Key Largo Wastewater Treatment District
Board of Commissioners Meeting
Agenda Item Summary

Meeting Date:
May 19, 2026

Agenda Item Number: N-1

Action Required:
Yes

Department:
Engineering

Sponsor:
Robert Mather, P.E.

Subject:
May 2026 Construction Standards Update

Summary of Discussion:

The District has previously adopted Minimum Design and Construction Standards and Specifications governing wastewater facilities constructed by developers, owners, customers, and users. Apex has performed a detailed review and modernization of the standards, which have not undergone revision in approximately ten years.
A key component of the revisions is that all newly constructed wastewater infrastructure is required to be equipped with Flovac monitoring components prior to final acceptance by the District to continue the progress in identifying and reducing inflow and infiltration.

Reviewed / Approved		Financial Impact	Attachments
Operations:	_____	$ 0.00	1. KLWTD May 2026 Construction Standards Update Memo
Administration:	_____		2. May 2026 KLWTD Construction Standards
Finance:	_____	Funding Source:	
District Counsel:	_____	N/A	
District Clerk:	_____	Budgeted:	
Engineering:	_____	N/A	

Approved By: _____ **Date:** 5-14-26
General Manager

Memorandum

Date: May 12, 2026

To: KLWTD Board of Commissioners

From: Robert Mather, P.E.

Regarding: Updates to the KLWTD Construction Standards

Dear Commissioners,

In accordance with the KLWTD General Rules and Regulations, the District has adopted Minimum Design and Construction Standards and Specifications governing wastewater facilities constructed by developers, owners, customers, and users. These standards define the engineering design criteria and construction requirements applicable to infrastructure ultimately conveyed to and maintained by the District and certain minimum requirements for onsite infrastructure that will remain the property of the property owner.

The District continues to demonstrate a strong commitment to identifying and reducing inflow and infiltration (I&I) within the collection system, most notably through implementation of the Flovac Monitoring System. To support and expand this effort, Apex has undertaken a comprehensive update of the District's construction standards. The current standards have not undergone significant revision in approximately ten (10) years, and updates are necessary to reflect current practices, technologies, and regulatory requirements.

A key component of the proposed revisions is the requirement that all newly constructed wastewater infrastructure be equipped with Flovac monitoring components. This requirement will apply to vacuum pits, buffer tanks, grinder pump systems, lift stations, and other applicable facilities. Installation of these components will be required prior to final acceptance by the District. Incorporating monitoring infrastructure at the time of construction ensures compatibility with the District's existing system and enhances long-term operational efficiency and data collection capabilities.

In addition to the monitoring requirements, Apex has performed a detailed review and modernization of the standards. The revised document includes updated notes, construction details, and testing procedures consistent with current industry standards. The standards address gravity, force main, and vacuum sewer systems; system testing and reporting protocols; and detailed requirements for service laterals, vacuum pits, cleanouts, air intake terminals, vacuum mains, manholes, trenching, valve boxes, and related appurtenances. The revisions also formally incorporate the current Florida Building Code: Plumbing (FBC), ensuring consistency with applicable state requirements.

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Table Summary of Revisions

Sheet	Revision	Description
G-1.0	Cover Sheet	Updated date and added drawing index
G-2.0	Gen. Notes	Incorporated Florida Building Code: Plumbing
G-2.0	Sewer Collection System	Updated force main pressure pipe specifications.
G-2.0	Testing Requirements	Updated leakage test pressure Added vacuum system testing procedures
G-2.0	Flovac Monitoring	Added Flovac Monitoring requirements
G-3.0	Concrete Collars	Increased thickness and width from 6” to 8”
G-4.0	Dedicated Air Intakes	Added VE zone protection requirement, increased pad thickness, added notes for coated rebar placement to support terminal
G-4.0	Flowable Fill Detail	Added plastic wrap requirements, revised mix strength
G-5.0	Airvac Details	Removed 90-degree connections to mains, updated notes
G-6.0	Vacuum Service Laterals	Revised connection details to eliminate 90-degree bends
G-7.0	Manhole Notes	Added requirements for pipe penetration sealing
G-7.0	Trench Details	Updated details for unsuitable soil conditions
G-1.0 to G-8.0	General Formatting	Improved clarity and organization; reduced from 10 sheets to 8 sheets

Based on the need to modernize the District’s standards, improve system monitoring capabilities, and align with current codes and best practices, Apex recommends that the Board approve and adopt the revised Minimum Design and Construction Standards and Specifications.

Enclosures: May 2026 KLWTD Construction Standards

SANITARY SEWER CONSTRUCTION STANDARDS

GENERAL NOTES AND STANDARD DETAILS FOR

KEY LARGO WASTEWATER TREATMENT DISTRICT

MAY 2026

INDEX OF DRAWINGS

OWNER

KEY LARGO WASTEWATER TREATMENT DISTRICT
103355 OVERSEAS HIGHWAY
KEY LARGO, FL 33037

PREPARED BY

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GENERAL NOTES

1. THE REQUIREMENTS OF KLWTD STANDARD SPECIFICATIONS AND STANDARD DETAILS SHALL GOVERN ALL UTILITIES WORK, WHERE A CONFLICT EXISTS IN THE REQUIREMENTS OF A REFERENCED MATERIAL OR INSTALLATION STANDARD, THE REQUIREMENTS OF THE KLWTD SHALL PREVAIL. WHERE THE REQUIREMENTS OF A STATE OR LOCAL AGENCY HAVING JURISDICTION ARE MORE STRINGENT, THOSE REQUIREMENTS SHALL PREVAIL.
2. THE CURRENT EDITION OF THE FLORIDA BUILDING CODE: PLUMBING IS HEREIN ADOPTED BY THE KLWTD BOARD OF COMMISSIONERS, AND SHALL BE APPLICABLE TO ALL PROJECTS WHERE THESE STANDARDS APPLY.
3. THE CONTRACTOR SHALL HAVE AVAILABLE AT THE JOB SITE, AT ALL TIMES, ONE COPY OF KLWTD STANDARD SPECIFICATIONS AND STANDARD DETAILS, ONE COPY OF THE CONTRACT DOCUMENTS INCLUDING PLANS, SPECIFICATIONS AND SPECIAL PROVISIONS, AND COPIES OF ANY REQUIRED CONSTRUCTION PERMITS.
4. CONTRACTOR IS RESPONSIBLE FOR CHECKING ACTUAL SITE CONDITIONS BEFORE STARTING CONSTRUCTION.
5. ANY DISCREPANCIES ON THE DRAWINGS SHALL BE BROUGHT TO THE ATTENTION OF THE ENGINEER AND KLWTD BEFORE COMMENCING WORK.
6. CONTRACTOR SHALL OBTAIN ALL REQUIRED PERMITS BEFORE COMMENCING WORK.
7. THE CONTRACTOR SHALL CONTACT ALL CONCERNED UTILITIES AND THE ENGINEER AT LEAST 48 HOURS IN ADVANCE OF CONSTRUCTION OPERATION.
8. NO FIELD CHANGES OR DEVIATIONS FROM DESIGN TO BE MADE WITHOUT PRIOR APPROVAL OF THE ENGINEER.
9. CONTRACTOR TO VERIFY THE LOCATIONS OF ALL UNDERGROUND UTILITIES BEFORE COMMENCEMENT OF WORK

SEWER COLLECTION SYSTEM

1. GRAVITY SEWER PIPE, WHEN SPECIFIED AS DUCTILE IRON, SHALL BE EPOXY COATED CLASS 51.
2. FORCE MAIN SANITARY SEWER PIPING SHALL BE PRESSURE PIPE CONFORMING TO AWWA C900/C905, PVC DR18, MIN PRESSURE RATED 235 PSI OR AWWA C906, HDPE DR11.
3. VACUUM MAIN SEWER PIPE SHALL BE PVC SDR 21, 200 PSI PRESSURE RATED PIPE CONFORMING TO ASTM D-2241 AND ASTM D3139.
4. JOINTS FOR PVC SEWER SHALL BE RUBBER GASKETED TYPE CONFORMING TO ASTM D3212 AND ASTM F477.
5. GASKETED JOINTS SHALL BE "RIEBER STYLE" (OR APPROVED EQUAL) 200 PSI RATED COMPLYING WITH ASTM D3139.
6. ALL PVC SEWER PIPE SHALL BE INSTALLED IN ACCORDANCE WITH THE UNI-BELL PLASTIC PIPE ASSOCIATION STANDARD NI-B-5.
7. ALL SEWER PIPE TO HAVE A MINIMUM COVER OF 3'-0" UNLESS OTHERWISE NOTED.
8. UNLESS OTHERWISE NOTED MANHOLE TOP ELEVATIONS SHALL BE: PAVED AREA - FLUSH WITH PAVEMENT. UNPAVED AREA - 0.25' ABOVE FINISH GRADE MINIMUM.
9. AIR RELEASE VALVES SHALL BE INSTALLED AT ALL HIGH POINTS ALONG FORCE MAIN.
10. SERVICE CONNECTIONS SHALL BE 4" FOR SINGLE AND 6" OR LARGER FOR MULTIPLE RESIDENTIAL AND COMMERCIAL SERVICES. LOCATE EACH SERVICE CONNECTION FROM THE CENTER OF THE DOWNSTREAM MANHOLE AND RECORD THEIR LOCATION.
11. THE SEWER COLLECTION SYSTEM SHALL NOT BE PLACED IN SERVICE UNTIL THE SYSTEM HAS BEEN VISUALLY INSPECTED AND FLUSHED OF SEDIMENT AND DEBRIS. MUST HAVE APPROVAL FROM KLWTD AND, WHEN APPLICABLE, FROM DEP PRIOR TO PLACING ANY SYSTEM INTO SERVICE.
12. GRAVITY SEWER LINES SHALL BE T.V. INSPECTED AND THE ALIGNMENT BETWEEN MANHOLES CHECKED BY USING LIGHTS, LASER BEAMS OR OTHER SUITABLE MEANS.
13. GRAVITY SEWER LINES SHALL BE TESTED BY ONE OF THE FOLLOWING METHODS: WATER EXFILTRATION OR LOW PRESSURE AIR EXFILTRATION AS DIRECTED BY KLWTD REPRESENTATIVE.
14. FORCE MAIN SEWER PIPE FITTINGS SHALL BE OF DUCTILE IRON, MECHANICAL JOINT, CEMENT MORTAR LINED IN ACCORDANCE WITH ANSI 21.4 RATED AT 350 PSI AND SHALL COMPLY WITH ANSI A21.10 AND A21.11.
15. MANHOLES AND LIFT STATIONS SHALL BE PHYSICALLY INSPECTED AND HYDROSTATICALLY TESTED TO ENSURE THE ABSENCE OF LEAKS.
16. FORCE MAIN SEWER PIPE SHALL BE PRESSURE TESTED IN ACCORDANCE WITH THE ENGINEER'S RECOMMENDATIONS.
17. VACUUM MAIN SEWER PIPE SHALL BE VACUUM TESTED IN ACCORDANCE WITH THE ENGINEER'S RECOMMENDATIONS.

CONSTRUCTION IN STREET AND ROAD RIGHT-OF-WAYS

1. OPEN ROAD CUTS REQUIRES PRIOR APPROVAL BY THE KLWTD, COUNTY, STATE OR ANY OTHER AGENCY WHICH MAY HAVE JURISDICTION.
2. ALL CONSTRUCTION, MATERIALS AND WORKMANSHIP ARE TO BE IN ACCORDANCE WITH FLORIDA DEPARTMENT OF TRANSPORTATION SPECIFICATIONS AND STANDARDS.
3. ALL AREAS IN EXISTING RIGHT-OF-WAY DISTURBED BY CONSTRUCTION SHALL RECEIVE SOD OR ROCK TO MATCH EXISTING.
4. STREET OR HIGHWAY RESTORATION TO BE DONE AS PER LOCAL OR STATE AGENCY HAVING JURISDICTION.
5. THE CONTRACTOR SHALL COMPLY WITH ALL RULES AND REGULATIONS OF THE STATE, COUNTY AND CITY AUTHORITIES REGARDING CLOSING OR RESTRICTING THE USE OF PUBLIC STREETS OR HIGHWAYS.
6. TRAFFIC CONTROL ON ALL COUNTY AND STATE HIGHWAY RIGHT-OF-WAYS SHALL MEET THE REQUIREMENTS OF THE CURRENT VERSION OF FDOT'S "STANDARD SPECIFICATIONS FOR ROAD & BRIDGE CONSTRUCTION' AND THE REQUIREMENTS OF THE STATE AND ANY LOCAL AGENCY HAVING JURISDICTION.
7. CONTRACTOR SHALL COMPLY WITH THE TRENCH SAFETY ACT (90-90 LAWS OF FLORIDA) EFFECTIVE OCTOBER 1, 1990.
8. CONTRACTOR TO HAVE PRE-APPROVED MOT PLANS FOR VARIOUS SITUATIONS ON HAND AND AVAILABLE FOR ON-SITE INSPECTION.

COLLECTION AND TRANSMISSION SYSTEM TESTING AND REPORTING REQUIREMENTS

GENERAL TESTING REQUIREMENTS

A. ALL FINAL TESTS SHALL BE MADE IN THE PRESENCE OF A REPRESENTATIVE FROM KEY LARGO WASTEWATER TREATMENT DISTRICT (THE UTILITY). NOTIFY THE UTILITY AT LEAST 48 HOURS BEFORE ANY WORK IS TO BE INSPECTED OR TESTED.

B. ALL DEFECTS IN PIPING SHALL BE REPAIRED AND/OR REPLACED AND RETESTED UNTIL ACCEPTABLE. REPAIRS SHALL BE MADE TO THE STANDARD OF QUALITY SPECIFIED FOR THE ENTIRE SYSTEM.

C. SECTIONS OF THE SYSTEM MAY BE TESTED SEPARATELY, BUT ANY DEFECT WHICH MAY DEVELOP IN A SECTION PREVIOUSLY TESTED AND ACCEPTED SHALL BE PROMPTLY CORRECTED AND RETESTED. PRESSURE TESTS SHALL BE MADE BETWEEN VALVES TO DEMONSTRATE ABILITY OF VALVES TO SUSTAIN PRESSURE.

D. PROVIDE ALL NECESSARY TESTING EQUIPMENT. INCREMENTS ON GAUGES USED FOR PRESSURE PIPE TESTING SHALL BE SCALED TO THE NEAREST 1 PSI. GAUGES AND PUMPS SHALL BE IN GOOD WORKING ORDER WITH NO NOTICEABLE LEAKS.

E. TESTS FOR ANY EXPOSED PIPING SHALL BE MADE BEFORE COVERING AND INSTALLATION IS PLACED.

F. THE PRESSURE AND LEAKAGE TEST FOR BURIED PIPING SHALL BE MADE AFTER ALL JOINTING OPERATIONS ARE COMPLETED AND RESTRAINTS HAVE BEEN IN PLACE AT LEAST SEVEN (7) DAYS. LINES TESTED BEFORE BACKFILL IS IN PLACE SHALL BE RETESTED AFTER COMPACTED BACKFILL IS PLACED.

G. SHORT SECTIONS OF PIPING, SUCH AS THOSE BETWEEN VALVES, MAY BE ISOLATED FOR TESTING. IF SHORT SECTIONS ARE TESTED, TEST PLUGS OR BULKHEADS REQUIRED AT THE ENDS OF THE TEST SECTION TOGETHER WITH ALL ANCHORS, BRACES, AND OTHER DEVICES REQUIRED TO WITHSTAND THE HYDROSTATIC PRESSURE WITHOUT IMPOSING ANY THRUST ON THE PIPE LINE, SHALL BE FURNISHED AND INSTALLED BY THE CONTRACTOR. CONTRACTOR SHALL BE SOLELY RESPONSIBLE FOR ANY DAMAGE WHICH MAY RESULT FROM THE FAILURE OF TEST PLUGS OR SUPPORTS.

H. ALL ITEMS INCLUDING VALVES AND CONTROLS SHALL BE GIVEN A THOROUGH TEST. THE ENTIRE SYSTEM SHALL BE OPERATED FOR TWO (2) DAYS TO PROVE COMPATIBILITY OF EQUIPMENT AND TO ACHIEVE PROPER ADJUSTMENT FOR OPERATION. VALVES, PIPES, TANKS, AND OTHER ITEMS THAT ARE NOT OPERATIONAL OR ARE ONLY OPERATED ON OCCASION, SHALL BE TESTED FOR THE ABILITY TO MEET REQUIRED DESIGN CRITERIA.

FORCE MAIN TESTING

PRESSURE AND LEAKAGE TESTING (PVC AND DI MAINS)

A. PIPING SHALL BE SLOWLY FILLED WITH WATER AND ALL AIR EXPELLED. CARE SHALL BE TAKEN THAT ALL AIR RELEASE VALVES ARE INSTALLED AND OPEN IN THE SECTION BEING FILLED, AND THAT THE RATE OF FILLING DOES NOT EXCEED THE VENTING CAPACITY OF THE AIR RELEASE VALVES.

B. APPLY LEAKAGE TEST PRESSURE OF 150 PSI. MAINTAIN PRESSURE AT A MAXIMUM VARIATION OF 5% DURING ENTIRE LEAKAGE TEST. THE DURATION OF THE LEAKAGE TEST SHALL BE TWO HOURS MINIMUM, AND FOR SUCH ADDITIONAL TIME NECESSARY FOR THE UTILITY TO COMPLETE INSPECTION OF THE SECTION OF LINE UNDER TEST. LEAKAGE MEASUREMENTS SHALL NOT BE STARTED UNTIL A CONSTANT TEST PRESSURE HAS BEEN ESTABLISHED. THE LINE LEAKAGE SHALL BE MEASURED BY MEANS OF A GRADUATED RESERVOIR INSTALLED ON THE SUPPLY SIDE OF THE PRESSURE PUMP.

C. NO LEAKAGE IS ALLOWED IN EXPOSED PIPING, BURIED PIPING WITH FLANGED, THREADED, OR WELDED JOINTS OR BURIED NON-POTABLE PIPING IN CONFLICT WITH POTABLE WATER LINES.

D. TESTED SECTIONS OF BURIED PIPING WITH SLIP-TYPE OR MECHANICAL JOINTS WILL NOT BE ACCEPTED IF IT HAS A LEAKAGE RATE IN EXCESS OF THE RATE DETERMINED BY THE FORMULA:

AWWA C-600 DUCTILE IRON MAINS L = SDP / 133,200
AWWA MANUAL NO. M-23 - PVC MAIN L = NDP / 7,400

L= MAXIMUM PERMISSIBLE LEAKAGE RATE, IN GALLONS PER HOUR, THROUGHOUT THE ENTIRE LENGTH OF LINE BEING TESTED.
S = LENGTH OF LINE TESTED (IN FEET)
D = NOMINAL INTERNAL DIAMETER (IN INCHES) OF THE PIPE
N = NUMBER OF JOINTS ALONG PIPE BEING TESTED
P = THE SQUARE ROOT OF THE ACTUAL PRESSURE (IN PSIG) ON ALL JOINTS IN THE TESTED PORTION OF THE LINE. THIS ACTUAL PRESSURE SHALL BE DETERMINED BY FINDING THE DIFFERENCE BETWEEN THE AVERAGE ELEVATION OF ALL TESTED PIPE JOINTS AND THE ELEVATION OF THE PRESSURE GAUGE AND ADDING THE DIFFERENCE IN ELEVATION HEAD TO THE AUTHORIZED TEST PRESSURE.

E. ALL APPARENT LEAKS DISCOVERED AFTER FINAL ACCEPTANCE OF THE WORK BY THE UTILITY SHALL BE LOCATED AND REPAIRED, REGARDLESS OF THE TOTAL LINE LEAKAGE RATE.

PRESSURE AND LEAKAGE TESTING (POLYETHYLENE MAINS)

A. PIPING SHALL BE SLOWLY FILLED WITH WATER AND ALL AIR EXPELLED. CARE SHALL BE TAKEN TO ENSURE THAT ALL AIR VALVES ARE INSTALLED AND OPEN IN THE SECTION BEING FILLED, AND THAT THE RATE OF FILLING DOES NOT EXCEED THE VENTING CAPACITY OF THE AIR VALVES.

B. SUBJECT PIPELINE TO BE TESTED TO A FOUR (4) HOUR EXPANSION PHASE PRIOR TO COMMENCING LEAKAGE TESTING. PIPELINE EXPANSION SHALL BE ACCOMPLISHED BY APPLYING HYDROSTATIC TEST PRESSURE OF 150 PSI. IN ORDER TO COMPENSATE FOR THE INITIAL EXPANSION OF THE PIPELINE, ADD SUFFICIENT MAKEUP WATER AT HOURLY INTERVALS TO RETURN TO THE REQUIRED TEST PRESSURE. AT THE END OF THE FOURTH HOUR, THE TEST PHASE IS TO COMMENCE.

C. AT THE CONCLUSION OF THE FOURTH HOUR OF THE EXPANSION PHASE, FILL THE PIPELINE AGAIN WITH MAKEUP WATER TO RETURN TO THE TEST PRESSURE. THE TEST PHASE SHALL CONSIST OF A TWO (2) HOUR OR THREE (3) HOUR PRESSURE TEST, AS REQUIRED BY THE UTILITY. AT THE END OF THE TEST PHASE, MEASURE THE AMOUNT OF MAKEUP WATER REQUIRED TO RETURN TO THE TEST PRESSURE. THE PIPELINE PASSES THE PRESSURE TEST IF THE MAKEUP WATER REQUIRED DOES NOT EXCEED THE FOLLOWING:

NOMINAL PIPE SIZE (IN)	ALLOWABLE MAKEUP WATER	
	TWO HOUR TEST	THREE HOUR TEST
4	0.25	0.4
6	0.6	0.9
8	1	1.5
12	2.3	3.4
16	3.3	5
18	4.3	6.5
20	5.5	8
24	8.9	13.3

D. IF ANY DEFECTS OR LEAKS ARE REVEALED, THEY SHOULD BE CORRECTED AND THE PIPELINE RETESTED AFTER A MINIMUM 24 HOUR RECUPERATION PERIOD BETWEEN TESTS. TOTAL TESTING CONDUCTED ON A SECTION OF PIPELINE SHALL NOT EXCEED 8 HOURS WITHIN A 24 HOUR PERIOD.

E. ALL APPARENT LEAKS DISCOVERED WITHIN ONE YEAR FROM THE DATE OF FINAL ACCEPTANCE OF THE WORK BY THE OWNER SHALL BE LOCATED AND REPAIRED BY CONTRACTOR, REGARDLESS OF THE TOTAL LINE LEAKAGE RATE.

GRAVITY SEWER TESTING

VISUAL INSPECTIONS (FOR NEW SYSTEMS ONLY)

A. PRIOR TO INSPECTIONS AND TESTING, CLEAN ALL INSTALLED LINES AND MANHOLES.

B. AFTER BACKFILL HAS BEEN PLACED, THE UTILITY WILL VISUALLY INSPECT ALL GRAVITY FLOW LINES TO CHECK ALIGNMENT AND GRADE. ALL OBSTRUCTIONS SHALL BE REMOVED.

C. PROVIDE LIGHT SOURCE AND MIRRORS FOR LAMPING OF SEWER. ANY SEWER IN WHICH THE DIRECT LIGHT OF A LAMP CANNOT BE VIEWED IN EITHER DIRECTION, FULL CIRCLE, BETWEEN ADJACENT MANHOLES SHALL BE CONSIDERED UNSATISFACTORY, UNLESS THE LINE IS DESIGNED WITH HORIZONTAL DEFLECTIONS, AND SHALL BE REPAIRED.

LEAKAGE TESTING (FOR NEW AND EXISTING SYSTEMS)

A. THE ALLOWABLE LIMITS OF INFILTRATION OR EXFILTRATION FOR THE ENTIRE SYSTEM, OR ANY PORTION THEREOF, SHALL NOT EXCEED A RATE OF 100 GALLONS PER INCH OF INSIDE PIPE DIAMETER PER MILE OF PIPE PER 24 HOURS. NO ADDITIONAL ALLOWANCE WILL BE MADE FOR HOUSE SERVICE LINES. THE ALLOWABLE LIMITS OF INFILTRATION OR EXFILTRATION OF MANHOLES SHALL NOT EXCEED A RATE OF FOUR (4) GALLONS PER MANHOLE PER 24 HOURS.

B. ANY PART OR ALL OF THE SYSTEM MAY BE TESTED FOR INFILTRATION OR EXFILTRATION, AS DIRECTED BY THE UTILITY. PRIOR TO TESTING FOR INFILTRATION, ISOLATE THE SYSTEM TO ELIMINATE ALL EXTERNAL WATER SOURCES. THE SYSTEM SHALL THEN BE PUMPED OUT SO THAT NORMAL INFILTRATION CONDITIONS EXIST AT THE TIME OF TESTING.

C. THE AMOUNTS OF INFILTRATION OR EXFILTRATION SHALL BE DETERMINED BY PUMPING INTO OR OUT OF CALIBRATED DRUMS OR BY OTHER METHODS APPROVED BY THE UTILITY.

D. THE EXFILTRATION TEST WILL BE CONDUCTED BY FILLING THE PORTION OF THE SYSTEM BEING TESTED WITH WATER TO A LEVEL EQUAL TO THE LOWEST PART OF THE MANHOLE FRAME.

E. TESTS SHALL BE CONDUCTED ON PORTIONS OF THE SYSTEM NOT EXCEEDING THREE MANHOLE RUNS OR MAXIMUM OF 1,200 FEET, WHICHEVER IS GREATER, UNLESS OTHERWISE DIRECTED BY THE UTILITY. TESTS SHALL BE RUN CONTINUOUSLY FOR TWO HOURS. TEST DURATION MAY BE REDUCED TO NO LESS THAN TEN MINUTES AT DISCRETION OF KLWTD INSPECTOR.

F. WHERE INFILTRATION OR EXFILTRATION EXCEED THE ALLOWABLE LIMITS SPECIFIED HEREIN, THE DEFECTIVE PIPE, JOINTS, OR OTHER FAULTY CONSTRUCTION SHALL BE LOCATED AND REPAIRED. IF THE DEFECTIVE PORTIONS CANNOT BE LOCATED, THESE PORTIONS SHALL BE REMOVED AND RECONSTRUCTED TO THE EXTENT NECESSARY TO CONFORM TO THE SPECIFIED ALLOWABLE LIMITS.

G. THE PROPERTY OWNER, AT NO EXPENSE TO THE UTILITY, SHALL PROVIDE ALL LABOR, EQUIPMENT AND MATERIALS, AND SHALL CONDUCT ALL TESTING REQUIRED, UNDER THE DIRECTION OF THE UTILITY.

DEFLECTION TESTING (FOR NEW SYSTEMS ONLY)

A. CONDUCT PIPELINE DEFLECTION TESTING AFTER THEFINAL BACKFILL HAS BEEN IN PLACE AT LEAST 30 DAYS.

B. MAXIMUM ALLOWABLE PIPE DEFLECTION IS 5%. MEASURE DEFLECTION BY MANUALLY PULLING A MANDREL THROUGH THE PIPE. THE MINIMUM MANDREL DIAMETER SHALL BE IN ACCORDANCE WITH THE FOLLOWING:

NOMINAL PIPE SIZE (IN)	BASE INSIDE DIAMETER (IN) (ASTMD3034 SDR 35 FOR PIPE 6" TO 15" ASTM F679 T-1 FOR PIPE 18" TO 27")	NIMUM MANDREL OUTER DIAMETER (IN) FOR 5% DEFLECTION TEST
6	5.742	5.45
8	7.665	7.28
10	9.563	9.08
12	11.361	10.79
15	13.898	13.20
18	16.979	16.13
21	20.004	19.00
24	22.480	21.36
27	25.327	24.06

C. DEFLECTION TESTING IS CONSIDERED SATISFACTORYIF THE MANDREL CAN BE PULLED BY HAND THROUGH THE PIPE BEING TESTED. IF THE MANDREL CANNOT BE PULLED THROUGH THE PIPE, REPLACE OR CORRECT THE PIPE AND RETEST UNTIL TESTING IS SATISFACTORY. ANY PIPE REMOVED OR CORRECTED DUE TO FAILINGDEFLECTION TESTING SHALL ALSO BE RE-TESTED FOR LEAKAGE.

LEAKAGE TESTING OF MANHOLES

A. PLUG INLETS AND OUTLETS AND FILL MANHOLE WITH WATER TO THE BOTTOM OF THE MANHOLE FRAME AND COVER. BYPASS PUMP SEWAGE AS REQUIRED.

B. WHERE PRACTICAL, A MANHOLE MAY BE FILLED 24 HOURS PRIOR TO TIME OF TESTING, IF DESIRED, TO PERMIT NORMAL ABSORPTION INTO THE PIPE WALLS TO TAKE PLACE.

C. LEAKAGE IN EACH MANHOLE SHALL NOT EXCEED 0.1 GALLON PER HOUR PER FOOT OF HEAD ABOVE THE INVERT.

D. DEFECTIVE MANHOLES; REPAIR BASED ON PLAN SUBMITTED TO AND APPROVED BY THE UTILITY. RETEST AS SPECIFIED.

SALINITY TESTING

A. CONDUCT FIELD TESTING FOR SALINITY AND SUBMIT DOCUMENTATION IN ACCORDANCE WITH THE FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION (FDEP) FT 1300- FIELD MEASUREMENT OF SALINITY MARCH 31,2008.

B. SAMPLE LOCATION: PUMP STATION WET WELL, MANHOLES, OR OTHER ACCESS POINT.

C. ACCEPTABLE SALINITY CONCENTRATION: LESS THAN 1 PART PER THOUSAND.

REPORTING REQUIREMENTS

A. A CONDITION REPORT, SIGNED AND SEALED BY AN ENGINEER LICENSED BY THE STATE OF FLORIDA, MUST BE ACCEPTED BY THE DISTRICT BEFORE THE FINAL TIE-IN IS COMPLETED.

B. THE CONDITION REPORT SHALL INCLUDE THE FOLLOWING:

1. A WRITTEN EVALUATION OF THE CONDITION OF THE EXISTING COLLECTION AND/OR TRANSMISSION SYSTEM. INCLUDE APPROXIMATE AGE OF THE SYSTEM AND CONSTRUCTION MATERIALS. DESCRIBE CONDITION OF MANHOLE AND WET WELL INTERIORS.

2. NOTE IF ANY OF THE FOLLOWING WAS OBSERVED:

2.1. STANDING WATER
2.2. EVIDENCE OF ROOT INTRUSION
2.3. ROOF DRAINS OR YARD DRAINS TIED INTO THE SYSTEM
2.4. INCORRECTLY SIZED GREASE TRAPS
2.5. OTHER PROBLEMS OR ABNORMALITIEN ENGINEER LICENSED BY THE STATE OF FLORIDA, MUST BE ACCEPTED BY THE DISTRICT BEFORE THE FINAL TIE-IN IS COMPLETED.

3. A DRAWING OR SKETCH OF THE COLLECTION AND/OR TRANSMISSION SYSTEM. INCLUDE PIPE LENGTHS AND DIAMETERS. INCLUDE A TYPICAL CROSS SECTION OF EXISTING MANHOLES.

4. TESTING REPORT THAT INCLUDES WHO WAS PRESENT, TIME AND DATE OF THE TEST, RESULTS OF THE TEST AND ANY CALCULATIONS.

5. RESULTS OF TESTS CONDUCTED IN ACCORDANCE WITH DISTRICT TESTING REQUIREMENTS. INDICATE WHETHER THE TEST PASSED OR FAILED. IF FAILED, DESCRIBE THE COURSE OF ACTION TO CORRECT DEFICIENCIES; AND INCLUDE THE RESULTS OF THE RETEST. INCLUDE CALCULATIONS.

VACUUM SEWER NOTES

VACUUM LINE TESTING - DAILY TESTING

A. A TWO (2) HOUR VACUUM TIGHTNESS TEST OF ALL SEWER MAINS AND LATERAL CONNECTIONS SHALL BE CONDUCTED DAILY AS FOLLOWS:

1.1. PLUG ALL OPEN CONNECTION WITH RUBBER STOPPERS OR TEMPORARY CAPS, FITTED TO THE PIPE BY "NO-HUB" COUPLINGS.
1.2. APPLY A VACUUM TO 22 INCHES HG TO THE PIPES AND ALLOW THE PRESSURE TO STABILIZE FOR 15 MINUTES.
1.3. THERE SHALL BE NO LOSS OF VACUUM IN EXCESS OF 1% PER HOUR FOR A TWO-HOUR TEST PERIOD.
1.4. THERE SHALL BE ABSOLUTELY NO WATER ALLOWED TO BE ADMITTED INTO THE PIPING NETWORK DURING THIS TEST.
1.5. THE DAILY TEST SHALL INCLUDE THE NEW SECTION OF PIPE LAID THAT PARTICULAR DAY IN ADDITION TO ALL PIPE CONNECTED TO THE SAME VACUUM MAIN THAT WAS LAID AND TESTED PREVIOUSLY.
1.6. ALL PARTIES SHALL WITNESS AND SIGN TESTING REPORT PER THE REPORTING REQUIREMENTS.

VACUUM LINE TESTING - FINAL TESTING

A. FOLLOWING THE INSTALLATION OF THE VACUUM MAIN, VACUUM LATERALS, AND VALVE PITS, ENSURE THAT THE DIVISION VALVES ARE OPENED.

B. A FINAL FOUR (4) HOUR VACUUM TIGHTNESS TEST OF ALL SEWER MAINS AND LATERAL CONNECTIONS SHALL BE CONDUCTED AS FOLLOWS:

1.1. PLUG ALL OPEN CONNECTION WITH RUBBER STOPPERS OR TEMPORARY CAPS, FITTED TO THE PIPE BY "NO-HUB" COUPLINGS.
1.2. APPLY A VACUUM TO 22 INCHES HG TO THE PIPES AND ALLOW THE PRESSURE TO STABILIZE FOR 15 MINUTES.
1.3. THERE SHALL BE NO LOSS OF VACUUM IN EXCESS OF 1" Hg FOR A FOUR-HOUR TEST PERIOD.
1.4. THERE SHALL BE ABSOLUTELY NO WATER ALLOWED TO BE ADMITTED INTO THE PIPING NETWORK DURING THIS TEST.
1.5. HE FINAL TEST SHALL INCLUDE ALL NEW SECTIONS OF PIPE LAID IN ADDITION TO ALL PIPE CONNECTED TO THE SAME VACUUM MAIN THAT WAS LAID AND TESTED PREVIOUSLY.
1.6. ALL PARTIES SHALL WITNESS AND SIGN TESTING REPORT PER THE REPORTING REQUIREMENTS.

FLOVAC MONITORING REQUIREMENTS

1. ALL NEW SANITARY SEWER INFRASTRUCTURE, INCLUDING VACUUM PITS, BUFFER TANKS, GRINDER PUMPS, AND LIFT STATIONS, PUBLIC OR PRIVATE, SHALL BE OUTFITTED WITH FLOVAC MONITORING COMPONENTS PRIOR TO FINAL ACCEPTANCE OF THE INFRASTRUCTURE.
2. MONITORING COMPONENTS SHALL BE TESTED AND VERIFIED TO BE IN GOOD, WORKING CONDITION PRIOR TO KLWTD TAKING OWNERSHIP OF THE COMPONENTS.
3. KLWTD WILL OWN, MAINTAIN, REPAIR, AND REPLACE THE MONITORING COMPONENTS FOLLOWING INSTALLATION.
4. FOR INSTALLATION OF MONITORING COMPONENTS ON PRIVATE PROPERTY, A GRANT OF EASEMENT FOR INSTALLATION AND MAINTENANCE OF LIFT STATION MONITORING EQUIPMENT WILL BE REQUIRED TO BE COMPLETED BY THE PROPERTY OWNER(S) AND RETURNED TO THE DISTRICT FOR RECORDING.

Project Information			
Approved By:	KLWTD	Design:	APEX
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Job No.:	KEY011	Checked:	APEX
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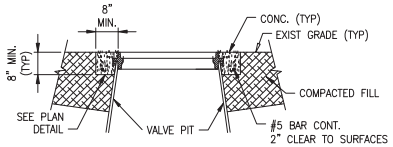
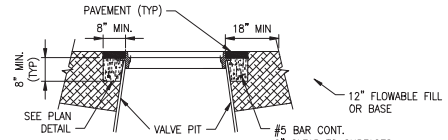
Date:	Revisions Description:

STANDARD DETAILS FOR
KEY LARGO WASTEWATER TREATMENT DISTRICT (KLWTD)
GENERAL NOTES AND SPECIFICATIONS

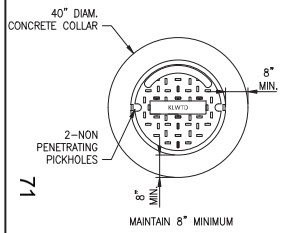
SHEET NO.
G-2.0



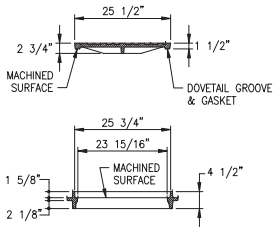
OUTSIDE PAVEMENT



WITHIN PAVEMENT

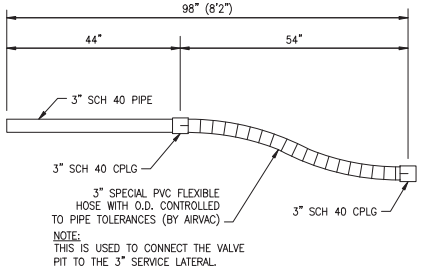


CONCRETE RING

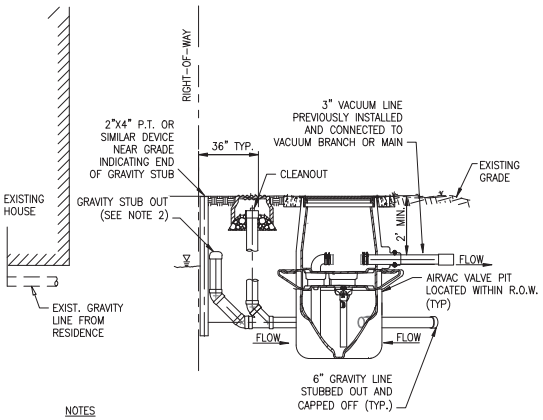


RING AND LID DIMENSIONS

VALVE PIT CONCRETE COLLAR DETAIL



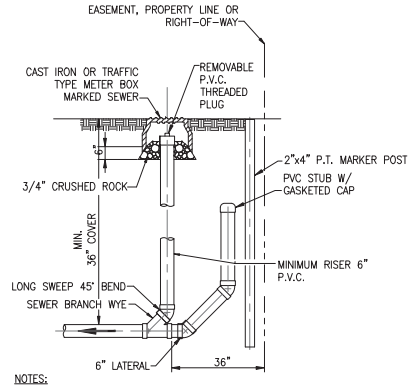
AIRVAC FLEXIBLE SERVICE LATERAL CONNECTOR (PREFABRICATED)



NOTES

1) 6-INCH GRAVITY LINE ROUTED FROM R/W LINE TO VACUUM VALVE PIT AND CONNECTED TO EXISTING STUB-OUT. USE SDR 21 OR PRESSURE PVC PIPE. PIPE TO BE INSTALLED WITH PROPER SLOPE (MIN 2%) AND BEDDING TO PREVENT POCKETS OR BELLIES. USE DWV 45° ELLS TO ADJUST DEPTH IF REQUIRED.
2) AFTER CLEANOUT STUB GRAVITY LATERAL AT A 45° ANGLE ABOVE THE WATER TABLE AND CAP.

VALVE PIT SECTION PRIOR TO HOME HOOK-UP

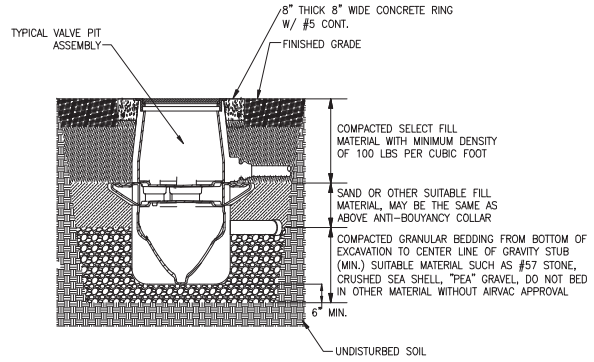


NOTES:

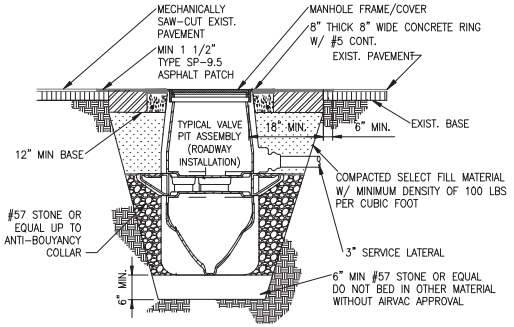
PROVIDE CLEAN-OUT ON SEWER LATERALS FOR THE FOLLOWING:

1. AT UTILITY EASEMENT LIMITS – SEE PLANS.
2. IN LOCATIONS WHERE LATERALS EXCEED 75 LINEAR FEET.

CLEANOUT DETAIL



1 PIECE VALVE PIT BEDDING AND BACKFILL DETAIL



NOTES:
1. SHIM MANHOLE FRAME/COVER TO MEET ROADWAY CROSS SECTION.
2. MATERIAL AND COMPACTION REQUIREMENTS AS PER SPECIFICATIONS
3. PRIME AND TACK COATS PER SPECIFICATIONS.

1 PIECE VALVE PIT INSTALLATION IN PAVED AREA

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GENERAL NOTES AND STANDARD DETAILS

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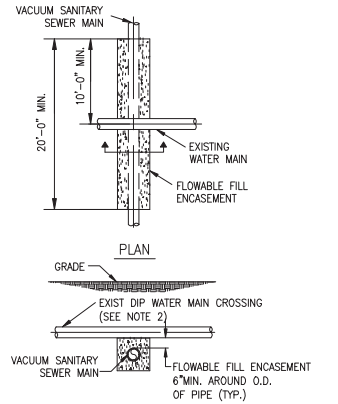
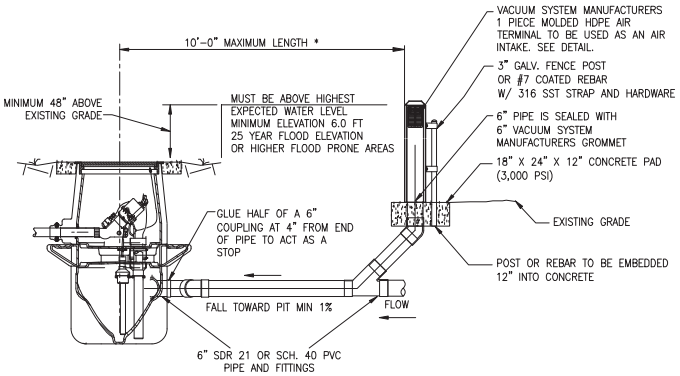
G-3.0



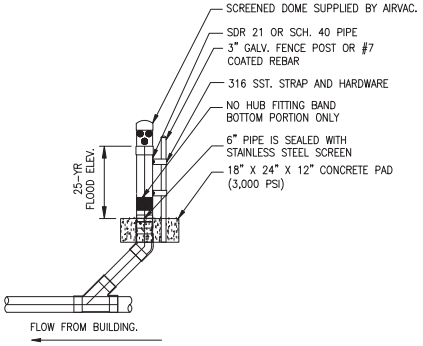
SECTION

ENCASEMENT NOTES:
1. CONCRETE ENCASEMENT LENGTH AS NOTED IN DRAWINGS.
2. EXCAVATABLE FLOWABLE FILL MIX: (500 PSI MIN)
3. MATERIALS SHALL BE AS SPECIFIED IN SECTION 03300 CONCRETE.
4. REQUIREMENT IS SAME FOR EXIST. WATER MAINS CROSSING UNDER VACUUM SANITARY SEWER MAINS.
5. THIS DETAIL SHALL BE USED WHERE VACUUM SEWER MAIN CROSSES ABOVE OR BELOW AN EXISTING OR PROPOSED WATERMAIN AND VERTICAL SEPARATION PER FAC 62-555 CANNOT BE MET.
6. VACUUM PIPE TO BE WRAPPED IN PLASTIC BEFORE ENCASEMENT.

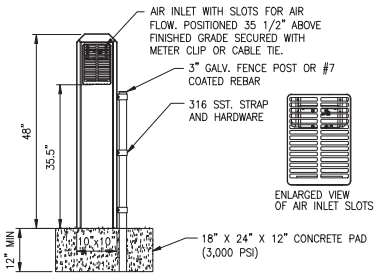
FLOWABLE FILL ENCASEMENT (VACUUM SANITARY SEWER MAINS)



6" AIR INTAKE TERMINAL DETAIL



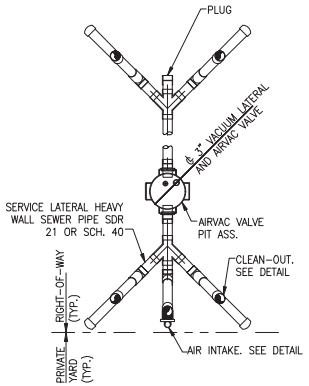
ALTERNATIVE AIR INTAKE



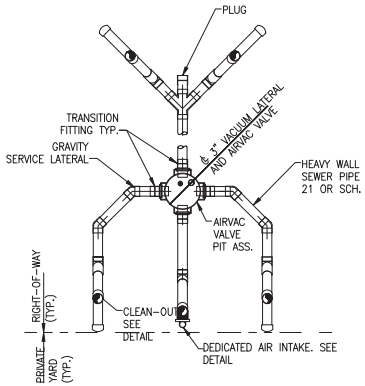
AIR TERMINAL DETAIL

AIR INTAKE NOTES:
1. MATERIAL: POLYETHYLENE, MOLDED CONSTRUCTION WITH APPROX. 3/16" WALL THICKNESS.
2. INSTALLATION: PUSH DOWN ONTO 6"Ø PVC PIPE INSTALLED AT 30" ABOVE GRADE ELEVATION. THE 6" PVC PIPE TO BE A DEDICATED AIR INTAKE PIPE FROM PIT.
3. BOTTOM OF INLET SHALL BE A MINIMUM 35.5" ABOVE GRADE.
4. WHERE 25-YR FLOOD ELEVATION IS GREATER THAN 36" ABOVE EXISTING GRADE THE ALTERNATE AIR INTAKE SHALL BE USED.
5. WHERE AIR INTAKES ARE INSTALLED IN "VE" FLOOD ZONES, ENGINEER IS REQUIRED TO PROVIDE DETAIL ON PROTECTION FROM WAVE AND DEBRIS IMPACTS.
6. AIR INTAKE PIPING SHALL CONNECT TO THE TOP OF GRAVITY LATERAL. WYE MUST BE IN VERTICAL POSITION.
7. ONE (1) AIR INTAKE SHALL BE INSTALLED PER PIT.
8. AIR INTAKE SHALL BE INSTALLED WITHIN 10' OF PIT.

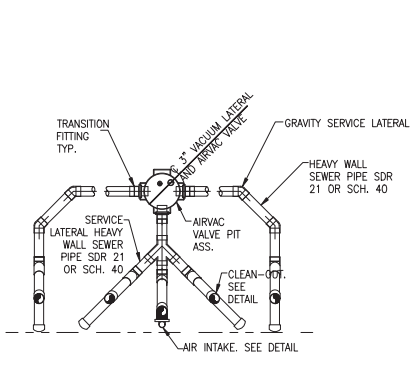
DEDICATED AIR INTAKES



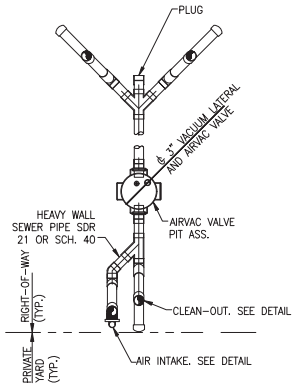
4 SERVICE CONNECTION
W/ DEDICATED BREATHER



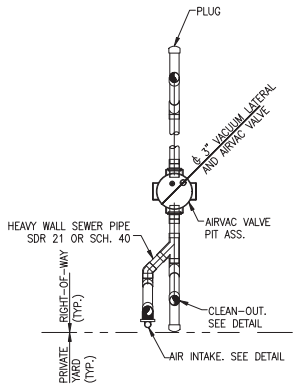
4 SERVICE CONNECTION (ALTERNATE)
W/ DEDICATED BREATHER



2, 3, OR 4 SERVICE CONNECTION
W/ DEDICATED BREATHER
SAME SIDE OF STREET



3 SERVICE CONNECTION
W/ DEDICATED BREATHER



2 SERVICE CONNECTION
W/ DEDICATED BREATHER

SERVICE CONNECTION DETAILS

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STANDARD DETAILS FOR
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GENERAL NOTES AND STANDARD DETAILS

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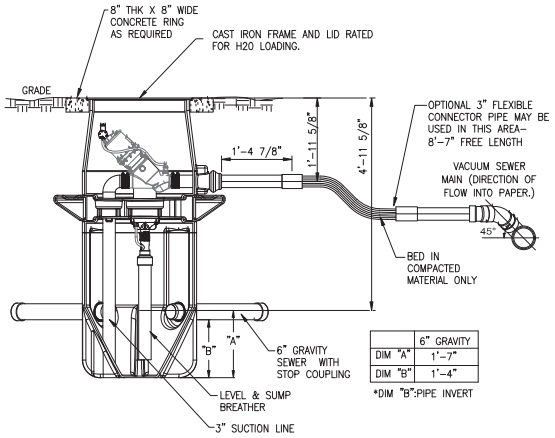
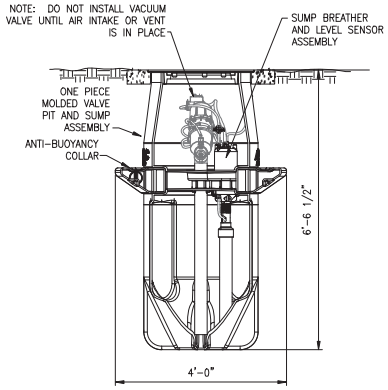


VALVE PIT MODEL VP4830P1

OVERALL DEPTH 6'–6 1/2"

DEPTH TO CENTERLINE GRAVITY 4'–11 5/8"



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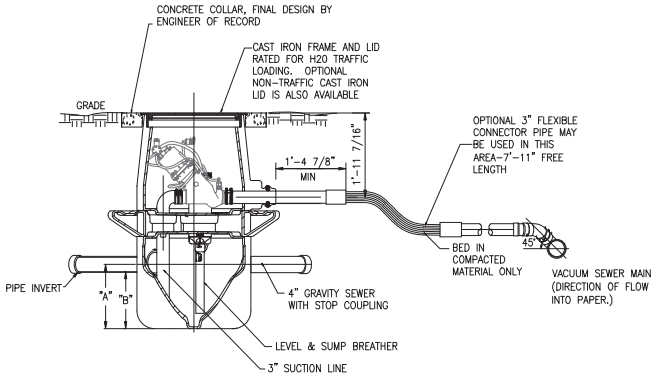
OVERALL DEPTH 6'–6 1/2"

DEPTH TO CENTERLINE GRAVITY 4'–11 5/8"



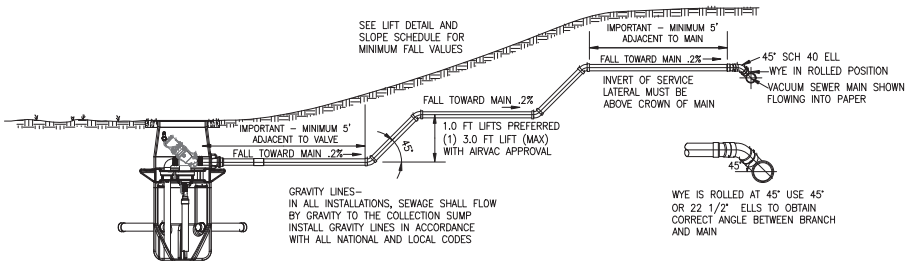
VALVE PIT MODEL VP3030P1

OVERALL DEPTH 5'–0 1/2"

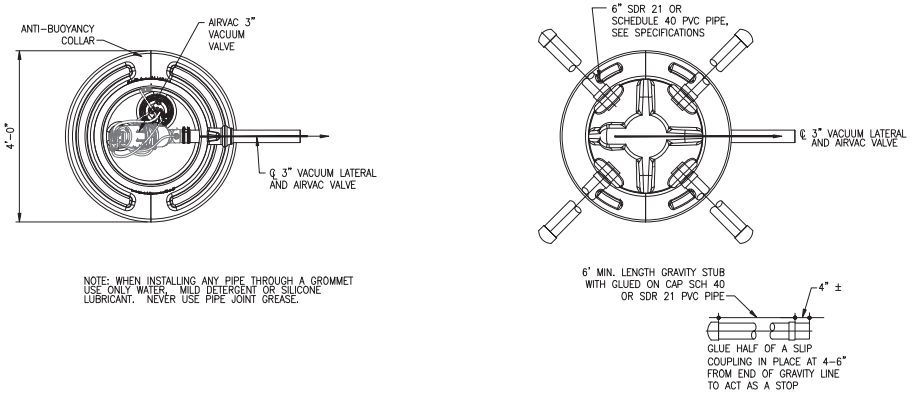
NOTES:

1. ALL GROMMETS FOR VALVE PIT AND SUMP SUPPLIED BY AIRVAC.
2. ALL HOLES IN VALVE PIT AND PIT BOTTOM ARE FACTORY CUT. ALL GRAVITY LINE CONNECTION OPENING IN THE SUMP ARE FIELD CUT.
3. WHEN INSTALLING ANY PIPE THROUGH A GROMMET, USE ONLY WATER, MILD DETERGENT, OR SILICONE LUBRICANT. NEVER USE PIPE JOINT GREASE.
4. DO NOT INSTALL VACUUM VALVE UNTIL HOME GRAVITY LINE IS NEAR COMPLETION AND AIR INTAKE PIPING IS IN PLACE.
5. INTERNAL SUMP BREATHER IS TO BE EQUIPPED WITH AUTOMATIC SHUT OFF DEVICES TO PREVENT LIQUID CONTAMINATION OF THE CONTROLLER AND INTERFACE VALVE DURING AN EMERGENCY HIGH LIQUID LEVEL EVENT. THESE DEVICES SHALL BE POSITIVE SEALING, SHALL NOT INHIBIT THE VALVE'S PERFORMANCE UNDER NORMAL CONDITIONS AND SHALL RESET AUTOMATICALLY WHEN RECOVERING FROM AN EMERGENCY HIGH LIQUID LEVEL EVENT.
6. INSTALL VACUUM SERVICE LATERAL PIPING AND WHIP WITH MIN 0.2% FALL TOWARD VACUUM MAIN.

ONE PIECE VALVE PIT ELEVATIONS



LIFT DETAILS FOR 3" SERVICE LATERAL



VALVE PIT AND SUMP PLAN VIEWS

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STANDARD DETAILS FOR

KEY LARGO WASTEWATER TREATMENT DISTRICT (KLWTD)

GENERAL NOTES AND STANDARD DETAILS

SHEET NO.

G-5.0

GENERAL NOTES:

LIFTS:

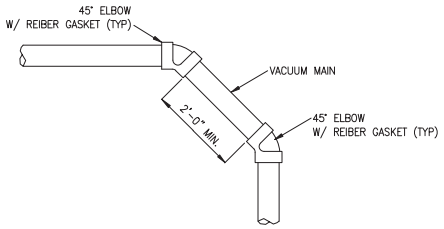
1. MINIMUM SLOPE BETWEEN LIFTS 0.20% OR 0.25 FT; IF DISTANCE BETWEEN LIFTS IS LESS THAN 125 FEET
2. MINIMUM SPACING BETWEEN LIFTS – 20'–0"
3. MAXIMUM ELEVATIONS IN ANY ONE LIFT –3'–0"

SERVICE LINES:

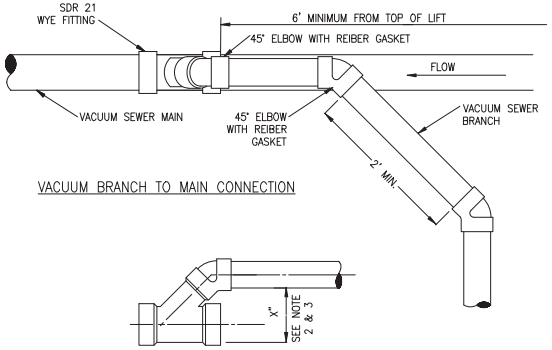
1. MINIMUM LENGTH OF PIPING FROM MAIN TO VALVE PIT – 5'–0".
2. SLOPE FROM VALVE PIT TO MAIN – 2" OR 0.20% FALL (WHICHEVER IS GREATER).
3. MINIMUM DISTANCE FROM VALVE PIT TO LIFT IN SERVICE LINE – 5'–0"
4. MINIMUM DISTANCE FROM LIFT IN SERVICE LINE TO CROSSOVER CONNECTION – 5'–0".

CROSSOVER CONNECTIONS (SERVICE LINE OR BRANCH CONNECTION TO MAIN)

1. MINIMUM SPACING BETWEEN ANY TWO CROSSOVER CONNECTIONS – 5'–0".
2. MINIMUM DISTANCE FROM TOP OF LIFT TO ANY CROSSOVER CONNECTION – 5'–0".
3. ALL CROSSOVER CONNECTIONS MUST ENTER OVER TOP OF THE MAIN (WYE IN VERTICAL POSITION).



CHANGE IN DIRECTION

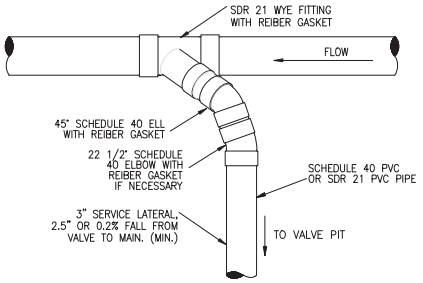


VACUUM BRANCH TO MAIN CONNECTION

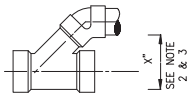
NOTES:

1. FITTINGS SHALL BE AS SPECIFIED IN SECTION 15481 – VACUUM SEWER SYSTEM AND ACCESSORIES.
2. CONNECTION MAY BE ROTATED TO MAINTAIN ELEVATIONS NOTED ON THE PLAN AND PROFILE SHEETS.
3. ADJUST PER FIELD CONDITIONS.
4. FITTING AND PIPING DIAMETERS PER DRAWINGS.

VACUUM BRANCH TO MAIN LINE CONNECTIONS



VALVE PIT TO MAIN CONNECTIONS



NOTES:

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2. CONNECTION MAY BE ROTATED TO MAINTAIN ELEVATIONS NOTED ON THE PLAN AND PROFILE SHEETS.
3. ADJUST PER FIELD CONDITIONS.
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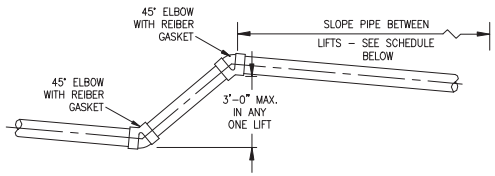
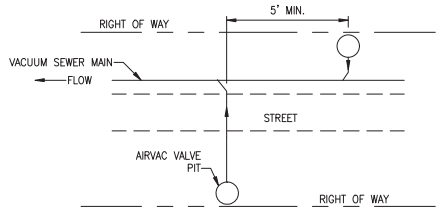
VACUUM SERVICE LATERAL TO MAIN OR BRANCH CONNECTION



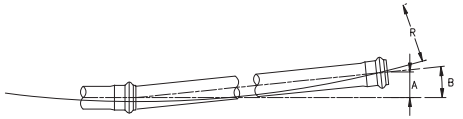
SLOPE SCHEDULE			
PIPE DIA	MINIMUM FALL BETWEEN LIFTS USE GREATER VALUE OF (A) OR (B) (A)	(B)	DISTANCE AT WHICH (B) GOVERNS
3"	0.20FT	0.2% X DISTANCE	>100FT
4"	0.25FT	0.2% X DISTANCE	>125FT
6"	0.25FT	0.2% X DISTANCE	>125FT
8"	0.25FT	0.2% X DISTANCE	>125FT
10"	0.25FT	0.2% X DISTANCE	>125FT

LIFT DETAIL AND SLOPE SCHEDULE



MINIMUM SPACING BETWEEN SERVICE CONNECTIONS

PVC DEFLECTION SCHEDULE						
NOMINAL SIZE PVC PIPE (INCHES)	MAXIMUM DISTANCE OF OFFSET (INCHES)		MAXIMUM ANGLE OF OFFSET (DEG.)		MINIMUM RADIUS OF CURVE (FT.)	
	A		B		C	
	20'	10'	20'	10'	20'	10'
4	8	4	2	2	450	300
6	8	4	2	2	570	380
8	8	4	2	2	570	380
10	8	4	2	2	570	380



NOTE:
1) MINIMUM RADIUS OF CURVATURE VALID FOR 20' & 10' PIPE LENGHTS

PVC PIPE DEFLECTION

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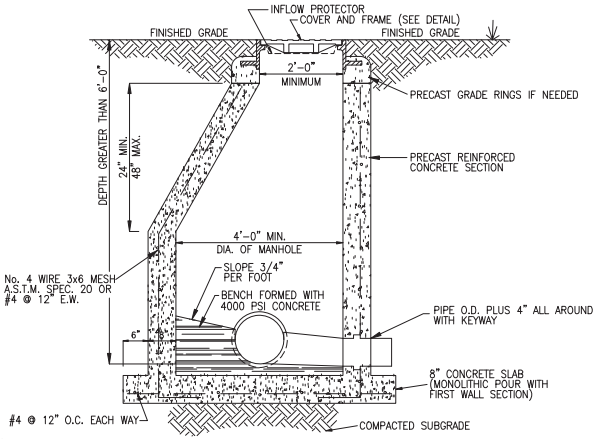
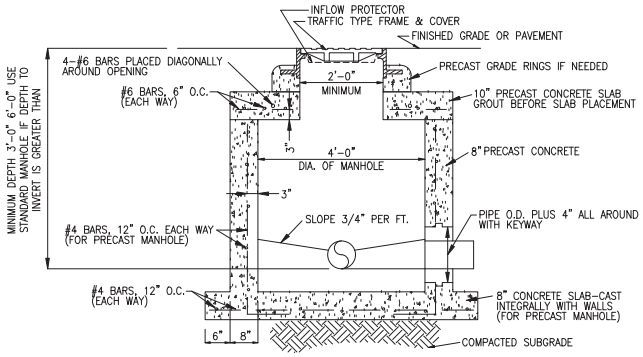


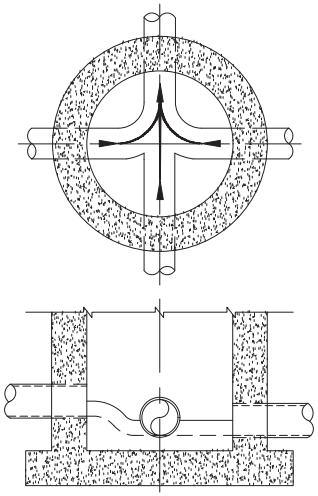
NOTES:
1. PRECAST CONCRETE TYPE II 4000 P.S.I.
2. "RAMNEK" OR EQUAL AT ALL RISER JOINTS (1/2" THICK WITH THE WIDTH AT LEAST 1/2 THE WALL THICKNESS) WITH GROUT ON INSIDE AND OUTSIDE.
3. ALL PIPE PENETRATIONS MUST BE SEALED WITH A FACTORY INSTALLED GASKET OR LINK-SEAL TYPE SEALANT DEVICE. ALL OPENINGS SHALL BE FINISHED WITH NON-SHRINK GROUT INSIDE AND OUTSIDE.
4. FLOW CHANNELS SHALL BE CONSTRUCTED TO DIRECT INFLUENT INTO FLOW STREAM.
5. ALL PIPE HOLES SHALL BE PRECAST OR CORE DRILLED.
6. FOR PVC PIPE ENTERING MANHOLE USE THE APPROVED NON-ASBESTOS PVC-MANHOLE ADAPTER FOR THE APPROPRIATE PIPE DIAMETER AND DIMENSION RATIO. THE ADAPTER SHALL NOT EXTEND MORE THAN 1" INTO THE MANHOLE.
7. MANHOLE FABRICATION SHALL BE IN ACCORDANCE WITH ASTM C-478, LATEST STANDARD.
8. MANHOLES TO BE COATED INSIDE AND OUTSIDE WITH "RAVEN 405" EPOXY COATING, 125 MILS THICKNESS OR APPROVED EQUAL

STANDARD MANHOLE



NOTES:
1. IF NECESSARY PRECAST GRADE RINGS MAY BE USED.
2. THE FIRST THREE SECTIONS OF PIPE AT BOTH INFLUENT AND EFFLUENT OF EACH MANHOLE TO BE A MAXIMUM OF 2'-0" IN LENGTH.
3. LIFT HOLES THROUGH PRECAST SECTIONS NOT PERMITTED.
4. ALL PIPE PENETRATIONS MUST BE SEALED WITH A FACTORY INSTALLED GASKET OR LINK-SEAL TYPE SEALANT DEVICE. ALL OPENINGS SHALL BE FINISHED WITH NON-SHRINK GROUT INSIDE AND OUTSIDE.
5. A FLOW CHANNEL SHALL BE CONSTRUCTED INSIDE MANHOLE TO DIRECT INFLUENT INTO FLOW STREAM.
6. MANHOLES TO BE COATED INSIDE AND OUTSIDE WITH "RAVEN 405" EPOXY COATING, 125 MILS THICKNESS OR APPROVED EQUAL.
7. ALL STANDARD MANHOLE NOTES AND DETAILS ARE APPLICABLE.

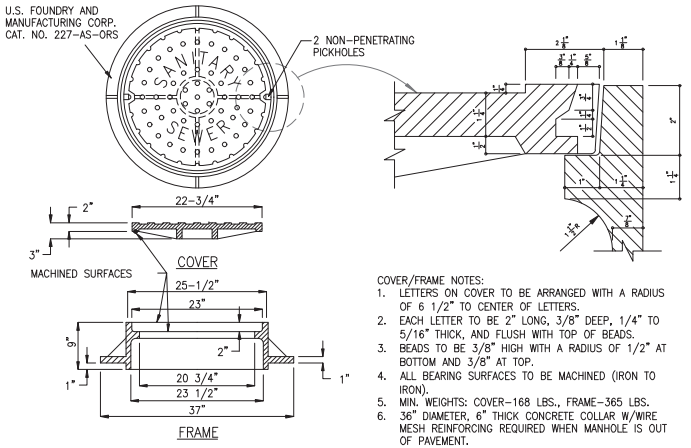
SHALLOW MANHOLE



NOTES:
1. ALL INVERT CHANNELS ARE TO BE CONSTRUCTED FOR SMOOTH FLOW WITHOUT OBSTRUCTION.
2. PROPERLY SHAPED SPILLWAYS SHALL BE CONSTRUCTED BETWEEN PIPES WITH DIFFERENT INVERT ELEVATIONS TO PROVIDE FOR SMOOTH FLOWS.
3. SERVICE LATERALS SHALL NOT ENTER MANHOLES UNLESS SPECIFIED ON PLANS AND THEN MUST BE TREATED AS MAINS (ELEVATIONS SHOWN, PRECAST HOLE, FLOW CHANNEL).
4. CONCRETE RUBBLE PERMITTED AS FLOW CHANNEL BUILDUP.
5. SIDE WALLS OF FLOW CHANNEL SHALL BE AT LEAST HALF OF PIPE HEIGHT AT ALL POINTS.
6. NO INSIDE DROP SHALL BE ALLOWED WITH 3 OR 4 INVERTS.

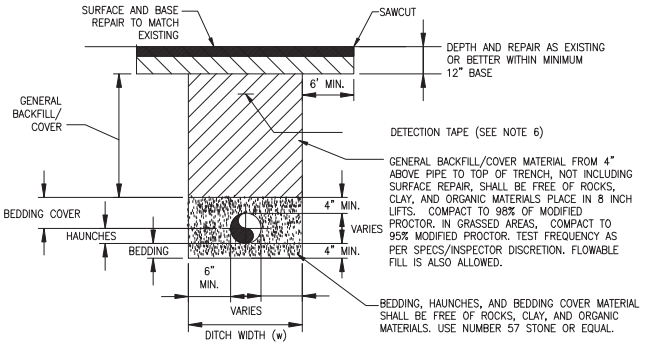
INVERT FLOW CHANNELS

75



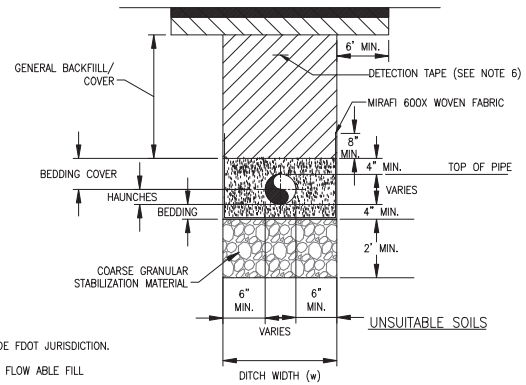
COVER/FRAME NOTES:
1. LETTERS ON COVER TO BE ARRANGED WITH A RADIUS OF 6 1/2" TO CENTER OF LETTERS.
2. EACH LETTER TO BE 2" LONG, 3/8" DEEP, 1/4" TO 5/16" THICK, AND FLUSH WITH TOP OF BEADS.
3. BEADS TO BE 3/8" HIGH WITH A RADIUS OF 1/2" AT BOTTOM AND 3/8" AT TOP.
4. ALL BEARING SURFACES TO BE MACHINED (IRON TO IRON).
5. MIN. WEIGHTS: COVER-168 LBS., FRAME-365 LBS.
6. 36" DIAMETER, 6" THICK CONCRETE COLLAR W/WIRE MESH REINFORCING REQUIRED WHEN MANHOLE IS OUT OF PAVEMENT.
7. INSTALL INFLOW PROTECTOR ON ALL MANHOLES, RAINGARD PVC OR EQUAL.

STANDARD MANHOLE COVER AND FRAME



SUITABLE SOILS

TRENCH/BEDDING NOTES:
1. CONTRACTOR SHALL FOLLOW THE BEDDING, HAUNCHES AND BEDDING COVER OF THIS DETAIL FOR ALL PIPELINE INSTALLATION OUTSIDE FDOT JURISDICTION.
2. FOR ALL WORK INSTALLED IN FDOT JURISDICTION FOLLOW FDOT DETAILED CRITERIA FOR THE TRENCH AREA ABOVE BEDDING COVER.
3. TEMPORARY ASPHALT SHALL BE APPLIED TO ALL TRENCHES NOT REPAIRED WITHIN 14 DAYS AFTER PIPING INSTALLATION WHERE THE FLOW ABLE FILL OPTION IS NOT USED.
4. AT THE CONTRACTORS OPTION, FLOWABLE FILL MAY BE INSTALLED FLUSH WITH EXISTING PAVEMENT AS A TEMPORARY MEASURE. FINAL RESTORATION WILL REQUIRES MILLING OF THE FLOWABLE FILL AND INSTALLATION OF 1 1/2" OF ASPHALT.
5. VACUUM SEWER MAINS SHALL HAVE A MINIMUM COVER OF 30 INCHES, UNLESS OTHERWISE NOTED.
6. 6" WIDE DETECTION TAPE WITH METALLIC BACKING TO BE INSTALLED DIRECTLY ON THE CENTERLINE OF MAIN 1' BELOW THE SURFACE. TAPE TO BE MARKED AS STATED IN THE GENERAL NOTES.
7. WHERE PORTIONS OF THE BOTTOM OF TRENCHES OR EXCAVATIONS CONSIST OF MATERIAL UNSTABLE TO SUCH A DEGREE THAT, IN THE OPINION OF THE ENGINEER, IT CANNOT ADEQUATELY SUPPORT THE PIPE OR STRUCTURE, THE BOTTOM SHALL BE OVER-EXCAVATED AND STABILIZED WITH APPROVED COARSE GRANULAR STABILIZATION MATERIAL. MINIMUM DEPTH OF OVER-EXCAVATION IS 2 FEET. IN ADDITION, FILTER FABRIC WILL ALSO BE USED AS SHOWN IN THE DETAIL TO ENCAPSULATE THE BEDDING MATERIAL.



UNSUITABLE SOILS

NOTE: FABRIC MUST EXTEND A MINIMUM OF 12" OVER THE TOP OF THE PIPE OR 12" ABOVE THE UNSTABLE SOILS INTERFACE.

TRENCH AND PIPE BEDDING DETAILS

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STANDARD DETAILS FOR
KEY LARGO WASTEWATER TREATMENT DISTRICT (KLWTD)
GENERAL NOTES AND STANDARD DETAILS

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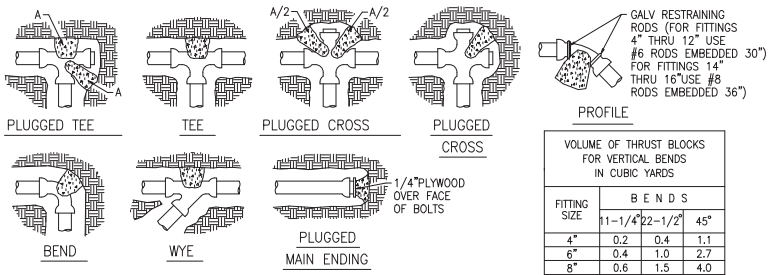


THRUST BLOCK NOTES

1. REQUIRED VOLUMES OR BEARING AREAS INDICATED AT FITTINGS ARE BASED UPON TEST PRESSURES OF 150 PSIG, 2,000 LBS/SF ALLOWABLE SOIL.
2. BEARING STRESS AND THE WEIGHT OF CONCRETE EQUAL TO 4050 LBS/CY.
3. BEARING AREAS OF THRUST BLOCKS SHALL NOT BE LESS THAN 1.0 SF. KEEP CONCRETE CLEAR OF JOINT AND JOINT ACCESSORIES AND WRAP THE FITTING WITH VISQUEEN PRIOR TO PLACING CONCRETE.
4. BEARING AREAS, VOLUMES, AND SPECIAL BLOCKING DETAILS SHOWN ON DRAWINGS SHALL TAKE PRECEDENCE OVER THIS STANDARD.
5. THRUST BLOCKS FOR VERTICAL BENDS HAVING DOWNWARD RESULTANT THRUSTS SHALL BE THE SAME AS HORIZONTAL BENDS.
6. COMPUTE BEARING AREAS FOR HORIZONTAL BEND THRUST BLOCKS AT DIFFERENT TEST PRESSURES AND SOIL BEARING STRESSES WITH THE FOLLOWING EQUATION:
   - 6.1. BEARING AREA = (REQUIRED TEST PRESSURE/150 X (2,000/ACTUAL SOIL BEARING STRESS) X (TABLE VALUE)
7. COMPUTE VOLUMES OF CONCRETE FOR VERTICAL BENDS HAVING UPWARD RESULTANT THRUSTS AT DIFFERENT TEST PRESSURES WITH THE FOLLOWING EQUATION:
   - 7.1. VOLUME = (REQUIRED TEST PRESSURE/150) X (TABLE VALUE)

(THRUST BLOCKS ALLOWED AT LOCATIONS SHOWN ON DRAWINGS ONLY)

VOLUME OF THRUST BLOCKS FOR VERTICAL BENDS IN CUBIC YARDS

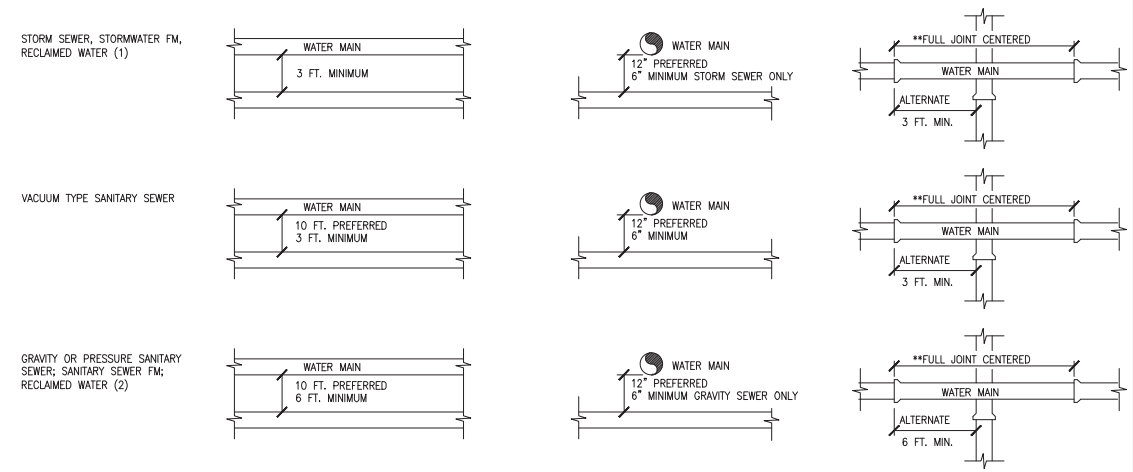
FITTING SIZE	BENDS		
	11-1/4°	22-1/2°	45°
4"	0.2	0.4	1.1
6"	0.4	1.0	2.7
8"	0.6	1.5	4.0
10"	0.9	2.3	6.0
12"	1.3	3.2	8.5
14"	1.8	4.3	11.5
16"	2.3	5.6	14.8

BEARING AREA OF THRUST BLOCKS IN SQ.FT. (HORIZONTAL FITTINGS)

FITTING SIZE	BENDS			TEE,WYE PLUG,OR CAP	TEE (PLUGGED RUN		90 BEND OR PLUGGED CROSS
	11-1/4°	22-1/2°	45°		A1	A2	
4"			1.0	1.0	1.9	1.4	1.4
6"		1.0	1.6	2.1	4.3	3.0	3.0
8"	1.0	1.5	2.9	3.8	7.6	5.4	5.3
10"	1.2	2.4	4.6	5.9	11.8	8.4	8.4
12"	1.7	3.4	6.6	8.5	17.0	12.0	12.0
14"	2.3	4.6	8.9	11.5	23.0	16.3	16.3
16"	3.0	6.0	11.6	15.0	30.0	21.3	21.3
18"	3.8	7.6	14.6	19.0	38.0	27.0	27.0
20"	4.7	9.4	18.1	23.5	47.0	33.3	33.3
24"	6.8	13.6	26.2	34.0	68.0	48.0	48.0

THRUST BLOCK NOTES AND DETAILS

FDEP PIPE SEPARATION REQUIREMENTS



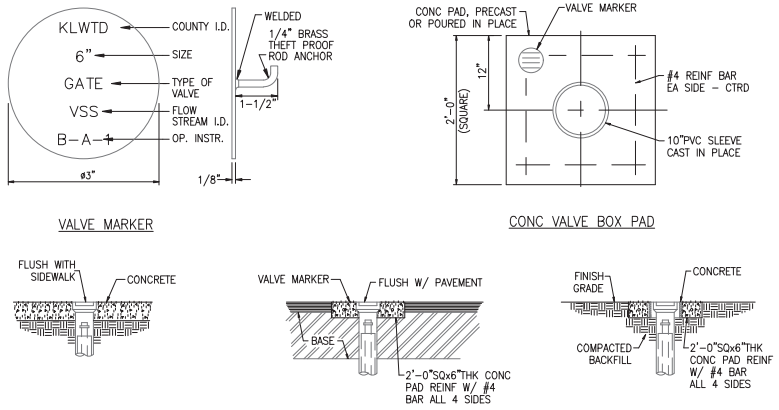
(1) RECLAIMED WATER REGULATED UNDER PART III 62-610 F.A.C.

(2) RECLAIMED WATER NOT REGULATED UNDER PART III 62-610 F.A.C

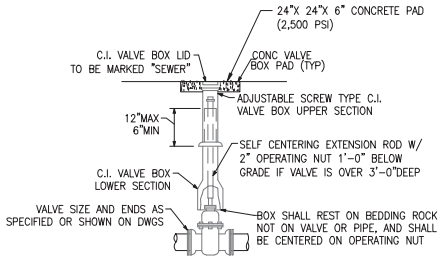
*WATER MAIN SHOULD CROSS ABOVE OTHER PIPE. WHEN WATER MAIN MUST BE BELOW OTHER PIPE THE MINIMUM VERTICAL SEPARATION SHALL BE 12".

**FULL LENGTH OF PIPE CENTERED AT CROSSING.

THE TABLE REPRESENTS THE MINIMUM SEPARATION REQUIREMENTS AS DESCRIBED IN F.D.E.P. RULES OF THE FLORIDA ADMINISTRATION CODE (F.A.C.).



VALVE BOX SETTING DETAILS



VALVE NOTES:
1) ADJUSTABLE CAST IRON VALVE BOX SHALL BE TYLER / UNION 6850 SERIES OR EQUAL.
2) SEE SPECIFICATION SECTION 15100 FOR MORE INFORMATION ON VALVES.

GATE OR PLUG VALVE WITHOUT GEAR OPERATOR

MINIMUM LENGTH (FT) TO BE RESTRAINED ON EACH SIDE OF FITTING(S)

TYPE	PIPE SIZE									
	4"	6"	8"	10"	12"	16"	20"	24"	30"	36"
90° BEND	14	19	25	30	34	44	52	60	70	80
45° BEND	6	8	10	12	14	18	21	25	30	34
22-1/2° BEND	3	4	5	6	7	9	10	12	14	16
11-1/4° BEND	1	2	3	4	5	6	7	8	9	10
PLUG OR BRANCH OF TEE	30	40	52	63	72	93	111	130	155	178
VALVE	15	20	25	32	36	47	56	65	78	89

RESTRAINT NOTES:
1. FITTINGS SHALL BE RESTRAINED JOINTS UNLESS OTHERWISE INDICATED.
2. INSTALL FULL LENGTH JOINTS WITH TOTAL LENGTH EQUAL TO OR GREATER THAN SHOWN IN THE TABLE.
3. WHERE TWO OR MORE FITTINGS ARE TOGETHER, USE FITTING WHICH YIELDS GREATEST LENGTH OF RESTRAINED PIPE.
4. ALL LINE VALVES AND THROUGH RUN OF TEES SHALL BE RESTRAINED.
5. FOR PIPE ENCASED IN POLYETHYLENE, INCREASE THE GIVEN VALUE BY A FACTOR OF 1.25.

PIPE RESTRAINT TABLE

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