

**CITY OF WOODLAND PARK, COLORADO
ENGINEERING SPECIFICATIONS**

TABLE OF CONTENTS

TITLE 1:	POLICIES AND PROCEDURES FOR INFRASTRUCTURE IMPROVEMENT PROJECTS		
SECTION	1.1	PURPOSE	1-1
	1.1.1	ADOPTED STANDARDS	1-1
SECTION	1.2	DESIGN POLICY	1-2
	1.2.1	GENERAL	1-2
	1.2.1.1	SUBDIVISION FLOW CHART	1-3
	1.2.1.2	SITE PLAN REVIEW FLOW CHART	1-4
	1.2.2	PREAPPLICATION CONFERENCE	
		CONCEPT/SKETCH PLAN	1-5
	1.2.3	PRELIMINARY PLANS AND REPORTS	1-5
	1.2.4	CONSTRUCTION PLANS	1-8
	1.2.5	CONSTRUCTION DRAWINGS	1-9
	1.2.6	EASEMENTS	1-11
SECTION	1.3	CONSTRUCTION POLICY	1-11
	1.3.1	ENGINEERED AND APPROVED PLANS	1-11
	1.3.2	CONTRACTOR LICENSES REQUIRED	1-11
	1.3.3	PERMITS	1-11
	1.3.4	PRE-CONSTRUCTION CONFERENCE	1-11
	1.3.5	INSPECTION, TESTING, STOP WORK ORDERS	1-12
	1.3.5.1	RE-INSPECTIONS	1-13
	1.3.5.2	INSPECTIONS OUTSIDE NORMAL INSPECTION HOURS	1-13
	1.3.5.3	STOP WORK ORDERS	1-13
	1.3.6	“AS-BUILT” DRAWINGS	1-14
	1.3.6.1	RESPONSIBILITIES	1-15
	1.3.6.2	SPECIFIC “AS-BUILT” REQUIREMENTS	1-15
	1.3.6.3	SUBMITTAL OF CERTIFIED “AS-BUILT” PLANS AND DOCUMENTS	1-17
	1.3.7	ACCEPTANCE AND WARRANTY	1-17
	1.3.7.1	PRE-ACCEPTANCE INSPECTION AND PUNCH LIST	1-17
	1.3.7.2	INITIAL ACCEPTANCE	1-18
	1.3.7.3	FINAL ACCEPTANCE	1-19

TITLE 2: WATER SYSTEM SPECIFICATIONS

SECTION	2.1	DESIGN	2-3
	2.1.1	GENERAL	2-3
	2.1.2	MAIN SIZE, WATER PRESSURE	2-6
	2.1.3	FIRE HYDRANTS	2-7
	2.1.4	PUMP STATIONS, STORAGE TANKS, PRESSURE REDUCING STATIONS, HIGH PRESSURE MAINS	2-8
	2.1.5	ABOVE GROUND FACILITIES REQUIRED	2-9
	2.1.6	AIR VACUUM RELEASE VALVES	2-9
	2.1.7	LOCATION	2-9
	2.1.8	WATER AND SEWER SEPARATION	2-10
	2.1.9	AWWA STANDARDS	2-10
	2.1.10	BACKFLOW PREVENTION DEVICES	2-10
	2.1.11	CURVILINEAR WATER MAINS	2-11
SECTION	2.2	MATERIALS	2-11
	2.2.1	MAINS	2-11
	2.2.2	FIRE HYDRANTS	2-12
	2.2.3	VALVES	2-13
	2.2.4	FITTINGS	2-13
	2.2.5	SERVICES	2-13
	2.2.6	JOINT RESTRAINTS	2-15
	2.2.7	TRACER WIRE	2-16
	2.2.8	POLYETHYLENE WRAP	2-17
	2.2.9	PRESSURE REDUCING STATIONS	2-17
	2.2.10	ENCASEMENT AND BRIDGING OF PIPE	2-17
	2.2.11	PIPE BEDDING MATERIALS	2-18
	2.2.12	AWWA STANDARDS	2-18
	2.2.13	NEW PRODUCTS OR MATERIALS	2-18
SECTION	2.3	CONSTRUCTION	2-18
	2.3.1	RESPONSIBILITY FOR MATERIAL	2-18
	2.3.2	HANDLING AND STORAGE OF MATERIAL	2-19
	2.3.3	ALIGNMENT AND GRADE	2-20
	2.3.4	EXCAVATION AND PREPARATION OF TRENCH	2-21
	2.3.5	LAYING	2-21
	2.3.6	JOINING OF ANY MECHANICAL JOINT PIPE	2-24
	2.3.7	JOINING OF ANY PUSH-ON JOINT PIPE	2-25
	2.3.8	SETTING OF VALVES AND FITTINGS	2-26
	2.3.9	SETTING OF HYDRANTS	2-26
	2.3.10	ANCHORAGE	2-27
	2.3.11	BACKFILLING AND COMPACTION	2-29
	2.3.12	WATER SYSTEM REPAIRS	2-29

	2.3.13	SERVICE CONNECTIONS	2-29
	2.3.14	SERVICE LINE DISCONNECTIONS	2-29
SECTION	2.4	TESTING	2-30
	2.4.1	TESTING	2-30
	2.4.2	DISINFECTION	2-30
	2.4.3	FLUSHING THE LINE	2-31
	2.4.4	PRESSURE/LEAKAGE TEST	2-31
	2.4.5	BACTERIOLOGICAL TESTS	2-33
SECTION	2.5	FIGURES	
	2.5.1	TYPICAL TRENCH SECTION AND PIPE PROTECTION	
	2.5.2	FIRE HYDRANT INSTALLATION DETAIL	
	2.5.3	HYDRANT PROTECTION POST (BOLLARD) DETAIL	
	2.5.4	TYPICAL VALVE BOX SETTING	
	2.5.5	STANDARD BLOW-OFF INSTALLATION (TYPE 1)	
	2.5.6	STANDARD BLOW-OFF INSTALLATION (TYPE 2)	
	2.5.7	POURED CONCRETE THRUST REACTION BLOCK	
	2.5.8	REVERSE ANCHOR DETAILS	
	2.5.9	COPPER TRACER WIRE DETAILS	
	2.5.10	POLYETHYLENE WRAP	
	2.5.11	WATER AND SEWER CROSSING (TYPE I)	
	2.5.12	WATER AND SEWER CROSSING (TYPE II)	
	2.5.13	BRIDGING DETAIL	
	2.5.14	REINFORCED CONCRETE ENCASEMENT DETAIL	
	2.5.15	WATERLINE LOWERING DETAIL	
	2.5.16	WATERLINE STANDARD DETAIL PIPE CLAMP	
	2.5.17	REMOTE READING WATER METER, TYPICAL INSIDE SETTING	
	2.5.18	¾" AND 1" SERVICE LINE DETAIL, INSIDE METER SETTING	
	2.5.19	AIR VACUUM RELEASE AND VALVE INSTALLATION	
	2.5.20	8-INCH PRESSURE REDUCING STATION (PAGE 1)	
	2.5.21	PRESSURE REDUCING STATIONS (PAGE 2)	
	2.5.22	FIRE HYDRANT SPACING MEASUREMENTS	
TITLE 3:		SANITARY SEWER SPECIFICATIONS	
SECTION	3.1	DESIGN	3-3
	3.1.1	GENERAL	3-3
	3.1.2	PLANNING CONSIDERATIONS	3-6
	3.1.3	MINIMUM SIZE	3-7
	3.1.4	MINIMUM DEPTH	3-7
	3.1.5	SLOPES	3-7
	3.1.6	HIGH VELOCITY PROTECTION	3-8

	3.1.7	ALIGNMENT	3-8
	3.1.8	INTERSECTIONS	3-8
	3.1.9	SERVICE CONNECTIONS	3-8
	3.1.9.1	PRESSURE LATERALS	3-9
	3.1.10	MANHOLES	3-9
	3.1.11	MANHOLE SIZES	3-9
	3.1.12	DROP MANHOLES	3-9
	3.1.13	MANHOLE CHANNELS	3-10
	3.1.14	MANHOLE RINGS AND COVERS	3-10
	3.1.15	MANHOLE WATERTIGHTNESS	3-10
	3.1.16	INVERTED SIPHONS	3-10
	3.1.17	LOCATION	3-10
	3.1.18	STREAM AND DRAINAGE CHANNEL CROSSINGS	3-11
	3.1.19	CROSSINGS UNDER HIGHWAYS	3-12
	3.1.20	STUB OUTS FROM MANHOLES	3-12
	3.1.21	SERVICE STUBS	3-12
	3.1.22	WASTEWATER PUMPING STATIONS	3-12
	3.1.23	GENERAL REQUIREMENTS	3-13
	3.1.24	PUMP STATION DESIGN	3-13
	3.1.25	INSTRUCTION, EQUIPMENT OPERATION AND MAINTENANCE	3-16
	3.1.26	GREASE AND SAND/OIL INTERCEPTORS	3-16
	3.1.27	THERMAL INSULATION FOR SEWER MAINS AND SERVICE LATERALS	3-17
SECTION	3.2	MATERIALS	3-18
	3.2.1	POLYVINYL CHLORIDE PIPE FOR SEWERS AND FORCE MAINS	3-18
	3.2.2	CAST IRON AND DUCTILE IRON GRAVITY SEWER PIPE	3-20
	3.2.3	HIGH DENSITY POLYETHYLENE GRAVITY SEWER PIPE (HDPE)	3-21
	3.2.4	MANHOLES	3-21
	3.2.5	DROP MANHOLES	3-22
	3.2.6	CONCRETE	3-22
SECTION	3.3	CONSTRUCTION	3-22
	3.3.1	EXCAVATION AND PREPARATION OF TRENCH	3-22
	3.3.2	LAYING OF PIPE	3-22
	3.3.3	TRACER WIRE	3-23
	3.3.4	MANHOLES	3-23
	3.3.5	MANHOLE CASTINGS	3-24
	3.3.6	FITTINGS, COUPLINGS, WYES AND SADDLES	3-24
	3.3.7	SERVICE CONNECTIONS	3-24
	3.3.8	DEEP SERVICE CONNECTION	3-25

	3.3.9	BACKFILLING AND COMPACTION	3-25
	3.3.10	SERVICE LINE DISCONNECTIONS	3-25
	3.3.11	SERVICE LINE INSPECTIONS	3-25
	3.3.12	ABANDONMENT OF MAINS AND APPURTENANCES	3-25
	3.3.13	REPAIRS AND REPLACEMENTS	3-25
	3.3.14	TESTING	3-26
	3.3.15	AIR TESTS	3-26
	3.3.16	EXFILTRATION TESTS	3-27
	3.3.17	INFILTRATION TEST	3-28
	3.3.18	TELEVISION INSPECTION	3-28
SECTION	3.4	FIGURES	
	3.4.1	STANDARD MANHOLE CONSTRUCTION	
	3.4.2	STANDARD CONCRETE MANHOLE CONE CAP	
	3.4.3	STANDARD OUTSIDE DROP MANHOLE	
	3.4.4	STANDARD INTERNAL DROP MANHOLE	
	3.4.5	48" PRE-CAST CONCRETE MANHOLE DECK	
	3.4.6	60" PRE-CAST CONCRETE MANHOLE DECK	
	3.4.7	MANHOLE RING AND COVER	
	3.4.8	STREAM CROSSING ENCASEMENT WITHOUT CAISSONS	
	3.4.9	STREAM CROSSING ENCASEMENT AND TYPICAL CAISSON	
	3.4.10	DEEP SERVICE CONNECTIONS	
	3.4.11	HIGH VELOCITY PROTECTION	
	3.4.12	SANITARY SEWER SERVICE DETAIL	
	3.4.13	TYPICAL BORE CONSTRUCTION	
TITLE 4:		DRAINAGE AND EROSION CONTROL SPECIFICATIONS	
SECTION	4.1	DESIGN	4-2
	4.1.1	DRAINAGE DESIGN CRITERIA	4-2
	4.1.2	DRAINAGE REPORT	4-2
	4.1.3	MINIMUM PIPE SIZE	4-3
	4.1.4	MANHOLES	4-3
	4.1.5	CLEARANCE	4-4
	4.1.6	CULVERT INLET AND OUTLET PROTECTION	4-4
SECTION	4.2	MATERIALS	4-4
	4.2.1	REINFORCED CONCRETE PIPE	4-4
	4.2.2	CONCRETE PIPE JOINING MATERIALS	4-6
	4.2.3	STEEL PIPE	4-6
	4.2.4	HIGH DENSITY POLYETHYLENE PIPE	4-8
	4.2.5	MANHOLES	4-9

	4.2.6	CONCRETE	4-9
	4.2.7	Rip- RAP	4-9
SECTION	4.3	DRAINAGE CHANNEL CONSTRUCTION	4-10
	4.3.1	CHANNEL EXCAVATION	4-10
	4.3.2	CONCRETE CHANNEL CONSTRUCTION	4-11
	4.3.3	EARTH CHANNEL CONSTRUCTION	4-12
	4.3.4	GROUTED CHANNEL CONSTRUCTION	4-12
SECTION	4.4	STORM SEWER CONSTRUCTION	4-13
	4.4.1	EXCAVATION	4-13
	4.4.2	PIPE CONSTRUCTION	4-13
	4.4.3	INITIAL ACCEPTANCE	4-13
	4.4.4	MAINTENANCE BETWEEN INITIAL AND FINAL ACCEPTANCE	4-13
SECTION	4.5	EROSION CONTROL	4-13
	4.5.1	NON-STRUCTURAL EROSION CONTROL MEASURES	4-14
	4.5.2	STRUCTURAL EROSION CONTROL MEASURES	4-14
SECTION	4.6	LOW IMPACT DEVELOPMENT	4-15
SECTION	4.7	FIGURES	
	4.7.1	RECOMMENDED TYPICAL DITCH CROSS SECTION	
	4.7.2	TYPICAL ROAD CROSS SECTION	
	4.7.3	CHANNEL PROFILE FOR EROSION CONTROL AT CULVERTS	
TITLE 5: STREET SYSTEM SPECIFICATIONS			
SECTION	5.1	DESIGN	5-1
	5.1.1	LAYOUT	5-1
	5.1.2	DRIVEWAY CONSTRUCTION REGULATIONS	5-2
	5.1.3	CURB CUTS FOR RECESSED DIAGONAL PARKING	5-4
	5.1.4	SUBGRADE INVESTIGATION AND PAVEMENT DESIGN (REPORT)	5-4
	5.1.5	MINIMUM ASPHALT REQUIREMENTS	5-5
	5.1.6	STREET SIGNAGE	5-6
SECTION	5.2	ASPHALT PAVEMENT MATERIALS AND CONSTRUCTION	5-6
	5.2.1	REQUIRED INSPECTIONS FOR ROADWAYS	5-6

	5.2.2	SUBGRADE	5-7
	5.2.3	BASE COURSE	5-8
	5.2.4	ASPHALT PRIME COAT AND TACK COAT	5-11
	5.2.5	ASPHALT CONCRETE PAVEMENT	5-13
	5.2.6	ASPHALTIC OVERLAY (PLANT-MIX SEAL)	5-15
	5.2.7	SEAL COAT	5-15
	5.2.8	CONTROL OF MATERIALS	5-15
	5.2.9	FINAL ACCEPTANCE	5-16
SECTION	5.3	FIGURES	
	5.3.1	UTILITIES IN R.O.W. (PLAN VIEW)	
	5.3.2	UTILITIES IN R.O.W. (CROSS SECTIONS)	
TITLE 6:	5.3	FIGURES	
TITLE 6:	6.1	DESIGN	6-1
SECTION	6.1	DESIGN	6-1
	6.1.1	GENERAL PROVISIONS	6-1
SECTION	6.2	CONCRETE	6-1
	6.2.1	CEMENT	6-1
	6.2.2	WATER	6-2
	6.2.3	ADMIXTURES	6-2
	6.2.4	FINE AGGREGATE	6-2
	6.2.5	COARSE AGGREGATE	6-2
	6.2.6	FIBEROUS REINFORCING	6-3
SECTION	6.3	CONSTRUCTION	6-4
	6.3.1	MIX DESIGN	6-4
	6.3.2	SPACING OF JOINTS	6-5
	6.3.3	REINFORCING STEEL AND FORMS	6-6
	6.3.4	PLACING CONCRETE	6-8
	6.3.5	FINISHING AND CURING	6-9
	6.3.6	MISCELLANEOUS	6-12
	6.3.7	TESTING	6-14
	6.3.8	FLOWCRETE/FLOWFILL CONCRETE	6-16
SECTION	6.4	FIGURES	
	6.4.1	CURB & GUTTER - TYPE I	
	6.4.2	CURB, GUTTER & SIDEWALK GUTTER - TYPE II	
	6.4.3	CROSS-PAN	
	6.4.4	INTERSECTION DETAIL	
	6.4.5	CURB RAMP	
	6.4.6	PEDESTRIAN RAMP DETAIL	

- 6.4.7 DRIVEWAY DETAILS (VERTICAL CURB & GUTTER)
- 6.4.8 DRIVEWAY DETAILS (DRIVE-OVER CURB, GUTTER AND SIDEWALK)

TITLE 7: EXCAVATION IN THE PUBLIC RIGHT-OF-WAY

SECTION	7.1	PERMIT AND LICENSES REQUIRED	7-2
SECTION	7.2	TRAFFIC CONTROL AND PEDESTRIAN SAFETY	7-2
	7.2.1	BARRICADES REQUIRED	7-3
SECTION	7.3	EXCAVATION	7-3
	7.3.1	GENERAL	7-3
	7.3.2	CLEARING AND GRUBBING	7-3
	7.3.3	REMOVAL OF MISCELLANEOUS MATERIALS/STRUCTURES	7-4
	7.3.4	PROTECTION OF UTILITY LINES AND STRUCTURES	7-5
	7.3.5	PROTECTION OF PUBLIC AND PRIVATE INSTALLATIONS	7-5
	7.3.6	WIDTH OF TRENCH	7-6
	7.3.7	EXCAVATION IN POOR SOIL AND REFILLING TO GRADE	7-6
	7.3.8	EXCAVATION AND EMBANKMENT	7-6
	7.3.9	BORROW	7-7
	7.3.10	BLASTING	7-7
	7.3.11	PIPE CLEARANCE IN ROCKS	7-8
	7.3.12	SUBGRADE	7-8
	7.3.13	SUBBASE CONSTRUCTION	7-8
	7.3.14	GRADING	7-10
	7.3.15	FINAL PROOF-ROLLING	7-10
SECTION	7.4	BEDDING	7-11
	7.4.1	PREPARATION OF FOUNDATION FOR PIPE LAYING	7-11
	7.4.2	BEDDING TYPES	7-11
SECTION	7.5	BACKFILLING AND COMPACTION	7-13
	7.5.1	CAREFULLY PLACED	7-13
	7.5.2	COMPACTION REQUIREMENTS	7-13
SECTION	7.6	TRENCH SAFETY	7-15
	7.6.1	GENERAL	7-15

SECTION	7.7	REMOVAL, RESTORATION AND MAINTENANCE OF PAVEMENT SURFACE	7-16
	7.7.1	REMOVAL OF PAVEMENT	7-16
	7.7.2	TEMPORARY ASPHALT REPLACEMENT	7-16
	7.7.3	PERMANENT ASPHALT REPLACEMENT	7-16
	7.7.4	CLEAN UP	7-17
	7.7.5	BACKFILL WARRANTY AND MAINENANCE	7-17
SECTION	7.8	FIGURES	
	7.8.1	TYPICAL BEDDING AND MATERIAL DETAIL	
TITLE 8:	PARKING STANDARDS		
SECTION	8.1	ON STREET PARKING	8-1
SECTION	8.2	OFF STREET PARKING	8-1
SECTION	8.3	FIGURES	
	8.3.1	ON STREET PARKING PAVED STREETS	
	8.3.2	OFF STREET PARKING TABLE	
	8.3.3	OFF STREET PARKING LAYOUT	
TITLE 9:	BIKEWAYS & TRAILS STANDARDS		
SECTION	9.1	DESIGN	9-1
SECTION	9.2	STANDARDS AND CRITERIA	9-1
SECTION	9.3	MATERIALS AND CONSTRUCTION	9-4
TITLE 10:	SAMPLE SUBDIVISION DEVELOPMENT AGREEMENT		
SECTION	10.1	SAMPLE SUBDIVISION DEVELOPMENT AGREEMENT	10-1
SECTION	10.2	SAMPLE PERFORMANCE GUARANTEE	10-6