Jildardo Arias, PE, CFM
Director of Engineering/
City Engineer

Date

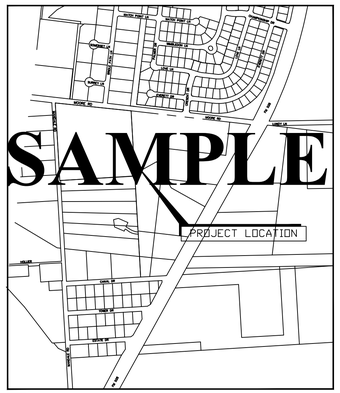
René Ibarra, CFM, CPM
Director of Public Works

Date

NOTE:

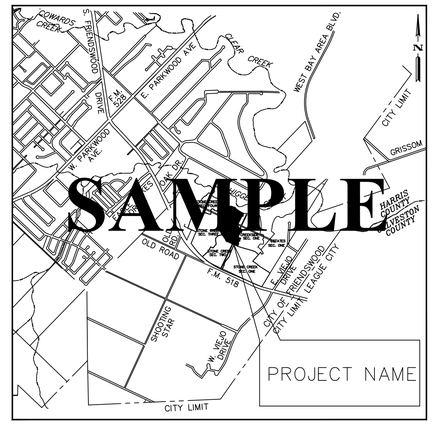
This is to certify that the above signed have reviewed all sheets provided and found them to be in general comformance with the requirements established by the City of Friendswood. This approval is only valid for three hundred sixty-five (365) calendar days. Please note, this does not necessarily mean that all the calculations provided in the plans have been completely checked and verified. The plans submitted have been prepared, signed and sealed by a professional engineer licensed to practice engineering in the State of Texas, which conveys the engineer's responsibility and accountability.

EFFECTIVE DATE: SEPTEMBER 3, 2022



LOCATION MAP
KEY MAP: 656K
SCALE: 1"= 500'

GALVESTON OR HARRIS COUNTY
CITY OF FRIENDSWOOD, TEXAS
PROJECT NAME
DESCRIPTION OF WORK



VICINITY MAP
KEY MAP: 656K
SCALE: 1"= 2500'

SHEET INDEX

NOTES:
1. WHERE CITY AND PROJECT TYPICAL DETAILS AND NOTES CONFLICT, THE STRICTER OF THE TWO SHALL SUPERSEDE

DATE SUBMITTED

OWNER NAME
ADDRESS
CITY AND STATE
PHONE

ENGINEER COMPANY NAME
TPBE FIRM #
ADDRESS
CITY AND STATE
PHONE

REV. NO.	DATE	DESCRIPTION	P.E. APPR.
△			
△			

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EFFECTIVE DATE: SEPTEMBER 3, 2022

GENERAL NOTES:

1. ALL WORK SHALL BE DONE IN ACCORDANCE WITH THE LATEST REVISED CITY OF FRIENDSWOOD STANDARD DETAILS AND TECHNICAL SPECIFICATIONS.
2. ELEVATION AND CONTOURS SHOWN, UNLESS OTHERWISE DEFINED, ARE BASED ON NAD 83.
3. TRENCH SAFETY SYSTEM TO MEET, AS A MINIMUM, THE REQUIREMENTS OF OSHA SAFETY AND HEALTH REGULATIONS PART 1926, SUBPART P.
4. EXISTING UNDERGROUND UTILITIES ARE NOT SHOWN. THE CONTRACTOR SHALL CONTACT THE UTILITY COORDINATING COMMITTEE AT (713-223-4567) FOR CENTERPOINT, TEXAS-NEW MEXICO POWER AND AT&T TELEPHONE AND TEXAS ONE-CALL SYSTEM (811) FOR PIPELINES AND CABLE TV.
5. IT IS THE CONTRACTOR'S RESPONSIBILITY TO DETERMINE THE DEPTH, LOCATION AND EXISTENCE OF ALL EXISTING UTILITIES WHICH MAY CONFLICT WITH THE PROPOSED CONSTRUCTION.
6. CONTRACTOR SHALL VERIFY ALL DIMENSIONS AND CONDITIONS IN THE FIELD BEFORE COMMENCING WORK. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO REPORT ANY AND ALL DISCREPANCIES TO THE OWNER AND THE ENGINEER IN A TIMELY MANNER.
7. CONTRACTOR SHALL ADEQUATELY PROTECT EXISTING STRUCTURES, UTILITIES, TREES, SHRUBS, OTHER PERMANENT OBJECTS AND ADJOINING PROPERTY.
8. NO OPEN EXCAVATIONS SHALL BE LEFT OPEN OVERNIGHT. ALL EXCAVATIONS WHICH CANNOT BE BACKFILLED OVERNIGHT SHALL BE COVERED, AS A MINIMUM, WITH STEEL PLATING WHEN IN PAVED AREAS; 3/4 INCH PLYWOOD, WOOD PLANKING WITH OSHA ORANGE PLASTIC EXPANDED MESH BARRIER AROUND PERIMETER IN UNPAVED AREAS, OR AS APPROVED BY THE CITY OF FRIENDSWOOD.
9. EXISTING PAVEMENTS, CURBS, SIDEWALKS AND DRIVEWAYS DAMAGED OR REMOVED DURING CONSTRUCTION BY THE CONTRACTOR FOR THEIR CONVENIENCE SHALL BE REPLACED PER CURRENT TECHNICAL SPECIFICATIONS BY THE CONTRACTOR AT HIS EXPENSE.
10. CONTRACTOR SHALL PLAN, SCHEDULE, AND PERFORM HIS WORK SO AS TO PROVIDE AND MAINTAIN SAFE PUBLIC TRAFFIC (INGRESS AND EGRESS) AS WELL AS NON-INCONVENIENCE TO ALL PROPERTY OWNERS ALONG THE PROJECT RIGHT OF WAYS DURING CONSTRUCTION PERIOD.
11. FOR LOCATIONS WHERE OPEN CUT CONSTRUCTION IS REQUIRED IN STREETS THE CONTRACTOR SHALL FURNISH AND MAINTAIN ADEQUATE BARRICADES, WARNING AND DIRECTING SIGNS, FLAGS, AND LIGHTS, NOTIFY CITY OF FRIENDSWOOD ENGINEERING DEPARTMENT AT (281) 993-3411.
12. ALL SIGNS, BARRICADES, PAVEMENT MARKINGS, TRAFFIC SIGNALS, AND CHANNELIZING DEVICES USED TO HANDLE TRAFFIC SHALL BE SHOWN ON A TRAFFIC CONTROL PLAN (TO BE APPROVED BY THE CITY AND TxDOT IF APPLICABLE) AND SHALL CONFORM TO THE LATEST REVISIONS OF THE TEXAS MANUAL ON UNIFORM TRAFFIC CONTROL DEVISED FOR STREET AND HIGHWAYS (TMUTCD), "PART VI-TRAFFIC CONTROLS FOR STREET AND HIGHWAY CONSTRUCTION AND MAINTENANCE OPERATIONS."
13. CONTRACTOR SHALL NOTIFY THE CITY OF FRIENDSWOOD ENGINEERING DEPARTMENT AT (281) 993-3411 48 HOURS PRIOR TO THE START OF CONSTRUCTION.

PAVING:

1. PAVEMENT SUBGRADE SHALL BE CONSTRUCTED IN ACCORDANCE WITH THE CITY OF FRIENDSWOOD STANDARD DETAILS AND TECHNICAL SPECIFICATIONS, LATEST REVISIONS.
2. CONTRACTOR SHALL NOTIFY THE CITY OF FRIENDSWOOD ENGINEERING DEPARTMENT AT (281) 993-3411 TWENTY-FOUR (24) HOURS PRIOR TO ALL LIMING AND PAVING OPERATIONS.
3. ALL RETURNS SHALL HAVE A TWENTY-FIVE (25) FOOT RADIUS AT BACK OF CURB UNLESS OTHERWISE NOTED.
4. GUIDELINES SET FORTH IN THE "TEXAS MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES" SHALL BE OBSERVED.
5. ALL FILL IN EXISTING OR PROPOSED RIGHTS-OF WAY, INCLUDING BACKDRESSING BEHIND THE CURB, SHALL BE PLACED IN MAXIMUM LOOSE LIFTS OF EIGHT (8) INCHES OR LESS AND COMPACTED TO NINETY-FIVE PERCENT (95%) STANDARD PROCTOR DENSITY WITH AN OPTIMUM MOISTURE CONTENT OF ± 3%.
6. MINIMUM PAVEMENT REINFORCEMENT REQUIREMENT SHALL BE GRADE 60, NO. 4 REBAR, SPACED AT SIXTEEN (16) INCH ON CENTERS EACH WAY.
7. PAVING EXPANSION JOINTS SHALL BE PLACED AT A MAXIMUM OF FORTY (40) FEET WITH CONTROL JOINTS NO GREATER THAN EVERY TEN (20) FEET.
8. ALL CONCRETE USED FOR PAVEMENT SHALL BE CLASS "A" CONCRETE WITH A MINIMUM 5.0 SACK OF CEMENT PER CUBIC YARDS AND A MINIMUM 3,000 PSI COMPRESSIVE STRENGTH AT TWENTY-EIGHT (28) DAYS.
9. CLASS "A" HYDRATED LIME SHALL BE APPLIED FOR SUBGRADE STABILIZATION AT A MINIMUM OF 6%.
10. CONTRACTOR SHALL INSTALL STREET SIGNS AND STOP SIGNS PER CITY OF FRIENDSWOOD STANDARD DETAILS AND TECHNICAL SPECIFICATIONS.
11. ALIGNMENTS, CENTERLINE CURVE DATA, AND STATIONING FOR ALL CONSTRUCTION SHALL BE DETERMINED FROM SUBDIVISION PLAT.
12. FOR ALL CONCRETE TO BE REMOVED, A THREE (3) INCH DEEP SAW CUT SHALL BE PROVIDED PRIOR TO REMOVAL.
13. REPRESENTATIVES FROM THE CITY, THE OWNER AND THE TESTING LABORATORY SHALL BE PRESENT FOR ALL DENSITY TESTS, LIME OPERATIONS AND PLACEMENT OF CONCRETE PAVING.
14. UNDER NO CIRCUMSTANCES SHALL WATER BE ADDED TO A CONCRETE LOAD AFTER SLUMP TEST AND/OR CONCRETE CYLINDERS HAVE BEEN TAKEN.
15. BLUE REFLECTIVE PAVEMENT MARKERS SHALL BE PLACED AT FIRE HYDRANT LOCATIONS AND OFFSET SIX (6) INCHES FROM THE CENTERLINE OF THE ROADWAY. REFLECTORS SHALL FACE FLOW OF TRAFFIC.
16. FOR PAVEMENT WIDTHS LESS THAN OR EQUAL TO TWENTY-EIGHT (28) FEET B/B OF CURB:
    - 16.1. MINIMUM STABILIZED SUBGRADE THICKNESS SHALL BE SIX (6) INCHES.
    - 16.2. MINIMUM CONCRETE SLAB THICKNESS SHALL BE SIX (6) INCHES.
17. FOR PAVEMENT WIDTHS GREATER THAN TWENTY-EIGHT (28) FEET B/B OF CURB AND ALL MAJOR ARTERIAL THOROUGHFARES:
    - 17.1. MINIMUM STABILIZED SUBGRADE THICKNESS SHALL BE EIGHT (8) INCHES.
    - 17.2. MINIMUM CONCRETE SLAB THICKNESS SHALL BE SEVEN (7) INCHES.

SANITARY SEWERS

1. FINISHED ELEVATION ON SANITARY MANHOLE RIMS SHALL BE THREE (3) INCHES ABOVE FINISHED GRADE WITHIN THE UTILITY EASEMENT. IF MANHOLE IS LOCATED ADJACENT TO A PUBLIC STREET, THE FINAL ELEVATION OF THE MANHOLE RIM SHALL BE TWO (2) INCHES ABOVE THE CURB OR CENTERLINE OF STREET FOR STREETS WITHOUT PERIMETER CURB.
2. WATER LINES AND SANITARY SEWERS SHALL BE INSTALLED IN SEPARATE TRENCHES AND BE A MINIMUM SEPARATION OF NINE (9) FEET.
3. POLYVINYL CHLORIDE (PVC) SHALL BE IN ACCORDANCE WITH ASTM D3034, SDR 26 FOR ALL DEPTHS.
4. ALL PVC PIPES (ALL TYPES AND SDR/DR WALL THICKNESS TO BE USED) SHALL HAVE A RUBBER GASKET EQUIPPED BELL AND SPIGOT JOINTS CONFORMING TO ASTM D3212. THE GASKET MATERIAL SHALL CONFORM TO ASTM F477, SOLVENT WELDED JOINTS WILL NOT BE APPROVED FOR CITY SANITARY SEWER LINES.
5. ALL DUCTILE IRON (DI) PIPE SHALL BE ONE HUNDRED FIFTY (150) PSI WITH EIGHT (8) MIL, BLACK VIRGIN POLYETHYLENE WRAP AS SPECIFIED IN ANSI/AWWA A21.5/C105.

SANITARY SEWERS (CONT.)

6. SANITARY SEWER MATERIALS AND CONSTRUCTION SHALL BE IN ACCORDANCE WITH THE CITY OF FRIENDSWOOD DESIGN STANDARDS. CONTRACTOR TO FURNISH TEST PLUGS AND RISERS. ALL SANITARY SEWER LINES TO BE AIR TESTED IN ACCORDANCE WITH THE CITY OF FRIENDSWOOD TECHNICAL SPECIFICATIONS.
7. SANITARY SEWER TRENCHES UNDER OR WITHIN ONE (1) FOOT OF PROPOSED OR FUTURE PAVEMENT ARE TO BE BACKFILLED WITH CEMENT-STABILIZED SAND BACKFILL, AS SPECIFIED, TO WITHIN ONE (1) FOOT OF SUBGRADE. BEDDING WILL BE CEMENT-STABILIZED SAND BACKFILL (1.1 SACKS CEMENT PER TON OF SAND) FOR ALL SANITARY SEWERS.
8. WATER LINE/NEW SEWER LINE SEPARATION. WHEN NEW SANITARY SEWERS ARE INSTALLED, THEY SHALL BE INSTALLED NO CLOSER TO WATER LINES THAN NINE (9) FEET IN ALL DIRECTIONS. SEWERS THAT PARALLEL TO WATER LINES MUST BE INSTALLED IN SEPARATE TRENCHES. WHEN NINE (9) FEET OF SEPARATION CANNOT BE MAINTAINED, THE FOLLOWING GUIDELINES APPLY:
    - 8.1 WHEN THE SANITARY SEWER PARALLELS A WATER LINE, THE SANITARY SEWER SHALL BE CONSTRUCTED OF CAST IRON, DUCTILE IRON OR PVC MEETING ASTM SPECIFICATIONS WITH A PRESSURE RATING FOR BOTH THE PIPE AND JOINTS OF 150 PSI. THE VERTICAL SEPARATION SHALL BE A MINIMUM OF TWO (2) FEET BETWEEN OUTSIDE DIAMETERS AND THE HORIZONTAL SEPARATION SHALL BE A MINIMUM OF FOUR (4) FEET BETWEEN OUTSIDE DIAMETERS. THE SANITARY SEWER SHALL BE LOCATED BELOW THE WATER LINE.
    - 8.2 WHEN A SANITARY SEWER CROSSES A WATER LINE AND THE SEWER IS CONSTRUCTED OF CAST IRON, DUCTILE IRON OR PVC WITH A MINIMUM PRESSURE RATING OF 150 PSI; AN ABSOLUTE MINIMUM OF SIX (6) INCHES BETWEEN OUTSIDE DIAMETERS SHALL BE MAINTAINED. THE SANITARY SEWER SHALL BE LOCATED BELOW THE WATER LINE WHEN POSSIBLE AND ONE (1) LENGTH OF THE SANITARY SEWER PIPE MUST BE CENTERED ON THE WATER LINE.
    - 8.3 WHEN A SANITARY SEWER CROSSES UNDER A WATER LINE AND THE SEWER IS CONSTRUCTED OF ABS TRUSS PIPE, SIMILAR SEMI-RIGID PLASTIC COMPOSITE PIPE, CLAY PIPE OR CONCRETE PIPE WITH GASKETED JOINTS, A MINIMUM OF TWO (2) FEET OF SEPARATION SHALL BE MAINTAINED. THE INITIAL BACKFILL SHALL BE CEMENT-STABILIZED SAND (MINIMUM 1.1 SACKS OF CONCRETE PER TON OF SAND) FOR ALL SECTIONS OF SANITARY SEWER WITHIN NINE (9) FEET OF THE WATER LINE. THE INITIAL BACKFILL SHALL BE FROM ¼ DIAMETER BELOW THE CENTERLINE OF THE PIPE TO ONE PIPE DIAMETER (BUT NOT LESS THAN TWELVE (12) INCHES) ABOVE THE PIPE.
    - 8.4 WHEN A SANITARY SEWER CROSSES OVER A WATER LINE, ALL PORTIONS OF THE SANITARY SEWER WITHIN NINE (9) FEET OF THE WATER LINE SHALL BE CONSTRUCTED OF CAST IRON, DUCTILE IRON OR PVC PIPE WITH A PRESSURE RATING OF AT LEAST 150 PSI USING APPROPRIATE ADAPTERS. IN LIEU OF THIS PROCEDURE THE NEW SANITARY SEWER MAY BE ENCASED IN A JOINT OF 150 PSI PRESSURE CLASS PIPE AT LEAST EIGHTEEN (18) FEET LONG AND TWO (2) NOMINAL SIZES LARGER THAN THE NEW SANITARY SEWER. THE SPACE AROUND THE CARRIER PIPE SHALL BE SUPPORTED AT INTERVALS OF FIVE (5) FEET WITH SPACERS OR BE FILLED TO THE SPRINGLINE WITH WASHED SAND. THE ENCASEMENT PIPE SHOULD BE CENTERED ON THE CROSSING AND BOTH ENDS SEALED WITH NON-SHRINK CEMENT GROUT OR WITH A MANUFACTURED SEAL.
9. ALL PROPOSED SANITARY SEWER LINES SHALL BE DUCTILE IRON OR SDR 26 PVC. DUCTILE IRON PIPE SHALL ONLY BE USED AS APPROVED BY THE CITY OF FRIENDSWOOD.
10. FOR ALL PVC PIPE, USE MANHOLE WATER STOP GASKET AND CLAMP ASSEMBLY AT MANHOLE CONNECTIONS.
11. SANITARY SEWER MANHOLES SHALL BE STANDARD TYPE, UNLESS OTHERWISE NOTED. ALL SANITARY SEWER MANHOLES SHALL BE AT LEAST THREE (3) INCHES ABOVE FINISHED GRADE OR ABOVE THE 100 YEAR BASE FLOOD ELEVATION (BFE). FOR MANHOLES LOCATES IN THE 100-YEAR FLOOD PLAIN, VENT AND SEAL (BOLTED MANHOLE LID W/ FOUR (4) BOLTS, NO HOLES IN LID) THE MANHOLE TOP AND PROVIDE INFLOW PROTECTOR INSERT UNDER COVER. SECTIONS OF PRECAST MANHOLES SHALL BE JOINED WITH "RAM NEK" IN FLOOD PLAIN.
12. SANITARY SEWER LINES IN PIPE ZONE INSIDE LOT EASEMENT SHALL BE BACKFILLED WITH CEMENT-STABILIZED SAND OR SELECT FILL MATERIAL WITH A PI BETWEEN 20 AND 40.
13. IF WET SAND IS ENCOUNTERED IN TRENCH, USE SPECIAL BEDDING. UNDER NO CIRCUMSTANCES IS SAND TO BE ADDED TO A TRENCH UNDER WATER.
14. SANITARY SEWERS CROSSING UTILITIES OTHER THAN WATER LINES SHALL HAVE A MINIMUM CLEARANCE OF SIX (6) INCHES.
15. ALL PRECAST MANHOLES SHALL HAVE A TOP ADJUSTMENT CONSTRUCTED OF PRECAST PCC RINGS NO GREATER THAN TWENTY-FOUR (24) INCHES IN HEIGHT, SEALED WITH NON-SHRINK GROUT, INSIDE AND OUTSIDE. BRICK AND FIBERGLASS MANHOLES SHALL NOT BE ALLOWED.
16. ALL SANITARY SEWER MANHOLE COVERS MUST INCLUDE THE WORD "SANITARY SEWER" AND "CITY OF FRIENDSWOOD". THEY MUST ALSO HAVE THE CITY SEAL.
17. SANITARY SEWER MANHOLE COVERS SHALL BE A MINIMUM OF THIRTY-TWO (32) INCHES IN DIAMETER.
18. ALL SANITARY SEWER MANHOLES SHALL HAVE AN INFLOW PROTECTOR,

STORM SEWERS:

1. STORM SEWERS SHALL BE CONSTRUCTED IN ACCORDANCE WITH THE CITY OF FRIENDSWOOD TECHNICAL SPECIFICATIONS AND STANDARD DETAILS, LATEST REVISIONS.
2. ALL STORM SEWER PIPE SHALL BE REINFORCED CONCRETE PIPE (RCP), ASTM C76, CLASS III, TONGUE AND GROOVE, RAM-NEK JOINTS UNLESS OTHERWISE NOTED.
3. REINFORCED CONCRETE STORM SEWER (PIPE, BOX, ETC.) SHALL BE INSTALLED, BEDDED AND BACKFILLED IN CONFORMITY WITH CITY OF FRIENDSWOOD TECHNICAL SPECIFICATIONS AND STANDARD DETAILS. STORM SEWER PIPE INSTALLED UNDER OR WITHIN ONE (1) FOOT OF PROPOSED OR EXISTING PAVEMENT SHALL BE BACKFILLED WITH CEMENT-STABILIZED SAND, (1.1 SACKS OF CEMENT PER TON OF SAND), TO THE BOTTOM OF THE SUBGRADE.
4. CONCRETE FOR INLETS AND MANHOLES SHALL BE CLASS "A" AND SHALL HAVE A MINIMUM COMPRESSIVE STRENGTH OF 4,000 PSI AT TWENTY-EIGHT (28) DAYS.
5. ALL MANHOLES SHALL BE ADJUSTED TO FINISHED GRADE BEFORE PAVING IS COMPLETE.
6. MINIMUM STORM SEWER SIZE IS TWENTY-FOUR (24) INCH DIAMETER. MINIMUM UPSTREAM ROADSIDE DITCH CULVERT SIZE IS EIGHTEEN (18) INCH DIAMETER.
7. ALL STORM SEWER MANHOLE COVERS MUST INCLUDE THE WORDS, "STORM SEWER" AND "CITY OF FRIENDSWOOD" AND HAVE THE "CITY SEAL." MANHOLE COVERS SHALL BE THIRTY-TWO (32) INCHES IN DIAMETER EXCEPT AT CURB INLET COVERS WHICH ARE TWENTY-FOUR (24) INCHES.
8. CONTRACTOR SHALL PROVIDE A MINIMUM OF SIX (6) INCHES CLEARANCE AT ALL UTILITY CROSSINGS WITH STORM SEWERS.
9. ALL INLETS IN RESIDENTIAL DEVELOPMENTS TO BE TYPE "H-2" OR TYPE "B-B" WITH GRATES. ALL INLETS IN COMMERCIAL DEVELOPMENTS AND ON MAJOR THOROUGHFARES TO BE TYPE "H-2" ONLY, UNLESS OTHERWISE APPROVED BY THE CITY OF FRIENDSWOOD.
10. ALL DISTURBED AREAS IN DRAINAGE EASEMENTS OR DETENTION PONDS, SHALL BE HYDROMULCHED AS PER TECHNICAL SPECIFICATIONS SECTION 02910 – HYDROMULCH SEEDING OR APPROVED EQUAL.

WATER LINES:

1. WATER LINE CONSTRUCTION AND TESTING IS TO BE PERFORMED IN ACCORDANCE WITH CITY OF FRIENDSWOOD TECHNICAL SPECIFICATIONS.

WATER LINES (CONT.):

2. ALL WATER MAINS SHALL HAVE A MINIMUM COVER OF FOUR (4) FEET MEASURED FROM CENTERLINE OF STREET OR EXISTING NATURAL GROUND WHICHEVER DEPTH IS GREATER, UNLESS OTHERWISE NOTED.
3. PRESSURE TEST OF ALL WATER LINES SHALL BE AT 150 PSI FOR FOUR (4) HOURS AND WITNESSED BY THE CITY OF FRIENDSWOOD ENGINEERING DEPARTMENT, EXCEPT FIRE LINES WHICH SHALL BE TESTED AT 200 PSI FOR TWO (2) HOURS AND WITNESSED BY THE FIRE MARSHAL.
4. SINGLE METER SERVICE LINES SHALL BE ONE (1) INCH MINIMUM I.D., C.T.S. POLYETHYLENE, SDR-9.
5. CONTRACTOR TO FURNISH AND INSTALL SINGLE SERVICE METER BOXES AT FINISH GRADE.
6. FIRE HYDRANT ASSEMBLIES SHALL INCLUDE ONE (1) EACH LINE SIZE BY SIX (6) INCH TEE, ONE (1) EACH SIX (6) INCH GATE VALVE AND BOX, ONE (1) EACH FIRE HYDRANT WITH SIX (6) INCH LEAD PIPING AND TIE BACKS.
7. WATER VALVES ON MAIN LINES SHALL BE LOCATED AS CLOSE AS POSSIBLE TO EXTENDED PROPERTY LINE AND SHALL CONFORM TO AWWA C-500, OPEN COUNTER CLOCKWISE LEFT, EQUIPPED WITH TWO (2) INCH SQUARE OPERATING NUT. OPERATING NUT SHALL BE A MAXIMUM OF FIVE (5) FEET BELOW FINISH GRADE.
8. WATER LINES FOUR (4) INCH THROUGH TWELVE (12) INCH I.D. SHALL COMPLY THE REQUIREMENTS OF AWWA STANDARD C-900-75, CLASS 150, SDR-18, WITH CAST IRON OUTSIDE DIAMETER AND GASKET BELL END. FITTINGS ARE TO BE MECHANICAL JOINTS IN ACCORDANCE WITH AWWA C-100 OR C-110.
9. ALL CONCRETE THRUST BLOCKING SHALL BE PLACED TO FORM A SOLID CONNECTION BETWEEN FITTINGS, VALVES, AND FIRE HYDRANTS AND UNDISTURBED EARTH. CONCRETE FOR THRUST BLOCKING SHALL BE CLASS "C" AND HAVE A MINIMUM OF 2,500 PSI COMPRESSIVE STRENGTH AT TWENTY-EIGHT (28) DAYS AND CONFORM TO CITY OF FRIENDSWOOD TECHNICAL SPECIFICATIONS AND STANDARD DETAILS.
10. GRAY IRON AND DUCTILE IRON FITTINGS SHALL CONFORM TO AWWA C-110 AND END JOINTS OF FITTINGS AND MAIN VALVES SHALL CONFORM TO AWWA C-110. FOR RUBBER GASKETED JOINTS, END JOINTS TO FITTINGS AND MAIN LINE VALVES SHALL CONFORM TO AWWA C-111. GRAY IRON AND DUCTILE IRON FITTINGS SHALL BE CEMENT LINED OR EPOXY COATED.
11. MINIMUM BURY FOR ALL FIRE HYDRANTS SHALL BE FOUR (4) FEET UNLESS OTHERWISE NOTED. ALL FIRE HYDRANTS AND VALVE BOXES ARE TO BE ADJUSTED TO FINISH GRADE AFTER PAVING IS COMPLETE. PUMPER SERVICE CONNECTION TO FACE CURB.
12. INSTALL CONCRETE BLOCK BENEATH FIRE HYDRANTS BEFORE PLACING CONCRETE THRUST BLOCKING TO INSURE THAT FIRE HYDRANTS ARE INSTALLED LEVEL.
13. CONTRACTOR SHALL NOTIFY THE CITY OF FRIENDSWOOD ENGINEERING DEPARTMENT AT (281) 993-3411 SEVENTY-TWO (72) HOURS PRIOR TO START OF CONSTRUCTION.
14. ALL WATER LINES TO BE BACKFILLED TO ONE (1) FOOT ABOVE TOP OF PIPE WITH BANK SAND. FOR PORTIONS OF PIPE LOCATED UNDER PAVEMENT, BACKFILL FROM INITIAL BACKFILL OF BANK SAND TO ONE (1) FOOT BELOW PROPOSED SUBGRADE UNDER PAVEMENT WITH CEMENT-STABILIZED SAND (1.1 SACKS OF CEMENT PER TON OF SAND).
15. ALL FIRE HYDRANTS ARE TO BE LOCATED AS SHOWN ON THE PLANS AND SET THREE (3) FEET BEHIND THE CURB, ONE (1) FOOT FROM PROPERTY LINE FOR STREETS WITH DITCHES OR AT AN APPROVED LOCATION ON RURAL SECTION ROADS. ALL FIRE HYDRANTS SHALL BE AUDITED AND PAINTED AS PER CITY OF FRIENDSWOOD TECHNICAL SPECIFICATIONS.
16. ALL TAPPING SLEEVES SHALL BE STAINLESS STEEL FULL CIRCLE WITH MECHANICAL JOINT TAPPING SLEEVE.
17. THE CONTRACTOR SHALL NOT OPERATE EXISTING CITY WATER VALVES. THE CONTRACTOR SHALL NOTIFY THE CITY OF FRIENDSWOOD ENGINEERING DEPARTMENT AT (281) 993-3411 TWENTY-FOUR (24) HOURS MINIMUM FOR ANY VALVE OPERATION NECESSARY FOR THE PROJECT. IF ANY VALVE CLOSING RESULTS IN INTERRUPTED SERVICE TO RESIDENTS OR BUSINESSES, THE CONTRACTOR SHALL BE RESPONSIBLE FOR PROVIDING PROPER NOTICE TO THE AFFECTED PARTIES TWENTY-FOUR (24) HOURS IN ADVANCE OF THE INTERRUPTION.
18. FOR ALL CONSTRUCTION WATER USAGE ON THE PROJECT, A FIRE HYDRANT METER SHALL BE OBTAINED FROM THE CITY PUBLIC WORKS DEPARTMENT AT 15355 BLACKHAWK BLVD (281-996-3380). A DEPOSIT SHALL BE REQUIRED FOR THE METER AND A FEE SHALL BE CHARGED FOR ALL METERED WATER USAGE. THE CONTRACTOR SHALL SUPPLY A BACKFLOW PREVENTER FOR THE FIRE HYDRANT METER.

TESTING

ALL TESTING SHALL CONFORM WITH THE CITY OF FRIENDSWOOD TECHNICAL SPECIFICATIONS SECTION 01470 - TESTING LABORATORY SERVICES AND SECTION 01475 - TESTING PROCEDURES.

1. SECTION 02125 - EXCAVATION AND BACKFILL FOR UTILITIES:
    - 1.1. BACKFILL SHALL BE PLACED IN MAXIMUM LIFTS OF EIGHT (8) INCHES AND COMPACTED TO A DENSITY OF NOT LESS THAN 95% STANDARD PROCTOR WITH OPTIMUM MOISTURE BETWEEN PLUS 3% AND MINUS 3% OR AS OTHERWISE SPECIFIED BY THE SOILS LABORATORY. TEST SHALL BE TAKEN EVERY LIFT, EVERY 500 LINEAR FEET, OR BETWEEN MANHOLES, WHICHEVER RESULTS IN THE GREATEST NUMBER OF DENSITY TESTS.
    - 1.2. FIELD MOISTURE/DENSITY TEST SHALL BE PERFORMED AT A FREQUENCY OF AT LEAST ONE (1) TEST PER 500 SQUARE YARDS OF COMPACTED LIFT. THE DENSITY SHALL NOT BE LESS THAN 95% OF STANDARD PROCTOR WITH A MOISTURE CONTENT OF BETWEEN PLUS 3% AND MINUS 3% OPTIMUM MOISTURE, OR AS DETERMINED BY SOILS LABORATORY. MAXIMUM LIFT FOR TESTING COMPACTED FILL SHALL NOT EXCEED TWELVE (12) INCHES.
2. SECTION 02300 - CAST-IN-PLACE CONCRETE MANHOLES AND SECTION 02305 - PRECAST CONCRETE MANHOLES:
    - 2.1. EXFILTRATION TEST SHALL BE REQUIRED ON EACH MANHOLE SYSTEM.
        - 2.1.1. EACH MANHOLE IS TO BE PLUGGED, FILLED TO THE TOP OF THE RIM WITH WATER FOR THIRTY (30) MINUTES WITH THE ALLOWABLE LEAKAGE OF NOT MORE THAN ½ INCH; OR
        - 2.1.2. PLUG MANHOLE AND VACUUM TEST AT TEN (10) INCHES OF MERCURY WITH A LOSS OF NO MORE THAN ONE (1) INCH OF MERCURY FOR THE TIME TO BE DETERMINED BY THE WIDTH AND DEPTH OF THE MANHOLE.
3. SECTION 02400 - WATER LINES
    - 3.1. PRESSURE TEST:
        - 3.1.1. A TEST, TO BE SUCCESSFUL SHALL BE WITNESSED BY THE CITY OF FRIENDSWOOD ENGINEERING DEPARTMENT FOR A FOUR (4) HOUR PERIOD, DURING REASONABLE HOURS. THE ALLOWABLE LEAKAGE SHALL BE NO GREATER THAN DETERMINED BY THE FOLLOWING FORMULA:

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

            IN WHICH L IS THE ALLOWABLE LEAKAGE, IN GALLONS PER HOUR OF TESTING; S IS THE LENGTH OF PIPE BEING TESTED, IN FEET; D IS THE NOMINAL INSIDE DIAMETER OF THE PIPE, IN INCHES; AND P IS THE AVERAGE TEST PRESSURE DURING THIS TEST, IN POUNDS PER SQUARE INCH. THE TEST PRESSURE SHALL BE 150 PSI FOR FOUR (4) HOURS. ALL VALVES, FIRE HYDRANTS, AND SERVICES ARE TO BE TESTED TOGETHER.
        - 3.1.2 FIRE LINES SHALL BE TESTED AT 200 PSI FOR TWO (2) HOURS AND SHALL BE WITNESSED BY THE FIRE MARSHAL. LEAKAGE SHALL BE CALCULATED AS STATED ABOVE.

GENERAL CONSTRUCTION NOTES

ENGINEERING DEPARTMENT

FILE NAME: 2-GCN1-2022.DWG	DATE APPROVED: SEPTEMBER 3, 2022		PROJECT NUMBER:	DATE SUBMITTED:	SHEET: 1 OF 2
	SCALE: NTS	REVISED DATE: SEPT. 2022			

TESTING (CONT.)

3.2 BACTERIAL TEST (BAC-T):

3.2.1 BACTERIAL SAMPLE IS REQUIRED FOR EACH 1,200 FEET OF WATER MAIN, OR CLOSER DEPENDING ON FIRE HYDRANT LOCATIONS, OR PORTION THEREOF. ALSO DEAD ENDS ARE SUBJECT TO TESTING, SUCH AS CUL-DE-SAC. THE FORM NEEDS TO BE LABELED "CONSTRUCTION" OR "SPECIAL." BOTH FORM AND SAMPLE ARE TESTED AT A LABORATORY APPROVED BY TCEQ. PAYMENT SHALL BE EXPECTED AT TIME OF SAMPLING. SAMPLINGS SHALL ONLY BE CONDUCTED ON TUESDAYS AND THURSDAYS WITH FORTY-EIGHT (48) HOUR NOTIFICATION TO THE CITY OF FRIENDSWOOD ENGINEERING DEPARTMENT AT (281) 993-3411.

4. SECTION 02500 - GRAVITY SANITARY SEWERS:

4.1 LOW PRESSURE AIR TEST - THE PIPE SHALL UNDERGO A LOW PRESSURE AIR TEST WHICH SHALL CONFORM TO ASTM C828 AND ASTM C494. THE PRESSURE SHALL BE FIVE (5) PSI FOR A DURATION AS DETERMINED BY THE LENGTH AND NOMINAL I.D. OF THE PIPE BEING TESTED.

4.2 MANDREL DEFLECTION TEST - FLEXIBLE AND SEMI-RIGID PIPE DIAMETER DEFLECTION TEST SHALL BE DONE NO SOONER THAN THIRTY (30) DAYS AFTER FINAL BACKFILL. RUN TEST WITH A MANDREL HAVING A DIAMETER EQUAL TO 95% OF THE INSIDE NOMINAL DIAMETER OF THE PIPE BEING TESTED. MANDREL SHALL BE NINE (9) ARM WITH STEEL PROVING RING 2½ INCH RING WIDTH. TO PASS, MANDREL SHALL PASS FREELY THROUGH THE PIPE, PULLED BY ONE (1) WORKER. NO MECHANICAL MEANS SHALL BE ALLOWED TO PULL THE MANDREL.

5. SECTION 02720 - LIME-STABILIZED SUBGRADE:

5.1 LIME

5.1.1 PERCENT LIME DETERMINATION TEST SHALL BE TAKEN BY A CERTIFIED TESTING LABORATORY IN ACCORDANCE WITH ASTM C977-92, BUT SHALL NOT BE LESS THAN 6%.

5.1.2 THE PERCENT LIME USED SHALL BRING THE SOIL TO A P.I. OF NOT MORE THAN 15.

5.1.3 HYDRATED LIME SHALL BE SAMPLED AND TAKEN AT THE DISTRIBUTION AREA OF THE TANKER TRUCK AND TESTED.

5.2. SUBGRADE

5.2.1. ALL SUBGRADE SHALL MEET THE FOLLOWING REQUIREMENTS WHEN TEST DRY BY LABORATORY SIEVES:

MINIMUM PASSING 1¾ INCH SIEVE - 100%
MINIMUM PASSING ¾ INCH SIEVE - 85%
MINIMUM PASSING #4 SIEVE - 60%

5.2.2. ALL SUBGRADE SHALL PASS A DENSITY TEST OF NOT LESS THAN 95% STANDARD PROCTOR. METHOD OF TESTING AS PER ASTM D698. TEST TO BE TAKEN EVERY 200 FEET AS MEASURED ALONG CENTERLINE OF THE ROADWAY AT VARYING DISTANCES FROM CENTERLINE OF THE ROADWAY, OR AS DIRECTED BY THE CITY.

5.2.3. THICKNESS TESTS SHALL BE TAKEN AT EVERY 200 FEET AS MEASURED ALONG THE CENTERLINE OF THE ROADWAY.

5.2.4. IF A SINGLE STORM EVENT PRODUCES ONE (1) INCH OR MORE OF RAINFALL, CONTRACTOR SHALL RETEST THE SUBGRADE FOR DENSITY. THE INTERVAL FOR DENSITY RETESTS SHALL BE NOT LESS THAN 500 FEET AS MEASURED ALONG THE CENTERLINE OF THE ROADWAY.

6. SECTION 02805 - CONCRETE PAVING:

6.1 THE CONCRETE PAVEMENT WILL BE TESTED FOR DEPTHS IN ACCORDANCE WITH ASTM C174 TEST. THICKNESS SHALL NOT BE DEFICIENT BY MORE THAN ¼ INCH.

7. SECTION 03300 - STRUCTURAL CONCRETE:

7.1 THE SLUMP, WHEN PLACING CONCRETE, SHALL NOT BE GREATER THAN FIVE (5) INCHES. THIS TEST SHALL BE TAKEN FOR EVERY 100 CUBIC YARDS OF CONCRETE, BUT MAY BE TAKEN MORE FREQUENTLY IF THE CONSISTENCY OF THE CONCRETE APPEARS TO VARY PER THE TESTING LABORATORY TECHNICIAN OR THE CITY PROJECT MANAGER.

7.2 TEMPERATURE OF THE CONCRETE WILL BE TAKEN AS DIRECTED BY THE CITY PROJECT MANAGER AND SHALL BE LESS THAN 90° F.

7.3 THERE SHALL BE CYLINDERS TAKEN BY THE TESTING LABORATORY TECHNICIAN, IN ACCORDANCE WITH ASTM C31 TEST, NUMBERING FOUR (4) CYLINDERS PER 150 CUBIC YARDS OF PAVING OR PART THEREOF FOR EACH DAYS PLACEMENT. TWO (2) CYLINDERS SHALL BE TESTED AT SEVEN (7) DAYS AND TWO (2) CYLINDERS SHALL BE TESTED AT TWENTY-EIGHT (28) DAYS TO ASSURE THE MINIMUM DESIGN STRENGTH IS ACHIEVED.

PRIVATE UTILITY NOTES:

AT&T TEXAS/SWBT FACILITIES:

1. THE LOCATION OF AT&T TEXAS/SWBT FACILITIES ARE SHOWN IN AN APPROXIMATE WAY ONLY. THE CONTRACTOR SHALL DETERMINE THE EXACT LOCATION BEFORE COMMENCING WORK. CONTRACTOR AGREES TO BE FULLY RESPONSIBLE FOR ANY AND ALL DAMAGES WHICH MIGHT BE OCCASIONED BY THIS FAILURE TO EXACTLY LOCATE AND PRESERVE THESE UNDERGROUND UTILITIES.
2. THE CONTRACTOR SHALL CALL (800) 344-8377 A MINIMUM OF FORTY-EIGHT (48) HOURS PRIOR TO CONSTRUCTION TO HAVE UNDERGROUND LINES FIELD LOCATED.
3. WHEN EXCAVATING WITHIN EIGHTEEN (18) INCHES OF AT&T TEXAS/SWBT FACILITIES, ALL EXCAVATIONS MUST BE ACCOMPLISHED USING NON-MECHANIZED EXCAVATION PROCEDURES. WHEN BORING THE CONTRACTOR SHALL EXPOSE THE AT&T TEXAS/SWBT FACILITIES.
4. WHEN AT&T TEXAS/SWBT FACILITIES ARE EXPOSED, THE CONTRACTOR WILL PROVIDE SUPPORT TO THE CONDUIT DUCTS OR CABLES. WHEN EXCAVATING NEAR TELEPHONE POLES THE CONTRACTOR SHALL BRACE THE POLE FOR SUPPORT.
5. THE PRESENCE OR ABSENCE OF AT&T TEXAS/SWBT UNDERGROUND CONDUIT FACILITIES SHOWN ON THESE PLANS DOES NOT MEAN THAT THERE ARE NO DIRECT BURIED CABLES OR OTHER CABLES IN CONDUIT.
6. PLEASE CONTACT AT&T TEXAS DAMAGE PREVENTION MANAGER MR. ROOSEVELT LEE JR. AT (713) 567-4452 OR EMAIL HIM AT RL7259@ATT.COM, IF THERE ARE ANY QUESTIONS ABOUT BORING OR EXCAVATING NEAR OUT AT&T TEXAS/SWBT FACILITIES.

CENTERPOINT ENERGY EASEMENT:

NO APPROVAL TO USE, CROSS, OR OCCUPY CENTERPOINT FEE OF EASEMENT PROPERTY IS GIVEN. IF YOU NEED TO USE CENTERPOINT PROPERTY, PLEASE CONTACT CENTERPOINT ENERGY SURVEYING & RIGHT OF WAY DIVISION AT (713) 207-6248 OR (713) 207-5769.

CENTERPOINT ENERGY ELECTRIC FACILITIES:

1. CAUTION - OVERHEAD ELECTRICAL LINES. OVERHEAD LINES MAY EXIST ON THE PROPERTY. THE LOCATION OF OVERHEAD LINES HAS NOT BEEN DRAWN ON THESE DRAWINGS AS THE LINES ARE CLEARLY VISIBLE, BUT YOU SHOULD LOCATE THEM PRIOR TO BEGINNING CONSTRUCTION. TEXAS LAW, SECTION 752, HEALTH AND SAFETY CODE FORBIDS ACTIVITIES THAT OCCUR IN CLOSE PROXIMITY TO HIGH VOLTAGE LINES, SPECIFICALLY:

   1.1 ANY ACTIVITY WHERE PERSON OR THINGS MAY COME WITHIN SIX (6) FEET OF LIVE OVERHEAD HIGH VOLTAGE LINES; AND

   1.2 OPERATING A CRANE, DERRICK, POWER SHOVEL, DRILLING RIG, PILE DRIVER, HOISTING EQUIPMENT, OR SIMILAR APPARATUS WITHIN TEN (10) FEET OF LIVE OVERHEAD HIGH VOLTAGE LINES.

2. PARTIED RESPONSIBLE FOR THE WORK, INCLUDING CONTRACTORS ARE LEGALLY RESPONSIBLE FOR THE SAFETY OF CONSTRUCTION WORKERS UNDER THIS LAW. THIS LAW CARRIES BOTH CRIMINAL AND CIVIL LIABILITY. TO ARRANGE FOR LINES TO BE TURNED OFF OR REMOVED CALL CENTERPOINT ENERGY AT (713) 207-2222.

PRIVATE UTILITY NOTES(CONT.):

CENTERPOINT ENERGY GAS FACILITIES:

1. CAUTION - UNDERGROUND GAS FACILITIES. LOCATIONS OF CENTERPOINT ENERGY MAIN LINES (TO INCLUDE CENTERPOINT ENERGY, INTRASTATE PIPELINE, LLC WHERE APPLICABLE) ARE SHOWN IN APPROXIMATE LOCATION ONLY. SERVICE LINES ARE USUALLY NOT SHOWN. OUR SIGNATURE ON THESE PLANS ONLY INDICATES THAT OUR FACILITIES ARE SHOWN IN APPROXIMATE LOCATION. IT DOES NOT IMPLY THAT A CONFLICT ANALYSIS HAS BEEN MADE. THE CONTRACTOR SHALL CONTACT THE UTILITY COORDINATING COMMITTEE AT (800) 223-545-6001 OR 811 A MINIMUM OF FORTY-EIGHT (48) HOURS PRIOR TO CONSTRUCTION TO HAVE MAIN AND SERVICE LINES FIELD LOCATED.
2. WHEN CENTERPOINT ENERGY PIPE LINE MARKINGS ARE NOT VISIBLE CALL (713) 945-8037 (7:00 AM TO 4:30 PM) FOR STATUS OF LINE LOCATION REQUEST BEFORE EXCAVATION BEGINS.
3. WHEN EXCAVATING WITHIN EIGHTEEN (18) INCHES OF THE INDICATED LOCATION OF CENTERPOINT ENERGY FACILITIES, ALL EXCAVATION MUST BE ACCOMPLISHED USING NON-MECHANIZED EXCAVATION PROCEDURES.
4. WHEN CENTERPOINT ENERGY FACILITIES ARE EXPOSED, SUFFICIENT SUPPORT MUST BE PROVIDED TO THE FACILITIES TO PREVENT EXCESSIVE STRESS ON THE PIPING.
5. FOR EMERGENCIES REGARDING GAS LINES CALL (713) 659-3552 OF (713) 207-4200.
6. THE CONTRACTOR IS FULLY RESPONSIBLE FOR DAMAGES CAUSED BY THEIR FAILURE TO EXACTLY LOCATE AND PRESERVE THESE UNDERGROUND FACILITIES.

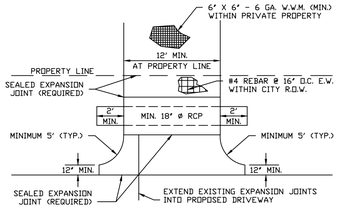
COMCAST FACILITIES:

1. CONTACT MR. BILL LEOPARD AT (281) 802-1679 OR MR. MOHAMMAD WOHEIDY AT (713) 895-1213 BEFORE PROCEEDING WITH CONSTRUCTION WORK IN THE VICINITY OF COMCAST/TIME WARNER CABLE FACILITIES.
2. WHEN EXCAVATING WITHIN EIGHTEEN (18) INCHES OF THE INDICATED LOCATION OF UNDERGROUND FACILITY, ALL EXCAVATION MUST BE ACCOMPLISHED USING NON-MECHANIZED EXCAVATION PROCEDURES.

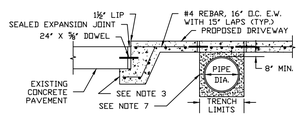
TEXAS-NEW MEXICO POWER COMPANY ELECTRIC FACILITIES:

1. CAUTION - OVERHEAD ELECTRICAL LINES. TEXAS LAW, ARTICLE 1436C, PROHIBITS ALL ACTIVITIES IN WHICH PERSONS OR EQUIPMENT MAY COME WITHIN SIX (6) FEET OF ENERGIZED OVERHEAD POWER LINES, AND FEDERAL REGULATIONS, TITLE 29, PART 1910.180(1) AND PART 1926.550(A)(15) REQUIRE A MINIMUM CLEARANCE OF TEN (10) FEET FROM THESE FACILITIES. ABOVE LAWS CARRY BOTH CRIMINAL AND CIVIL LIABILITIES. IF THE CONTRACTOR PERFORMS ANY WORK NEAR OVERHEAD POWER LINES THEY MUST CALL (281) 996-0453 FOR THE LINES TO BE DE-ENERGIZED AND/OR MOVED AT THEIR EXPENSE PRIOR TO PERFORMING WORK.
2. NOTE: LOCATION OF TEXAS-NEW MEXICO POWER COMPANY FACILITIES ARE APPROXIMATE AND HAVE NOT BEEN VERIFIED BY ACTUAL FIELD CHECK.
3. OVERHEAD LINES MAY EXIST ON THE PROPERTY. WE HAVE NOT ATTEMPTED TO MARK THOSE LINES HAS SINCE THEY ARE CLEARLY VISIBLE, BUT YOU SHOULD LOCATE THEM PRIOR TO BEGINNING CONSTRUCTION.
4. TEXAS LAW, SECTION 752, HEALTH AND SAFETY CODE FORBIDS ACTIVITIES WHICH PERSONS OR THINGS MAY COME WITHIN SIX (6) FEET OF LIVE OVERHEAD HIGH VOLTAGE LINES.
5. CONTRACTORS ARE LEGALLY RESPONSIBLE FOR THE SAFETY OF CONSTRUCTION WORKERS UNDER THIS LAW. LAW CARRIES BOTH CRIMINAL AND CIVIL LIABILITY. TO ARRANGE FOR LINES TO BE TURNED OFF OR MOVED CALL TEXAS-NEW MEXICO POWER COMPANY AT (281) 996-0453.
6. CONTRACTOR TO NOTIFY THE "UNDERGROUND COORDINATING COMMITTEE" TELEPHONE (713) 223-4567 FORTY-EIGHT (48) HOURS BEFORE STARTING WORK IN STREET RIGHTS-OF-WAY OR EASEMENTS..

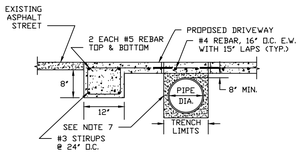
GENERAL CONSTRUCTION NOTES (CONTINUED)			ENGINEERING DEPARTMENT	
FILE NAME: 3-GCN2-2022.DWG	DATE APPROVED: MARCH 30, 2022			PROJECT NUMBER: / DATE SUBMITTED: / SHEET: 2 OF 2
	SCALE: NTS	REVISED DATE: MARCH 2022		



PLAN – ALL STREETS



PROFILE – CONCRETE STREETS

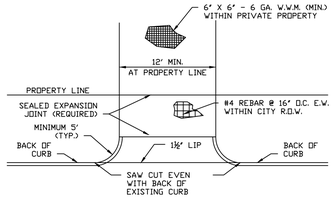


PROFILE – ASPHALT STREETS

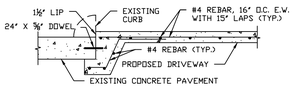
RESIDENTIAL CONCRETE DRIVEWAY
(OPEN DITCH STREETS)

NOTES:

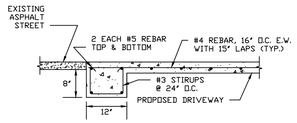
1. EXPANSION JOINT ON CONCRETE STREETS SHALL BE NOMINAL REDWOOD OR ASPHALTIC EXPANSION JOINT MATERIAL WITH 1" PULL-OF STRIP TO BE FILLED WITH APPROVED JOINT SEALANT.
2. 1½" LIP (CONCRETE STREETS ONLY) SHALL NOT BE REQUIRED ON STREETS WITH 4" X 12" MOUNTABLE CURB.
3. CONCRETE PAVEMENT HEADERS SHALL BE BUILT IN ACCORDANCE WITH CITY OF FRIENDSWOOD PAVING DETAILS.
4. CONNECTION TO EXISTING ASPHALT STREETS SHALL BE MADE BY BLOCKING NEW CONCRETE WITH EDGE OF PAVEMENT. A 8" DEEP BY 12" WIDE BEAM SHALL BE PLACED ALONG THE EDGE OF THE ASPHALT PAVEMENT. NO EXPANSION JOINT MATERIAL REQUIRED BETWEEN EXISTING ASPHALT STREET AND NEW CONCRETE DRIVEWAY.
5. DAMAGE TO EXISTING STREETS, WHETHER ASPHALT OR CONCRETE, SHALL BE REPAIRED AT CONTRACTORS EXPENSE.
6. ALL CONCRETE SHALL BE CLASS "A", 4,000 PSI AT TWENTY-EIGHT DAYS.
7. USE MATERIAL AND DIMENSION AS SPECIFIED IN STORM SEWER DETAILS FOR TRENCH WIDTHS AND BACKFILL.
8. NO MORE THAN ONE (1) DRIVEWAY ON LOTS WITH LESS THAN 120' OF FRONTAGE.



PLAN – ALL STREETS



PROFILE – CONCRETE STREETS

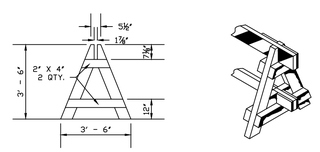


PROFILE – ASPHALT STREETS

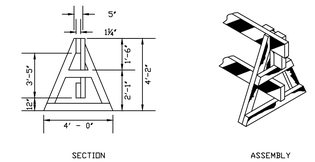
RESIDENTIAL CONCRETE DRIVEWAY
(CURB & GUTTER STREETS)

NOTES:

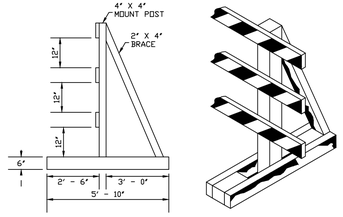
1. EXPANSION JOINT ON CONCRETE STREETS SHALL BE NOMINAL REDWOOD OR ASPHALTIC EXPANSION JOINT MATERIAL WITH 1" PULL-OF STRIP TO BE FILLED WITH APPROVED JOINT SEALANT.
2. 1½" LIP (CONCRETE STREETS ONLY) SHALL NOT BE REQUIRED ON STREETS WITH 4" X 12" MOUNTABLE CURB.
3. CONCRETE PAVEMENT HEADERS SHALL BE BUILT IN ACCORDANCE WITH CITY OF FRIENDSWOOD PAVING DETAILS.
4. CONNECTION TO EXISTING ASPHALT STREETS SHALL BE MADE BY BLOCKING NEW CONCRETE WITH EDGE OF PAVEMENT. A 8" DEEP BY 12" WIDE BEAM SHALL BE PLACED ALONG THE EDGE OF THE ASPHALT PAVEMENT. NO EXPANSION JOINT MATERIAL REQUIRED BETWEEN EXISTING ASPHALT STREET AND NEW CONCRETE DRIVEWAY.
5. DAMAGE TO EXISTING STREETS, WHETHER ASPHALT OR CONCRETE, SHALL BE REPAIRED AT CONTRACTORS EXPENSE.
6. ALL CONCRETE SHALL BE CLASS "A", 4,000 PSI AT TWENTY-EIGHT DAYS.



"A" FRAME STAND

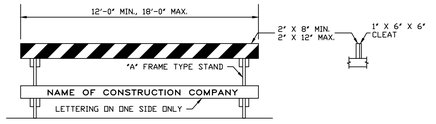


MODIFIED "A" FRAME STAND

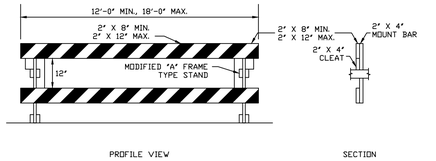


SKID & POST STAND

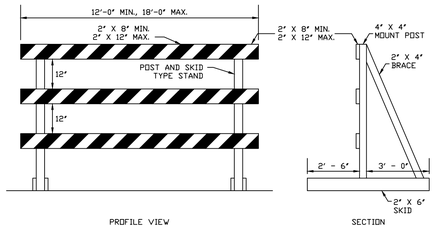
BARRICADE STANDS



TYPE I BARRICADE



TYPE II BARRICADE

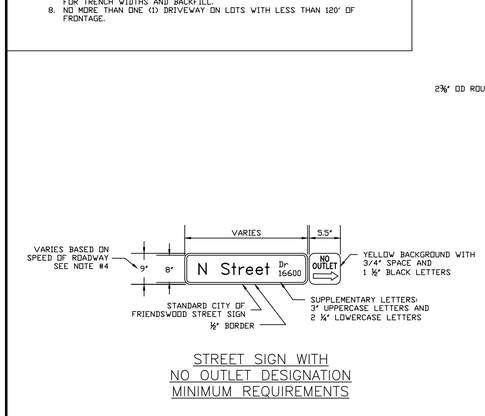


TYPE III BARRICADE

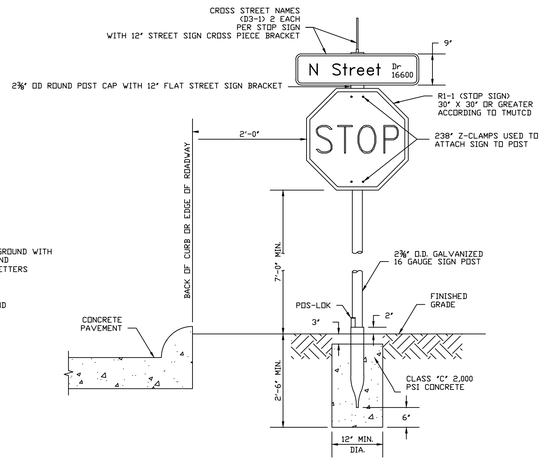
TEMPORARY BARRICADES

BARRICADE CONSTRUCTION NOTES:

1. BARRICADES SHALL BE CONSTRUCTED OF CLEAN SOUND LUMBER SURFACED ON TWO SIDES CUT TO THE NOMINAL DIMENSION SHOWN ON THESE DETAILS. BARRICADES SHALL BE PAINTED WITH TWO (2) COATS OF AN APPROVED BRAND OF WHITE PAINT TO PROVIDE THOROUGH COVERAGE AND A UNIFORM WHITE COLOR. THE PAINT FOR BARRICADE STRIPES SHALL BE AN APPROVED BRAND OF RED OR ORANGE AND WHITE PAINT APPLIED TO PROVIDE UNIFORM COLOR, AND THEY SHALL BE REFLECTORIZED.
2. REFLECTORIZATION FOR BARRICADES OR SIGNS MAY BE BY MEANS OF APPROVED REFLECTIVE COATINGS ON THE SIGN BACKGROUND WHICH SHALL CONSIST OF EITHER GLASS BEADS ON PAINT, REFLECTIVE SHEETING, REFLECTIVE LIQUID, OR RETRO-DIRECTIVE REFLECTORS. THE RETRO-DIRECTIVE REFLECTORS MAY BE EITHER GLASS OR CRYSTAL PLASTIC REFLECTOR BUTTONS. ALL REFLECTING ELEMENTS SHALL REFLECT WHITE LIGHT, UNLESS OTHERWISE INDICATED IN THE DETAILS.
3. ALL BARRICADES EXTENDING ACROSS MOVING LANES OR FOR DELINEATION THROUGH A PROJECT SHALL BE SUPPLEMENTED BY LIGHTS, PLACED SO AS NOT TO INTERFERE WITH THE VISIBILITY OF REFLECTOR BUTTONS OR REFLECTORIZED SURFACES. THESE LIGHTS SHALL BE MAINTAINED IN CONTINUOUS OPERATION FROM SUNSET TO SUNRISE AND SHALL BE OF THE FLASHING ELECTRIC TYPE, WITH THE RATE OF FLASHING BETWEEN SEVENTY (70) AND ONE HUNDRED-TWENTY (120) FLASHES PER MINUTE. FLASHING ELECTRIC LIGHTS SHALL NOT BE CONNECTED IN SERIES. ALL LIGHTS SHALL BE OF THE COLOR YELLOW.
4. BARRICADE TYPE III SHALL BE TREATED WITH EIGHT POUND (8 LB.) PENTACHLOROPHENOL (OR SIMILAR TREATMENT ALLOWED BY AWPA) WOOD PRESERVATIVE AND PAINTED WITH A PRIME COAT CONSISTING OF SPAR VARNISH VEHICLE ALUMINUM PAINT, FOLLOWED WITH ONE (1) COAT OF EXTERIOR GRADE WHITE PAINT STRIPED WITH ALTERNATE DIAGONAL ORANGE OR RED REFLECTIVE STRIPES WHERE SPECIFIED.
5. BARRICADES FOR CONSTRUCTION SHALL BE ALTERNATE ORANGE AND WHITE STRIPES SLOPING DOWNWARD AT AN ANGLE OF FORTY-FIVE DEGREES (45°) IN THE DIRECTION TRAFFIC IS TO PASS. BARRICADES USED OTHER THAN FOR CONSTRUCTION SHALL BE ALTERNATE RED AND WHITE STRIPES. THE ORANGE AND WHITE, AND RED AND WHITE MARKINGS SHALL NOT BE INTERMIXED IN THE SAME INSTALLATION AREA.
6. PERMANENT BARRICADES SHALL HAVE RED AND WHITE STRIPING.
7. TEMPORARY CONSTRUCTION BARRICADES SHALL HAVE ORANGE AND WHITE STRIPING.
8. SIGNS FOR BARRICADES SHALL BE MADE FROM WOOD, HARDBOARD, METAL OR PLASTIC CONFORMING WITH THESE REQUIREMENTS:
   - 8.1. METAL OR PLASTIC – SIGNS SHALL CONSIST OF STEEL, ALUMINUM ALLOY, OR PLASTIC WITH SUFFICIENT THICKNESS TO RETAIN RIGIDITY UNDER NORMAL CONDITIONS.
   - 8.2. WOOD – SIGN STOCK SHALL BE TWO INCH (2") STOCK B & B GRADE, KILN-DRIED LUMBER, OR EQUAL, OR WATERPROOF RESIN-BONDED EXTERIOR GRADE PLYWOOD, DOUGLAS FIR PLYWOOD ASSOCIATION OR EQUAL. ALL WOODEN SIGNS CONSTRUCTED OF TWO (2) OR MORE BOARDS SHALL HAVE A ONE INCH (1") BY SIX INCH (6") CLEAT FASTENED TO THE BACK OF THE SIGN AT EACH END AND EXTENDING FULL DEPTH OF THE SIGN. IN ADDITION TO CLEATS, THE BOARDS SHALL BE FASTENED TOGETHER WITH ONE-HALF INCH (½") CORRUGATED FASTENERS SPACED AT NOT MORE THAN TWELVE INCH (12") CENTERS DRIVEN FROM THE BACK OF THE SIGN. IT IS RECOMMENDED THAT WOOD USED FOR SIGNS BE TREATED WITH EITHER CHROMATED ZINC CHLORIDE, WOLMAN SALTS OR PENTACHLOROPHENOL. ALL WOOD PRESERVATIVES SHALL BE OF A TYPE WHICH WILL PROHIBIT THE BLEEDING OF PRESERVATIVE THROUGH PAINT COATINGS.
   - 8.3. HARDBOARD – SIGN STOCK SHALL BE TEMPERED DUOLUX, THREE-EIGHTHS INCH (⅜") NOMINAL THICKNESS, LAMINATED WITH WATERPROOF CASEIN GLUE, OR EQUAL.
9. REGULATORY SIGN LETTERING SHALL BE WELL-DEFINED, REFLECTIVE, OPEN ROUNDED TYPE CAPITAL LETTERS, AS APPROVED BY THE JOINT COMMITTEE ON UNIFORM TRAFFIC CONTROL DEVICES AND PUBLISHED BY THE FEDERAL HIGHWAY ADMINISTRATION.
10. CONTRACTOR SHALL BE RESPONSIBLE FOR VERIFYING THE LOCATION OF ALL EXISTING UTILITIES PRIOR TO EXCAVATION. DURING THE COURSE OF ANY AND ALL CLEARING, GRUBBING, FILL, GRADING, EXCAVATION OR OTHER CONSTRUCTION, CONTRACTOR SHALL ENSURE THAT STORM DRAINAGE PATHWAYS ARE MAINTAINED AND REMAIN OPEN TO ENSURE POSITIVE DRAINAGE AND THAT SUCH CONVEYANCES ARE NOT IMPEDED OR BLOCKED IN ANY WAY. STORM SEWER INLETS SHALL BE PROTECTED FROM ENTRY OF SILT, TRASH, DEBRIS, AND ANY SUBSTANCES DELETERIOUS TO THE STORM SEWER SYSTEM AND/OR WATERWAYS RECEIVING STORM WATER RUNOFF. CONTRACTOR SHALL, AT COMPLETION OF WORK, FILL LOW SPOTS AND GRADE ALL RIGHTS-OF-WAY AND UTILITY EASEMENTS AND REGRADE/RESTORE DITCHES AS NECESSARY TO MAINTAIN AND/OR ESTABLISH POSITIVE DRAINAGE.



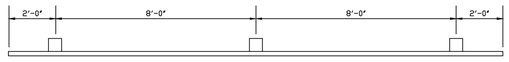
STREET SIGN WITH NO OUTLET DESIGNATION MINIMUM REQUIREMENTS



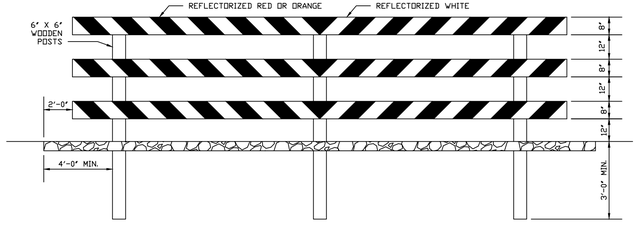
TYPICAL SIGN MOUNT DETAIL

NOTES:

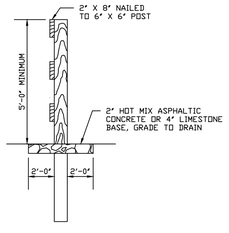
1. SIGN MATERIAL CONSISTS OF PRESSURE ACTIVATED WHITE BACKING MADE OF SUPER HIGH DENSITY OR DIAMOND/PRISMATIC VINYL WITH MINIMUM TEN (10) YEAR REFLECTIVITY WARRANTY. LETTERING CUT OUT OF SIGN MAKING FILM E.S.M. OR 3M TRANSPARENT VINYL SHEETING CUT ON CAD SIGN PLOTTER.
2. SIGN BLANKS SHALL BE .080" FLAT TRAFFIC GRADE (5052) ALUMINUM.
3. STREET NAME SIGN BLANKS SHALL BE COVERED WITH WHITE DIAMOND/PRISMATIC VINYL. LETTERS IN FONT TYPE "B", CUT OUT OF GREEN TRANSPARENT VINYL SHALL BE PLACE OVER THE WHITE DIAMOND/PRISMATIC VINYL TO PROJECT WHITE LETTERING WITH GREEN BACKGROUND.
4. PER T.M.U.T.C.D. ALL POST-MOUNTED STREET NAME SIGNS ON MULTI-LANE ROADWAYS WITH A SPEED LIMIT MORE THAN 40 MPH SHALL USE AN 8" INITIAL UPPER CASE LETTER AND 6" LOWER CASE LETTERING. POST-MOUNTED SIGNS ON MULTI-LANE ROADWAYS WITH A SPEED LIMIT OF 40 MPH OR LESS SHALL USE A 6" INITIAL UPPER CASE LETTER AND 4.5" LOWER CASE LETTERING. ALL CUL-DE-SAC STREETS SHALL HAVE A SIGN WITH A "NO OUTLET" DESIGNATION.
5. NO OUTLET SIGN TO BE REMOVED IF STREET BECOMES A THRU STREET.
6. STOP SIGNS SHALL BE RED 3M REFLECTIVE COATING ON WHITE DIAMOND/PRISMATIC VINYL BACKING. SEE TMUTCD FOR STOP SIGN SIZE REQUIREMENTS.
7. SIGN POST SHALL BE 2¾" O.D., 16 GAUGE GALVANIZE 120 CPOZ STEEL POST G90, TEN (10) FEET LONG.
8. SIGN POST SHALL BE MOUNTED WITH "POS-LOK" OR SIMILAR SYSTEM CONSISTING OF 27" GALVANIZED SLEEVE AND REMOVABLE WEDGE.



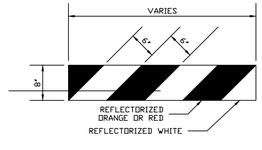
PLAN



FRONT VIEW



SIDE VIEW

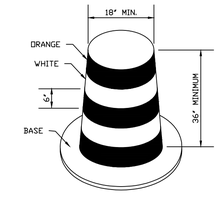


STRIPING

PERMANENT TYPE III BARRICADE

NOTE:

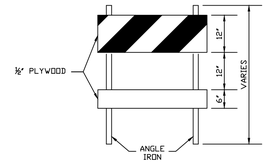
1. USE ORANGE AND WHITE REFLECTORIZED STRIPES DURING CONSTRUCTION ONLY. ALL OTHER TIMES RED AND WHITE REFLECTORIZED STRIPES SHALL BE USED.



BARREL DETAIL

NOTES:

1. TWO (2) WHITE STRIPES SHALL BE RETLECTORIZED AND SHALL BE 4" TO 8".
2. FLASHING OR STEADY BURN LIGHTS SHALL BE USED ON BARRICADES, PANELS AND BARRELS AS NEEDED.
3. METAL BARRELS ARE NOT PERMITTED.



PORTABLE TYPE I BARRICADE

BARRICADE AND MISCELLANEOUS DETAILS

FILE NAME: 4-BAMSD-2022.DWG

DATE APPROVED: MARCH 30, 2022

SCALE: NTS

REVISED DATE: MARCH 2022

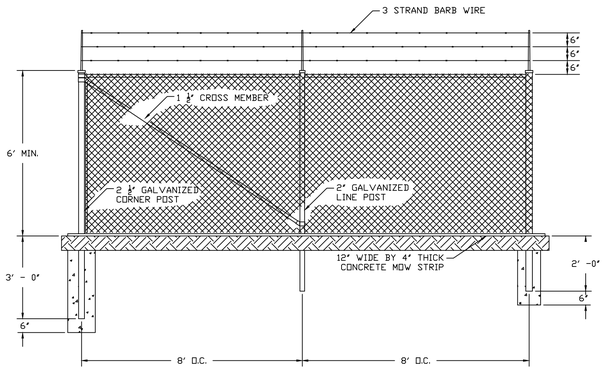
FRIENDSWOOD TEXAS

ENGINEERING DEPARTMENT

PROJECT NUMBER:

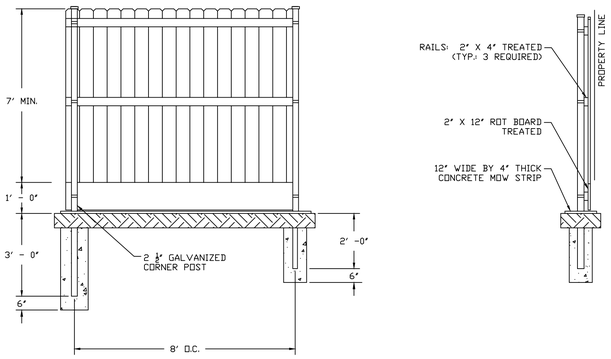
DATE SUBMITTED:

SHEET: 1 OF 1



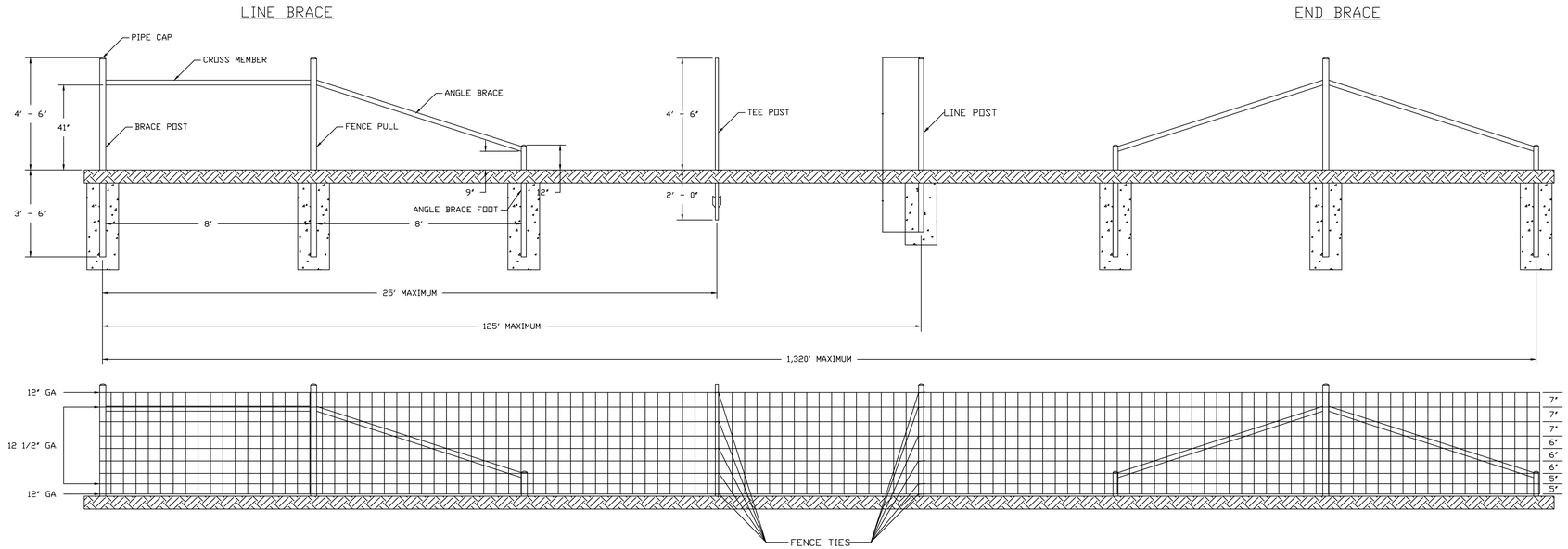
CHAIN LINK FENCE

N. T. S.



WOOD SLAT FENCE

N. T. S.



END BRACE MATERIALS	
ITEM	DESCRIPTION
BRACE POST	8' X 2 7/8" SCHEDULE 40 GALVANIZED PIPE
FENCE PULL	8' X 2 7/8" SCHEDULE 40 GALVANIZED PIPE
CROSS MEMBER	8' X 2 3/8" SCHEDULE 40 GALVANIZED PIPE
ANGLE BRACE	9' X 2 3/8" SCHEDULE 40 GALVANIZED PIPE
ANGLE BRACE FOOT	4' - 6 " X 2 7/8" SCHEDULE 40 GALVANIZED PIPE
PIPE CAPS	3 1/2" PIPE CAPS OR CONCRETE PLUGS

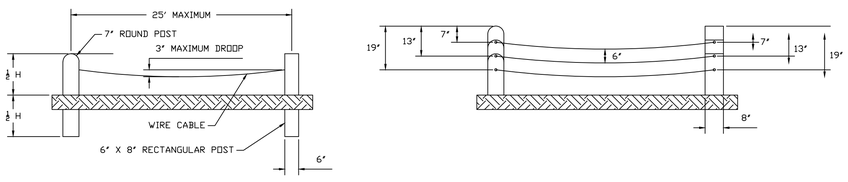
LINE & TEE POST MATERIALS	
ITEM	DESCRIPTION
TEE POST	6' - 6" 1.5 LBS/FT GALVANIZED OR PAINTED
LINE POST	7' X 2 3/8" SCHEDULE 40 GALVANIZED PIPE

LINE BRACE MATERIALS	
ITEM	DESCRIPTION
BRACE POST	8' X 2 7/8" SCHEDULE 40 GALVANIZED PIPE
CROSS MEMBER	8' X 2 3/8" SCHEDULE 40 GALVANIZED PIPE
ANGLE BRACE	9' X 2 3/8" SCHEDULE 40 GALVANIZED PIPE
ANGLE BRACE FOOT	4' - 6 " X 2 7/8" SCHEDULE 40 GALVANIZED PIPE
PIPE CAPS	3 1/2" PIPE CAPS OR CONCRETE PLUGS

FIXED KNOT FABRIC FENCE

N. T. S.

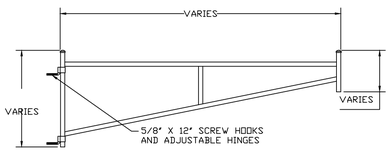
NOTES:
1. A LINE POST SHALL BE SET ON TOP OF ALL HIPS AND AT THE BOTTOM OF ALL DIPS.
2. BRUSH ALL WELDS AND TREAT WITH COLD-GALV OR EQUIVALENT TO PREVENT RUST.
3. TENSION FENCE BY PULLING TO CENTER OF PULL USING APPROVED STRETCHER BARS AND STRETCHER BAR PULLERS.
4. FENCE SHALL GENERALLY FOLLOW NATURAL GROUND CONTOURS AND BOTTOM WIRE OF FENCE SHOULD BE NO MORE THAN TWO INCHES (2 IN) FROM NATURAL GROUND.



NUMBER OF WIRES	POST LENGTH	BURY DEPTH	WIRE HOLE LOCATIONS
1	6'	3'	7' FROM THE TOP
2	7'	3' - 6"	7' AND 13' FROM THE TOP
3	8'	4'	7', 13', AND 19' FROM THE TOP

WIRE ROPE BOUNDARY FENCE

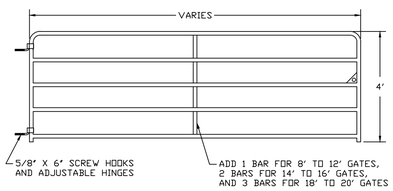
N. T. S.



TUBULAR BARRIER GATE

N. T. S.

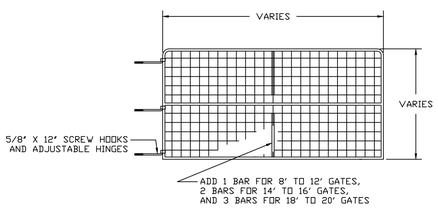
NOTES:
1. BARS SHALL BE 1 7/8", 19 GAUGE GALVANIZED TUBING.



PASTURE TUBE GATE

N. T. S.

NOTES:
1. BARS SHALL BE 1 5/8", 19 GAUGE GALVANIZED TUBING.
2. BARS SHALL BE SADDLED AND FITTED BEFORE WELDING.



GAME PROOF GATE

N. T. S.

NOTES:
1. BARS SHALL BE 1 5/8", 19 GAUGE GALVANIZED TUBING.
2. BARS SHALL BE SADDLED AND FITTED BEFORE WELDING.
3. 4" X 4" OPENING WIRE PANEL.

FENCES AND GATES STANDARD DETAILS

FILE NAME: 5-FGSD-2022.DWG

DATE APPROVED: MARCH 30, 2022

SCALE: NTS

REVISED DATE: MARCH 2022

ENGINEERING DEPARTMENT

PROJECT NUMBER:

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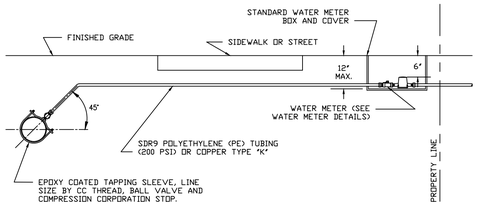
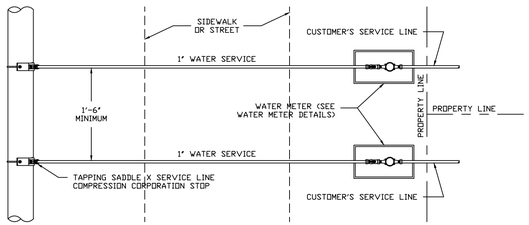
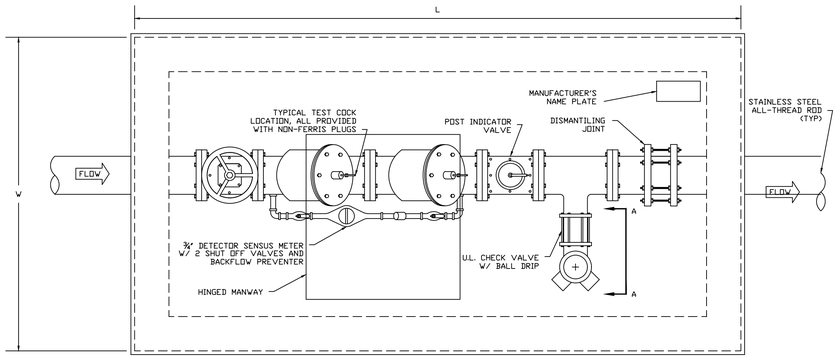


PROFILE

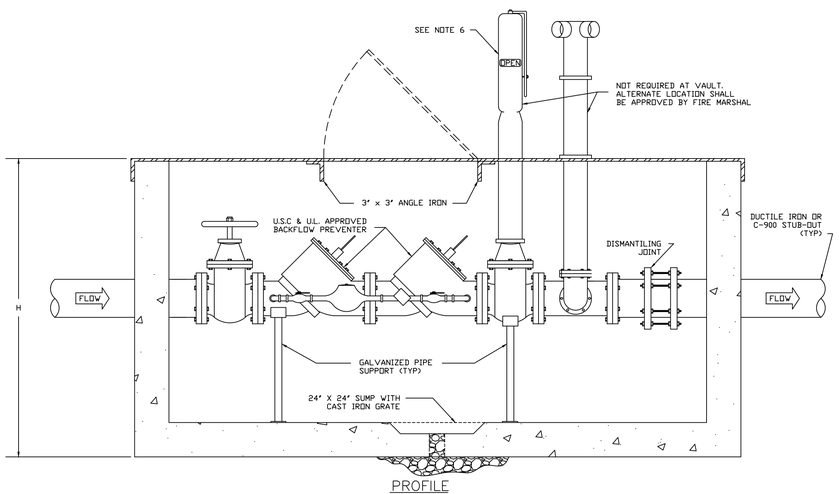


PLAN

WATER SERVICE CONNECTIONS

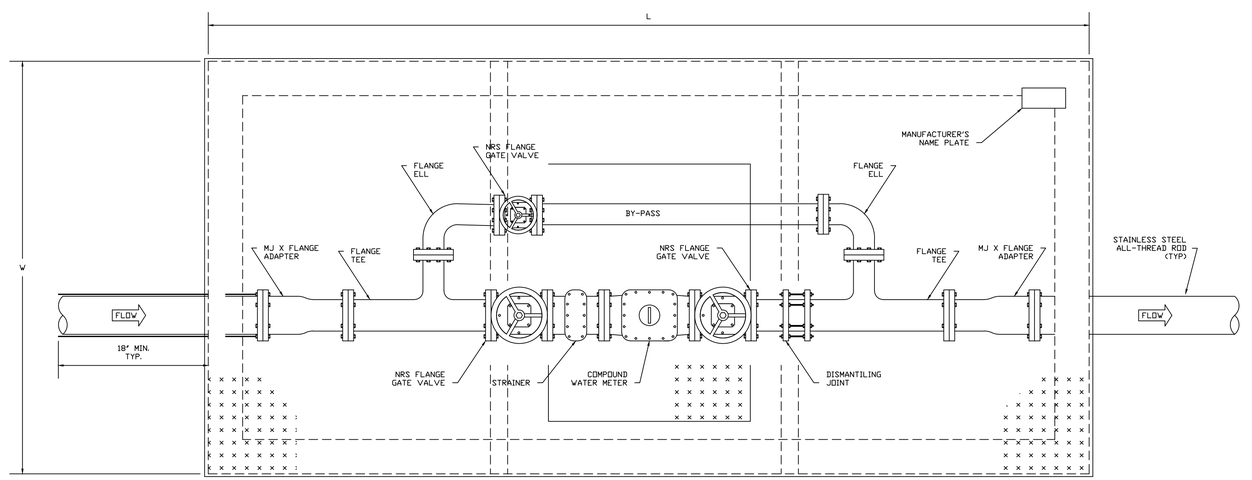


PLAN

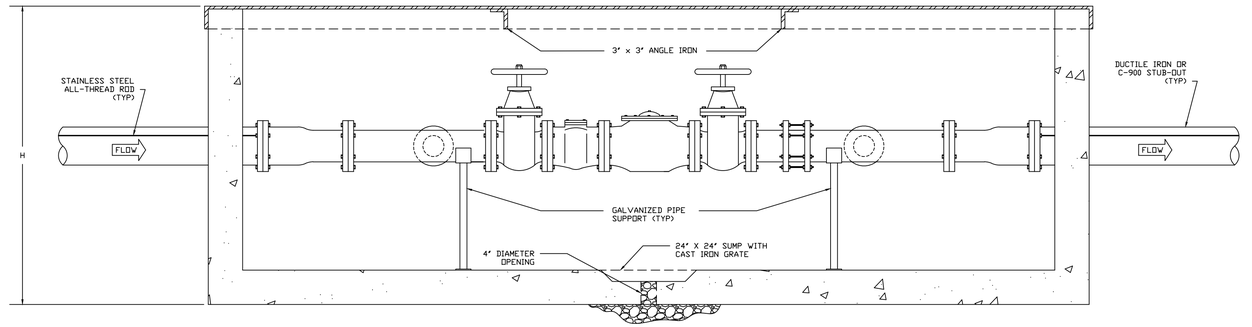


PROFILE

BACKFLOW PREVENTER WITH OPTIONAL FDC/PIV IN VAULT



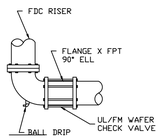
PLAN



PROFILE

METER VAULT DIMENSIONS				
PIPE SIZE	BY-PASS SIZE	L	W	H
3"	2"	8'-8"	4'-8"	4'-0"
4"	2"	8'-8"	4'-8"	4'-0"
6"	3"	8'-8"	4'-8"	4'-0"
8"	4"	11'-0"	11'-0"	4'-6"
10"	6"	11'-0"	11'-0"	4'-6"

METER VAULT



SECTION A–A

BACKFLOW PREVENTER W/ FDC AND PIV VAULT DIMENSIONS			
PIPE SIZE	L	W	H
4"	7'-10"	4'-4"	5'-6"
6"	7'-10	4'-4"	5'-6"
8"	8'-8"	5'-0"	5'-6"
10"	9'-0"	6'-0"	6'-6"

METER AND VAULT CONSTRUCTION NOTES

1. CLASS 1 CONCRETE WITH A DESIGN STRENGTH OF 4500 PSI AT 28 DAYS.
2. REINFORCING STEEL SHALL BE GRADE 60, CONFORMING TO ASTM A615 ON REQUIRED CENTERS OR EQUAL.
3. COVER SHALL BE GALVANIZED STEEL SKID–RESISTANT FLOOR PLATE, WELDED TO 3" ANGLE IRON FRAME WITH (2) 3" X 3" ANGLE SUPPORTS (300 PSF).
4. VAULTS SHALL BE SET ON SIX (6) INCH BED OF GRAVEL FOR POSITIVE DRAINING.
5. ALL BOLTS, NUTS, AND WASHERS SHALL BE MADE OF 316 STAINLESS STEEL.
6. ALL VALVES CONTROLLING THE WATER SUPPLY FOR AN AUTOMATIC SPRINKLER SYSTEM SHALL BE ELECTRICALLY SUPERVISED AT THE FIRE ALARM CONTROL PANEL.

METER AND VAULT STANDARD DETAILS

FILE NAME: 6-MVSD-2022.DWG

DATE APPROVED: MARCH 30, 2022

SCALE: NTS

REVISED DATE: MARCH 2022

FRIENDSWOOD TEXAS

ENGINEERING DEPARTMENT

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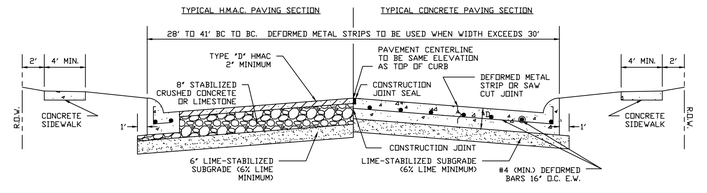
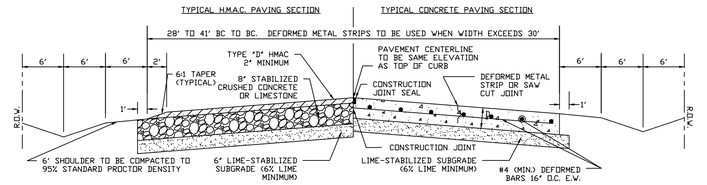
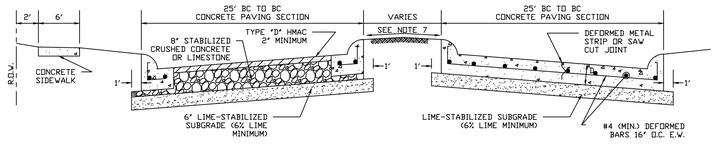


SINGLE ROADWAY CURB SECTION



SINGLE ROADWAY OPEN DITCH SECTION

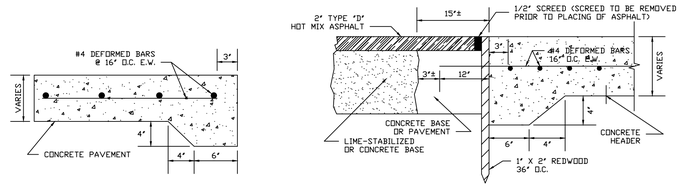


DOUBLE ROADWAY SECTION

ROADWAY SECTIONS

NOTES:

1. ALL REINFORCING BAR SHALL CONFORM TO ASTM A15-54T AND A305-53T.
2. EXPANSION JOINTS SHALL BE PLACED AT THE END OF EACH CURB RETURN, AND AT A MAXIMUM SPACING OF FORTY (40) FEET WITH CONTROL JOINTS NO GREATER THAN TEN (10) FEET. THE MAXIMUM LENGTH BETWEEN LONGITUDINAL JOINTS SHALL NOT EXCEED FIFTEEN (15) FEET.
3. ALL PAVEMENT CROSS-SECTION SHALL EITHER BE HYPERBOLIC OR TANGENT CROWN. MINIMUM SLOPE SHALL BE ONE-QUARTER (¼) INCH PER FOOT.
4. MINIMUM SLOPE FOR ANY MEDIAN SHALL BE ONE-HALF (½) INCH PER FOOT.

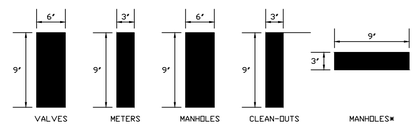


CONCRETE PAVING HEADER

ASPHALT PAVING HEADER

UNDERCUT DETAIL

PAVING HEADERS

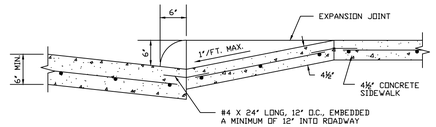


WATER LINES SANITARY SEWER STORM SEWER

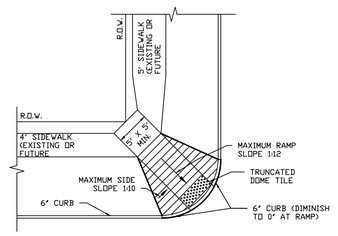
UTILITY MARKINGS

NOTES:

1. SAW CUT CURB OR EDGE AND APPLY APPROPRIATE MARKING AS LISTED BELOW.
2. WATER VALVE MARKING SHALL BE 6' X 9' IN SIZE MARKED IN BLUE PAINT ON CURB OR EDGE OF STREET.
3. WATER METER MARKING SHALL BE 3' X 9' IN SIZE MARKED IN BLUE PAINT ON CURB OR EDGE OF STREET.
4. SANITARY SEWER MANHOLE MARKING SHALL BE 6' X 9' IN SIZE MARKED IN GREEN PAINT ON CURB OR EDGE OF STREET.
5. SANITARY SEWER CLEAN-OUT MARKING SHALL BE 3' X 9' IN SIZE AND MARKED IN GREEN PAINT ON CURB OR EDGE OF STREET.
6. STORM SEWER MANHOLE MARKING SHALL BE 9' X 3' IN SIZE AND MARKED IN BLACK PAINT. *ONLY STORM SEWER MANHOLES SHALL BE MARKED NOT, INLETS.



SIDEWALK & WHEEL CHAIR RAMP SECTION

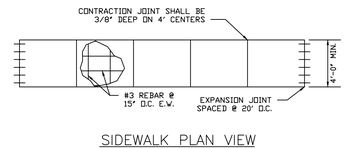


WHEELCHAIR RAMP – PLAN VIEW

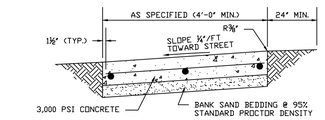
NOTES:

1. RAMP SHALL MEET ADA (AMERICANS WITH DISABILITIES ACT) AND TABA (TEXAS ARCHITECTURAL BARRIERS ACT).
2. FINISHED SURFACE OF WHEELCHAIR RAMP AND SIDE SLOPE SHALL BE GROOVED LATERALLY WITH ¼' WIDE BY ¼' DEEP GROOVES, SPACED AT 2¼' O.C. WITH BLACK BROOM FINISH. CONTRACTOR SHALL MAKE ADJUSTMENTS TO RAMPS TO FIT LOCAL CONDITION.
3. ALL CUTOUTS MUST HAVE BARRICADES INSTALLED UNTIL WHEELCHAIR RAMPS ARE COMPLETED.
4. MINIMUM CLEARANCE (WIDTH) OF RAMP SHALL BE THIRTY-SIX (36) INCHES.
5. FINISH SURFACES OF RAMP AND SIDE SLOPE SHALL BE TREATED WITH COLOR SD THAT THE SURFACES ARE IN CONTRAST WITH SURFACE COLOR OF ADJACENT SIDEWALKS AND STREETS.
6. CONTRAST COLOR OF WHEELCHAIR RAMPS AND SIDE SLOPES SHALL BE BLACK DYE PER CITY OF FRIENDSWOOD TECHNICAL SPECIFICATIONS.

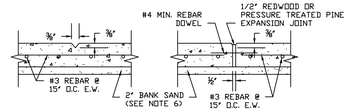
SIDEWALKS AND WHEELCHAIR RAMPS



SIDEWALK PLAN VIEW



SIDEWALK SECTION



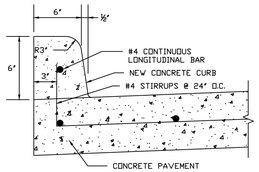
CONTRACTION JOINT

EXPANSION JOINT

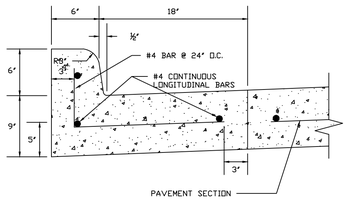
SIDEWALK JOINTS

NOTES:

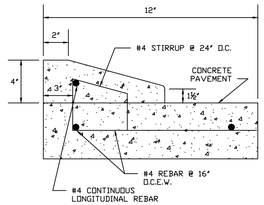
1. ALL EDGES SHALL BE ROUNDED WITH ¾' RADIUS.
2. CONTRACTION JOINTS SHALL BE PLACED AT 4'-0' INTERVALS.
3. CONTRACTION JOINTS SHALL BE ¾' DEEP AND HAVE TROWEL EDGE.
4. ½' EXPANSION JOINT MATERIAL REQUIRED WHERE SIDEWALKS ABUT BUILDINGS, CURBS, DRIVEWAYS, OR EXISTING SIDEWALKS.
5. EXPANSION JOINTS SHALL BE PLACED AT 20'-0' INTERVALS.
6. 2' INCH CLEAN BANK SAND SHALL BE TAMPED TO 95% STANDARD PROCTOR.
7. WHERE NEW SIDEWALK IS PLACED AGAINST EXISTING SIDEWALK, SAW CUT EXISTING SIDEWALK TO AN EVEN STRAIGHT LINE PRIOR TO INSTALLATION OF THE NEW SIDEWALK INSTALL #4 REBAR DOWEL INTO EXISTING SIDEWALK.



TYPE I – 6" CONCRETE CURB



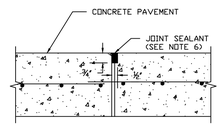
TYPE II – MONOLITHIC CONCRETE CURB AND GUTTER



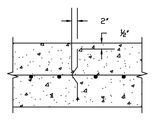
TYPE III – 4" x 12" CONCRETE CURB

CONCRETE CURB

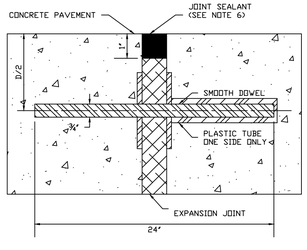
NOTE:
1. WHEN CONCRETE CURB IS TO BE PLACED ON EXISTING CONCRETE DOWEL IN #3 DEFORMED BARS @ 36' O.C. AND SET IN SULFUR, OR QUICK SETTING CEMENT.
2. MORTAR FINISH IS NOT REQUIRED WHEN CURB IS PLACED BY A MACHINE, BUT CURB SHALL STILL HAVE THE SAME OUTSIDE DIMENSIONS.



CONSTRUCTION JOINT



DEFORMED METAL STRIP

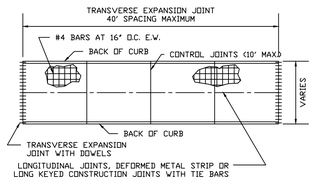


DOWEL EXPANSION JOINT

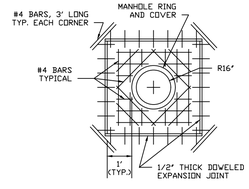
NOTES:

1. CANTILEVER TYPE, CAST MALLEABLE IRON LOAD TRANSMISSION UNIT-STARLUG MODEL D-27 OR EQUAL ON 22' O.C. ARE ACCEPTABLE ALTERNATIVES.
2. EXPANSION JOINTS SHALL BE PLACED AT THE END OF EACH CURB RETURN, AND AT A MAXIMUM OF FORTY (40) FEET WITH CONTROL JOINTS NO GREATER THAN EVERY TEN (10) FEET.
3. STAKES FOR TRANSVERSE JOINTS SHALL NOT BE PLACED CLOSER THAN 6' TO A LONGITUDINAL JOINT. THE TOP OF STAKE SHALL NOT BE LESS THAN 1½' BELOW THE FINISH SURFACE.
4. LOCATION OF CONSTRUCTION JOINTS AND DEFORMED STRIPS MAY BE VARIED WITH THE APPROVAL OF THE CITY, TO SUIT PROPOSED CONSTRUCTION OF THE CONTRACTOR.
5. JOINTS AND SEALANTS SHALL ADHERE TO CITY OF FRIENDSWOOD TECHNICAL SPECIFICATION 02840 - CONCRETE PAVEMENT JOINTS.

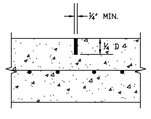
PAVEMENT JOINTS



PAVING PANEL



MANHOLE BLOCKOUT



CONTRACTION JOINT

NOTES:

1. D = DEPTH OF CONCRETE.
2. SAW-CUT CONTRACTION JOINT TO DIMENSIONS SHOWN.

PAVING CONSTRUCTION NOTES:

1. PAVEMENT AND SUBGRADE SHALL BE CONSTRUCTED IN ACCORDANCE WITH THE CITY OF FRIENDSWOOD STANDARD DETAILS AND TECHNICAL SPECIFICATIONS, LATEST REVISION.
2. CONTRACTOR SHALL NOTIFY THE CITY OF FRIENDSWOOD ENGINEERING DEPARTMENT AT (281) 993-3411 A MINIMUM OF TWENTY-FOUR (24) HOURS PRIOR TO ALL LIMING AND PAVING OPERATIONS.
3. ALL TURN-OUTS SHALL HAVE A TWENTY-FIVE (25) FOOT RADIUS AT THE BACK OF CURB UNLESS OTHERWISE NOTED.
4. GUIDELINES SET FORTH IN THE "TEXAS MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES" (TMUTCD), LATEST EDITION, SHALL BE OBSERVED.
5. ALL FILL IN EXISTING RIGHTS-OF-WAY, INCLUDING BACKDRESSING BEHIND THE CURB, SHALL BE PLACED IN A MAXIMUM LOOSE LIFTS OF TWELVE (12) INCHES OR LESS AND COMPACTED TO A NINETYU-FIVE PERCENT (95%) STANDARD PROCTOR DENSITY WITH A MOISTURE CONTENT THREE PERCENT (3%) ± ONE PERCENT (1%) OF OPTIMUM MOISTURE,
6. MINIMUM PAVEMENT REINFORCEMENT REQUIREMENT SHALL BE GRADE 60, NO, 4 REBAR, SPACED AS SIXTEEN (16) INCHES ON CENTER, EACH WAY.
7. FOR PAVEMENT WIDTHS LESS THAN OR EQUAL TO TWENTY-EIGHT (28) FEET BACK OF CURB TO BACK OF CURB:

   8.1 MINIMUM CONCRETE SLAB THICKNESS SHALL BE SIX (6) INCHES.

   8.2 MINIMUM STABILIZED SUBGRADE THICKNESS SHALL BE SIX (6) INCHES.
8. FOR PAVEMENT WIDTHS GREATER THAN TWENTY-EIGHT (28) FEET FROM BACK OF CURB TO BACK OF CURB AND MAJOR ARTERIAL THOROUGHFARES:

   9.1 MINIMUM CONCRETE SLAB THICKNESS SHALL BE SEVEN (7) INCHES.

   9.2 MINIMUM STABILIZED SUBGRADE THICKNESS SHALL BE EIGHT (8) INCHES.
10. PAVING EXPANSION JOINTS SHALL BE PLACED AT A MAXIMUM OF FORTY (40) FOOT INTERVALS.
11. ALL CONCRETE USED FOR PAVEMENT SHALL BE "CLASS A" CONCRETE, MINIMUM FIVE (5.0) SACKS OF CEMENT PER CUBIC YARD OF CONCRETE, 4,000 PSI COMPRESSIVE STRENGTH AT TWENTY-EIGHT (28) DAYS, CONCRETE USED FOR SIDEWALKS MAY BE 3,000 PSI COMPRESSIVE STRENGTH AT TWENTY-EIGHT (28) DAYS.
12. CLASS "A" HYDRATED LIME SHALL BE APPLIED FOR SUBGRADE AT A MINIMUM OF SIX PERCENT(6%).
13. CONTRACTOR SHALL INSTALL STREET SIGNS AND REGULATORY SIGNS PER CITY OF FRIENDSWOOD STANDARD DETAILS AND TECHNICAL SPECIFICATIONS, LATEST EDITION.
14. ALIGNMENTS, CENTERLINE CURVE DATA, AND STATIONING FOR ALL CONSTRUCTION SHALL BE DETERMINED FROM SUBDIVISION PLAT.
15. FOR ALL CONCRETE TO BE REMOVED, SHALL BE SAW CUT ONE HALF OF THE PAVEMENT DEPTH BEFORE REMOVAL.
16. REPRESENTATIVES FROM THE CITY OF FRIENDSWOOD, THE OWNER, AND THE TESTING LABORATORY SHALL BE PRESENT FOR ALL GRADATIONS, DENSITY TESTING, LIME OPERATIONS, AND PLACEMENT OF CONCRETE OR ASPHALTIC PAVING.
17. UNDER NO CIRCUMSTANCES SHALL WATER BE ADDED TO A CONCRETE LOAD AFTER SLUMP TESTS HAVE BEEN TAKEN.
18. BLUE REFLECTORIZED RAISED PAVEMENT MARKERS SHALL BE PLACED ADJACENT TO FIRE HYDRANT LOCATIONS AT A POINT SIX (6) INCHES FROM THE CENTERLINE OF THE ROADWAY, ON THE SIDE OF THE FIRE HYDRANT (REFLECTORS SHALL FACE TRAFFIC FLOW).
19. CONTRACTOR SHALL BE RESPONSIBLE FOR VERIFYING LOCATION OF ALL EXISTING UTILITIES PRIOR TO EXCAVATION. DURING THE COURSE OF AND ALL CLEARING, GRUBBING, FILL, GRADING, EXCAVATION, OR OTHER CONSTRUCTION, CONTRACTOR SHALL ENSURE THAT STORM DRAINAGE PATHWAYS ARE MAINTAINED AND REMAIN OPEN TO ENSURE POSITIVE DRAINAGE AND SUCH CONVEYANCES ARE NOT IMPEDED OR BLOCKED IN ANY WAY. STORM SEWER INLETS SHALL BE PROTECTED FROM ENTRY OF SILT, TRASH, DEBRIS, AND ANY OTHER SUBSTANCES DELETERIOUS TO THE STORM SEWER SYSTEM AND/OR WATERWAYS RECEIVING STORM WATER RUNOFF. CONTRACTOR SHALL, AT COMPLETION OF WORK, FILL LOW SPOTS AND GRADE ALL RIGHTS-OF-WAY AND UTILITY EASEMENTS AND REGRADE/RESTORE DITCHES AS NECESSARY TO MAINTAIN AND/OR ESTABLISH POSITIVE DRAINAGE.

PAVING STANDARD DETAILS

FILE NAME: 7-PSD-2022.DWG

DATE APPROVED: MARCH, 30 2022

SCALE: NTS

REVISED DATE: MARCH 2022

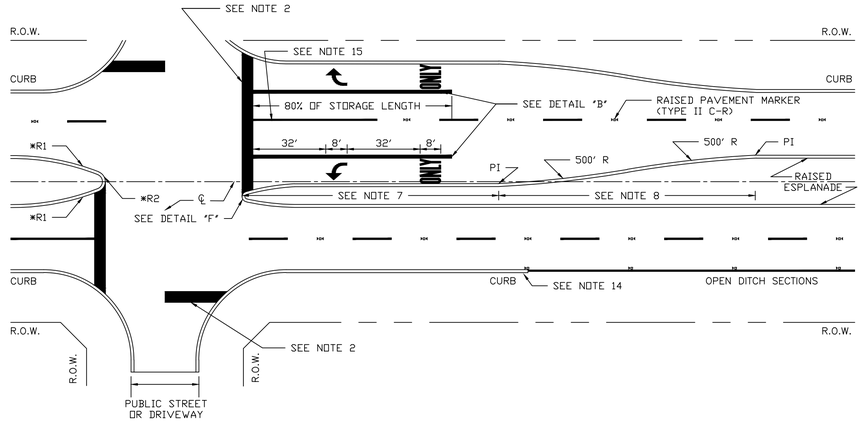
FRIENDSWOOD TEXAS

ENGINEERING DEPARTMENT

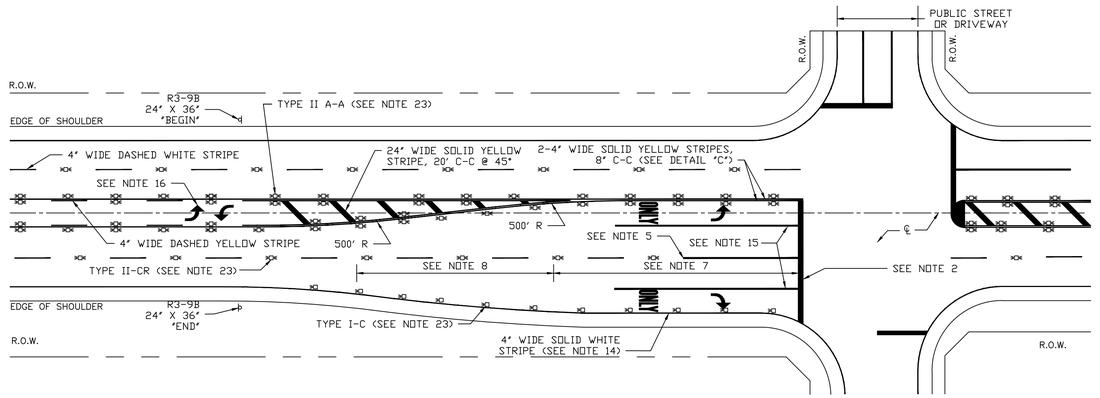
PROJECT NUMBER:

DATE SUBMITTED:

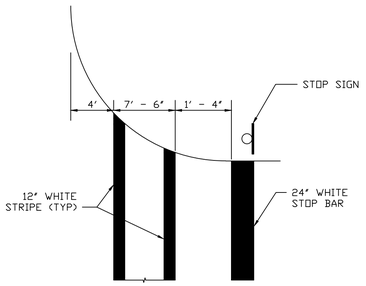
SHEET: 1 OF 1



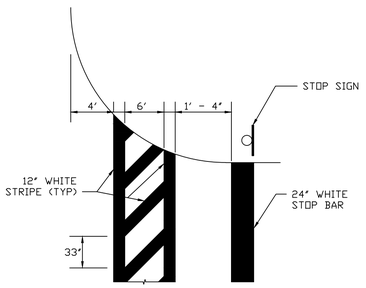
TYPICAL RAISED ESPLANADE SECTION



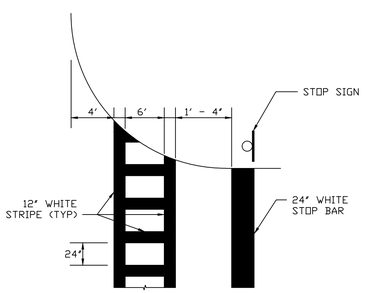
TYPICAL TWO-WAY LEFT TURN SECTION



STANDARD TYPE



SCHOOL ZONE TYPE 1

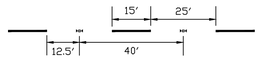


SCHOOL ZONE TYPE 2

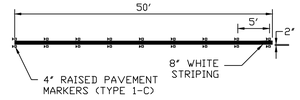
TYPICAL CROSSWALK PLACEMENT

ESPLANADE	*R1	*R2
<8'	N/A	W/2
8'-38'	90°	W/5
>38'	N/A	15'

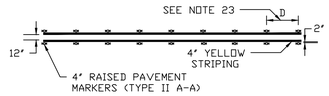
RADIUS DIMENSIONS



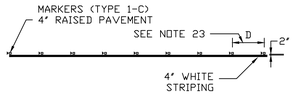
DETAIL A



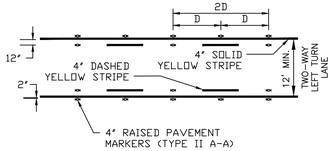
DETAIL B



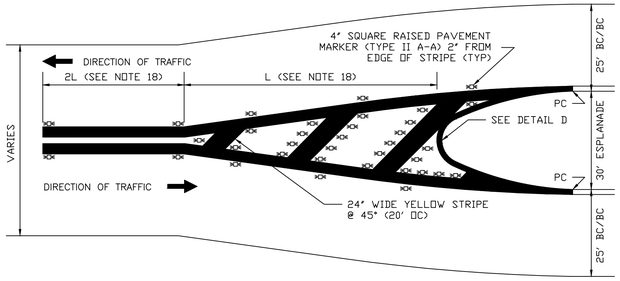
DETAIL C



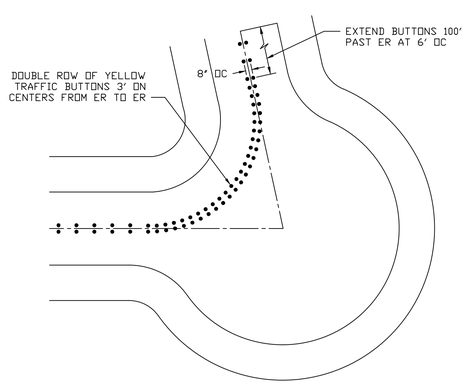
DETAIL D



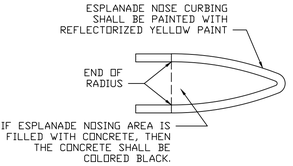
DETAIL E



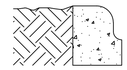
UNDIVIDED STREET TO ESPLANADE SECTION



TYPICAL BUTTON DETAIL FOR CURVES ≥ 60°



ESPLANADE NOSING PLAN VIEW



TYPICAL CURB SECTION

DETAIL F

NOTE:

1. PAINT FROM THE BACK OF THE CURB TO THE GUTTER LINE.

PERMANENT PAVEMENT MARKING CONSTRUCTION NOTES:

1. IF A CROSSWALK IS REQUIRED, SEE TYPICAL CROSSWALK PLACEMENT DETAIL AND CONFIRM WITH CITY TYPE TO BE USED AND LOCATION OF CROSSWALK.
2. ALL INTERSECTIONS WHERE A STOP SIGN/SIGNAL IS LOCATED SHALL HAVE A STOP BAR. STOP BARS SHALL BE LOCATED 1'-4" BEHIND CROSSWALKS, WHERE PEDESTRIAN CROSSWALKS ARE PROVIDED. STOP BARS SHALL BE 24" WIDE SOLID WHITE STRIPE EXTENDING ACROSS ALL APPROACH LANES TO INDICATE THE POINT AT WHICH THE STOP IS INTENDED OR REQUIRED TO BE MADE.
3. CROSSWALKS SHALL BE A MINIMUM INSIDE WIDTH OF 5'. AT LOCATIONS WHERE ADDITIONAL VISIBILITY IS REQUIRED, WHERE TRAFFIC CONTROL DEVICES ARE NOT PRESENT, CONTINENTAL TYPE CROSSWALKS SHALL BE USED.
4. NOT ALL INTERSECTIONS ARE FOUR-WAY STOP CONTROLLED. AS SUCH, NOT ALL STRIPING AND MARKINGS MAY APPLY.
5. ON APPROACH TO INTERSECTION – BEGINNING WITH STOP BAR, INSTALL A 4" WIDE SOLID WHITE LINE FOR 50' FROM BACK OF STOP BAR, SKIP 25' AND BEGIN NORMAL LANE LINE.
6. ON EXIT FROM INTERSECTION – BEGINNING WITH THE CROSSWALK, OR 12' FROM CURB LINE OF INTERSECTING STREET, INSTALL 4" SOLID WHITE LINE FOR 50' AND BEGIN NORMAL LANE LINE.
7. TURN STORAGE BAYS SHALL BE A MINIMUM OF 100' FOR MINOR STREETS AND 150' FOR MAJOR STREETS.
8. TRANSITIONS TO STORAGE BAYS SHALL BE A MINIMUM OF 100', THOUGH 160' IS DESIRABLE.
9. ALL STREET CROSSINGS SHALL COMPLY WITH T.A.S AND A.D.A DETAILS AND CRITERIA.
10. PAVEMENT SURFACE AREAS PRIOR TO PLACEMENT OF PAVEMENT MARKINGS, AND/OR RAISED PAVEMENT MARKERS SHALL BE CLEANED IN ACCORDANCE WITH CITY OF FRIENDSWOOD TECHNICAL SPECIFICATIONS (COFTS). AREAS SHALL BE FREE OF CURING MEMBRANE, DIRT, GREASE, LOOSE AND/OR FLAKING EXISTING MARKERS AND OTHER FORMS OF DEBRIS. SURFACES SHALL BE DRY BEFORE APPLYING PAVEMENT MARKINGS OR RAISED PAVEMENT MARKERS.
    - 10.1. CONCRETE SURFACES SHALL BE CLEANED BY ABRASIVE BLASTING MEDIUM.
    - 10.2. ASPHALTIC PAVEMENT SURFACES SHALL BE CLEANED BY BRUSHING,WASHING, COMPRESSED AIR, AND/OR HIGH-PRESSURE WATER.
11. ALL PAVEMENT MARKINGS AT INTERSECTIONS SHALL BE THERMOPLASTIC IN ACCORDANCE WITH C.O.F.T.S. APPROVED PRODUCTS LIST.
12. ALL PAVEMENT MARKINGS SHALL BE SHOWN ON THE APPROVED CONSTRUCTION PLANS. ALL PAVEMENT MARKINGS SHALL BE RETRO-REFLECTIVE MATERIAL APPLIED TO ROAD SURFACE IN A MOLTEN STATE BY SCREED/EXTRUSION, SUSPENDED EXTRUSION OR SPRAY MEANS, WITH A SURFACE APPLICATION OF GLASS BEADS.
13. ALL ESPLANADE NOSING, AND CURBS IN LEFT TURN STORAGE BAYS SHALL BE PAINTED WITH YELLOW REFLECTORIZED PAINT AND SHALL COMPLY WITH T.M.U.T.C.D., A.D.A, T.A.S, AND C.O.F.T.S STANDARDS, AND ALL REVISIONS THEREOF.
14. ALL ROADWAYS WITHOUT A CURB SHALL HAVE A 4" SOLID WHITE REFLECTORIZED STRIPE 12" INSIDE THE EDGE OF THE PAVEMENT (SEED DETAIL D).
15. INTERSECTIONS HAVING TWO LANES IN ONE DIRECTION SHALL SEPARATE LANES BY INSTALLING AN 8" SOLID WHITE STRIPE FROM STOP BAR TO EIGHTY PERCENT (80%) OF TURN STORAGE BAY LENGTH (SEE DETAIL B).
16. REPEAT CENTER TURN ARROWS AT APPROXIMATELY EVERY 1000' THROUGHOUT TWO-WAY CENTER TURN LANE.
17. ALL PAVEMENT MARKINGS, AND/OR RAISED PAVEMENT MARKERS SHALL COMPLY WITH T.M.U.T.C.D., A.D.A., T.A.S., AND C.O.F.T.S. AND ALL REVISIONS THEREOF.
18. TRANSITIONS FROM UNDIVIDED TO DIVIDED AND/OR ESPLANADE SECTIONS:
    - 18.1 FOR SPEEDS 45 MPH AND GREATER USE L=W*S.
    - 18.2 S = POSTED OR STATUTORY SPEED LIMIT.
    - 18.3 W = WIDTH OF CENTER LANE OR ESPLANADE OR OFFSET DISTANCE.
    - 18.4 MINIMUM L IN URBAN AREAS SHALL BE 100'.
    - 18.5 MINIMUM L IN RURAL AREAS SHALL BE 200'.
    - 18.6 L SHALL BE EXTENDED AS REQUIRED FOR SIGHT DISTANCE CONDITIONS.
19. THE COLOR OF RAISED PAVEMENT MARKERS UNDER DAYLIGHT AND NIGHTTIME CONDITIONS SHALL CONFORM TO THE COLOR OF THE MARKING FOR WHICH THEY SERVE AS A POSITIONING GUIDE OR FOR WHICH THEY SUPPLEMENT OR SUBSTITUTE.
20. ALL TRAFFIC BUTTONS AND RAISED PAVEMENT MARKERS SHALL BE INSTALLED ADJACENT TO STRIPES AT APPROXIMATELY 2" FROM EDGE OF BUTTON/MARKER TO STRIPE.
21. ALL BUTTONS AND RAISED PAVEMENT MARKERS SHALL BE INSTALLED WITH AN APPROVED EPOXY.
22. A BLUE REFLECTORIZED RAISED PAVEMENT MARKER (TYPE II B-B) SHALL BE SET 6" OFF CENTERLINE OF ROADWAY OR PAVEMENT STRIP ON THE ADJACENT SIDE OF ALL FIRE HYDRANTS.
23. SPACING OF RAISED PAVEMENT MARKERS TYPE II A-A, TYPE II C-R AND TYPE I-C:
    - 23.1 IN STORAGE BAYS AND TRANSITIONS TO STORAGE BAYS D=5' O.C.
    - 23.2 IN CURVES D=20' O.C.
    - 23.3 IN NORMAL ROADWAY D=40' O.C.
24. ALL MARKINGS SHALL HAVE A UNIFORM CROSS-SECTION, AND THE DENSITY AND QUALITY OF THE MARKINGS SHALL BE UNIFORM THROUGHOUT THEIR THICKNESS.
25. PAVEMENT MARKINGS, BUTTONS AND RAISED PAVEMENT MARKERS THAT ARE NOT IN ALIGNMENT OR SEQUENCE, AS SHOWN IN THE DRAWINGS OR STATED IN THE PROJECTS' SPECIFICATIONS SHALL BE REMOVED AND REPLACED AT THE CONTRACTORS' EXPENSE.
26. FOR SKEW INTERSECTIONS AND STREET WIDTHS NOT SHOWN, COORDINATE WITH THE CITY OF FRIENDSWOOD ENGINEERING DEPARTMENT AT (281) 993-3411

PERMANENT PAVEMENT MARKING STANDARD DETAILS

FILE NAME: 8-PPMSD-2022.DWG

DATE APPROVED: MARCH 30, 2022

SCALE: NTS

REVISED DATE: MARCH 2022

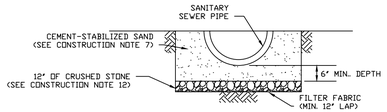
FRIENDSWOOD TEXAS

ENGINEERING DEPARTMENT

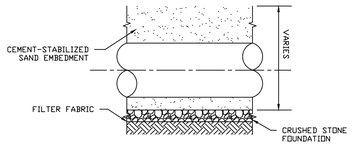
PROJECT NUMBER:

DATE SUBMITTED:

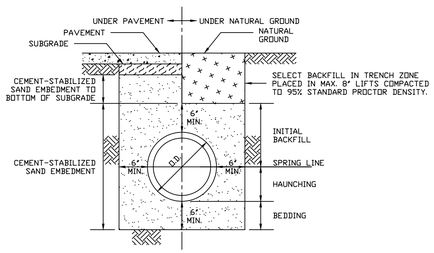
SHEET: 1 OF 1



WET BEDDING CROSS-SECTION



WET BEDDING LONGITUDINAL-SECTION

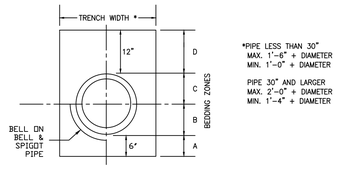


DRY STABLE TRENCH

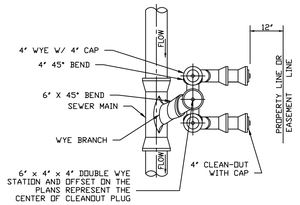
GRAVITY LINE BEDDING AND BACKFILL

BEDDING ZONE				
PIPE MATERIAL	A	B	C	D
CAST IRON	BS	BS	BS	EF
DUCTILE IRON (PRESSURE)	BS	BS	BS	EF
DUCTILE IRON (GRAVITY)	CS	CS	CS	EF
PVC (PRESSURE PIPE)	BS	BS	BS	EF
PVC (GRAVITY PIPE)	CS	CS	CS	EF
STEEL	BS	BS	BS	EF

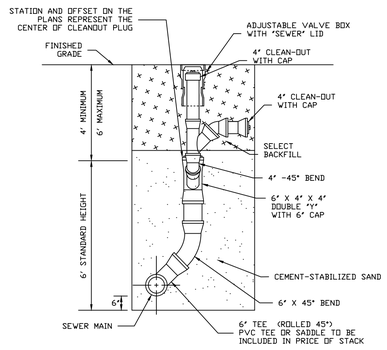
BS-BANK SAND
AB-AGGREGATE BEDDING (WET CONDITIONS ONLY)
ES-SELECT EARTH PLACED SAME DAY PIPE IS LAID
EF-EARTH FILL PLACED NEXT DAY (OR LATER) AFTER PIPE IS LAID
CS-CEMENT STABILIZED SAND



ORDINARY TRENCH EMBEDMENT & BACKFILL



PLAN VIEW

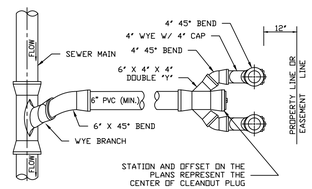


PROFILE VIEW

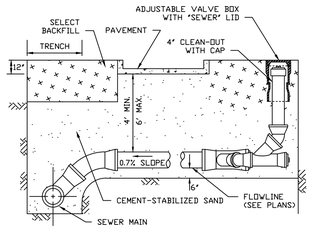
NEAR SIDE SERVICE CONNECTION

NOTES:

1. ONLY SDR26 PVC OR EQUIVALENT SHALL BE USED UNLESS OTHERWISE APPROVED BY THE CITY ENGINEER.
2. USE SINGLE WYE BRANCH FOR SINGLE SERVICE AND DOUBLE WYE BRANCH FOR DOUBLE SERVICE.
3. MAIN STACKS SHALL BE A MINIMUM OF 6" IN DIAMETER.
4. ALL CONNECTIONS TO THE MAIN SANITARY SEWER SHALL BE APPROVED BY THE CITY OF FRIENDSWOOD PUBLIC WORKS AT (281) 996-3380.
5. ALL SEWER LINES SHALL BE TESTED IN ACCORDANCE WITH THE CITY OF FRIENDSWOOD TECHNICAL SPECIFICATIONS, LATEST REVISION.
6. INDIVIDUAL RESIDENTIAL CLEANOUTS SHALL BE 4" PVC.



PLAN VIEW



PROFILE VIEW

FAR SIDE SERVICE CONNECTION

NOTES:

1. ONLY SDR26 PVC OR EQUIVALENT SHALL BE USED UNLESS OTHERWISE APPROVED BY THE CITY ENGINEER.
2. USE SINGLE WYE BRANCH FOR SINGLE SERVICE AND DOUBLE WYE BRANCH FOR DOUBLE SERVICE.
3. ALL CONNECTIONS TO THE MAIN SANITARY SEWER SHALL BE APPROVED BY THE CITY OF FRIENDSWOOD PUBLIC WORKS AT (281) 996-3380.
4. ALL SEWER LINES SHALL BE TESTED IN ACCORDANCE WITH THE CITY OF FRIENDSWOOD TECHNICAL SPECIFICATIONS, LATEST REVISION.
5. INDIVIDUAL RESIDENTIAL CLEANOUTS SHALL BE 4" PVC.

SANITARY SEWER SYSTEM CONSTRUCTION NOTES

1. FINISHED ELEVATION ON SANITARY MANHOLE RIMS SHALL BE THREE (3) INCHES ABOVE FINISHED GRADE IN UTILITY EASEMENTS. IF THE MANHOLE IS LOCATED ADJACENT TO A PUBLIC STREET, THE FINAL ELEVATION SHALL BE TWO (2) INCHES ABOVE THE TOP OF THE CURB OR TWO (2) INCHES ABOVE THE CENTERLINE OF THE STREET FOR STREETS WITH NO PERIMETER CURB (TOP OF CURB SHOULD EQUAL CENTERLINE OF STREET).
2. WATER LINES AND SANITARY SEWER LINES SHALL BE INSTALLED IN SEPARATE TRENCHES, PER ITEM EIGHT (8) BELOW.
3. ALL PROPOSED SANITARY SEWER LINES SHALL BE DUCTILE IRON OR PVC. PVC PIPE SHALL CONFORM TO ASTM D3034, SDR 26 FOR ALL DEPTHS.
4. ALL PVC PIPE (ALL TYPES SDR/DR WALL THICKNESS TO BE USED) SHALL HAVE RUBBER GASKET EQUIPPED BELL AND SPIGOT JOINTS CONFORMING TO ASTM D212. THE GASKET MATERIAL SHALL CONFORM TO ASTM F477. SOLVENT WELDED JOINTS WILL NOT BE APPROVED FOR CITY SANITARY SEWER LINES.
5. ALL DUCTILE IRON PIPE SHALL BE 150 PSI WITH EIGHT (8) MIL BLACK VIRGIN POLYETHYLENE WRAP AS SPECIFIED IN ANSI A21.5/AWWA C105.
6. SANITARY SEWER MATERIALS AND CONSTRUCTION SHALL BE IN ACCORDANCE WITH THE CITY OF FRIENDSWOOD DESIGN STANDARDS AND TECHNICAL SPECIFICATIONS, LATEST REVISION. CONTRACTOR TO FURNISH TEST PLUGS AND RISERS. ALL SANITARY SEWER LINES TO BE AIR TESTED IN ACCORDANCE WITH THE CITY OF FRIENDSWOOD TECHNICAL SPECIFICATIONS.
7. SANITARY SEWER TRENCHES WITHIN OR UNDER ONE (1) FOOT OF PROPOSED OR FUTURE PAVEMENT TO BE BACKFILLED WITH CEMENT-STABILIZED SAND BACKFILL (1.1 SACKS OF CEMENT PER TON OF SAND) TO THE BOTTOM OF THE SUBGRADE. BEDDING, HAUNCHING, AND INITIAL FILL SHALL BE CEMENT-STABILIZED SAND FOR GRAVITY SANITARY SEWERS AND BANK SAND FOR FORCE MAIN SANITARY SEWERS.
8. WATER LINE/NEW SANITARY SEWER LINE SEPARATION. WHEN NEW SANITARY SEWERS ARE INSTALLED, THEY SHALL BE INSTALLED NO CLOSER THAN NINE (9) FEET IN ALL DIRECTIONS. SANITARY SEWERS THAT PARALLEL WATER LINES SHALL BE INSTALLED IN SEPARATE TRENCHES. WHEN NINE (9) FEET OF SEPARATION CANNOT BE MAINTAINED, THEN THE FOLLOWING GUIDELINES APPLY:
   - 8.1. WHEN THE SANITARY SEWER PARALLELS A WATER LINE, THE SANITARY SEWER SHALL BE CONSTRUCTED OF CAST IRON OR PVC MEETING ASTM SPECIFICATIONS WITH THE PRESSURE RATING FOR BOTH THE PIPE AND JOINTS OF 150 PSI. THE VERTICAL SEPARATION SHALL BE A MINIMUM OF TWO (2) FEET BETWEEN THE OUTSIDE DIAMETERS OF THE PIPE AND THE HORIZONTAL SEPARATION SHALL BE A MINIMUM OF FOUR (4) FEET BETWEEN THE OUTSIDE DIAMETERS OF THE PIPE. THE SANITARY SEWER LINE SHALL BE LOCATED BELOW THE WATER LINE.
   - 8.2. WHEN A SANITARY SEWER CROSSES A WATER LINE AND THE SANITARY SEWER LINE IS CONSTRUCTED OF CAST IRON, DUCTILE IRON OR PVC WITH A MINIMUM PRESSURE RATING OF 150 PSI; AN ABSOLUTE MINIMUM DISTANCE OF SIX (6) INCHES BETWEEN THE OUTSIDE DIAMETERS SHALL BE MAINTAINED. THE SANITARY SEWER LINE SHALL BE LOCATED BELOW THE WATERLINE WHEN POSSIBLE AND ONE (1) LENGTH OF THE SANITARY SEWER PIPE SHALL BE CENTERED ON THE WATER LINE.
   - 8.3. WHEN A SANITARY SEWER LINE CROSSES UNDER A WATER LINE AND THE SANITARY SEWER IS CONSTRUCTED OF ABS TRUSS PIPE, SIMILAR SEMI-RIGID PLASTIC COMPOSITE PIPE, CLAY PIPE OR CONCRETE PIPE WITH GASKETED JOINTS, A MINIMUM OF TWO (2) FEET OF SEPARATION SHALL BE MAINTAINED. THE INITIAL BACKFILL SHALL BE CEMENT-STABILIZED SAND (1.1 SACKS OF CONCRETE PER 1 TON OF SAND) FOR ALL SECTIONS OF SANITARY SEWER WITHIN NINE (9) FEET OF THE WATER LINE. THIS INITIAL BACKFILL SHALL BE FROM ONE QUARTER (¼) DIAMETER BELOW THE CENTERLINE OF THE PIPE TO ONE (1) PIPE DIAMETER, BUT NOT LESS THAN TWELVE (12) INCHES ABOVE THE TOP OF PIPE.
   - 8.4. WHEN A SANITARY SEWER CROSSES OVER A WATER LINE, ALL PORTIONS OF THE SANITARY SEWER WITHIN NINE (9) FEET OF THE WATER LINE SHALL BE CONSTRUCTED OF CAST IRON, DUCTILE IRON, OR PVC PIPE WITH A PRESSURE RATING OF AT LEAST 150 PSI USING APPROPRIATE ADAPTERS. IN LIEU OF THIS PROCEDURE THE NEW SANITARY SEWER MAY BE ENCASED IN A JOINT OF 150 PSI CLASS PIPE AT LEAST EIGHTEEN (18) FEET LONG AND A MINIMUM OF TWO (2) NOMINAL SIZES LARGER THAN THE NEW SANITARY SEWER. THE SPACE AROUND THE CARRIER PIPE SHALL BE SUPPORTED AT INTERVALS OF FIVE (5) FEET WITH SPACERS OR BE FILLED TO THE SPRING LINE WITH WASHED SAND. THE ENCASEMENT PIPE SHOULD BE CENTERED ON THE CROSSING AND BOTH ENDS SEALED WITH CEMENT GROUT OR WITH AN APPROVED MANUFACTURER SEAL.
9. FOR ALL PVC PIPE, USE MANHOLE WATER STOP GASKET AND CLAMP ASSEMBLY AT MANHOLE CONNECTIONS. CLAMP SHALL BE STAINLESS STEEL MATERIAL.
10. SANITARY SEWER MANHOLES SHALL BE STANDARD TYPE, UNLESS OTHERWISE NOTED. TOP OF RIMS OF ALL SANITARY SEWER MANHOLES SHALL BE AT LEAST THREE (3) INCHES ABOVE FINISHED GRADE OR ABOVE THE 100-YEAR BASE FLOOD ELEVATION AND HAVE INFLOW PROTECTORS UNDER THE COVERS. FOR MANHOLES LOCATED IN THE 100-YEAR FLOOD PLAIN, VENT AND SEAL THE MANHOLE COVERS. SECTIONS OF PRECAST MANHOLES SHALL BE JOINED WITH "RAM NEK" GASKET MATERIAL OR AS APPROVED BY THE CITY OF FRIENDSWOOD.
11. SANITARY SEWER LINES LOCATED IN OTHER AREAS NOT SPECIFIED IN ITEM 7 SHALL BE BACKFILLED ABOVE THE INITIAL BACKFILL WITH CEMENT-STABILIZED SAND OR SELECT BACKFILL MATERIAL WITH A PI BETWEEN TWENTY (20) AND FORTY (40).
12. IF WET SAND IS ENCOUNTERED IN THE FIELD, USE SPECIAL BEDDING.
13. SANITARY SEWERS CROSSING UTILITIES OTHER THAN WATER SHALL HAVE A MINIMUM CLEARANCE OF SIX (6) INCHES (ADDRESSED IN CITY OF FRIENDSWOOD TECHNICAL SPECIFICATION 02125 – EXCAVATION AND BACKFILL FOR UTILITIES).
14. ALL PRECAST CONCRETE MANHOLES SHALL HAVE THE TOP ADJUSTMENT CONSTRUCTED OF PRECAST PCC RINGS, SEALED WITH NON-SHRINK GROUT INSIDE AND OUTSIDE, AND BETWEEN EACH SECTION AND MANHOLE COVERS.
15. ALL SANITARY SEWER MANHOLE COVERS SHALL INCLUDE THE WORDS "SANITARY SEWER" AND "CITY OF FRIENDSWOOD" AND INCLUDE THE CITY OF FRIENDSWOOD SEAL. ALL MANHOLE COVERS SHALL HAVE A MINIMUM DIAMETER OF THIRTY-TWO (32) INCHES, AS SHOWN IN THE DETAIL ON THIS SHEET.
16. CONTRACTOR SHALL BE RESPONSIBLE FOR VERIFYING LOCATION OF ALL EXISTING UTILITIES PRIOR TO EXCAVATION. DURING THE COURSE OF ANY AND ALL CLEARING, GRUBBING, FILL, GRADING, EXCAVATION OR OTHER CONSTRUCTION, CONTRACTOR SHALL ENSURE THAT STORM SEWER DRAINAGE PATHWAYS ARE MAINTAINED AND REMAIN OPEN TO ENSURE POSITIVE DRAINAGE AND THAT SUCH CONVEYANCES ARE NOT IMPEDED OR BLOCKED IN ANY WAY. STORM SEWER INLETS SHALL BE PROTECTED FROM ENTRY OF SILT, TRASH, DEBRIS AND ANY SUBSTANCES DELETERIOUS TO THE STORM SEWER SYSTEM AND/OR WATERWAYS RECEIVING STORM WATER RUNOFF. CONTRACTOR SHALL, AT COMPLETION OF WORK, FILL LOW SPOTS AND GRADE ALL RIGHTS-OF WAY AND UTILITY EASEMENTS AND RE-GRADE/RESTORE DITCHES AS NECESSARY TO MAINTAIN AND/OR ESTABLISH POSITIVE DRAINAGE.

SANITARY SEWER STANDARD DETAILS

FILE NAME: 9-SSSD1-2022.DWG

DATE APPROVED: MARCH 30, 2022

SCALE: NTS

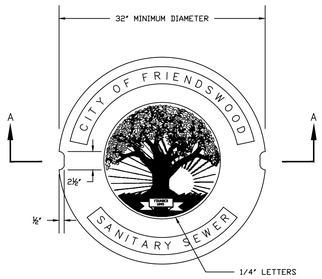
REVISED DATE: MARCH 2022

ENGINEERING DEPARTMENT

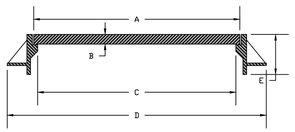
PROJECT NUMBER:

DATE SUBMITTED:

SHEET: 1 OF 2



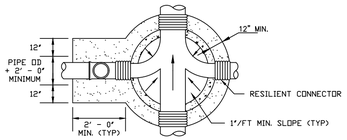
PLAN



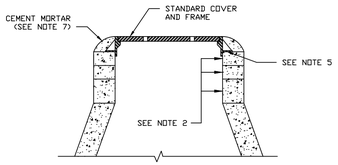
SECTION A–A

DIMENSIONS					
TYPE	A	B	C	D	E
H-2 INLET	23½"	1½"	22"	32¾"	6"
ALL OTHERS	32"	1½"	30⅞"	40"	6½"

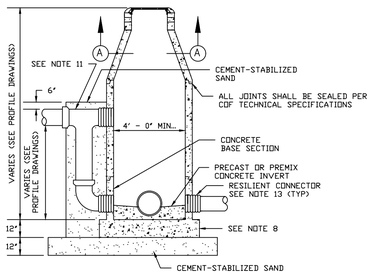
MANHOLE FRAME AND COVER



FOUNDATION PLAN



SECTION A



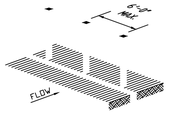
PROFILE VIEW

SANITARY SEWER MANHOLES

NOTES:

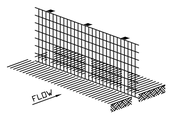
1. DEPTH OF MANHOLE DETERMINES SECTIONS REQUIRED.
2. PRECAST ADJUSTMENT RINGS SHALL BE PROVIDED FOR A COMBINED ADJUSTMENT HEIGHT OF AT LEAST TWELVE (12) INCHES. THE TOTAL HEIGHT OF ADJUSTMENT RINGS SHALL NOT EXCEED EIGHTEEN (18) INCHES.
3. MANHOLE WALL THICKNESS FOR DEPTHS EXCEEDING 12' - 0" SHALL BE DETERMINED TO MEET LOADING CONDITIONS. MINIMUM WALL THICKNESS SHALL BE FIVE (5) INCHES.
4. MANHOLE DROP AND INTERSECTING PIPES SHALL ONLY BE INSTALLED WHEN CALLED FOR IN THE PLAN AND PROFILE DRAWINGS.
5. SEAT MANHOLE FRAME IN SEALANT PER CITY OF FRIENDSWOOD TECHNICAL SPECIFICATIONS.
6. ECCENTRIC PRECAST MANHOLE CONE MAY BE USED.
7. OMIT CEMENT MORTAR WHEN MANHOLE IS LOCATED IN PAVED AREAS. IN PAVED AREAS A BLOCKOUT SHALL BE SUPPLIED THAT IS TWO (2) FEET PAST THE OUTSIDE EDGE OF THE MANHOLE.
8. MINIMUM REINFORCING BARS IN THE BASE SHALL BE #5 @ 8" O.C.E.W. MINIMUM REINFORCING BARS IN MANHOLE, INCLUDING CONE, SHALL BE #4 @ 12" O.C.E.W.
9. PROVIDE BACKFILL TO MATCH ADJACENT PIPE TRENCH. BACKFILL PER CITY OF FRIENDSWOOD TECHNICAL SPECIFICATIONS.
10. BRICK CONSTRUCTION SHALL NOT BE PERMITTED.
11. SANITARY SEWER DROP CONNECTION SHALL BE REQUIRED WHEN THE DIFFERENCE BETWEEN THE SANITARY SEWER FLOWLINE AND BOTTOM OF MANHOLE IS THIRTY (30) INCHES OR GREATER.
12. CONCRETE SHALL BE CLASS "A" CONCRETE WITH A DESIGN STRENGTH OF 4,000 PSI AT TWENTY-EIGHT (28) DAYS AND RATED FOR H-20 LOADING.
13. RESILIENT CONNECTOR SHALL BE RUBBER GASKETED SLEEVE AND STAINLESS STEEL CLAMP. RESILIENT CONNECTOR SHALL BE PER CITY OF FRIENDSWOOD TECHNICAL SPECIFICATIONS AND SHALL BE WATERTIGHT.
14. PROVIDE SIX (6) INCH BASE EXTENSION FOR ALL MANHOLE DEPTHS GREATER THAN FIFTEEN (15) FEET AS MEASURED FROM INVERT FLOWLINE TO MANHOLE COVER.

SANITARY SEWER STANDARD DETAILS (MANHOLES)		ENGINEERING DEPARTMENT	
FILE NAME: 10-SSSD2-2022.DWG	DATE APPROVED: MARCH 30, 2022		PROJECT NUMBER: / DATE SUBMITTED: / SHEET: 2 OF 2
	SCALE: NTS / REVISED DATE: MARCH 2022		



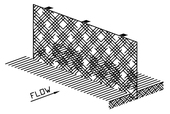
STEP 1:

SET POSTS AND EXCAVATE FOUR (4) INCH BY FOUR (4) INCH TRENCH UPSLOPE ALONG LINE OF POSTS (SEE NOTE 1).



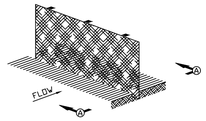
STEP 2:

SECURE WIRE FENCING TO POSTS (SEE NOTE 2).



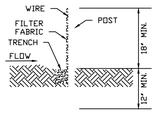
STEP 3:

ATTACH FILTER FABRIC MATERIAL TO WIRE FENCE AND EXTEND IT INTO TRENCH (SEE NOTE 3).

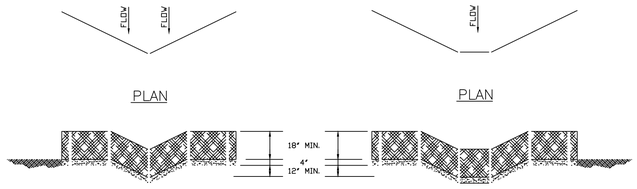


STEP 4:

BACKFILL AND COMPACT EXCAVATED SOIL (SEE NOTE 4).



SECTION "A" – "A"



V–BOTTOM DITCH PROFILE

FLAT BOTTOM DITCH PROFILE

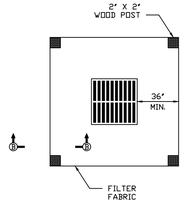
SILT FILTER FABRIC FENCE

NOTES:

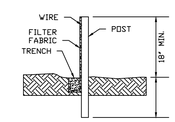
1. SET TWO (2) INCH BY TWO (2) INCH WOODEN STAKES EMBEDDED TWELVE (12) INCHES INTO GROUND. SPACING SHALL BE A MAXIMUM OF SIX (6) FEET APART FOR REINFORCED FILTER FABRIC FENCE AND A MAXIMUM OF THREE (3) FEET APART FOR NON-REINFORCED FILTER FABRIC FENCE.
2. REINFORCED FILTER FABRIC FENCE SHALL HAVE WOVEN WIRE FENCE WHICH SHALL BE FASTENED SECURELY TO FENCE POSTS.
3. FASTEN FILTER FABRIC FENCE AS FOLLOWS:
   3.1. REINFORCED FILTER FABRIC FENCE SHALL SECURELY FASTENED TO WOVEN WIRE FENCE WITH TIES SPACED EVERY TWENTY-FOUR (24) INCHES AT TOP AND MIDSECTION.
   3.2. NON-REINFORCED FILTER FABRIC FENCE SHALL BE FASTENED AT EVERY WOOD POST AT TOP AND MIDSECTION.
4. MINIMUM HEIGHT OF FILTER FABRIC SHALL BE EIGHTEEN (18) INCHES ABOVE NATURAL GROUND AND A MAXIMUM OF THIRTY-SIX (36) INCHES ABOVE NATURAL GROUND.
5. FILTER FABRIC SHALL EXTEND INTO THE FOUR (4) INCH BY FOUR (4) INCH TRENCH DOWN THE SIDE CLOSEST TO THE WOODEN POSTS, ACROSS THE BOTTOM OF THE TRENCH AND HALF WAY UP THE OPPOSITE SIDE.
6. ALL INSTALLATIONS OF SILT FENCE SHALL BE IN ACCORDANCE WITH THE CITY OF FRIENDSWOOD TECHNICAL SPECIFICATION SECTION 02005 - FILTER FABRIC SILT FENCE.
7. METAL STAKES OR T-POSTS MAY BE USED IN LIEU OF WOOD POSTS.

SC	STABILIZED CONSTRUCTION EXIT
FF	FILTER FABRIC SILT FENCE
RFB	REINFORCED FILTER FABRIC BARRIER
IPB–I	INLET PROTECTION BARRIER TYPE I
IPB–II	INLET PROTECTION BARRIER TYPE II
IPB–III	INLET PROTECTION BARRIER TYPE III
LPIP	LOW PROFILE INLET PROTECTOR
LPIGP	LOW PROFILE INLET GRATE PROTECTOR
CW–A	CONCRETE WASHOUT AREA - ABOVE GROUND
CW–B	CONCRETE WASHOUT AREA - BELOW GROUND

SWPPP SYMBOLS



PLAN

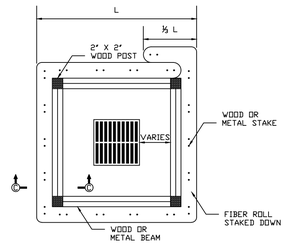


SECTION "B" – "B"

INLET PROTECTION TYPE I

NOTES:

1. MAXIMUM POST SPACING SHALL BE FOUR (4) FEET. ADDITIONAL POSTS MAY BE ADDED AS NEEDED. POSTS SHALL BE PLACED A MINIMUM AT EACH CORNER AS SHOWN.
2. PLACEMENT OF FILTER FABRIC BARRIER FROM INLET SHALL VARY ACCORDING TO SITE CONDITIONS. TYPICAL PLACEMENT SHALL BE A MINIMUM OF THIRTY-SIX (36) INCHES FROM INLET EDGE.



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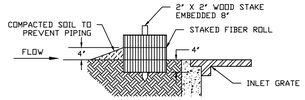
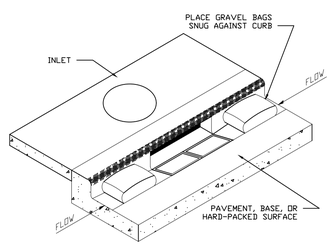


SECTION "C" – "C"

INLET PROTECTION TYPE II

NOTES:

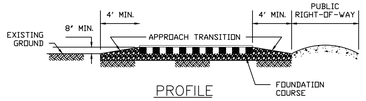
1. MAXIMUM POST SPACING SHALL BE FOUR (4) FEET. ADDITIONAL POSTS MAY BE ADDED AS NEEDED. POSTS SHALL BE PLACED A MINIMUM AT EACH CORNER AS SHOWN.
2. PLACEMENT OF FIBER ROLL FROM INLET SHALL VARY ACCORDING TO SITE CONDITIONS. TYPICAL PLACEMENT SHALL BE TWENTY-FOUR (24) INCHES FROM INLET.
3. FIBER ROLLS SHALL BE UTILIZED ONLY WHEN SITE CONDITIONS DO NOT PERMIT THE USE OF FILTER FABRIC BARRIER.
4. IF UNDERLYING MATERIAL IS BASE OR OTHER HARD-PACKED MATERIAL, THEN FIBER ROLLS MAY BE PLACED ON HARD PACKED SURFACE AND WEIGHTED DOWN WITH GRAVEL BAGS.



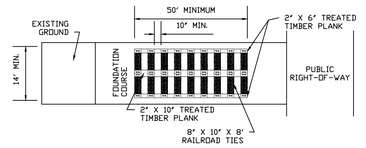
INLET PROTECTION BARRIER TYPE III

NOTES:

1. IPB TYPE III SHALL BE USED FOR EXISTING OR PROPOSED STAGE II TYPE "B", "B-B" AND "H-2" INLETS ONLY.
2. PLACE GRAVEL BAG IN THE GUTTER ON EACH SIDE OF THE INLET OPENING. GRAVEL BAG SHALL BE PLACED TIGHTLY AGAINST THE FACE OF CURB.
3. PLACE GRAVEL BAGS AT BACK OF CURB ALONG INLET.
4. DO NOT PLACE BAGS TO BLOCK THROAT OF INLET, UNLESS DIRECTED BY THE ENGINEER AND APPROVED BY THE CITY OF FRIENDSWOOD.



PROFILE

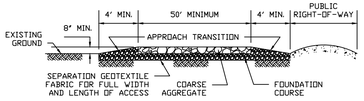


PLAN

CONSTRUCTION ACCESS TYPE I

NOTES:

1. LENGTH SHALL BE AS SHOWN ON THE CONSTRUCTION DRAWINGS, BUT NOT LESS THAN FIFTY (50) FEET.
2. THICKNESS SHALL BE A MINIMUM OF EIGHT (8) INCHES.
3. WIDTH SHALL BE NOT LESS THAN FULL WIDTH OF ALL POINTS OF INGRESS AND EGRESS.
4. THE TREATED TIMBER PLANKS SHALL BE #2 GRADE MINIMUM, AND SHOULD BE FREE FROM LARGE AND LOOSE KNOTS.
5. THE TREATED TIMBER PLANKS SHALL BE ATTACHED TO THE RAILROAD TIES WITH ⅜" X 6" MINIMUM LAG BOLTS. OTHER FASTENERS MAY BE USED AS APPROVED BY THE CITY.
6. APPROACH TRANSITION SHALL BE A MINIMUM OF EIGHT (8) INCHES IN DEPTH AND 6:1 SLOPE MINIMUM.
7. FOUNDATION COURSE SHALL BE A MINIMUM OF SIX (6) INCHES. FOUNDATION COURSE MATERIAL SHALL BE FLEXIBLE BASE, BITUMINOUS CONCRETE, PORTLAND CEMENT CONCRETE OR OTHER MATERIAL APPROVED BY THE CITY.
8. ACCESS SHALL BE GRADED TO PREVENT RUN-OFF FROM LEAVING SITE, ALLOWING DRAINAGE TO A SEDIMENT TRAPPING DEVICE.
9. CONSTRUCTION ACCESS SHALL ADHERE TO CITY OF FRIENDSWOOD SPECIFICATION 02020 – STABILIZED CONSTRUCTION ACCESS, ROADS, PARKING AND WASH AREAS.
10. STABILIZATION FOR OTHER AREAS SHALL HAVE THE SAME AGGREGATE THICKNESS AND WIDTH REQUIREMENTS AS THE STABILIZED CONSTRUCTION ACCESS, UNLESS OTHERWISE SHOWN ON THE CONSTRUCTION DRAWINGS.
11. STABILIZED AREA MAY BE WIDENED OR LENGTHENED TO ACCOMMODATE TRUCK WASHING AREA. AN OUTLET SEDIMENT TRAP MUST BE PROVIDED FOR TRUCK WASHING AREA.
12. STABILIZED CONSTRUCTION ACCESS SHALL BE MAINTAINED FREE OF SEDIMENT FOR THE DURATION OF THE PROJECT.



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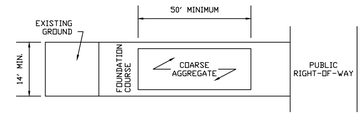
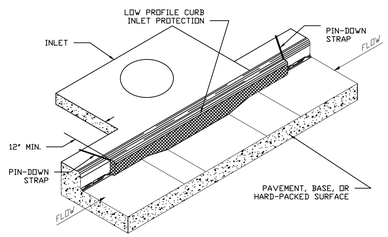


PLAN

CONSTRUCTION ACCESS TYPE II

NOTES:

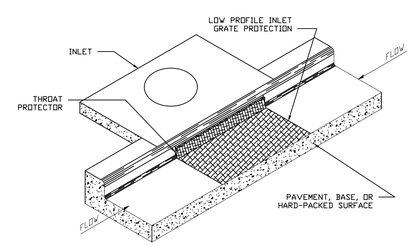
1. LENGTH SHALL BE AS SHOWN ON THE CONSTRUCTION DRAWINGS, BUT NOT LESS THAN FIFTY (50) FEET.
2. THICKNESS SHALL BE A MINIMUM OF EIGHT (8) INCHES.
3. WIDTH SHALL BE NOT LESS THAN FULL WIDTH OF ALL POINTS OF INGRESS AND EGRESS.
4. APPROACH TRANSITION SHALL BE A MINIMUM OF EIGHT (8) INCHES IN DEPTH AND 6:1 SLOPE MINIMUM.
5. FOUNDATION COURSE SHALL BE A MINIMUM OF SIX (6) INCHES. FOUNDATION COURSE MATERIAL SHALL BE FLEXIBLE BASE, BITUMINOUS CONCRETE, PORTLAND CEMENT CONCRETE OR OTHER MATERIAL APPROVED BY THE CITY.
6. ACCESS SHALL BE GRADED TO PREVENT RUN-OFF FROM LEAVING SITE.
7. CONSTRUCTION ACCESS SHALL ADHERE TO CITY OF FRIENDSWOOD SPECIFICATION 02020 – STABILIZED CONSTRUCTION ACCESS, ROADS, PARKING AND WASH AREAS.
8. STABILIZATION FOR OTHER AREAS SHALL HAVE THE SAME AGGREGATE THICKNESS AND WIDTH REQUIREMENTS AS THE STABILIZED CONSTRUCTION ACCESS, UNLESS OTHERWISE SHOWN ON THE CONSTRUCTION DRAWINGS.
9. STABILIZED AREA MAY BE WIDENED OR LENGTHENED TO ACCOMMODATE TRUCK WASHING AREA. AN OUTLET SEDIMENT TRAP MUST BE PROVIDED FOR TRUCK WASHING AREA.
10. STABILIZED CONSTRUCTION ACCESS SHALL BE MAINTAINED FREE OF SEDIMENT FOR THE DURATION OF THE PROJECT.



LOW PROFILE INLET PROTECTOR

NOTES:

1. LPIP SHALL BE REQUIRED IN HIGH TRAFFIC VOLUME ROADWAYS.
2. LPIP SHALL BE USED FOR EXISTING OR PROPOSED STAGE II TYPE "H-2" INLETS ONLY.
3. LPIP SHALL EXTEND A MINIMUM OF TWELVE (12) INCHES PAST THE THROAT OPENING OF THE INLET.
4. LPIP SHALL BE PINNED DOWN BEHIND THE CURB AS SHOWN.
5. ONLY GUTTER GATOR™ OR GUTTER GUARD™ SHALL BE USED, UNLESS PREVIOUSLY APPROVED BY THE CITY ENGINEER.



LOW PROFILE INLET GRATE PROTECTOR

NOTES:

1. LPIGP SHALL BE REQUIRED IN HIGH TRAFFIC VOLUME ROADWAYS.
2. LPIGP SHALL BE USED FOR EXISTING OR PROPOSED STAGE II TYPE "B" AND "B-B" INLETS ONLY.
3. THROAT PROTECTION SHALL BE A MINIMUM OF 4" IN HEIGHT.
4. ONLY GRATE GATOR™ OR INLET GUARD PLUS® SHALL BE USED, UNLESS PREVIOUSLY APPROVED BY THE CITY ENGINEER.

STORM WATER POLLUTION PREVENTION PLAN (SWPPP) STANDARD DETAILS

FILE NAME: 11-SW3PSD1-2022.DWG

DATE APPROVED: MARCH 30, 2022

SCALE: NTS

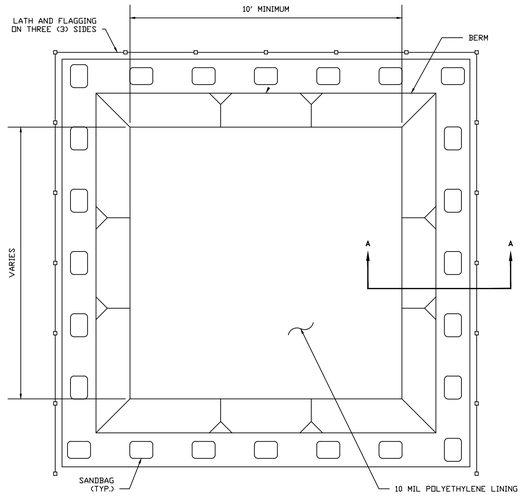
REVISED DATE: MARCH 2022

ENGINEERING DEPARTMENT

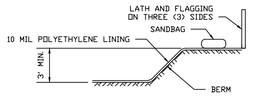
PROJECT NUMBER:

DATE SUBMITTED:

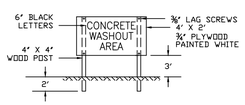
SHEET: 1 OF 2



PLAN VIEW

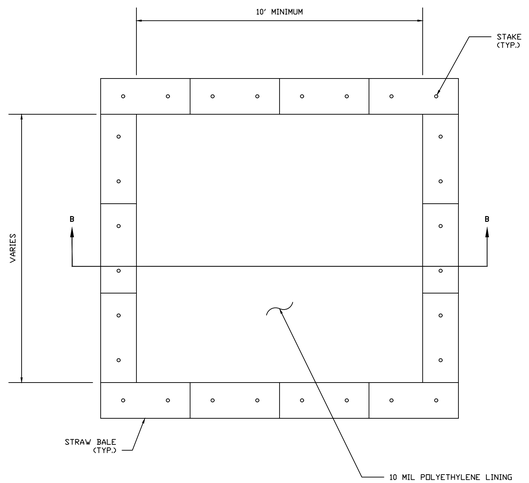


SECTION 'A-A'

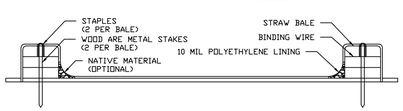


SIGN DETAIL

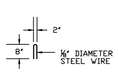
ABOVE GROUND



PLAN



SECTION 'B-B'



STAPLE DETAIL

BELOW GROUND

CONCRETE WASHOUT AREA

NOTES:

1. ACTUAL LAYOUT TO BE DETERMINED IN THE FIELD.
2. THE CONCRETE WASHOUT SIGN SHALL BE INSTALLED WITHIN THREE (3) FEET OF THE CONCRETE WASHOUT FACILITY.

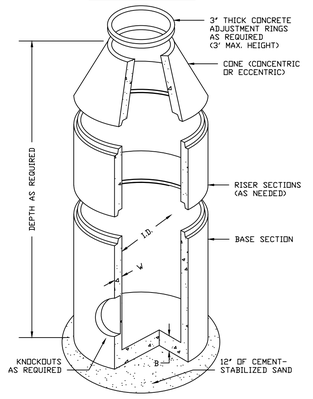
STORM WATER POLLUTION PREVENTION PLAN (SWPPP) STANDARD DETAILS (CONT.)

FILE NAME: 12-SW3PSD2-2022.DWG
DATE APPROVED: MARCH 30, 2022
SCALE: NTS
REVISED DATE: MARCH 2022

ENGINEERING DEPARTMENT

PROJECT NUMBER:
DATE SUBMITTED:
SHEET: 2 OF 2

DIMENSIONS AND WEIGHTS			
ID SIZE (IN)	W (IN)	B (IN)	RISER WT/LF (LB)
48	5	6	868
60	6	8	1300
72	7	8	1811
96	9	8	3090

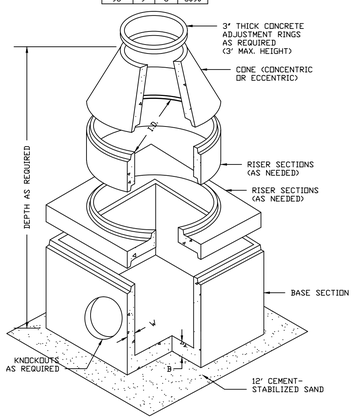


CONCRETE MANHOLE

NOTES:

1. LIFTING INSERTS AS REQUIRED.
2. ALL JOINTS SHALL BE SEALED WITH RAM-NEK OR APPROVED EQUAL.
3. MANHOLES TO BE PLACED ON 12" OF CEMENT-STABILIZED SAND.
4. CONCRETE DESIGN STRENGTH SHALL BE 4000 PSI AT 28 DAYS, RATED FOR H-20 LOADING.
5. FOR USE WITH PIPE 72" DIAMETER AND SMALLER ONLY.

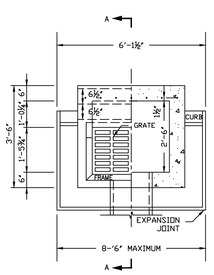
DIMENSIONS AND WEIGHTS			
ID SIZE (IN)	W (IN)	B (IN)	RISER WT/LF (LB)
48	5	6	868
60	6	8	1300
72	7	8	1811
96	9	8	3090



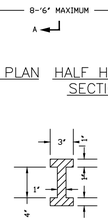
CONCRETE JUNCTION BOX

NOTES:

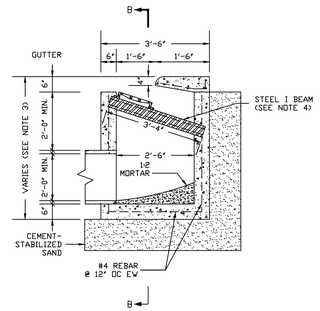
1. LIFTING INSERTS AS REQUIRED.
2. ALL JOINTS SHALL BE SEALED WITH RAM-NEK OR APPROVED EQUAL.
3. MANHOLES TO BE PLACED ON 12" OF CEMENT-STABILIZED SAND.
4. CONCRETE DESIGN STRENGTH SHALL BE 4000 PSI AT 28 DAYS, RATED FOR H-20 LOADING.
5. WIDTH VARIES ACCORDING TO PIPE SIZE.



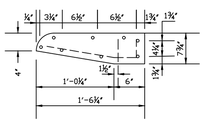
HALF PLAN HALF HORZ. SECTION



I BEAM SECTION



SECTION A–A

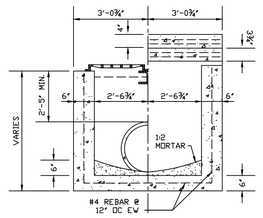


SECTION C–C

TYPE B AND B–B INLET

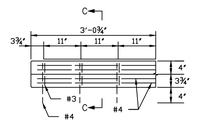
NOTES:

1. USE STANDARD CAST IRON FRAME AND GRATES.
2. LEADS SHALL LEAVE INLET AT LOCATION AND GRADE REQUIRED.
3. DIMENSION VARIES BASED ON PIPE DIAMETER AND WALL THICKNESS.
4. CENTER STEEL BEAM ON INLET AND CAST WALLS AS SHOWN (B–B INLET ONLY).
5. TYPE B AND B–B INLETS ARE FOR RESIDENTIAL USE ONLY.

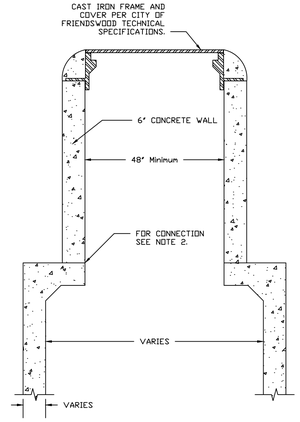


HALF FRONT ELEV. HALF SECTION

SECTION B–B



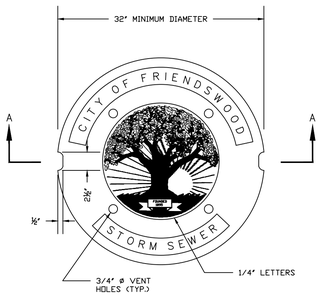
INLET TOP HALF FRONT ELEVATION



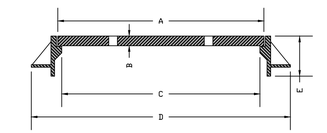
MANHOLE FOR BOX SEWERS

NOTE:

1. "E" INLET GRATE MAY BE USED IN PLACE OF MANHOLE COVER.
2. CONNECT MANHOLE TO TOP BY USING KEYWAY, DOWELING OR PRECAST JOINT.



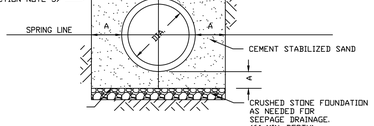
PLAN



SECTION A–A

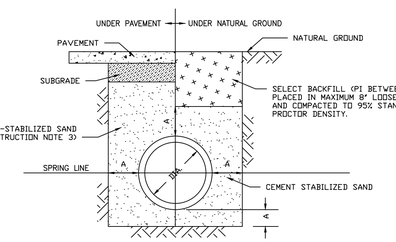
DIMENSIONS					
TYPE	A	B	C	D	E
H-2 INLET	23⅝"	15"	22"	32¾"	6"
ALL OTHERS	32"	15"	30"	46"	6¾"

MANHOLE FRAME AND COVER



UNSATISFACTORY SOIL CONDITIONS

A	STORM SEWER DIAMETER
6"	36" OR LESS
12"	42" OR GREATER



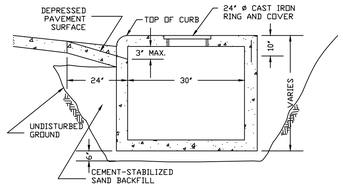
SATISFACTORY SOIL CONDITIONS

BEDDING AND BACKFILL

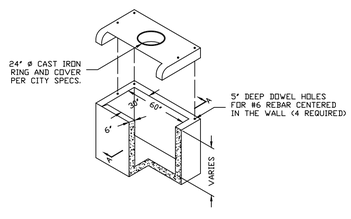
NOTES:

1. THE SATISFACTORY SOIL CONDITIONS METHOD SHALL BE USED FOR STORM SEWER PIPE WHERE THE SOIL CONDITIONS ARE AS FOLLOWS:
   1.A. STRATA FROM THE SPRING LINE TO 3 FT BELOW THE FLOWLINE OF THE PIPE CONSIST OF NON-WATERBEARING COHESIVE SOILS HAVING A SHEAR STRENGTH OF 1000 PSF OR GREATER.
   1.B. NO WET SAND STRATA EXIST IN AREA FROM 1 FT ABOVE THE TOP OF THE PIPE TO 3 FT BELOW THE FLOWLINE.
2. FOR ALL OTHER SOIL CONDITIONS USE THE DETAIL FOR UNSATISFACTORY CONDITIONS SHOWN ABOVE.

TYPE H-2 INLET PLAN VIEW



SECTION A – A
TYPE H-2 INLET
CROSS SECTION

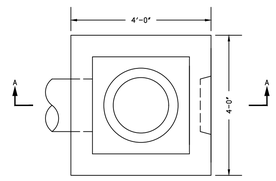


ISOMETRIC VIEW

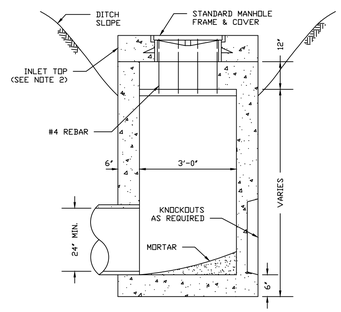
TYPE H-2 INLET

NOTES:

1. H-2 TYPE 1 LENGTH = 5'-0", H-2 TYPE 2 LENGTH 10'-0".
2. THIN WALL KNOCK-OUTS OR THRU HOLES FOR PIPE PER JOB REQUIREMENTS.
3. REFER TO PAVING DETAIL SHEET FOR INSTALLATION OF H-T TYPE 1 5'-0" CURB INLET.
4. INLET WALLS MAY BE EXTENDED USING PRECAST RISER SECTION.
5. INLET TOPS SHALL BE SECURED TO THE INLET WALL USING #6 DOWELS DRILLED AND GROUTED A MINIMUM DEPTH OF 5" INTO THE INLET WALL.
6. INLET BACKFILL SHALL BE CEMENT-STABILIZED SAND TO THE TOP OF THE INLET FIRST STAGE.
7. GRADE 60, #4 REINFORCEMENT BARS TO CONFORM TO ASTM A615 ON REQUIRED CENTERS OR EQUAL.
8. GROUT ALL EXPOSED LIFT HOLES.



PLAN



SECTION A–A

TYPE E INLET

NOTES:

1. USE #4 REBAR IN THROAT OPENING AT 6" CENTERS.
2. CONNECT INLET TO TOP BY USING KEYWAY, DOWELING OR PRECAST JOINT.

STORM SEWER CONSTRUCTION NOTES:

1. *STORM SEWERS SHALL BE CONSTRUCTED IN ACCORDANCE WITH CITY OF FRIENDSWOOD TECHNICAL SPECIFICATIONS AND STANDARD DETAILS, LATEST REVISIONS.*
2. *ALL STORM SEWER PIPE SHALL BE REINFORCED CONCRETE PIPE (RCP), ASTM C-76, CLASS III, TONGUE AND GROOVE, RAM-NEK JOINTS UNLESS OTHERWISE NOTED AND APPROVED BY THE CITY.*
3. *REINFORCED CONCRETE STORM SEWER (PIPE, BOX, ETC.) SHALL BE INSTALLED, BEDDED AND BACKFILLED IN CONFORMITY WITH THE CITY OF FRIENDSWOOD TECHNICAL SPECIFICATIONS AND STANDARD DETAILS. STORM SEWER PIPE INSTALLED UNDER OR WITHIN ONE (1) FOOT OF PROPOSED OR EXISTING PAVEMENT SHALL BE BACKFILLED WITH CEMENT-STABILIZED SAND, (1.1 SACKS OF CEMENT PER TON OF SAND), TO THE BOTTOM OF THE SUBGRADE.*
4. *CONCRETE FOR INLETS AND MANHOLES SHALL BE CLASS "A" AND SHALL HAVE A MINIMUM STRENGTH OF 4000 PSI AT TWENTY-EIGHT (28) DAYS.*
5. *ALL MANHOLES SHALL BE ADJUSTED TO FINISHED GRADE AFTER PAVING IS COMPLETE.*
6. *MINIMUM STORM SEWER SIZE IS TWENTY-FOUR (24) INCH DIAMETER. MINIMUM ROADSIDE DITCH CULVERT IS EIGHTEEN (18) INCH DIAMETER.*
7. *ALL STORM SEWER MANHOLE COVERS MUST INCLUDE THE WORDS "STORM SEWER" AND "CITY OF FRIENDSWOOD" AND HAVE THE "CITY SEAL." MANHOLE COVERS SHALL BE THIRTY-TWO (32) INCHES IN DIAMETER EXCEPT AT CURB INLET COVERS WHICH ARE TWENTY-FOUR (24) INCHES.*
8. *CONTRACTOR SHALL PROVIDE A MINIMUM OF SIX (6) INCHES CLEARANCE AT ALL UTILITY CROSSINGS WITH STORM SEWERS.*
9. *ALL INLETS, IN RESIDENTIAL DEVELOPMENTS TO BE TYPE "H-2" OR TYPE "B-B" WITH GRATES. ALL INLETS IN COMMERCIAL DEVELOPMENTS AND ON MAJOR THOROUGHFARES TO BE TYPE "H-2" ONLY, UNLESS OTHERWISE APPROVED BY THE CITY OF FRIENDSWOOD.*
10. *ALL DISTURBED AREAS IN DRAINAGE EASEMENTS OR DETENTION PONDS, SHALL BE HYDRO-MULCHED AS PER TECHNICAL SPECIFICATION SECTION 02910 – HYDROMULCH SEEDING OR APPROVED EQUAL.*
11. *CONTRACTOR SHALL BE RESPONSIBLE FOR VERIFYING THE LOCATION OF ALL EXISTING UTILITIES PRIOR TO EXCAVATION. DURING THE COURSE OF ANY AND ALL CLEARING, GRUBBING, FILL, GRADING, EXCAVATION OR OTHER CONSTRUCTION, THE CONTRACTOR SHALL ENSURE THAT STORM DRAINAGE PATHWAYS REMAIN OPEN AND ARE MAINTAINED TO ENSURE POSITIVE DRAINAGE. CONVEYANCES ARE NOT TO BE IMPEDED OR BLOCKED IN ANY WAY. STORM SEWER INLETS SHALL BE PROTECTED FROM ENTRY OF SILT, TRASH, DEBRIS AND ANY OTHER SUBSTANCES THAT MAY DAMAGE THE STORM SEWER SYSTEM AND/OR WATERWAYS RECEIVING STORM WATER RUNOFF. AT COMPLETION OF WORK, THE CONTRACTOR SHALL FILL ALL LOW SPOTS, GRADE ALL RIGHTS-OF WAY, AND UTILITY EASEMENTS, AND REGRADE/RESTORE DITCHES AS NECESSARY TO MAINTAIN AND/OR ESTABLISH POSITIVE DRAINAGE.*

STORM SEWER STANDARD DETAILS

FILE NAME: 13-SWSSD1-2022.DWG

DATE APPROVED: MARCH 30, 2022

SCALE: NTS

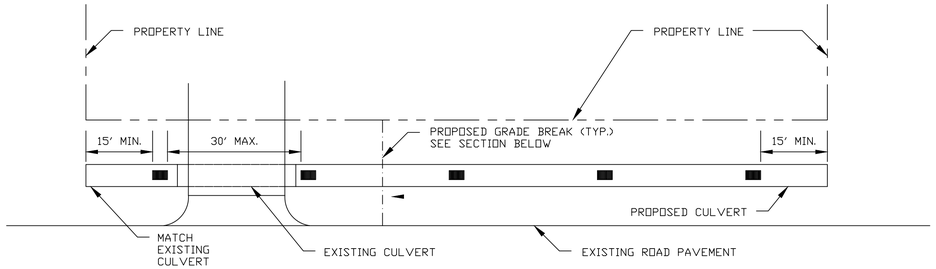
REVISED DATE: MARCH 2022

DEPARTMENT OF ENGINEERING & PROJECTS

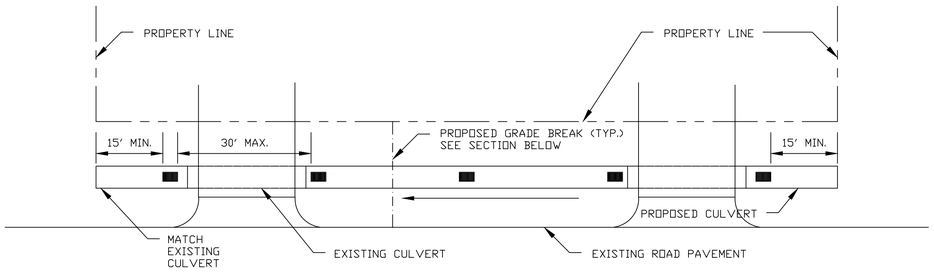
PROJECT NUMBER:

DATE SUBMITTED:

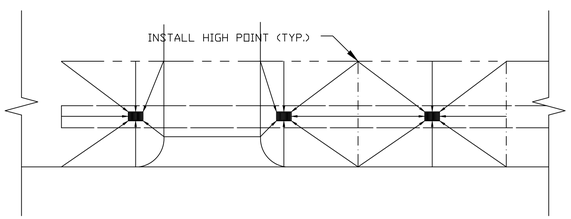
SHEET: 1 OF 2



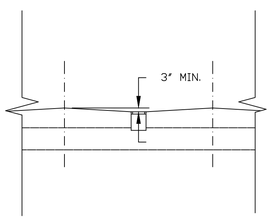
PLAN VIEW FOR SINGLE DRIVEWAY



PLAN VIEW FOR DOUBLE DRIVEWAY



DRAINAGE GRADING – PLAN

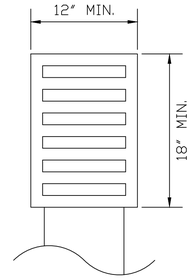


DRAINAGE GRADING – PROFILE

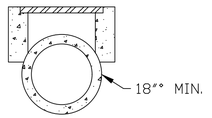
FILLING IN AN OPEN DITCH

NOTES:

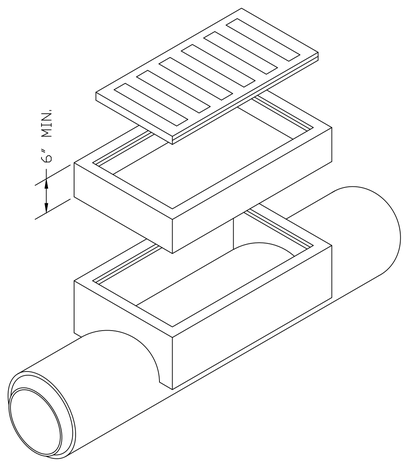
1. *MINIMUM LOT FRONTAGE SHALL BE ONE HUNDRED (100) FEET.*
2. *MINIMUM DISTANCE BETWEEN DRIVEWAYS SHALL BE FORTY-FIVE (45) FEET EDGE TO EDGE.*



TOP VIEW

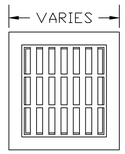


CROSS SECTION

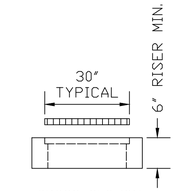


ISOMETRIC VIEW

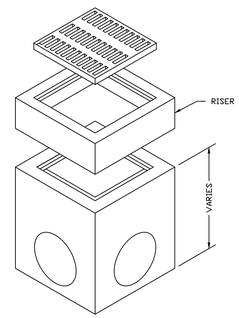
TYPE S INLET



TOP VIEW



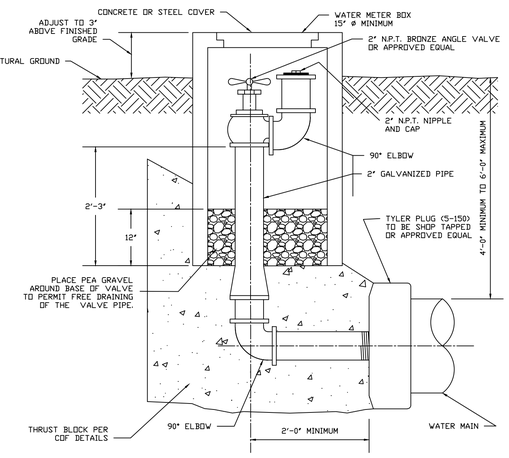
CROSS SECTION



ISOMETRIC VIEW

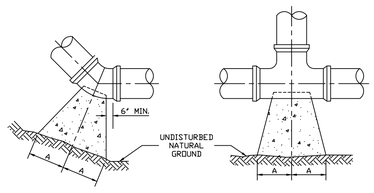
TYPE A INLET

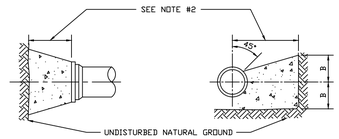
STORM SEWER STANDARD DETAILS (CONTINUED)			DEPARTMENT OF ENGINEERING & PROJECTS	
FILE NAME: 14-SWSSD2-2022.DWG	DATE APPROVED: MARCH 30, 2022			PROJECT NUMBER: / DATE SUBMITTED: / SHEET: 1 OF 1
	SCALE: NTS	REVISED DATE: MARCH 2022		



BLOW-OFF VALVE ASSEMBLY

SIZE	90° BEND		45° BEND		22 ½° BEND		TEES		PLUGS	
	A	B	A	B	A	B	A	B	A	B
4"	10"	7"	6"	7"	3"	7"	7"	7"	10"	20"
6"	15"	10"	8"	10"	6"	8"	10"	12"	10"	21"
8"	22"	13"	12"	13"	8"	10"	13"	16"	12"	28"
10"	28"	17"	14"	17"	10"	15"	16"	20"	14"	30"
12"	29"	21"	16"	21"	11"	18"	18"	24"	16"	41"
14"	35"	24"	18"	24"	12"	20"	22"	27"	18"	45"
16"	38"	27"	21"	27"	12"	24"	24"	30"	20"	54"

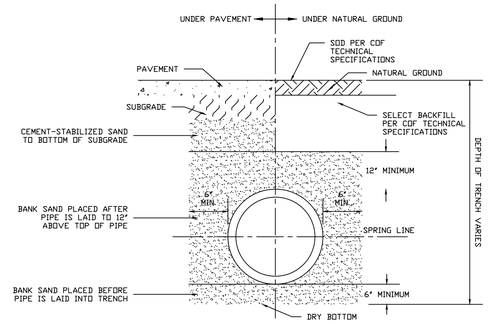




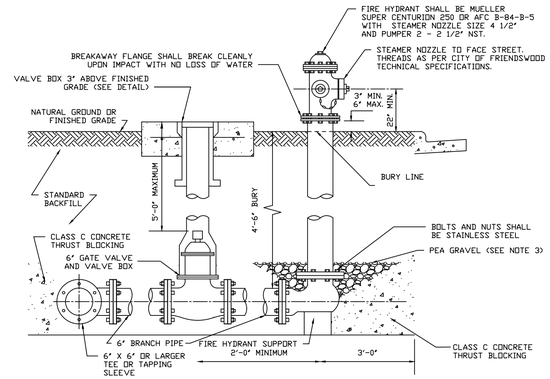
THRUST BLOCK

NOTES:

1. THRUST BLOCKS AT TRENCH FACE SHALL HAVE A MINIMUM BEARING SURFACE OF 10 SF AND THE LEAST DIMENSION SHALL BE NO SMALLER THAN 1.5 TIMES PIPE DIAMETER.
2. FROM THE BACK OF PIPE TO THE TRENCH WALL SHALL BE A MINIMUM OF 18" FOR PIPE DIAMETERS OF 10 INCHES AND LESS, AND A MINIMUM OF 24" FOR PIPE DIAMETERS OF 12 INCHES OR GREATER.
3. ALL CONCRETE SHALL BE CLASS "C", 2,500 PSI AS PER CITY OF FRIENDSWOOD TECHNICAL SPECIFICATIONS.



BEDDING AND BACKFILL

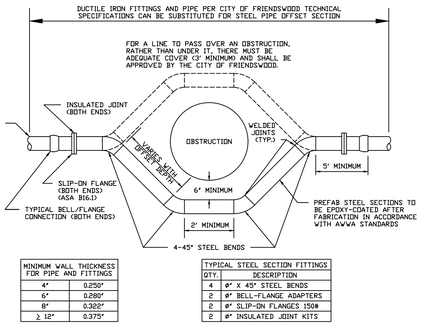


FIRE HYDRANT ASSEMBLY

1. RESTRAINED JOINTS SHALL BE USED (SEE FITTING ANCHOR DETAIL).
2. FIRE HYDRANTS SHALL BE AUDITED AND PAINTED ACCORDING TO THE CITY OF FRIENDSWOOD TECHNICAL SPECIFICATIONS.
3. FILL PEA GRAVEL TO A MINIMUM DEPTH OF 6" OVER TOP OF FLANGE.

WATER LINE CONSTRUCTION NOTES

1. *WATER LINE CONSTRUCTION AND TESTING SHALL BE PERFORMED IN ACCORDANCE WITH THE CITY OF FRIENDSWOOD TECHNICAL SPECIFICATIONS.*
2. *ALL WATER MAINS SHALL HAVE A MINIMUM OF FOUR (4) FEET OF COVER MEASURED FROM CENTERLINE OF STREET OR EXISTING NATURAL GROUND, WHICHEVER DEPTH IS GREATER, UNLESS OTHERWISE NOTED.*
3. *HYDROSTATIC TESTING FOR MAIN DISTRIBUTION AND DOMESTIC SERVICES LINES SHALL BE AT ONE HUNDRED AND FIFTY (150) PSI FOR FOUR (4) HOURS AND SHALL BE WITNESSED BY THE CITY OF FRIENDSWOOD ENGINEERING DEPARTMENT (SECTION 01475 – TESTING PROCEDURES).*
4. *SINGLE METER SERVICE LINES SHALL BE ONE (1) INCH MINIMUM I.D., C.T.S, POLYETHYLENE, SDR-9.*
5. *CONTRACTOR TO FURNISH AND INSTALL SINGLE SERVICE METER BOXES AT FINISHED GRADE.*
6. *FIRE HYDRANT ASSEMBLIES SHALL INCLUDE ONE (1) EACH LINE SIZE BY SIX (6) INCH TEE, ONE (1) EACH SIX (6) INCH GATE VALVE AND ADJUSTABLE BOX, ONE (1) EACH FIRE HYDRANT WITH SIX (6) INCH LEAD PIPING AND TIE BACKS.*
7. *WATER VALVES ON MAIN LINES SHALL BE LOCATED AS CLOSE AS POSSIBLE TO EXTENDED PROPERTY LINE AND SHALL CONFORM TO AWWA C500, OPEN COUNTER CLOCKWISE LEFT, EQUIPPED WITH TWO (2) INCH SQUARE OPERATING NUT.*
8. *WATER LINES FOUR (4) INCH THROUGH TWELVE (12) INCH I.D. SHALL COMPLY WITH ALL THE REQUIREMENTS OF AWWA STANDARD C900-75 CLASS 150, SDR-18 PVC, WHICH HAS AN OUTSIDE DIAMETER EQUAL TO CAST IRON PIPE OF THE SAME INSIDE DIAMETER, WITH GASKET BELL END.*
9. *ALL CONCRETE THRUST BLOCKING SHALL BE PLACED TO FORM A SOLID CONNECTION BETWEEN FITTINGS, VALVES, FIRE HYDRANTS AND UNDISTURBED EARTH. CONCRETE THRUST BLOCKING SHALL BE CLASS "C" CONCRETE WITH A MINIMUM OF 2,500 PSI COMPRESSIVE STRENGTH AFTER TWENTY-EIGHT (28) DAYS. ALL BOLTS AND NUTS AT FITTINGS AND FIRE HYDRANTS SHALL BE COVERED WITH PLASTIC BEFORE THRUST BLOCK IS PLACED.*
10. *GRAY IRON AND DUCTILE IRON FITTINGS SHALL CONFORM TO AWWA C110 AND END JOINTS OF FITTINGS AND MAIN VALVES SHALL CONFORM TO AWWA C110. ALL FITTINGS SHALL BE MECHANICAL JOINTS, CEMENT LINED OR EPOXY COATED.*
11. *MINIMUM BURY FOR ALL FIRE HYDRANT LEADS SHALL BE FOUR (4) FEET UNLESS OTHERWISE NOTED. ALL FIRE HYDRANTS AND VALVE BOXES ARE TO BE ADJUSTED TO FINISH GRADE AFTER PAVING IS COMPLETE.*
12. *INSTALL CONCRETE BLOCK BENEATH FIRE HYDRANT LEADS BEFORE PLACING CONCRETE THRUST BLOCKING TO INSURE THAT FIRE HYDRANTS ARE INSTALLED LEVEL.*
13. *CONTRACTOR SHALL CONTACT THE CITY'S PROJECT MANAGER A MINIMUM OF SEVENTY-TWO (72) HOURS PRIOR TO START OF CONSTRUCTION.*
14. *ALL WATER LINE TRENCHES TO BE BACKFILLED TO ONE (1) FOOT ABOVE TOP OF PIPE WITH BANK SAND. TRENCHES UNDER OR WITHIN ONE (1) FOOT OF PROPOSED OR FUTURE PAVEMENT, BACKFILL FROM TOP OF BANK SAND TO BOTTOM OF PROPOSED SUBGRADE UNDER PAVEMENT WITH CEMENT STABILIZED SAND (1.1 SACKS OF CEMENT PER TON OF SAND).*
15. *ALL FIRE HYDRANTS ARE TO BE LOCATED AS SHOWN ON THE PLANS AND SET THREE (3) FEET BEHIND THE CURB OR AT APPROVED LOCATION ON RURAL ROADS. ALL FIRE HYDRANTS SHALL BE OF THE DESIGNATED TYPE, AND AUDITED AND PAINTED AS PER CITY OF FRIENDSWOOD TECHNICAL SPECIFICATIONS.*
16. *ALL TAPPING SLEEVES SHALL BE STAINLESS STEEL FULL CIRCLE WITH MECHANICAL JOINT TAPPING SLEEVE.*
17. *THE CONTRACTOR SHALL NOT OPERATE EXISTING CITY WATER VALVES. THE CONTRACTOR SHALL NOTIFY THE CITY OF FRIENDSWOOD ENGINEERING DEPARTMENT A MINIMUM OF TWENTY-FOUR (24) HOURS PRIOR TO ANY VALVE OPERATION NECESSARY FOR THE PROJECT. IF ANY VALVE CLOSING WILL RESULT IN INTERRUPTED SERVICE TO RESIDENTS OR BUSINESSES, THE CONTRACTOR SHALL BE RESPONSIBLE FOR PROVIDING PROPER NOTICE TO THE AFFECTED PARTIES.*
18. *FOR ALL CONSTRUCTION WATER USAGE ON THE PROJECT, A FIRE HYDRANT METER SHALL BE OBTAINED FROM THE CITY OF FRIENDSWOOD PUBLIC WORKS DEPARTMENT AT 15355 BLACKHAWK BLVD (281-996-3380). A DEPOSIT SHALL BE REQUIRED FOR THE METER AND A FEE SHALL BE CHARGED FOR ALL METERED WATER USAGE. THE CONTRACTOR SHALL SUPPLY A BACKFLOW PREVENTER FOR THE FIRE HYDRANT METER.*
19. *ALL SPRINKLER AND IRRIGATION LINES SHALL BE EQUIPPED WITH A BACKFLOW PREVENTION DEVICE ACCORDING TO IT'S APPLICATION AS REQUIRED BY TCEQ.*
20. *BLUE REFLECTORIZED PAVEMENT MARKERS SHALL BE PLACED ADJACENT TO THE FIRE HYDRANTS AND AT A POINT OFFSET SIX (6) INCHES FROM THE CENTERLINE OF THE ROADWAY (REFLECTOR SURFACES TO FACE TRAFFIC FLOW).*
21. *BACKFLOW PREVENTERS SHALL BE INSTALLED INSIDE THE BUILDING.*
22. *WHERE THE FIRE LINE EXCEEDS SIXTY (60) FEET FROM THE TAP TO THE RISER, THE BACKFLOW PREVENTER SHALL BE INSTALLED IN A VAULT AT THE PROPERTY LINE.*
23. *CONTROL VALVES FOR FIRE SPRINKLER SYSTEMS SHALL BE INSTALLED INSIDE THE BUILDING.*
24. *ALL VALVES CONTROLLING THE WATER SUPPLY FOR AN AUTOMATIC SPRINKLER SYSTEM SHALL BE ELECTRICALLY SUPERVISED AT THE FIRE ALARM PANEL.*
25. *ALL PUMPS, TANKS, WATER LEVELS AND TEMPERATURES, CRITICAL AIR PRESSURES, AND WATER-FLOW SYSTEMS ON ALL SPRINKLER SYSTEMS SHALL BE SUPERVISED AT THE FIRE ALARM CONTROL PANEL.*
26. *RISER ROOM FOR THE SPRINKLER SYSTEM SHALL HAVE ACCESS FROM THE EXTERIOR OF THE BUILDING OR FROM A COMMON SPACE IN THE BUILDING. AT NO TIME SHALL AN ACCESS TO A RISER ROOM BE WITHIN A TENANT SPACE UNLESS THE BUILDING IS OCCUPIED BY A SINGLE TENANT.*
27. *THE FIRE DEPARTMENT CONNECTION (FDC) SHALL BE LOCATED AWAY FROM THE BUILDING AT LEAST ONE AND ONE-HALF (1½) TIMES THE HEIGHT OF THE BUILDING.*
28. *THE FDC SHALL BE ON THE STREET SIDE OF THE BUILDING.*
29. *THE FDC SHALL HAVE KNOX BOX LOCKING FDC CAPS.*
30. *A FIRE HYDRANT SHALL BE LOCATED WITHIN ONE HUNDRED (100) FEET OF THE FDC.*
31. *INSTALLATION OF PRIVATE FIRE SERVICE MAINS AND THEIR APPURTENANCES SHALL BE INSTALLED IN ACCORDANCE WITH IFC 2003 AND NFPA 24.*
32. *FIRE SERVICE LINES SHALL BE TESTED AT TWO HUNDRED (200) PSI FOR TWO (2) HOURS AND SHALL BE WITNESSED BY THE CITY FIRE MARSHAL.*
33. *WORKING PLANS SHALL BE SUBMITTED FOR APPROVAL BY THE CITY FIRE MARSHAL.*
34. *WORKING PLANS SHALL BE APPROVED, INSPECTED, AND TESTED BY THE CITY FIRE MARSHAL BEFORE THE BUILDING CAN BE OCCUPIED.*
35. *ALL VALVE OPERATING NUTS SHALL BE A MAXIMUM OF FOUR (4) FEET FROM TOP OF THE VALVE BOX. ANY EXTENSIONS REQUIRED TO ACHIEVE THE MAXIMUM LENGTH SHALL BE SUPPLIED BY THE CONTRACTOR AND ARE INCIDENTAL TO THE WORK.*
36. *CONTRACTOR SHALL BE RESPONSIBLE FOR VERIFYING THE LOCATION OF ALL EXISTING UTILITIES PRIOR TO EXCAVATION. DURING THE COURSE OF ANY AND ALL CLEARING, GRUBBING, FILL, GRADING, EXCAVATION OR OTHER CONSTRUCTION, CONTRACTOR SHALL ENSURE THAT STORM DRAINAGE PATHWAYS ARE MAINTAINED AND REMAIN OPEN TO ENSURE POSITIVE DRAINAGE AND THAT SUCH CONVEYANCES ARE NOT IMPEDED OR BLOCKED IN ANY WAY. STORM SEWER INLETS SHALL BE PROTECTED FROM ENTRY OF SILT, TRASH, DEBRIS, AND ANY SUBSTANCES DETERIOUS TO THE STORM SEWER SYSTEM AND/OR WATERWAYS RECEIVING STORM WATER RUNOFF. CONTRACTOR SHALL, AT COMPLETION OF WORK, FILL LOW SPOTS AND GRADE ALL RIGHTS-OF-WAY AND UTILITY EASEMENTS AND REGRADE/RESTORE DITCHES NECESSARY TO MAINTAIN AND/OR ESTABLISH POSITIVE DRAINAGE.*

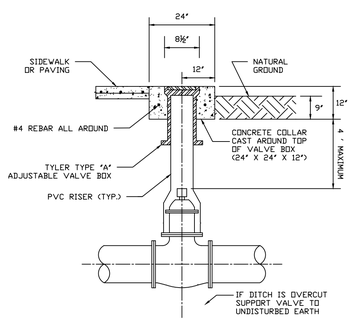


MINIMUM WALL THICKNESS FOR PIPE AND FITTINGS	
4"	0.250"
6"	0.280"
8"	0.322"
≥ 12"	0.375"

TYPICAL STEEL SECTION FITTINGS	
QTY.	DESCRIPTION
4	6" X 45° STEEL BENDS
2	6" BELL-FLANGE ADAPTERS
2	6" SLIP-ON FLANGES 150#
2	6" INSULATED JOINT KITS

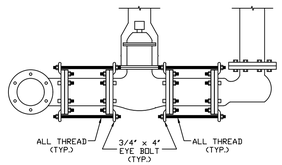
STEEL PIPE OFFSET SECTION

1. ALL MATERIALS AND COATINGS SHALL BE IN ACCORDANCE WITH THE CITY OF FRIENDSWOOD TECHNICAL SPECIFICATIONS.
2. RESTRAIN EXISTING PIPING BEYOND STEEL SECTION AS REQUIRED TO PREVENT MOVEMENT.
3. INSULATED JOINT SHALL BE MADE UP USING INSULATING GASKETS, PLASTIC BOLT SLEEVES AND WASHERS OF INSULATING GASKET MATERIAL BACKED WITH STAINLESS STEEL WASHERS OR OTHER METHODS APPROVED BY THE CITY ENGINEER.
4. NO FIELD FABRICATION OR INTERIOR COATING OF STEEL WATER PIPE OFFSETS ALLOWED.

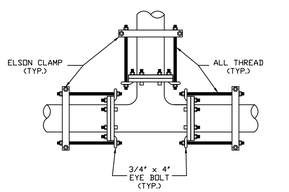


VALVE BOX INSTALLATION

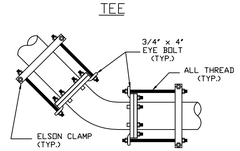
ALL FLUSHING AND GATE VALVES TO BE MECHANICAL JOINT AWWA STANDARD COUNTER-CLOCKWISE OPENING WITH RESILIENT SEATS.



FIRE HYDRANT ASSEMBLY



TEE



BEND

FITTING ANCHORS

NOTES:

1. MEGA-LUGS MAY BE USED IN PLACE OF ELSON CLAMPS AND ALL THREAD TO RESTRAIN JOINTS.
2. ALL NUTS, WASHERS AND ALL THREAD SHALL BE STAINLESS STEEL.

WATER DISTRIBUTION STANDARD DETAILS

FILE NAME: 15-WDSD-2022.DWG

DATE APPROVED: MARCH 30, 2022

SCALE: NTS

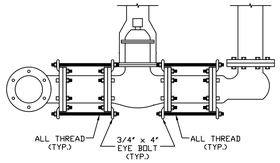
REVISED DATE: MARCH 2022

FRIENDSWOOD TEXAS

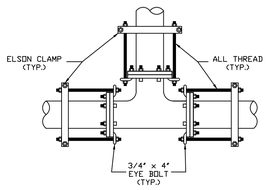
ENGINEERING DEPARTMENT

PROJECT NUMBER:

DATE SUBMITTED:



FIRE HYDRANT ASSEMBLY



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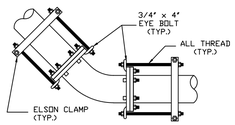

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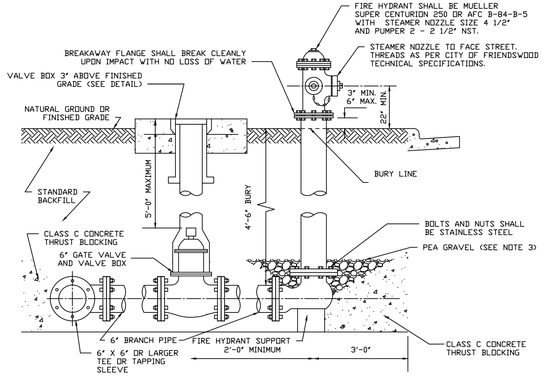

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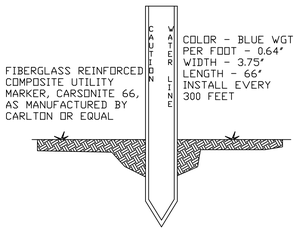
3. FILL PEA GRAVEL TO A MINIMUM DEPTH OF 6" OVER TOP OF FLANGE.



FIBERGLASS REINFORCED COMPOSITE UTILITY MARKER, CARSONITE 66, AS MANUFACTURED BY CARLTON OR EQUAL

COLOR - BLUE WGT PER FOOT - 0.64#
WIDTH - 3.75"
LENGTH - 66"
INSTALL EVERY 300 FEET

WATERLINE MARKER

WATER DISTRIBUTION STANDARD DETAILS (CONTINUED)

FILE NAME: 16-WDSD2-2022.DWG

DATE APPROVED: MARCH 30, 2022

SCALE: NTS

REVISED DATE: MARCH 2022

ENGINEERING DEPARTMENT

PROJECT NUMBER:

DATE SUBMITTED:

SHEET: 2 OF 2