

Chapter 9-4

STREET SYSTEM STANDARDS

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9-4-1: General Provisions

(A) General. The purpose of these Engineering Specifications is to provide minimum standards to safeguard life and limb, health, property and public welfare by regulating the design of, construction of, choice of materials used for, location of, maintenance and use of all public improvements and common facilities including, but not limited to, public and private streets, traffic signals and devices, public and private parking lots and appurtenances thereto. All equipment and material shall be new unless approved by the City of Montrose (City).

These Engineering Specifications represent minimum requirements and design values. Additional requirements of higher design values, commensurate with conditions, may be required by the City Engineer if, in his judgment, they are in the best interest of the City. These design guidelines have been prepared to assist engineers preparing plans for roads and other street related public improvement projects in the City of Montrose. Variations may be considered based solely on sound engineering practice and will be reviewed and approved by the City Engineer on an individual basis. Such variations must be requested in writing along with sufficient documentation supporting the request.

(B) **CDOT Specifications.** Section 101 and Sections 200 through 717 of the current Standard Specifications for Road and Bridge Construction of the Colorado Department of Transportation, State of Colorado, (*CDOT Specifications*) as reemphasized, supplemented or amended by the State and by these specifications shall govern all road and bridge construction work within the public right-of-way and in other areas of City jurisdiction or ownership. Where a conflict in specifications exists, City of Montrose Specifications shall rule unless otherwise approved by the City Engineer.

9-4-2: Street System Design Criteria

(A) **Layout.** Layout of all street systems shall conform to the City subdivision requirements as defined in the Subdivision Regulations. Generally, local residential cross sections shall be used in areas where average daily traffic (ADT) is not likely to exceed one thousand (1,000) vehicles per day. Collector and arterial streets shall be constructed whenever engineered traffic analysis of the future traffic volumes indicates the need of a cross section greater than that of a local service street.

Additional ROW and/or easements may be required to satisfy other criteria contained in these Engineering Design Standards, or as deemed necessary by the City Engineer. Areas outside the ROW shall be contour graded, compacted, and sloped, as required for proper drainage, soil stability, and maintenance accessibility. Cuts and fills proposed on slopes greater than three (3) horizontal to one (1) vertical shall require supporting calculations provided by a qualified geotechnical engineer based on a soils analysis.



- (B) **Design Element Coordination.** Horizontal and vertical alignment continuity shall be provided between new and existing streets to achieve safe and aesthetically pleasing transitions. Sufficient data on existing infrastructure shall be depicted on plans, and limits of construction shall be designated to ensure that the desired continuity is achieved. Drainage and utility facilities are to comply with all applicable sections of these Engineering Design Standards and are to be fully coordinated with the street design and proposed construction.
- (C) **Traffic Impact Study.** All requests for subdivision, zoning and other site developments shall provide a Traffic Impact Study using the Institute of Traffic Engineers (I.T.E.) informational manual, as required by the City Subdivision Regulations or requested by the City Engineer, in a form specified by the City Engineer.
- (D) **Driveway Construction Regulations.** Every driveway hereafter constructed, reconstructed or altered, in the City right-of-way, shall conform to the following regulations.
 - (1) No driveway shall be so located as to create a hazard to pedestrians, motorists, or to invite or compel illegal or unsafe traffic movements.
 - (2) Unless otherwise approved by the City Engineer, all driveways shall be constructed within lines at right angles to the curb or street line.
 - (3) No driveway shall be constructed in such a manner as to create a hazard to any existing street lighting standard, utility pole, traffic regulating device or fire hydrant. The cost of relocating any such street structure when necessary to do so shall be borne by the responsible party. Relocation of any street structure shall be performed only by or through the person holding authority for the particular structure involved.
 - (4) No construction, alteration or repair shall be permitted for any driveway which can be used only as a parking space or which provides access only to the area between the street roadway and private property.
 - (5) All driveways shall be so constructed that they shall not interfere with the drainage system of the street.
 - (6) Where curbs exist, or are required, driveways shall be paved for their full width from the back of curb to the property line.
 - (7) Where a driveway crosses a sidewalk, the sidewalk thickness shall be increased to a minimum of six (6) inches of concrete.
 - (8) A driveway or curb cut on a corner lot shall be set back a minimum of ten (10) feet from the property line at the corner or shall be a minimum of twenty (20)



feet from the cross street curb line whichever is greater.

- (9) No property shall be allowed more than one driveway on any particular street (no looped driveways).
- (10) The following minimum widths are required for driveways:

ZONING DISTRICT	MINIMUM WIDTH OF DRIVEWAYS
Single Family	12'
Multiple Family	24'
Commercial & Industrial	24'

- (11) Water meter pits shall not be located in any driving or parking surface unless otherwise approved by the City Engineer.
- (12) No curb cuts shall be allowed on a State Highway except with written permission of the Colorado Department of Transportation. The responsible party shall obtain all required permits.
- (13) Where curbs do not exist and a driveway crosses a drainage ditch, a culvert shall be installed by the property owner at a diameter sized according to the ditch capacity, but in no case less than twelve (12) inches. The minimum length of any culvert shall be five (5) feet greater than the driveway width or twenty (20) feet whichever is greater. Culvert installation shall include flared end sections with geotextile beneath riprap to prevent erosion. Corrugated metal pipe shall not be used for culverts in the City ROW.
- (14) Any deviation from these standards shall be allowed only by special written permission from the City Engineer.

(E) Angled Parking in City-Owned Rights-of-Way

- (1) Proposed angled parking in rights-of-way shall not be allowed on Federal or State Highways, City major arterial streets, or City minor arterial streets, whether inside the red line shown on the Downtown Transition Areas Parking Strategy Boundary map, or elsewhere within the City.
- (2) New angled parking in the right-of-way shall be constructed in sections not less than half ($\frac{1}{2}$) of a city block in length.
- (3) The applicant shall submit two (2) sets of construction drawings to the City Engineer and Community Development staff, and receive approval from the City Engineer and Community Development staff of said drawings, prior to initiating construction of any angled parking in the right-of-way. The entity



performing the construction shall obtain any necessary permits to work in the City right-of-way.

- (4) Angled parking in the right-of-way shall meet the following design standards:
 - (a) A six (6) foot wide sidewalk with a minimum six (6) foot landscaped area between the sidewalk and the vertical curb section, or a fourteen (14) foot sidewalk with a two (2) foot strip of a different pattern or texture before the beginning of the curb/gutter section shall be included, with street trees placed at required intervals in appropriately designed tree grates.
 - (b) Trees shall be planted between the sidewalk and the parking area at approximately twenty-five (25) foot intervals.
 - (c) Angled parking in the right-of-way shall be delineated by vertical curbs.
 - (d) Landscaped islands defined by vertical curb and gutter extending as far into the street as is necessary to define the required depth of the parking spaces, and a twelve (12) foot to fourteen (14) foot travel lane shall be built at all corners, and at mid-block. The islands at the corners shall be of sufficient size to accommodate adequate snow storage during the winter. The specific size(s) for said islands shall be determined during the review of the construction plans.
 - (e) Sidewalks and a striped crosswalk at the mid-block crossing may be required. The decision as to the necessity of a sidewalk and crosswalk shall be made during the review of construction plans, and shall be based upon the location and projected level of use.
 - (f) Angled parking in the right-of-way shall be at either a sixty degree (60°) or forty-five degree (45°) angle. The size of parking spaces shall be in conformance with the Parking Table set forth in § 4-2-5(A)(2) of the City of Montrose Regulations Manual.
 - (g) Angled parking in the right-of-way shall not be allowed within forty (40) feet of corners (as measured from the existing curb line) where parked cars back into the travel lane toward an intersection; said parking shall comply with the distance requirements set forth in the edition of the *Model Traffic Code for Colorado Local Governments* currently adopted by the City of Montrose:
 - (i) No parking within five (5) feet of a driveway
 - (ii) No parking within fifteen (15) feet of a hydrant
 - (iii) No parking within twenty (20) feet of a crosswalk
 - (iv) No parking within thirty (30) feet of a traffic control signal



- (v) No parking within fifty (50) feet of a railroad crossing
- (h) All designs shall meet standards of the Americans with Disabilities Act, 42 U.S.C. § 12101, *et seq.*, as amended.
- (i) It shall be the applicant's responsibility to provide engineering drawings stamped by a registered engineer that show adequate drainage capacity, and integrate well with the drainage pattern throughout the rest of the block. Covered drains may only be allowed in the discretion of the City Engineer in areas where no other reasonable options exist.
- (j) Landscaping plans for the islands and the entire parking arrangement shall be submitted and approved by the City prior to construction. Landscaping shall meet the applicable requirements found in § 4-2-4 of the City of Montrose Regulations Manual. No vegetation or other objects shall intrude into clear vision areas, as defined in the Site Zone Detail Drawing (ST-07) in Title 9, Chapter 4 of the City of Montrose Regulations Manual.
- (k) Deviations from these design standards may not be allowed, as described in § 4-1-13 of the Official Code of the City of Montrose.
- (5) Adjacent property owners shall be responsible for maintaining the street trees, vegetated islands, and any planting strips located in the City's right-of-way. Adjacent landowners shall also be responsible for snow removal, striping, and pavement repair and/or replacement within any angled parking in the right-of-way.
- (6) Angled parking in the right-of-way shall be for use by the general public, and not solely for the private use of the person requesting it, or the adjacent landowner, or business entity owned by said requesting person. Signage is prohibited which purports to limit the public's use of angled parking spaces that have been installed in the right-of-way.
- (7) The illustration below provides a conceptual image intended to assist in visualization of the above design criteria; said illustration is not binding.





- (F) **Subgrade Investigation and Pavement Design Report.** This report shall be prepared by or under the supervision of and signed by a Professional Engineer currently registered in the State of Colorado and shall include the following information.
 - (1) Vicinity map to locate the investigated area.
 - (2) Scaled drawings showing the location of soil borings.
 - (3) Scaled drawings showing the estimated extent of subgrade soil types and ESAL for each street.
 - (4) Pavement design alternatives for each street on a scaled drawing.
 - (5) Tabular listing of sample designation, sample depth, Group Number, Liquid Limit, Plasticity Index, percent passing the No.200 sieve, Group Index, Unified and AASHTO Classification, and soil description.
 - (6) Proctor Compaction Curves.
 - (7) R-value test results of each soil type used in the design.
 - (8) Pavement design methodology following AASHTO *Guide for Design of Pavement Structures* with all assumptions and variables clearly defined.



- (9) Design calculations.
- (10) A narrative describing potential subgrade soil problems including, but not limited to, heave or settlement prone soils, frost susceptible soils, ground water, drainage considerations (surface and subsurface), cold weather construction (if appropriate), and other factors, properties, or fill areas which could affect the design or performance of the pavement system.
- (11) Recommendations to alleviate or mitigate the impact of problems discussed above.

(G) Quality Control and Quality Assurance.

(1) **Quality Control**. The Contractor is responsible for quality control of all work performed and shall implement whatever procedures, methods, testing, surveying, and supervision that is required in order to insure that the work conforms to the approved plans and Street System Standards.

The Contractor is responsible for submission of HMA quality control testing documentation to verify that the mix design for the work performed conforms to the Standards for Hot Mix Asphalt (HMA) as shown in Table 1.

(2) **Quality Assurance.** The developer, owner or entity responsible for administering the construction of public facilities shall provide a quality assurance program. This program shall include systematic inspection and testing of the work and materials during construction to assure the owner and the City that the Contractor is providing work that is in conformance with the Cityapproved plans and specifications.

Initial testing shall be performed at the beginning of each construction phase in order to identify and correct any non-compliant work.

A minimum of one test will be required for any portion of material less than that shown in the "Frequency" column on Table 1 below.

All failing tests shall be re-tested after the material has been reworked, modified or adjusted by the Contractor. The Contractor will be required to remove and replace any work or materials that do not meet test requirements or specifications to the satisfaction of the City Engineer.



TABLE 1 DECLUDED CHAI	ITV ASSLIDANCE (OA) /	OLIALITY CONTROL	24-May-12 (OC) TESTING			
TABLE 1 – REQUIRED QUALITY ASSURANCE (QA) / QUALITY CONTROL (QC) TESTING FREQUENCY						
TEST SPECIFICATION	TEST PROCEDURE	PART TIME	FULL TIME			
TEST REQUIRED	TOLERANCE	INSPECTION	INSPECTION			
Compaction of subgrade under	AASHTO T 99	1 per 200 LF	1 per 400 LF			
curbs, gutters, and sidewalks.	95% minimum					
Compaction of subgrade and	AASHTO T 99	1 per 400 SY	1 per 600 SY			
embankment under roadways.	CDOT 203.07					
Compaction of agg. base course	AASHTO T 180	1 per 200 LF	1 per 400 LF			
under concrete curbs, gutters, and	95% minimum					
sidewalks,						
Compaction agg. base course	AASHTO T 180	1 per fillet;	1 per fillet			
under fillets and drainage pans	95% minimum	1 per 50 LF pan	1 per 100 LF pan			
Compaction of aggregate base	AASHTO T 180	1 per 400 SY	1 per 600 SY			
course materials under roadways.	95% minimum					
Compaction of Structure Backfill	AASHTO T 180		ertical depth per 100			
	95% minimum	LF of structure period				
Gradation of aggregate base course	CDOT Table 703-2	1 per 5000 Ton	1 per 5000 Ton			
(QC)						
HMA *						
Asphalt Content (QC)	CP41 method	1 per 1000 Ton	1 per 1000 Ton			
	A or E, or CPL 5120	1 per day min.	1 per Day min.			
Gradation of aggregate (QC)	CP31	1 per 1000 Ton	1 per 1000 Ton			
	CDOT Table 703-3					
Air Voids (Pa) (QC)	AASHTO T 269	1 per 1000 Ton	1 per 1000 Ton			
	2.8% to 5.2%					
Voids in Mineral Aggregate	CP48	1 per 30,000 Ton	1 per 30,000 Ton			
(VMA) (<i>QC</i>)	See Table 5					
Percent Relative Compaction (QC)	CP81	1 per 500 SY	1 per 800 SY			
	92% to 96%					
CONCRETE TESTS *						
Compressive Strength (QC)	ASTM C 31 and C 39	1 set/100 CY	1 set/day/500 CY			
	4500 psi min in 28 days	(4 cylinders per				
		set)				
Air Content (QC)	ASTM C231	1 per 100CY	1/day/500 CY			
	5-8%					
Slump (QC)	ASTM C 143	1 per 100CY	1/day/500 CY			
	4" maximum					

CP= Colorado Procedure (CDOT) Field Materials Manual

Part Time Inspection. Where the Engineer or representative of the Engineer is on the project for periodic observation, documentation, and/or testing of the project construction, in an as needed capacity.

Full Time Inspection. Where the Engineer or representative of the Engineer is on the project for continuous observation, documentation and/or testing during the hours of project construction.

^{*} The job mix formulas for HMA and Portland Cement concrete shall be submitted in typed form by the Contractor to the City Engineer at least ten (10) days prior to the start of paving or concrete placement.



9-4-3: Removals, Excavation, Backfilling, and Restoration Specifications

- (A) **General.** This section covers surface removals, excavation, backfilling, compaction, disposal of surplus material, restoration of disturbed surfaces, and all other work required for the safe and proper road construction.
- (B) **Concrete Removal.** Concrete pavement shall be cut vertically along pre-marked lines, unless otherwise specified. The depth of the saw cut shall be to the full depth of the concrete section.
- (C) **HMA Pavement Removal.** HMA pavement designated to be cut for removal, where new HMA pavement will be placed against the cut face, shall be wheel cut or saw cut, along a neat line. HMA pavement designated for removal, where concrete pavement will be placed against the cut face, shall be saw cut along a straight line with a vertical face. Cut faces of concrete and HMA pavement shall be protected from damage until the new pavement is placed against them.
- (D) **Excavation and Backfill of Structures.** Flow-fill may be used to backfill utility trenches, manholes and other structures and excavations in paved and unpaved areas of City ROW. Flow-fill shall not be placed around the bottom half of pipes or structures that could be displaced or damaged by the buoyant forces of the flowable fill material. Pipe bedding and trench backfill material and compaction requirements are specified in Section 9-2-5 of this manual.

Flow-fill shall meet the requirements of section 9-5-10 of the *Concrete Standards*. The City Engineer may require that a sample of the proposed flow-fill mix be prepared, tested and/or placed in the backfill to demonstrate its performance prior to approval of the mix. Flow-fill shall be placed to the depth indicated on the plans or as directed by the City Engineer. Bleed water shall be drained off or otherwise removed from the surface of the flow-fill after it has been placed.

Excavation and backfill for the installation of all pipe, manholes, valves, vaults and other structures and appurtenances shall be in accordance with Section 9-2-5 of this manual.

(E) **Topsoil Placement.** Topsoil shall consist of free draining friable sandy loam free from roots, rocks larger than three-eight (3/8) inches, subsoil, debris, brush weeds, heavy clay, hard clods, toxic substances or other material which would be detrimental to its use on the project.

Wetland topsoil material shall consist of moist, organic soil, including any existing wetland vegetation and seeds to be excavated from areas shown on the plans or as directed.

(F) **Dust Control.** The Contractor shall furnish and apply a dust palliative on portions of the roadway, haul roads and other locations as necessary or as directed to prevent air



borne dust. This shall include prevention of dust generated from the Contractor's operations and from windy weather conditions. Dust abatement shall be provided, as needed, throughout the construction period, including nights, weekends and holidays.

(G) **Subgrade Stabilization.** Subgrade stabilization shall be used to replace wet or otherwise unstable ground conditions below the normal subgrade elevation. Subgrade stabilization shall include excavation of unsuitable material and the furnishing, placing and compaction of aggregate base course (class 2) to the depth and limits determined by the Engineer, and approved by the City Engineer.

9-4-4: Base Course Construction

- (A) **General.** Materials shall be placed on an approved subgrade that has been proof rolled within the previous twenty-four hours and found to be stable and non-yielding. Should weather conditions change, such as freezing, precipitation, etc., aggregate base materials shall not be placed until the subgrade is re-approved by the City Engineer.
 - (1) The required thickness of the base course may be reduced, subject to the approval of the City Engineer, by increasing the depth of HMA at the rate of two (2) inches of aggregate base course to one (1) inch of HMA, or appropriate depths based on strength coefficients.
 - (2) If the required compacted thickness exceeds six (6) inches, the base course shall be constructed in two or more lifts of equal thickness. The maximum thickness of any lift to be compacted shall not exceed six (6) inches.
 - (3) The minimum depth of base course on streets and alleys shall be six (6) inches. Class 5 and 6 material shall be classified as base course. Class 5 and Class 6 material shall have a minimum "R" value of 70.
 - (4) Class 2 material shall be classified as subbase course and shall be used only when the base requirement is greater than six (6) inches. Class 2 material shall have a minimum "R" value of 60.
- (B) **Base Course Placement.** The base course material shall be placed on the previously prepared subgrade at the locations and in the proper quantities to conform to the typical cross sections as shown on the plans. Placing and spreading shall be done by means of a spreader machine, moving vehicle, motor grader, or by other approved equipment methods. The material shall be placed without segregation. Any segregated areas shall be removed and replaced with uniformly graded material at the Contractor's expense.

The base material may be placed in lifts of up to six (6) inches, providing that after compaction, uniform density is obtained throughout the entire depth of the lift. If the required depth exceeds six (6) inches, it shall be placed in two (2) or more lifts of



approximate equal thickness. If uniform density cannot be obtained by six (6) inch lifts, the maximum lift shall not exceed four (4) inches in final thickness.

Base material shall not be placed on a foundation that is soft or spongy or one that is covered by ice or snow. Base material shall not be placed on a dry or dusty foundation where the existing condition would cause rapid dissipation of moisture from the base material and hinder or preclude its proper compaction. Such dry foundations shall have water applied to them and shall be reworked or re-compacted. A geotechnical engineer shall provide base material recommendations where foundations are not stable.

Care shall be exercised in the hauling and placing of base course so as to avoid segregation of the coarse and fine materials. The base course material shall be placed on the previously prepared and approved subgrade in sufficient quantity to conform to the thickness specified on the approved cross section. The material shall be mixed and watered to obtain a uniform mixture at optimum moisture.

(C) **Compaction.** Rolling shall be continuous until the base material has been compacted thoroughly in accordance with Section 304 of the current CDOT Standard Specifications. Water shall be uniformly applied as needed during compaction to obtain optimum moisture content and to aid in consolidation. The surface of each lift shall be maintained during the compaction operations such that a uniform texture is produced and the aggregates are firmly placed.

(D) **Optimum Moisture Content.**

- (1) Non-clay material shall be placed and compacted near optimum moisture plus or minus two percent (± 2%). The compaction shall be continued until the base course has a density of not less than ninety-five percent (95%) of its Modified Proctor near optimum moisture.
- (2) For clay soils, the material shall be placed and compacted at optimum moisture content up to plus four percent (+ 4%). The compaction shall be continued until the base course has a density of not less than ninety-five percent (95%) of its Modified Proctor at optimum moisture.
- (3) At least twenty percent (20%) of the tests shall be taken within one (1) foot of a manhole or valve box.
- (4) Nuclear testing equipment and methods are acceptable when performed by an approved certified testing laboratory and when performed in accordance with the requirements of ASTM D-2922 and ASTM D-3017.
- (E) **Final Proof-Rolling.** The finished base course surface shall be smooth and free of ruts and irregularities, and shall be true to grade and crown as shown on the plans. The base course shall be maintained in this condition by watering, drying, rolling, or



blading until the final surface is placed.

After the base course has been compacted, tested and found to meet specifications, the entire base shall be proof-rolled with a heavily loaded vehicle with the Engineer or approved representative onsite for observation. The vehicle must have a certified loaded GVW of fifty thousand (50,000) pounds with a loaded single axle weight of at least eighteen thousand (18,000) pounds and a tire pressure of ninety (90) psi. Subbase that is pumping, deforming, or failing in any way shall be reworked, replaced or otherwise modified to form a smooth, stable, non-yielding base for subsequent paving lifts. The City Engineer shall be notified at least twenty-four (24) hours before final proof rolling.

(F) **Base Course Approval.** The results of field density tests and proof rolling shall be submitted and reviewed by the City Engineer. Provided all tests are acceptable, compaction shall be approved for the placement of the HMA. Should testing indicate unsatisfactory work, the necessary reworking, compaction or replacement shall be required prior to continuation of the paving process. The approval is valid for twenty-four (24) hours. Changes in weather, such as freezing or precipitation, shall require re-approval of the base course.

9-4-5: HMA Pavement Materials and Construction.

(A) **General.** This work consists of one or more lifts of a bituminous mixture constructed on a prepared foundation in accordance with these Street System Standards. The placement of HMA shall conform to the lines, grades, thickness and typical cross sections shown on the plans or established. Each lift shall be compacted to the required density and approved before placement of the next lift.

HMA for patching consists of those quantities required for the replacement of unstable corrugated areas in the existing pavement, pipe trenches, areas removed for curb and gutter forms, areas between the curb and gutter or sidewalk and the existing paved parking lots, and areas designated on the plans.

(B) **Aggregates.** Aggregates shall be of uniform quality, clean, hard, durable particles of crushed stone, crushed gravel, natural gravel, or crushed slag free from clay balls, organic matter, or other deleterious materials. Aggregates meeting the requirements of Table 2 shall be used to develop the Job Mix Formula and the HMA mixture. The aggregate should be composed of angular, coarse textured, cube shaped particles. Excess of fine material shall be wasted before crushing. Sand may be used to obtain gradation of the blended aggregate mixture but should not exceed more than fifteen percent (15%). If the percent aggregate passing the #4 sieve is greater than ten percent (10%) by weight of the individual aggregate sample, plasticity will be determined in accordance with AASHTO T 90.

TABLE 2: AGGREGATE PROPERTIES



Property	Test Procedure	Coarse Retained on #4 Sieve	Fine Passing the #4 Sieve
Fine Aggregate Angularity Traffic Level Low, Moderate Trails and Pathways	CP-L5113 Method A		40% Minimum
Traffic Level 3 to 5 Moderate, High,			45% Minimum
Parking Lots Fractures Faces (minimum 2)	CP-45	80% Minimum	
LA Abrasion	AASHTO T 96	45% Minimum	
Flat and Elongated Places	AASHTO M 283	10% Maximum	
Sodium Sulfate Soundness	AASHTO T 104	12 % Maximu Coarse a	
Adherent Coating (Dry Sieve)	ASTM D 5711	0.5 %	45% Minimum
Sand Equivalent	AASHTO T 176		45% Minimum

- (1) Sources of Aggregates. Sources of aggregates shall be designated by the contractor with the submittal of the job mix formula
- (2) Gradation. The gradation of aggregates used in the mixture shall meet the criteria shown in Table 3, the Aggregate Master Range Table, and shall not vary from the low limit on one sieve to the high limit on the adjacent sieve, or vice versa, but shall be well graded from coarse to fine. The nominal size aggregate used in the HMA mixture shall not be more than one-third (1/3) the thickness of the HMA lift being constructed.



Sieve Size	Percent by Weight Passing Square Mesh Sieves					
Sieve Size	Grading S	Grading SG	Grading SX			
1 1/2"		100				
1"	100	90 - 100				
3/4"	90 - 100		100			
1/2"			90 - 100			
3/8"						
#4						
#8	23 - 49	19 - 45	28 - 58			
#30						
#200 ¹	2 - 8	1 - 7	2 - 10			

TABLE 3: AGGREGATE MASTER RANGE TABLE

- (C) **HMA Material.** Binder (asphaltic cement) shall be from an approved source and shall meet the requirements listed in Table 702.2 of the current CDOT Standard Specifications for Road and Bridge Construction. Based on climatic conditions and reliability, the binder grade approved for use in the Montrose area is PG 64-22 or PG 58-28 Non-Modified Binder and PG 64-28 Modified Binder.
 - (1) Composition of Mixture. The HMA plant mix shall be composed of a mixture of well-graded aggregate, filler (if required), bituminous material and antistripping additive. The aggregate fractions shall be sized, handled in separate size groups and combined in such proportions that the resulting mixture meets the grading requirements of the job mix formula.
 - Job Mix formula. No HMA mixture shall be produced until the City Engineer has approved a job mix formula.
 - (a) The job mix formula shall be submitted by the contractor to the City Engineer at least ten (10) days prior to the start of paving operations.

TABLE 4 DESIGN CRITERIA			
Test Property Requirements			
Stability	28 min		
Compaction Gyrations (N design)	75*		
Air Voids (percent by volume of mix)	3.0 to 5.0		
Voids Filled (percent by volume of mix)	65 TO 78		
Voids in Mineral Aggregate	See Table 5		

^{*} On roadways with high traffic loading, Ndesign greater than seventy-five (75) gyrations may be specified by the Engineer of record (See Table 2-1 in the CAPA Guideline for the Design and *Use of Asphalt Pavements for Colorado Roadways*)



TABLE 5 Voids in Mineral Aggregate (VMA)						
	Nominal Minimum VMA (percent)					
Maximum Particle Size *		Perce	nt Design Air	Voids		
mm	In.	3.0 4.0 5.0				
9.5	3/8	14	15	16		
12.5	1/2	13	14	15		
19	3/4	12	13	14		
25	1	11	12	13		
37.5	1-1/2	10	11	12		

^{*} The nominal maximum particle size is one sieve size larger than the first sieve to retain more than ten percent (10%).

- (b) The maximum size aggregate used shall not be more than one-third (1/3) of the thickness of the lift being constructed. (3:1 ratio)
- (c) Job mix control testing shall be performed by the contractor at the start of plant production and in conjunction with calibration of the plant for the job mix formula. It should be recognized that the aggregates produced by the plant may not satisfy the gradation requirements or produce a mix that exactly meets the job mix formula. In those instances, it will be necessary to reevaluate and redesign the mix using plant-produced aggregates.
- (d) Contractor may propose a design using rubber additives, recycled asphalt, warm mix asphalt, or other new technologies. The design shall be submitted to the City Engineer for approval.
- (D) **Job Mix Testing Requirements.** All commercial testing and laboratory work necessary to establish the job mix formula and all testing necessary to assure conformance of materials and workmanship to the requirements of the specifications shall be at the Contractor's expense. Copies of all test reports shall be submitted directly to the City Engineer.
- (E) **Volumetric Tolerances.** HMA mix design volumetric tolerances for the approved HMA mixture shall be within the limits shown in Table 6. Mixture being produced by the plant shall be verified prior to the start of the placement of the mixture. Verification shall be performed by a **LabCAT Level C** certified technician to verify the volumetric properties of the mixture. If the mixture has been produced for another project within the last ninety (90) days, verification results from that project may be submitted for this verification.



TARIE 6. HMA	MIVTIDE	DECION VEDI	FICATION TOLERANCES	
I ADLE 0: HIMA	WHALUKE	LUCSILIN VEKI	FICATION TOLEKANCES	

Property	Tolerances
Air Voids	∮ 1.2%
VMA	Ŷ 1.2%
Binder Content	Ŷ 0.3%
Stability	applicable minimum

- (F) **Lift Thickness**. Each lift of compacted HMA shall be of uniform thickness. The minimum compacted lift thickness shall be three (3) times the maximum nominal aggregate size. The maximum thickness shall be three (3) inches unless the contractor can demonstrate the ability to achieve compaction of thicker lifts.
- (G) **Patching**. Unless otherwise approved by the City Engineer, all trenches and excavations in collector or arterial streets shall be patched before the street is reopened to traffic. All longitudinal trenches shall be repaved with an asphalt paving machine. The contractor shall maintain all temporary patches until a permanent patch is installed. Between October 15th and May 1st, a five (5) inch thick concrete cap will be required on all exactions in asphalt section of right-of-way unless otherwise approved by the City Engineer.
- (H) **Prime Coat.** Prime coat materials and application shall be in accordance with the requirements of the current CDOT Standard Specifications, Section 407. Prime coat shall be applied to compacted base course material and concrete curb faces that will be in contact with new asphalt paving. Prime coat material shall be allowed to cure a minimum of twenty-four (24) hours prior to asphalt paving unless otherwise directed by the City Engineer.
 - (1) Surface Prep. Before applying the prime coat, all loose material shall be removed from the surface. That portion of the surface prepared for treatment shall be dry and in satisfactory condition. Dust or contamination of prime coats shall require brooming and reapplication.
 - (2) Emulsified Application. Asphalt Emulsified Prime (AEP) shall be applied in accordance with the manufactures recommendations. The prime coat shall be carefully applied. If excessive amounts of curb, sidewalks, or other structures are sprayed with liquid asphalt, they shall be cleaned at the Contractor's expense. The prime coat shall not be applied when the surface is excessively wet, when the atmospheric temperature is less than forty degrees (40°) Fahrenheit, when precipitation is imminent, or as recommended by the manufacturer.
 - (3) Curing. Curing shall be required for all prime coats. The prime coat shall be sticky, or tacky, when cured. The length of time required for curing shall depend on the air temperature, humidity and wind conditions, and the prime coat



shall be black when cured. The prime coat shall be allowed to cure for a minimum of twenty-four (24) hours prior to the paving operation unless otherwise authorized by the City Engineer. If after the curing period the prime coat has not penetrated the base material, and the surface must be used by traffic, a suitable blotter material shall be applied in amounts necessary to absorb excess liquid asphalt. The blotter material shall be a dry, gritty sand.

- (4) Coverage. Prime coat AEP shall be uniformly applied at a rate of three-tenth (0.3) gallons per square yard to the surface of the aggregate base course. Application rates for other approved prime coat materials shall be as specified in the Contract Documents or as directed by the Engineer.
- (I) **Tack Coat.** When tack coat is specified on the approved plans or required by the City Engineer, all materials and construction shall be in accordance with the requirements of the current CDOT Standard Specifications, Section 407. Tack coat shall be applied where additional HMA is to be placed over existing asphalt or Portland cement surfaces. Tack coats shall not be required where HMA is less than twenty-four (24) hours old and remains free of dust, dirt or debris.
 - (1) Surface Preparation. Before applying the tack coat, all loose material shall be removed from the surface. That portion of the surface prepared for treatment shall be dry and in satisfactory condition. Dust or contamination of tack coats shall require brooming and reapplication.
 - (2) Liquid Asphalt. The liquid asphalt used for tack coat shall be an emulsified asphalt grade CSS-1h or SS-1h and shall satisfy the requirements of ASTM D977. Other emulsified asphalts may be used upon written permission of the City Engineer.
 - (3) Application. The surface shall be allowed to cure to permit drying and setting of the tack coat prior to the paving operation. A 1:1 dilution should be applied at the rate of 0.05 to 0.15 gallons per square yard. A wand, spray bar, or hand spray nozzle attached to the spray bar can be used for applying tack to gutter faces, valve boxes, manholes and rings.
- (J) **Surface Smoothness.** The finished surface of all pavements may be subject to testing by the 10-foot straightedge method. At the request of the City Engineer, the Contractor shall furnish an approved ten (10) foot straightedge and depth gauge and provide an operator to assist the Engineer in testing the finished pavement surface. Areas to be tested shall be determined by the City Engineer or the Construction Inspector. The variation between any two contacts with the surface shall not exceed three-sixteenth (3/16) inch in ten (10) feet. Areas showing deviation of more than three-sixteenth (3/16) inch shall be marked and corrected at the Contractor's expense. This test may be waived by the City Engineer.



- (K) **Asphalt Content.** Asphalt content control shall be part of the Contractor's Quality Control. If the materials are within the specification limits, the lot shall be acceptable. Volumetrics falling outside the limits of the job mix formula will warrant corrective action, which may include removal and replacement of the represented day's production.
- (L) **Traffic Control Plan.** If a Traffic Control Plan (TCP) is not provided in the plans, then the Contractor shall furnish one. The TCP shall be prepared by a technician currently certified by the American Traffic Safety Services Association, Colorado Contractor Association, or other approved organization. The TCP shall conform to the latest edition of the Manual on Uniform Traffic Control Devices (MUTCD). The Contractor shall submit the TCP to the Engineer for review at least two (2) working days before the pre-construction meeting. The Contractor shall submit the TCP to the Engineer for review at least two (2) working days before the pre-construction meeting.

9-4-6: Final Inspection and Acceptance

- (A) The acceptance of all road and bridge improvements by the City will be based on the following.
 - (1) Submittal of satisfactory results of all required quality assurance (QA) tests certified by the Engineer or a qualified independent laboratory.
 - (2) Submittal of a copy of the daily inspection reports prepared by the Engineer or his representative.
 - (3) Passing a final inspection of the work by the City Engineer or his representative.
 - (4) Submittal of two sets of "As-Built" construction drawings on twenty-four inch by thirty-six inch (24"x 36") paper. All "As-Built" drawings shall be certified by a Professional Engineer currently licensed by the State of Colorado and shall state the name of the Contractor. "As-Built" drawings shall also be submitted as an electronic AutoCAD file in accordance with the City of Montrose submittal standards in Section 9-1-2.
 - (5) The Contractor shall guarantee all portions of the street for a period of two (2) years after completion against defective workmanship and materials and shall keep the street in good repair during that period. The City Engineer shall possess sole authority to require the Contractor to repair or replace dedicated public improvements throughout the warranty period. This decision shall be final and obligatory upon the Contractor.

9-4-7: Street Name Signs



- (A) **General.** Street name signs shall generally conform to the Manual of Uniform Traffic Control Devices section 2D.38. Colors used shall be those specified in the MUTCD.
- (B) <u>Design.</u> City street names signs shall be white legend and border on a green background. Letters shall be lower case with initial upper case for both names and street type designator. The font shall be Standard Alphabets for Traffic Control Devices Series B. The city logo shall be affixed to the left of the street name. Punctuation shall not be used.

Directional indicators shall not be used, except that on the streets numbered N 1st through N 9th and S 1st through S 9th, the "N" or "S" as appropriate shall be used. When the proper name of the street contains a direction (for example, North Forty Street), the direction shall not be abbreviated.

- (C) **Private Roads.** Street signs installed to designate private roads within the City, whether installed by the City or by the property owner, shall conform to this standard in all respects except that the background shall be blue and no logo shall be used.
- (D) **Size.** Design of street name signs shall conform to the following table:

	Multi-lane streets with posted speed limit 45 mph or greater	Arterials and streets with posted speed limit 30 mph or greater	Streets with posted speed limit 25 mph or less	Overhead Street Name Signs (may be illuminated)
Upper Case Letters	8"	6"	4"	12" (min)
Lower Case Letters	6"	4.5"	3"	9" (min)
City Logo	6" Aligned at top of street name	4.5" Aligned at top of street name	3" Aligned at top of street name	Same as height of uppercase, vertically aligned at center of street name
Street type designator (St, Ave), centered vertically*	4.5"	3"	3"	One-half the size of upper case letters

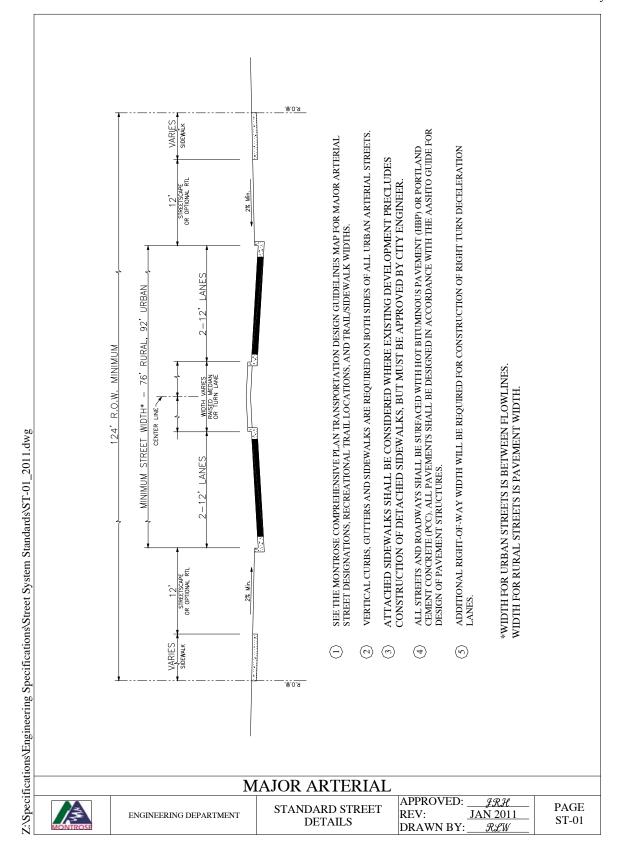
^{*}Exception: Numbered streets (N 1st through N 9th and S 1st through S 12th) type designator shall be the same size as all other lettering. Streets bearing the County section line naming (for example, 6530 Road) are not considered numbered streets in this context.



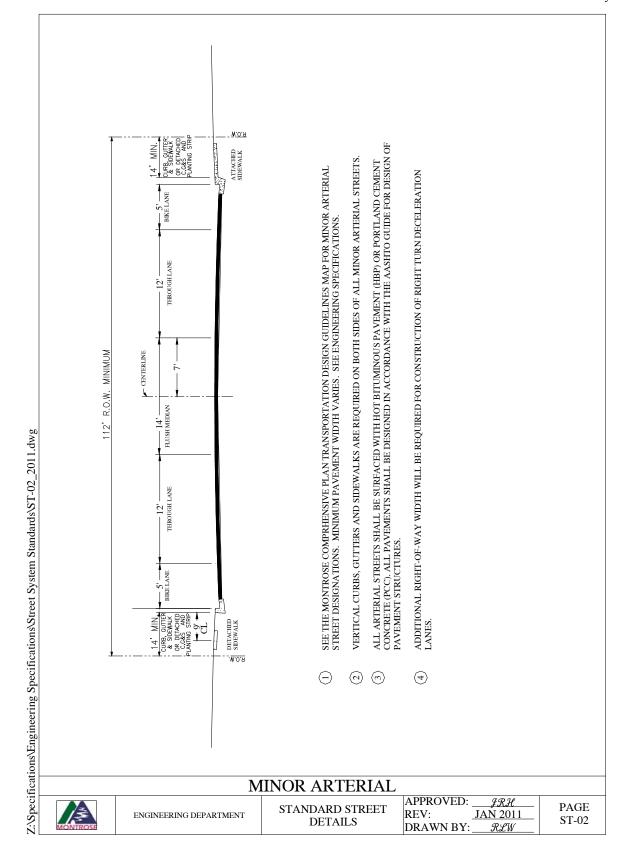


9-4-8:	Street System Details
ST-01	Major Arterial
ST-02	Minor Arterial
ST-03	Collector
ST-04	Urban/Residential Street
ST-05	Recreational Trail/Two-Way Shared Use Path
ST-06	Alley
ST-07	Site Zone Detail
ST-08	Utility Locations and Multi-Purpose Easement Detail
ST-09	Cul-De-Sac Turn Around – Commercial/Industrial Court
ST-10	Cul-De-Sac Turn Around – Residential Court
ST-11	General Notes For Multi-Purpose Easements

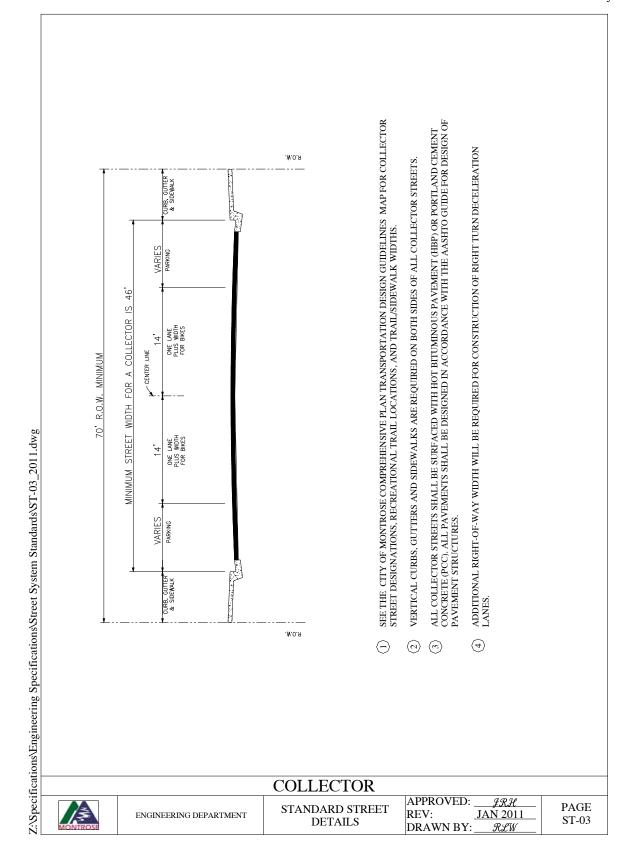




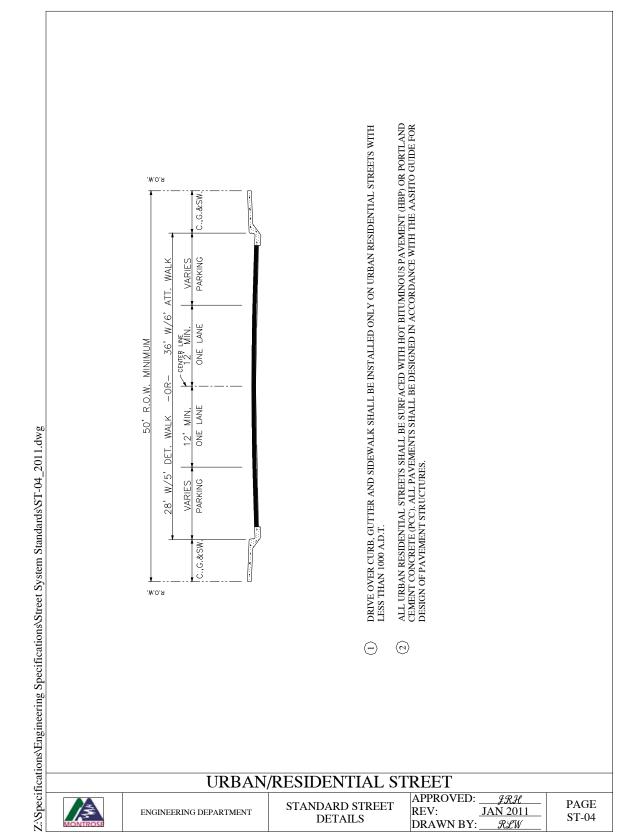




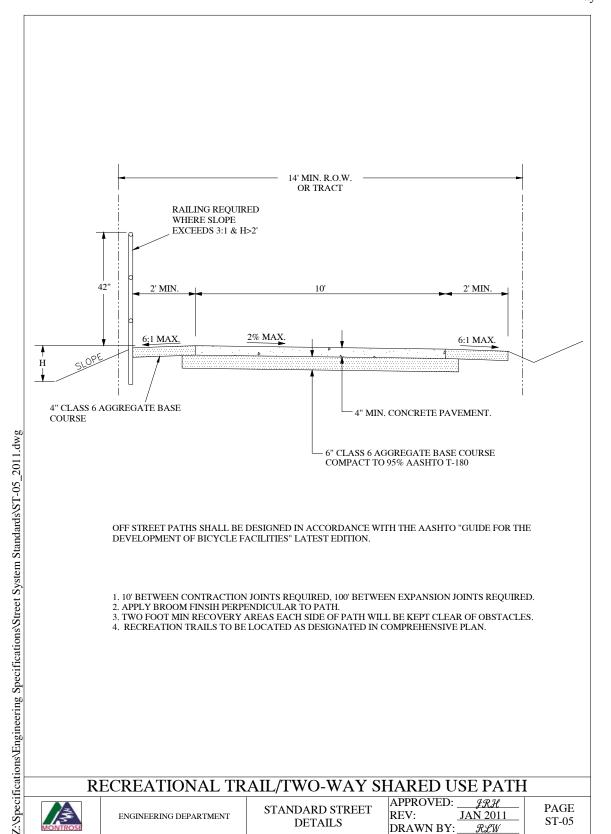












RECREATIONAL TRAIL/TWO-WAY SHARED USE PATH



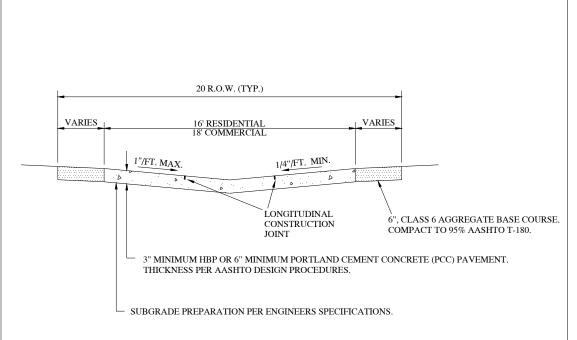
ENGINEERING DEPARTMENT

STANDARD STREET **DETAILS**

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- (1) SAW CUT LONGITUDINAL CONTRACTION JOINTS SPACED AT 1/3 PAVEMENT WIDTH.
- 2 SAW CUT TRANSVERSE CONTRACTION JOINTS AT 10' SPACING.
- 3 SEE STANDARD CONCRETE DETAILS FOR EXPANSION JOINT SPACING.
- $\textcircled{4}) \quad \text{ALL EXPANSION AND CONTRACTION JOINTS SHALL BE SEALED.}$
- $\stackrel{\textstyle \frown}{\bigcirc}$ PCC PAVEMENT SHALL BE DESIGNED IN ACCORDANCE WITH THE AASHTO GUIDE FOR DESIGN OF PAVEMENT STRUCTURES.

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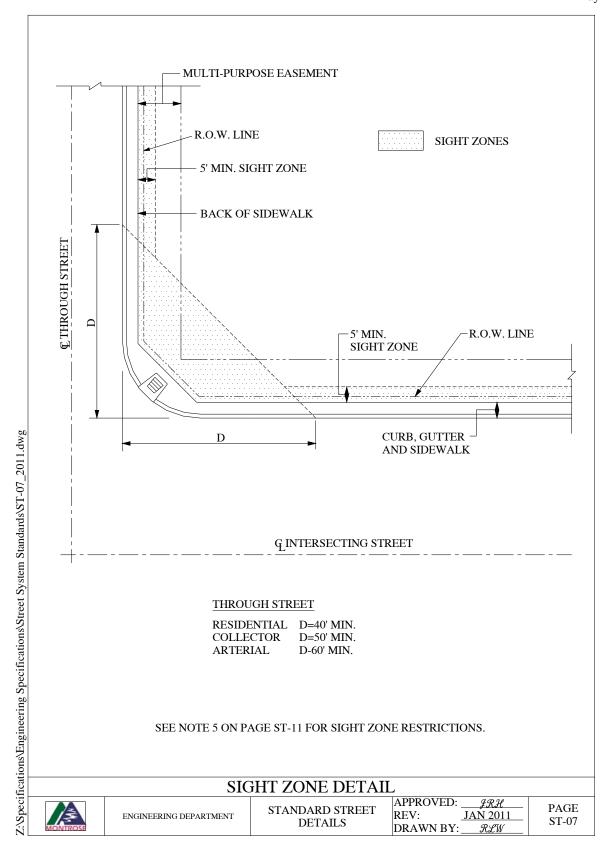
ENGINEERING DEPARTMENT

STANDARD STREET DETAILS

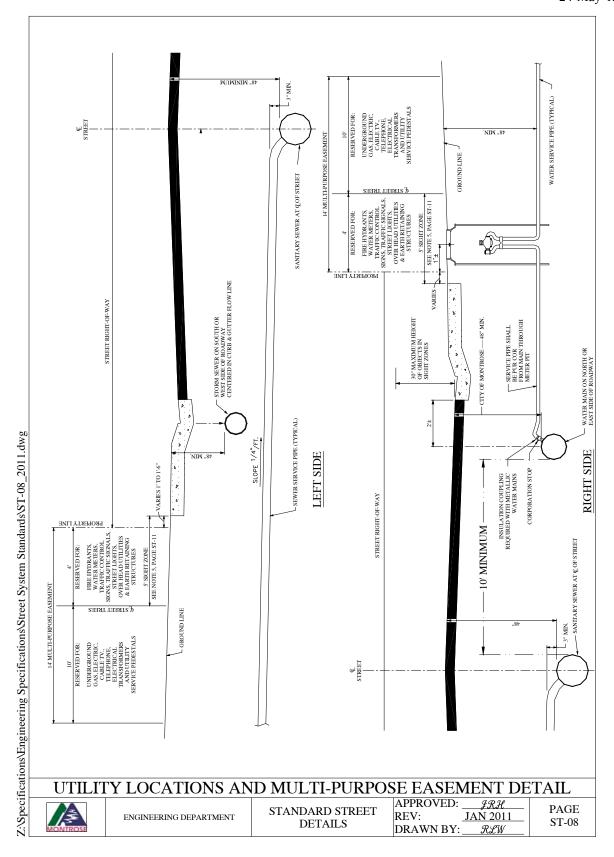
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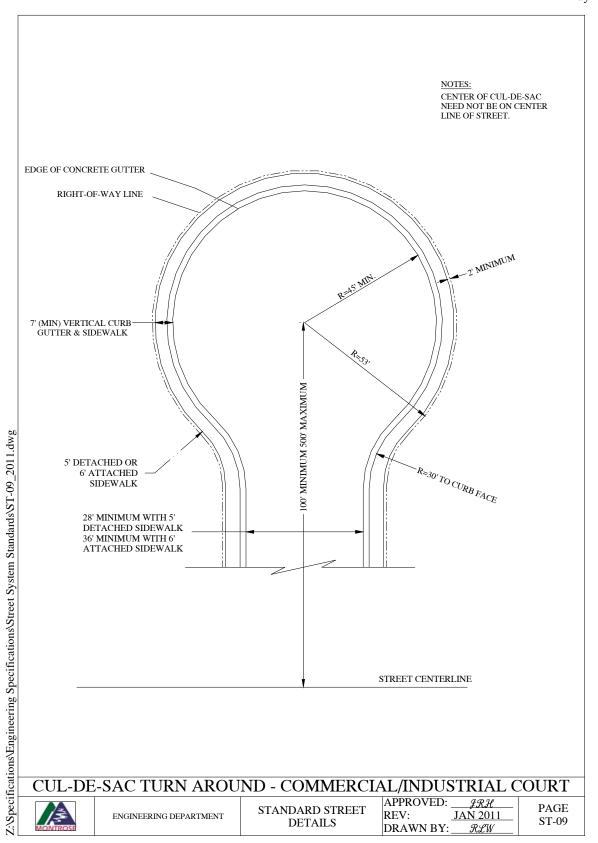




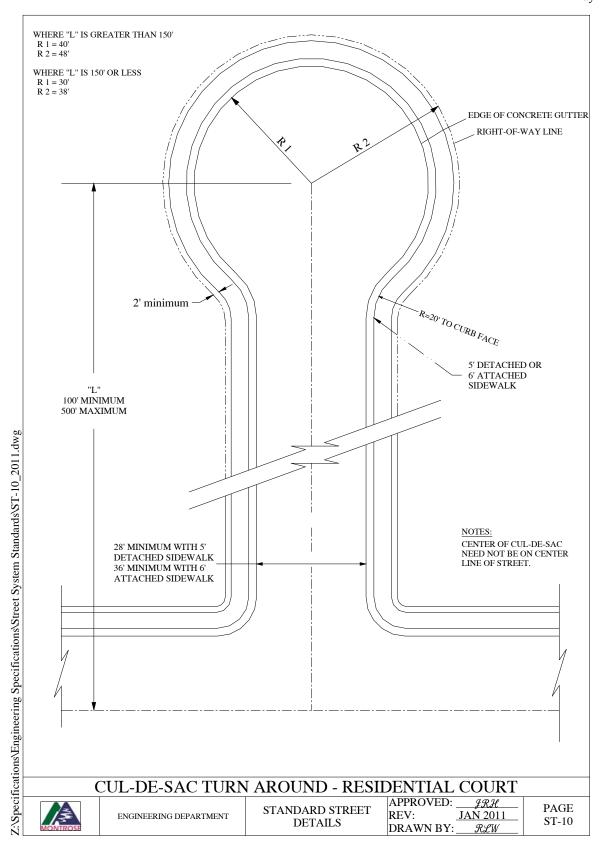














1. A 20' CONTINUOUS MULTI-PURPOSE EASEMENT SHALL BE PROVIDED ON BOTH SIDES OF ALL ROAD RIGHTS-OF-WAY. THIS EASEMENT SHALL BE RESERVED FOR PURPOSES INCLUDING, BUT NOT LIMITED TO INSTALLATION AND MAINTENANCE OF PUBLIC UTILITIES, TRAFFIC CONTROL SIGNS AND SIGNALS, STREETSCAPE, STREET TREES, AND SPRINKLING SYSTEMS, EARTH RETAINING STRUCTURES AND SURFACE SLOPING OR GRADING REQUIRED FOR STREET CONSTRUCTION.

UTILITY COMPANIES AND/OR THE CITY OF MONTROSE SHALL NOT BE RESPONSIBLE FOR DAMAGE TO PLANTINGS, IRRIGATION SYSTEMS, FENCES, OR OTHER APPURTENANCES LOCATED OR CONSTRUCTED WITHIN THE MULTI-PURPOSE EASEMENT WHEN SUCH DAMAGE RESULTS FROM THE INSTATLLATION AND/OR REPAIR OF UTILITIES WITHIN SAID MULTI-PURPOSE EASEMENT.

- 2. IRRIGATION DISTRIBUTION LINES SHALL BE LOCATED IN A SEPARATE EASEMENT LOCATED ON THE HOUSE SIDE OF THE MULTI-PURPOSE EASEMENT, OR AT THE BACK LOT LINE.
- 3. PROPERTY OWNERS MAY LANDSCAPE THE FULL WIDTH OF THE MULTI-PURPOSE EASEMENTS. SPRINKLING SYSTEMS INSTALLED WITHIN MULTI-PURPOSE EASEMENTS SHALL NOT BE LESS THAN 18" BELOW THE GROUND SURFACE AND SHALL BE BLOWN OUT PRIOR TO NOV 1.
- 4. STREET TREES SHALL BE LOCATED 5' FROM THE BACK OF SIDEWALK AND NO LESS THAN 10' FROM ANY DRIVEWAY. NO TREES SHALL BE PLANTED WITHIN THE MULTI-PURPOSE EASEMENT WITHOUT APPROVAL OF THE SPIECES AND LOCATION BY THE CITY PARKS DIVISION SUPERINTENDENT.
- 5. NO TREES, SHRUBS, HEDGES, FENCES, WALLS, OR OTHER OBSTRUCTIONS OVER 30" IN HEIGHT, MEASURED AT THE NEAR EDGE OF ROADWAY, SHALL BE LOCATED WITHIN SIGHT ZONES SHOWN ON THE TYPICAL STREET SECTIONS (PAGES ST-01 THROUGH ST-04) AND SITE ZONE DETAIL (PAGE ST-07). EXCEPTIONS WILL BE MADE FOR UTILITY POLES, TRAFFIC CONTROL SIGNS, TRAFFIC SIGNAL POLES AND "OPEN TYPE" FENCES. CHAIN LINK OR OTHER "OPEN TYPE" FENCES UP TO 48 INCHES IN HEIGHT MAY BE INSTALLED ON THE RIGHT-OF-WAY LINE. REFER TO THE CITY MUNICIPAL CODE FOR SPECIFIC FENCING REQUIREMENTS AND RESTRICTIONS.
- 6. ALL FIRE HYDRANTS AND WATER METERS SHALL REMAIN UNOBSTRUCTED AND ACCSESSIBLE AT ALL TIMES. NO FENCES, PLANTINGS, STRUCTURES OR OTHER OBSTACLE SHALL BE LOCATED WITHIN 3' OF ANY FIRE HYDRANT OR WATER METER. NO FENCES OR OTHER OBSTRUCTION SHALL BE LOCATED ON THE STREET SIDE OF ANY FIRE HYDRANT OR WATERMETER.
- 7. SANITARY SEWER MANHOLES SHALL BE LOCATED AT CENTER LINE OF TRAFFIC LANE.
- 8. STORM SEWER MANHOLES SHALL BE LOCATED AT THE CENTER LINE OF TRAFFIC LANE.
- 9. WATER, SANITARY SEWER AND STORM SEWER LINES SHALL HAVE 48" (MIN) COVER UNLESS OTHERWISE APPROVED BY CITY ENGINEER.

GENERAL NOTES FOR MULTI-PURPOSE EASEMENTS



ENGINEERING DEPARTMENT

STANDARD STREET DETAILS

APPROVED: JRH REV: JAN 2011 DRAWN BY: RLW

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