAL FIRE HYDRANT**

DATE:	3/15/2019
REV 1:	
REV 2:	
REV 3:	

DETAIL NO.	<b>W-5</b>



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**ENGINEERING DETAILS**

**WATER MAIN LOWERING DETAIL**

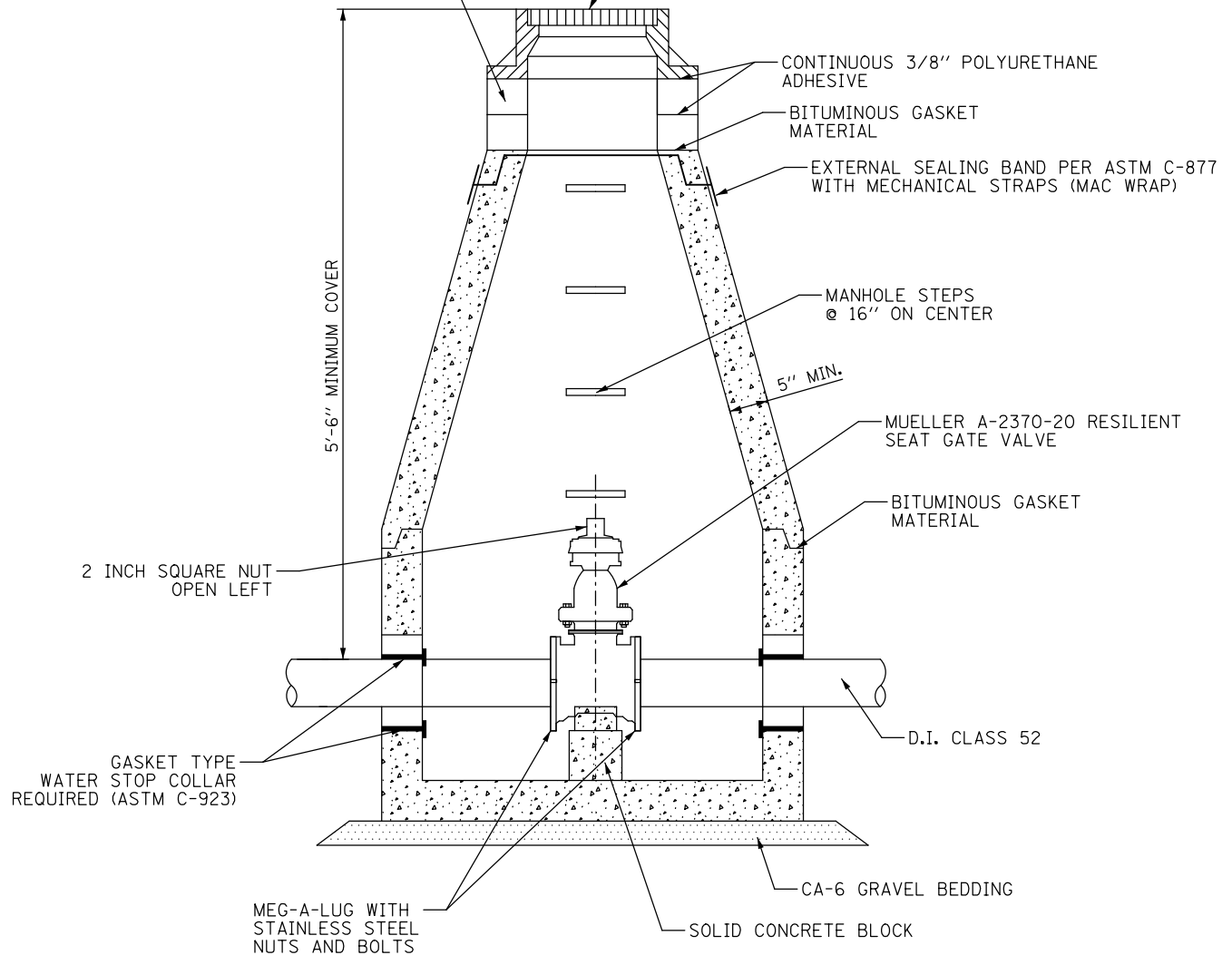
DATE:	3/15/2019
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REV 3:	

DETAIL NO.

**W-6**

PRE-CAST CONCRETE ADJUSTING RINGS (IF NEEDED) - (NO MORE THAN 2) MAX. ALLOWABLE ADJUSTMENT UTILIZING RINGS IS 8". IF GREATER ADJUSTMENT IS NEEDED, IT MUST BE ACCOMPLISHED UTILIZING 5' DIA. PRE-CAST BARREL SECTION.

EAST JORDAN 1050 MANHOLE FRAME AND COVER, TYPE "B" SELF-SEALING SOLID LID W/"WATER" IMPRINT (EAST JORDAN 1020 MAY BE USED IN GRASSY AREAS)



1. ALL MECHANICAL JOINT FITTINGS TO BE ASSEMBLED WITH STAINLESS STEEL TEFLON COATED NUTS AND BOLTS.
2. MECHANICAL JOINT RESTRAINT SHALL BE SERIES 2000PV FOR USE WITH C-900 PVC PIPE OR D.I. PIPE CLASS 52.
3. VALVES 4" OR LARGER MUST BE ENCLOSED IN A VALVE VAULT.



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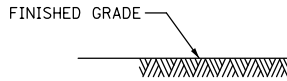
**ENGINEERING DETAILS**

**TYPICAL VALVE VAULT  
(5' I.D.)**

DATE:	3/15/2019
REV 1:	
REV 2:	
REV 3:	

DETAIL NO.

**W-7**



① SELECT TRENCH BACKFILL

GRANULAR TRENCH BACKFILL TO BE USED UNDER EXISTING OR PROPOSED PAVEMENT, CURB AND GUTTER, SIDEWALK OR WITHIN 2' OF ANY EXISTING OR PROPOSED CURB AND GUTTER OR SIDEWALK, SHALL BE MECHANICALLY COMPACTED CA-6, (NON-LIMESTONE)

MECHANICALLY COMPACTED BACKFILL OF EXCAVATED MATERIALS IN OTHER LOCATIONS IF APPROVED BY THE ENGINEER. REFER TO TRENCH BACKFILL SPECIAL PROVISIONS FOR MATERIALS AND COMPACTION REQUIREMENTS.

② PIPE BEDDING AND INITIAL TRENCH BACKFILL

#6 WASHED STONE FROM 6" BELOW TO 12" ABOVE TOP OF PIPE

③ UNSUITABLE MATERIALS

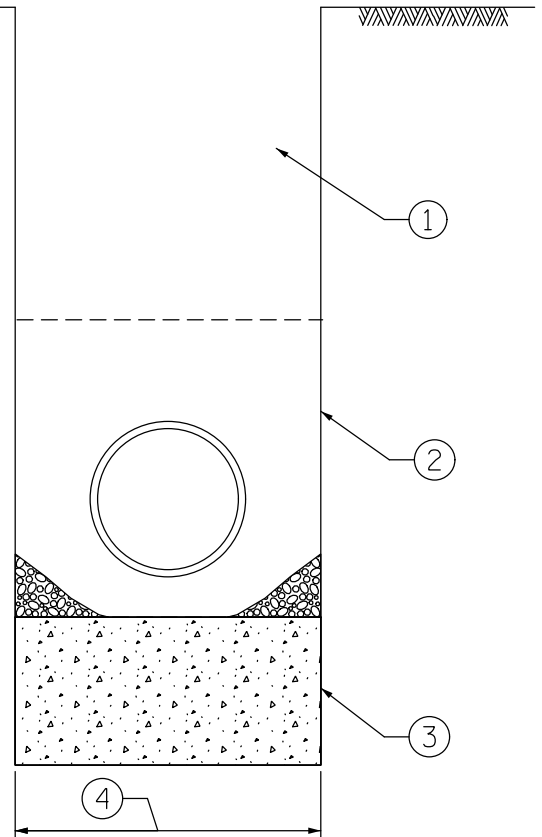
IF ENCOUNTERED - SHALL BE REMOVED WHERE DIRECTED BY THE ENGINEER AND REPLACED WITH SUITABLE AND COMPACTED MATERIAL.

④ TRENCH WIDTH

MINIMUM = PIPE O.D. +12"  
 MAXIMUM = PIPE O.D. +18"

NOTES:

1. ALL CA-6 MATERIAL TO BE IDOT APPROVED.



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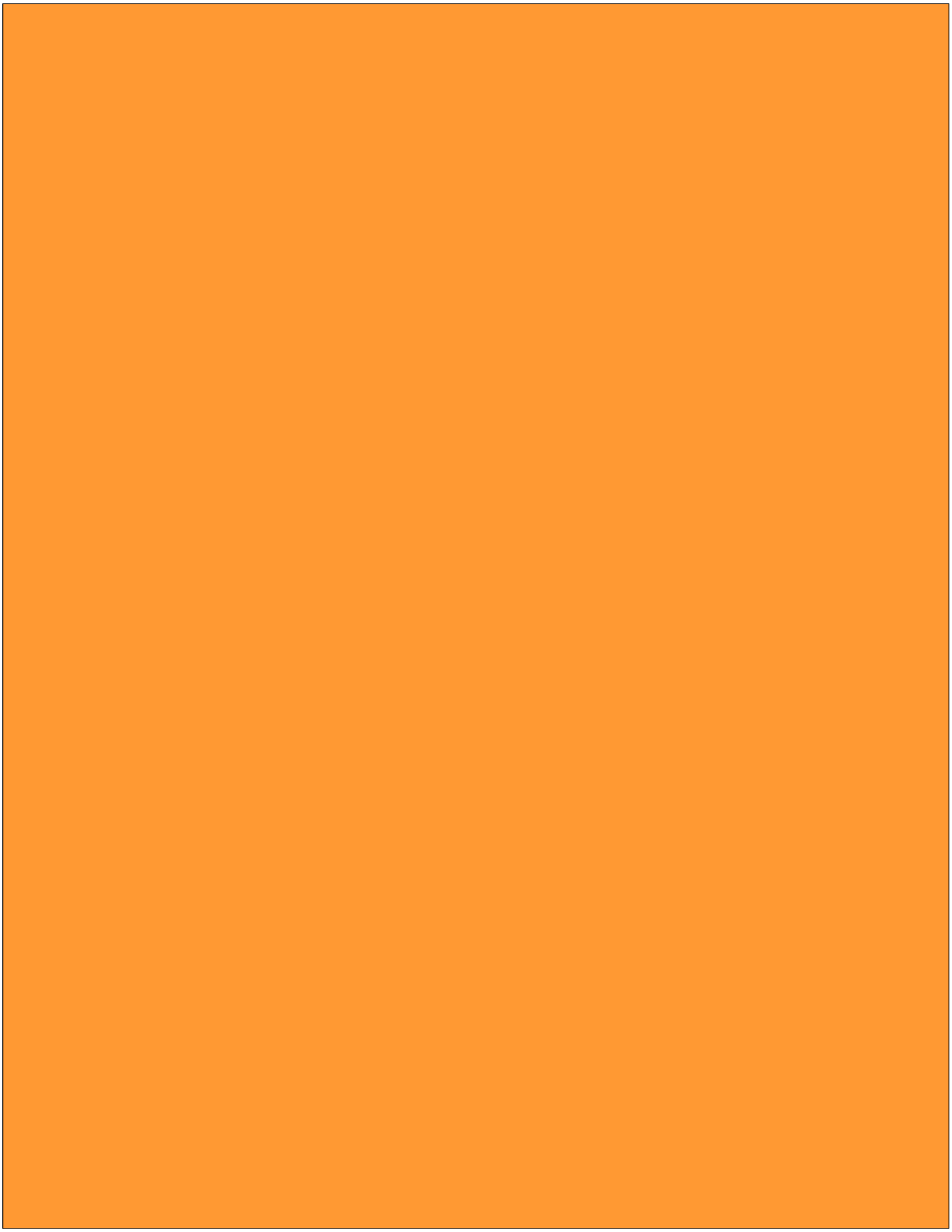
**ENGINEERING DETAILS**

**TYPICAL WATER MAIN  
 TRENCH CROSS SECTION**

DATE:	3/15/2019
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REV 3:	

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## Inspection Notes

1. All new developments will be required to hire a Soil Engineer who will certify that all roadways are constructed in accordance with the City of Harvard's specification "Field Quality Control Procedures for Pavement Area Subgrade".
  
2. Upon completion of all sanitary sewer and storm sewer, the sewer shall be videotaped and two (2) copies of the tape shall be supplied to the City in accordance with the City of Harvard Engineering Design Policies.



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### ENGINEERING DETAILS

### MISCELLANEOUS INSPECTION NOTES

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## Field Quality Control Procedures for Pavement Area Subgrade

The following procedures are recommended in order to prepare the subgrade for the project.

- A. The work area will first be stripped of vegetation or, in cut areas, excavated to a Design Subgrade Elevation as shown on the plans.
  - 1. The subgrade after cut will be proof rolled to verify a stable subgrade as directed by the Soils Engineer.
  - 2. A series of test pits may be needed as directed by the Soils Engineer to verify additional undercut as predicted or estimated by Boring Logs and the Earthwork Undercut Plan.

Proof rolling procedures will be as follows:

  - a. Two (2) to four (4) passes with a 25-ton rubber tire roller or equivalent;
  - b. Concentrate additional passes in areas that exhibit instability as directed by the Soils Engineer.
  
- B. Unstable and unsuitable subgrade materials will be removed to the depth encountered as directed by the Soils Engineer.
  - 1. Materials at undercut subgrade elevation should:
    - a. Have an unconfined compressive strength (Qu) of 2.0 tsf minimum, or cone index of 250 minimum;
    - b. Contain no foreign materials or have organic contents in excess of six (6) percent total organic matter as determined by the Wet Combustion Method (AASHTO T-194); or maximum dry densities less than 105 pcf as determined by AASHTO T-180 (ASTM D-1557);
    - c. Be able to support necessary construction equipment without severe rutting or deflection.
  
- C. At undercut subgrade elevation, the upper 8" of soil shall be scarified or disced and recompacted to 95 percent of the Maximum Dry Density as defined by AASHTO T-180 (ASTMD-1557), prior to remedial work fill placement.
  
- D. Proof rolling of the prepared undercut subgrade will be done if required by the Soils Engineer to further verify a stable subgrade prior to fill placement.
  
- E. Roadway FILL shall be placed in successive horizontal lifts of not more than 6" in loose depth (cohesive material), or not more than 9" in loose depth (porous granular material).
  
- F. The upper 8" of subgrade in areas not undercut shall also be scarified and recompacted to 95 percent of the maximum Dry Density as defined by AASHTO T-180 (ASTM D-1557), prior to placement of subsequent lift of FILL material.
  
- G. Once the existing subgrade is stabilized, FILL can be placed and compacted in lifts to design subgrade elevation. All roadway FILL materials shall be compacted to 95 percent of AASHTO T-180 (ASTM D-1557).



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### ENGINEERING DETAILS

## FIELD QUALITY CONTROL PROCEDURES FOR PAVEMENT AREA SUBGRADE

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H. When the work listed in the steps above has been completed, the subgrade will be checked by proof rolling and approved by the City before construction of the subbase, base course, or pavement is started. The City will make the determination as to whether areas failing this proof roll require additional drying and recompaction or whether the soil conditions warrant more extensive treatment.



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**ENGINEERING DETAILS**

**FIELD QUALITY CONTROL PROCEDURES  
FOR PAVEMENT AREA SUBGRADE**

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# Sanitary Sewer Testing Specifications

## Testing and Inspection for Acceptance of Sanitary Sewers

- Exfiltration of air under pressure
- Deflection of flexible Thermoplastic Pipe
- Televising

The method(s) of testing shall be specified in the Special Provisions or on the plans.

### TESTING TECHNIQUE

All Testing Methods: All wyes, tees, and stubs shall be plugged with flexible jointed caps, or acceptable alternate, securely fastened to withstand the internal test pressure. Such plugs or caps shall be readily removable.

1. Air Testing Method Procedures: The section of sewer to be tested shall have been trench backfilled and cleared. Pneumatic plugs (having a sealing length equal to or greater than the diameter of the pipe to be tested) placed in both ends of the pipe to be tested shall be inflated to 25 psig. The sealed sewer pipe shall then be pressurized to 4 psig above the average back pressure of groundwater over the sewer pipe and the air pressure allowed to stabilize for at least two minutes.

After the stabilization period the line shall be pressurized to 3.5 psig and the time in minutes measured for pressure to drop to 2.5 psig. If groundwater is present, the air pressure within shall be increased to 3.5 psig above the level of the groundwater and the drop of one pound of air pressure measured in minutes.

Air testing techniques shall be in accordance with the latest ASTM standard practice for testing sewer lines by low-pressure air test method for the appropriate pipe material, except that the time shall not be less than that shown in the Air Test Table contained in Section 31-1.11 C of the Standard Specifications for Water and Sewer Main Construction.

2. Deflection Testing for Flexible Thermoplastic Pipe:
  - a. The pipeline shall be tested for excess deflection by pulling a "go - no go" mandrel through the pipe from manhole to manhole. The mandrel shall be sized in accordance with Section 31-1.11 C(4) and as specified in the Special Provisions. A "deflectometer" may also be used to check and record deflection.
  - b. Wherever possible and practical, the testing shall initiate at the downstream lines and proceed towards the upstream lines.
  - c. Where deflection is found to be in excess of Allowable Testing Limits, the Contractor shall excavate to the point of excess deflection and carefully compact around the point where excess deflection was found. The line shall then be retested for deflection. However, should after the initial testing the deflected pipe fail to return to the original size (inside diameter), the line shall be replaced.



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## ENGINEERING DETAILS

## SANITARY SEWER TESTING SPECIFICATIONS

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## AIR TEST TABLE

Specification Time (Min:Sec) Required for Pressure Drop from 3½ to 2½ PSIG  
When Testing One Pipe Diameter Only

Length of Sewer Pipe in Feet	Pipe Diameter, Inches								
	4	6	8	10	12	15	18	21	24
25	0:04	0:10	0:18	0:28	0:40	1:02	1:29	2:01	2:38
50	0:09	0:20	0:35	0:55	1:19	2:04	2:58	4:03	5:17
75	0:13	0:30	0:53	1:23	1:59	3:06	4:27	6:04	7:55
100	0:18	0:40	1:10	1:50	2:38	4:08	5:56	8:05	10:34
125	0:22	0:50	1:28	2:18	3:18	5:09	7:26	9:55	11:20
150	0:26	0:59	1:46	2:45	3:58	6:11	8:30		
175	0:31	1:09	2:03	3:13	4:37	7:05			
200	0:35	1:19	2:21	3:40	5:17				12:06
225	0:40	1:29	2:38	4:08	5:40			10:25	13:36
250	0:44	1:39	2:56	4:35			8:31	11:35	15:07
275	0:48	1:49	3:14	4:43			9:21	12:44	16:38
300	0:53	1:59	3:31				10:21	13:53	18:09
350	1:02	2:19	3:47			8:16	11:54	16:12	21:10
400	1:10	2:38			6:30	9:27	13:36	18:31	24:12
450	1:19	2:50			6:48	10:38	15:19	20:50	27:13
500	1:28			5:14	7:34	11:49	17:01	23:09	30:14



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### ENGINEERING DETAILS

### SANITARY SEWER TESTING SPECIFICATIONS

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# Water Main Testing Specifications

## Pressure and Leakage Test

1. Testing Procedures
  - a. All pressure leakage testing shall be tested against installed pipe, fittings, valves, joints, and fire hydrants up to nozzles.
2. Valve Operations
  - a. City of Harvard Public Works personnel are the only individuals authorized to operate any water valves for pressurizing or flushing the system.
3. Taps for Testing
  - a. Contractor/developer is required to provide a minimum one (1)-inch service taps or size required for adequate flushing in manholes for test gauges, flushing needs, and for disinfection at each end of the pipe test section.
  - b. Service tap shall be a direct tap.
  - c. Contractor shall schedule an appointment with the City of Harvard Public Works for the witnessing/inspection of all taps. A 24-hour notice is required.
  - d. Contractor shall remove copper tube with whip assembly from manholes upon completion of testing and chlorination procedures. Corporation stop must be removed and replaced with a stainless steel full circle repair clamp.
4. Air Removal
  - a. Before applying the specified test pressure, air shall be expelled completely from the section of piping under test. Air removal will be done in conjunction with the flushing procedures of the water main (see Flushing Requirements.)
5. Allowable Leakage
  - a. Testing allowance shall be defined as the maximum quantity of makeup water that is added into a pipeline undergoing hydrostatic pressure testing, or any valved section thereof, in order to maintain pressure within  $\pm 5$  psi of the specified test pressure (after the pipeline has been filled with water and the air has been expelled\*). No pipeline installation will be accepted if the quantity of makeup water is greater than determined by the following formula:



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## ENGINEERING DETAILS

## WATER MAIN TESTING SPECIFICATIONS

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In inch-pound units,

$$L = \frac{SD\sqrt{P}}{148,000}$$

Where:

*L* = testing allowance (makeup water), in gallons per hour

*S* = length of pipe tested, in feet

*D* = nominal diameter of the pipe, in inches

*P* = average test pressure during the hydrostatic test, in pounds per square in (gauge)

These formulas are based on a testing allowance of 10.49 gpd/mi/in. of nominal diameter at a pressure of 150 psi. Values of testing allowance at various pressures are shown in the table below. When testing against closed metal-seated valves, an additional testing allowance per closed valve of 0.0078 gal/hr/in. of nominal value size shall be allowed. When hydrants are in the test section, the test shall be made against the main valve in the hydrant.

### ALLOWABLE LEAKAGE PER 1,000 FT OF PIPELINE

Avg. Test Pressure <i>psi</i>	Nominal Pipe Diameter— <i>in.</i>																	
	3	4	6	8	10	12	14	16	18	20	24	30	36	42	48	54	60	64
450	0.43	0.57	0.86	1.15	1.43	1.72	2.01	2.29	2.58	2.87	3.44	4.30	5.16	6.02	6.88	7.74	8.60	9.17
400	0.41	0.54	0.81	1.08	1.35	1.62	1.89	2.16	2.43	2.70	3.24	4.05	4.86	5.68	6.49	7.30	8.11	8.65
350	0.38	0.51	0.76	1.01	1.26	1.52	1.77	2.02	2.28	2.53	3.03	3.79	4.55	5.31	6.07	6.83	7.58	8.09
300	0.35	0.47	0.70	0.94	1.17	1.40	1.64	1.87	2.11	2.34	2.81	3.51	4.21	4.92	5.62	6.32	7.02	7.49
275	0.34	0.45	0.67	0.90	1.12	1.34	1.57	1.79	2.02	2.24	2.69	3.36	4.03	4.71	5.38	6.05	6.72	7.17
250	0.32	0.43	0.64	0.85	1.07	1.28	1.50	1.71	1.92	2.14	2.56	3.21	3.85	4.49	5.13	5.77	6.41	6.84
225	0.30	0.41	0.61	0.81	1.01	1.22	1.42	1.62	1.82	2.03	2.43	3.04	3.65	4.26	4.86	5.47	6.08	6.49
200	0.29	0.38	0.57	0.76	0.96	1.15	1.34	1.53	1.72	1.91	2.29	2.87	3.44	4.01	4.59	5.16	5.73	6.12
175	0.27	0.36	0.54	0.72	0.89	1.07	1.25	1.43	1.61	1.79	2.15	2.68	3.22	3.75	4.29	4.83	5.36	5.72
150	0.25	0.33	0.50	0.66	0.83	0.99	1.16	1.32	1.49	1.66	1.99	2.48	2.98	3.48	3.97	4.47	4.97	5.30
125	0.23	0.30	0.45	0.60	0.76	0.91	1.06	1.21	1.36	1.51	1.81	2.27	2.72	3.17	3.63	4.08	4.53	4.83
100	0.20	0.27	0.41	0.54	0.68	0.81	0.95	1.08	1.22	1.35	1.62	2.03	2.43	2.84	3.24	3.65	4.05	4.32

\*If the pipeline under test contains sections of various diameters, the testing allowance will be the sum of the testing allowance for each size.

†Calculated on the basis of Eq 1.



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## ENGINEERING DETAILS

## WATER MAIN TESTING SPECIFICATIONS

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6. Acceptance of Installation

- a. Acceptance shall be determined as the basis of allowable leakage or the procedures established by the City of Harvard Public Works Department. If any test of laid pipe discloses leakage greater than that specified, repairs or replacements shall be accomplished in accordance with the Specifications.
- b. All visible leaks are to be repaired regardless of the amount of leakage.
- c. Dye or any other form of coloring the water will not be introduced into the water main for the purpose of locating leaks.

**Disinfection of Water Mains**

1. Flushing Water Main

- a. Sections of pipe to be disinfected shall first be flushed to remove any solids or contaminated material that may have become lodged in the pipe. Fire hydrants in these sections will be flushed using either the two and a half (2 ½)-inches nozzle or the pumper nozzle to develop a velocity of at least 2.5 feet 3/sec in the main.
- b. All fire hydrants will be flushed and operated in the section of water main to be tested and disinfected.
- c. City of Harvard Public Works personnel are the only individuals authorized to operate any water valves.
- d. All valves that are closed will have a tap with copper tube and whip assembly installed in the vault for the purpose of flushing, and disinfecting the water main to the furthest end point of each section being tested.

2. Requirement of Chlorine

Before being placed into service, all new mains and repaired portion of, or extensions to existing mains shall be chlorinated so that the initial chlorine residual is not less than 50 mg/l and that a chlorine residual of not less than 25 mg/l remains in the water after standing 24 hours in the pipe. Mains must be flushed of chlorinated water within 24 hours of disinfection.

Continuous flushing method using sodium hyperchlorite Azone 15@ 12%/12.5 must be used.

3. Point of Application

The preferred point of application of the chlorinating agent is at the beginning of the pipeline extension or any valved section of it, and through a corporation stop inserted in the pipe.



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- a. The contractor will install corporation cocks with a copper tube gooseneck assembly for the purpose of disinfecting and as sample collection point at each branch, dead end, or a location which has a closed valve. Fire hydrants will be disinfected as part of this procedure.
- b. At a point not to exceed two (2)-feet downstream from the beginning of the new main the water entering the new main will receive a dose of chlorine fed at a constant rate such that the water will have not less than 25 mg/1 free chlorine.
- c. Water from the existing distribution system shall be made to flow at a constant rate into the new main.
- d. The City of Harvard Public Works personnel must witness the disinfection process. An appointment with 24-hour prior notice must be scheduled with City of Harvard Public Works Department.
- e. In the process of chlorinating newly laid pipe, all valves, fire hydrants, or other appurtenances shall be operated while the pipe line is filled with the chlorinating agent and under normal operating pressures.

#### Disinfection of Water Services (Larger Than Two (2) Inches)

For the purpose of clarifying this section, water service in this section refers to one (1) or more of the following installations that terminate inside of a building under construction.

- The service line being installed is for the purpose of a combination domestic and fire protection use.
- The service line being installed is for the purpose of branching into multiple domestic services inside of a meter room.
- The service line is the section of main being tested from the City of Harvard right-of-way valve to a location inside of the building.
- There are no fire hydrants installed on the service line.

#### 1. Meter Rooms/Building Installations

- a. The service line will be disinfected to the inside valve of the meter room prior to any branch service being connected.
- b. The meter room will have a permanent heating system installed and in working condition prior to the disinfection.
- c. One (1) sample point will be provided at the source and one (1) sample point will be provided at the inside valve provided the length of pipe does not exceed 1,000-feet.
- d. The contractor will supply a copper tube gooseneck assembly at each of the sample points and provide methods to divert the flushing water.



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- e. The City of Harvard Public Works personnel must witness the disinfection process. An appointment with 24 hours prior notice must be scheduled with City of Harvard Public Works Department.

2. Domestic/Fire Service Mains/Meter Room

- a. The service line will be disinfected up to the inside valve on both the fire branch and the domestic branch.
- b. The Fire Service Main Branch will have a valve of equal size to the riser section installed prior to chlorination.
- c. The building, meter room, or location of the incoming service line will have a permanent heating system installed and in working condition prior to the disinfection.
- d. One (1) sample point will be provided at the source and one (1) sample point will be provided at the inside valve provided the length of pipe does not exceed 1,000-feet and provide a method to divert the flushing water.
- e. The contractor will supply a copper tube goose neck assembly at each of the sample points.
- f. The City of Harvard Public Works personnel must witness the disinfection process. An appointment with 24 hours prior notice must be scheduled with City of Harvard Public Works Department.

De-chlorination Requirements

Following chlorination, all treated water shall be thoroughly flushed from the newly laid pipe using the fire hydrant(s) and/or all the copper gooseneck assemblies. The flushing shall replace the highly chlorinated water with water that has a chlorine residual of less than 1 mg/1 or equal to the residual from the supply service.

- The discharging of chlorinated water must be expelled to the surrounding ground surface.
- The contractor/developer must comply with all of the I.E.P.A. Rules, Regulations, and Standards for de-chlorinating water as part of the discharging.
- The contractor/developer is responsible for the equipment and materials to de-chlorinate the water at each point it is discharging.
- The City of Harvard Public Works personnel are the only individuals authorized to operate the valves.
- The City of Harvard Public Works personnel must witness the de-chlorination procedures when flushing the water mains. An appointment with



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24-hour prior notice must be scheduled with City of Harvard Public Works Department.

### Sampling and Testing

Sample collection for bacterial testing will start immediately after flushing the disinfection water from the system and prior to any portion of the water main being placed into service. Samples will be collected at all sample points designated by the City of Harvard Public Works. Sampling procedures must follow the I.E.P.A. Standards for construction of new water mains. Division.

1. Locations and Spacing
  - a. Samples will be collected from the service, along the water main, as required, and at the end of the line.
  - b. Samples will be collected from fire hydrants at points not to exceed 1,000-feet of linear water main, or as directed by the City of Harvard.
  - c. A sample will be collected from the copper goose-neck assembly point that is located no further than five (5)-feet downstream from the beginning of the new water main.
  
2. Collection Requirements
  - a. The contractor is required to collect all samples at the location(s) designated by the City of Harvard Public Works.
  - b. City of Harvard Public Works personnel are the only individuals authorized to operate any water valves and must witness all samples at time of collection. 24-hour prior notice must be scheduled with the City of Harvard Public Works Department.
  - c. A chain of custody form will be used to identify sample location, chloride residual, time of collection, etc. All collection samples will be sealed with a tamper proof label.
  - d. The contractor is required to take the collected samples to a certified laboratory approved by the City of Harvard.
  - e. The City of Harvard Public Works has the right to collect quality control samples at the same time contractor collects samples. The charges for the quality control samples will be charged to the contractor.
  - f. Samples must be collected on two consecutive days with at least 24-hours of separation between the collection times.
  - g. Each sample collected will be tested for quality and must show the absence of coliform organisms.



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3. Satisfactory Sample Results

If all the samples tested meet the Bacteriological Quality Standards and are certified as satisfactory by the testing lab:

- a. The contractor may have the lab email the results directly to the City of Harvard Public Works Department;
- b. The contractor must provide original copies of the certified results to the City of Harvard Public Works within seven (7) business days of the date on the test results; and
- c. The contractor must contact the City of Harvard Public Works to schedule an appointment to have the water main placed into service within 72 hours of the satisfactory test results being certified and only as approved by the Department of Public Works. All original chain of custody forms must be returned before activation.

4. Unsatisfactory Sample Results

If any one of the samples tested fails to meet the Bacteriological Quality Standards and is deemed unsatisfactory, then all the samples collected on the same date for the tested section of pipe, will be considered unsatisfactory.

- a. Unsatisfactory samples from the first day of collection will be discarded. A new first day collection must be collected with a new second day to be collected consecutively.

- b. Unsatisfactory samples from the second day of collection will be discarded. First day samples will also be discarded and the contractor must schedule new first and second day samples.

The contractor will have up to three (3) chances of first day and two (2) chances of second day bacterial testing to obtain satisfactory results on all the samples collected and tested.

- c. Should the contractor fail to obtain satisfactory results after the allotted attempts, the watermain section being tested is to have the original disinfection procedures repeated until satisfactory results are obtained.

Flow Test

After completion of all water mains and installation of all fire hydrants within a subdivision, a flow test shall be performed at the point in the subdivisions farthest away from the existing City water main. The flow test shall provide information regarding static pressure, residual pressure and flow rate, and the information shall be supplied to the City.



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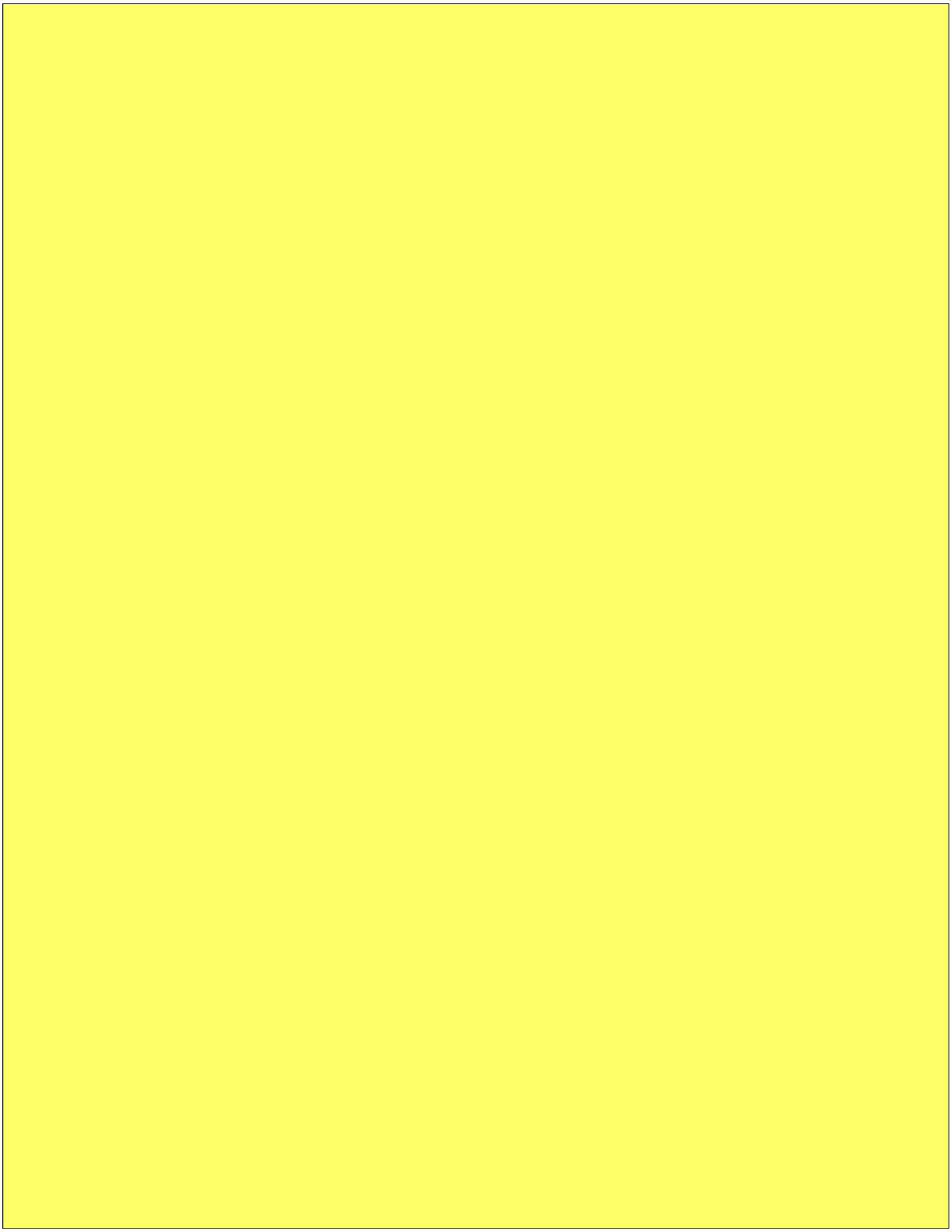
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## Miscellaneous Street Lighting Standard Notes

### GENERAL

- A. All developments shall include provisions for the construction of street lighting facilities in accordance with this Section.
- B. The street lighting plan shall show the location and direction of the pole and mast and the proposed routing of the electric cable and duct. The pole size, bracket size, and catalog numbers are to be shown on the street light plans. The street lighting plan and equipment submittals must be approved by the City prior to the installation of any part of the system.
- C. Street lights shall be installed and in good working order immediately upon completion of the roadway base course. The developer shall arrange with the Commonwealth Edison Company to energize the street light system as soon as possible. The developer shall be responsible for all connection fees.
- D. The City shall be billed for energy usage. Maintenance of the street light network within the development shall be the developer's responsibility until City Council formal acceptance of subdivision improvements. Reports of outages made to the City in the interim will be addressed by the City Public Works Department at the expense of the developer.
- E. Street lighting shall be installed in accordance with the current service rules and policies of Commonwealth Edison Company, and shall conform to the requirements of the *Harvard Municipal Code*, unless otherwise modified in this Section.

### BASIC DESIGN STANDARDS

- A. Street Lights shall be placed as follows:
  - 1. At all township, county, or state highway intersections.
  - 2. At all major street (streets with right-of-way widths greater than 66 feet) intersections.
  - 3. At all local street cross or "tee" intersections.
  - 4. At the end of streets and the turn-around of cul-de-sacs.
  - 5. At mid-block of all blocks, or at spacing not to exceed three hundred (300) feet.
  - 6. At all major curves in street alignment.
- B. Illumination shall not exceed the following intensities:

Residential within the right-of-way	0.5 foot-candle
Residential property	0.2 foot-candle
Commercial within the right-of-way	0.5 foot-candles
Commercial property	2.0 foot-candles
- C. Mounting height shall be twenty-five (25) feet for all poles, unless otherwise approved by the City Council.



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- D. Conductors shall be sized to the limit voltage drop to five percent (5%) at furthest light.
- E. All electric cable shall be placed underground in a one (1) inch minimum unit duct.
- F. For large developments, a service disconnect may be required by the City Engineer. If required, the service disconnect shall be thirty (30) amp fused, rain-tight enclosed and placed within three (3) feet of Commonwealth Edison's transformer or pedestal.
- G. Each individual light shall have its own fuse.
- H. A hand hole shall be provided in each pole base for splicing purposes. The hand hole shall be located on the side opposite of traffic flow, eighteen (18) inches above finished grade.

**MATERIAL SPECIFICATIONS AND DETAILS**

**A. Residential Light Standards and Brackets**

- 1. Pole - Light standards shall be manufactured of centrifugally cast, prestressed, steel reinforced concrete. The cross-section of the standard shall contain a raceway extending throughout the length of the standard. Pole shall be Ameron Centrecon Medium Embedded Octagonal Pole #MEO-7.5 with a Centrecon 8' MO-AD Davit arm.
- 2. Luminaire - The luminaire shall be Autobahn Series ATBS, LED Cobra Head
  - a. LED 7100 Lumens
  - b. Color temperature of 5K CCT, 70 CRI
  - c. 3 pin MEMA photocontrol receptacle
  - d. DTL DSS photo control
  - e. NEMA Label
  - f. R3 optics
  - g. Drop refractor for field installation
  - h. Surge protection- 20kV/10KA SPD
  - i. Standard gray paint
- 3. Vibration Requirements - There shall be no excessive vibrations in the shaft or mast arms under moderate wind pressure, where damage may result to the luminaire and/or its component parts, and/or mast arms. A dampening device, as an integral part of the shaft, shall be installed in the shaft to alleviate such excessive vibrations. The proposed vibration dampening device shall be submitted to the City Engineer for approval.
- 4. Ornamental Lighting shall be approved by the City.

**B. Electric Cable 600 Volt, Plastic Insulated, Materials**



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1. The conductors shall be a minimum of #10 AWG size in the light standard. When not within the light standard, the wire shall be a minimum of #8 AWG size in a one (1) inch unit duct.
2. A green ground wire (minimum #10) shall be used from pedestal to pole with connections.
3. The electric cable shall be contained within a minimum one (1) inch plastic unit duct. The unit duct shall be one piece without splices. The unit duct may be formed by extruding it over the insulated conductors. The unit duct shall have a smooth inner bore which does not adhere to the conductor insulation.

C. Conductors

1. Conductors of #8 AWG (and smaller) size (SLP or EPR-USE) shall be stranded annealed copper wire that complies with ASTM designation B-3. Conductors of #6 AWG size and larger shall be stranded annealed copper wire complying with ASTM designation B-8. Conductors shall be different colors to designate hot and neutral wires. Preferred colors are black, red, and white.
2. Conductors shall be sized to limit the voltage drop at the furthest pole to five (5%) percent.

D. Conduit

Street crossings of conductors shall be installed in Schedule 40 heavy wall rigid PVC conduit or galvanized steel. No open cutting of curb and gutter or pavement shall be performed. Pavement crossing shall extend a minimum of two (2) feet beyond the back of curb.

**INSTALLATION REQUIREMENTS**

A. Grounding

All foundations shall contain a ten (10) foot long grounding rod three-quarter (<sup>3</sup>/<sub>4</sub>) inch in diameter. The grounding rod shall be attached to the internal grounding lug located within the pole by clamps and electrical grounding wire.

B. Electric Cable

1. The electric cable shall be continuous without splices between service connections and light standards and through all conduits. The duct shall extend one (1) foot into the light standards and the cable shall be long enough for the splices to be withdrawn eighteen (18) inches out of the light standard hand holes. All electric cable and electric cable unit duct shall be buried underground at a minimum depth of thirty-two (32) inches below finished grade.



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2. The cable duct shall be placed in the bottom of the trench after all loose stones have been removed and all protruding stones have been removed or covered with acceptable bedding material.
3. No splices shall be allowed between the light standard and the connection to Commonwealth Edison electrical system. If the cable has been cut during construction, the cable and duct shall be replaced in its entirety from the Commonwealth Edison connection into the light standard.
4. The trench shall be backfilled and thoroughly compacted to a density equal to the existing ground, or greater, in such a manner as not to injure the cable duct or the bare copper wire. No stone or rock greater than two (2) inches in maximum dimensions shall be allowed in any layer of backfill. No sod, frozen material, or any material which might cause settlement shall be placed as backfill. Deleterious substances, such as coal, lignite, shells, clay lumps and conglomerate, and cemented particles shall not exceed five percent (5%) by weight in any one sample of backfill material. Any material excavated from the trench may be used as backfill provided it does not conflict with the above and the material is acceptable to the City Engineer.
5. Backfill from one (1) foot above conduit to roadway subgrade shall be compacted CA-6, and shall extend three (3) feet beyond the back of curb.
6. Red warning tape shall be laid one (1) foot above the top of the buried conductors for the entire length of the conductor runs.

C. Direct Burial Poles

Concrete poles shall include the placement of compacted limestone, IDOT gradation FA6, in the excavated void around the foundation. Normal backfill shall not be placed back around the foundation.

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