



## Public Improvements Review Checklist

- Plans must be sealed by a Registered Professional Engineer and shall be submitted for review and approval.
- All new development and redevelopment shall include a stormwater management plan. See the Independence Stormwater Management Manual.
- All projects that disturb over 50 cubic yards must have a Soil Management plan that meets the following:
  - I. A topsoil layer meeting these requirements:
    - An organic matter content, as measured by the loss-on-ignition test, of a minimum 5 percent (target 6 percent) dry weight in planting beds, or a minimum 2.5 percent (target 3 percent) organic matter content in turf areas.
    - A pH from 6.0 to 8.0 or matching the pH of the original undisturbed soil.
    - A minimum depth of 6 inches.
  - II. Scarify subsoils below the topsoil layer at least 4 inches for a finished minimum depth of 10 inches of uncompacted soil that is free of debris. Incorporate some of the upper material to avoid stratified layers, where feasible.
- Performance Standards from the new Stormwater Management Plan are as follow:
  - I. Post-development peak discharge rates from the site shall not exceed those indicated below:
    - 50% storm peak rate less than or equal to 0.5 cfs per site acre
    - 10% storm peak rate less than or equal to 1.0 cfs per site acre
    - 1% storm peak rate less than or equal to 1.8 cfs per site acre
  - II. 40-hour extended detention of runoff from the local 90% mean annual event (1.37"/24-hour rainfall). See Chapter 6 of the MARC/APWA BMP Manual for calculating this volume.



# INDEPENDENCE

★ COMMUNITY DEVELOPMENT ★

## STREETS

- Maximum street grades are as follows: 6% for Arterial, 8% for Collector, and 10% for Local Streets.
- Streets meet all horizontal and vertical curve requirements found in Section 20.07.002.
  - The design for crest vertical curves shall be based on stopping sight distance as follows:

Design Speed, mph	Minimum stopping sight distance, feet	K=Rate of Vertical curvature, length in feet per percent of A	
		Calculated	Rounded
30	200	28.6	28
40	275	54	55

- The design for sag vertical curves shall be as follows:

Design Speed, mph	Minimum stopping sight distance, feet	K=Rate of Vertical curvature, length in feet per percent of A	
		Calculated	Rounded
30	200	36.4	35
40	275	55.5	55

- Public Streets and Alleys are constructed in accordance with the approved standard drawings. The road classification is based on the Independence Thoroughfare Map.
- New streets connect with streets already dedicated and provide for future extensions.
- Streets proposed for future extension are terminated with deaceasable turnarounds where the distance from an intersecting street line is greater than two hundred feet (200').
- Deceasable turnaround has a deceasable right-of-way diameter of not less than one hundred feet, and a pavement diameter of eighty feet.
- No cul-de-sac street ends less than two hundred feet (200') from a crest unless the vertical curve is such that safe sight distance can be maintained.
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Option	Minimum Right-of-way	Minimum Pavement Width	Required Landscape Are	Required Clear Zone	Maximum Length
A	100'	30'	20'	10'	500'
B	110'	30'	30'	0'	500'
C	160'	30'	80'	0'	1320'

- Centerline off-sets of intersection streets are at least one hundred fifty feet (150') apart.
- Streets are laid out so as to intersect as nearly as possible at right angles and do not intersect at less than seventy-five degrees (75°).
- Street right-of-way intersections are rounded to a radius of not less than twenty-five feet (25').
- Raised medians do not encroach into any intersection beyond the beginning of the curb radius.
- Width of one-way traffic adjacent to a median is at least eighteen feet (18') back of curb to back of curb.
- Cul-de-sacs medians are at most twelve feet (12') to the back of curb section
- Streets are centered in the right-of-way
- The right-of-way widths for interior streets and alleys included in any subdivision shall not be less than the minimum dimensions for each classification as follows:

TYPE	RIGHT-OF-WAY
Major Arterial Streets	80'
Minor Arterial Streets	60'
Collector Streets	60'
Local Streets	50'

- Sidewalks are within the right-of-way on both sides of all collector and arterial streets and on one side of all local streets
  - Sidewalks are a minimum of four feet (4') in width and are located as shown on the approved standard drawing.
  - Handicap ramps are installed at all curb intersections.
  - Handicap ramps are constructed of six inch (6") thick concrete as shown on the approved standard drawing.
- Sidewalks are constructed of concrete
- Curbs are on all streets and are constructed in accordance with the approved standard drawings. All materials conform to applicable provisions of Chapter 20, Article 6.
- Traffic control for management of traffic around and through construction areas shall be provided in accordance with Part VI of the latest revision of the Manual on Uniform Traffic Control Devices (MUTCD)
- All traffic control plans shall have prior approval by the Engineer.
- Newly constructed streets, when observed to have traffic volumes sufficient to warrant control as decided by the Engineer, shall have permanent traffic control devices installed at the developer's expense, as submitted on a plan drawing and approved by the City Engineer.

**A Traffic Impact Study is Required When:**

- Any development project requiring a rezoning, Conditional Use Permit, or subdivision that may exceed 100 vehicles during peak hour.
- Any project anticipated to generate more than 100 AM & PM peak generating time trips.
- Any project anticipated to generate 1000 or more **added** vehicle trips to or from the site during a 24-hour period
  - Trip generation rates must be obtained from the most recent edition of the Trip Generation Handbook by the Institute of Transportation Engineering. Only "new" vehicle trips will be counted thus no pass-by or internal trip captured will be used in calculated vehicle trips.
- Any project located in the vicinity of the intersection of two arterial, collector, or some combination streets, or if the project could adversely impact the intersection as determined by the City Engineer.

- Any project anticipated to impact an existing high-accident or congested location.
- Any project that is anticipated to generate controversy or opposition.
- When the city or state does not consider a proposed access to be safe and/or provide efficient movement of traffic.



# INDEPENDENCE

★ COMMUNITY DEVELOPMENT ★

## STORM

- All developments, both residential and commercial, require stormwater detention.
  - Detention requirements are calculated using the methods outlined in APWA Storm Drainage Design Criteria section 5600, adopted 1990.
  - Developments include any activity, including subdivisions, that alters the surface of the land to create additional impervious surface, including but not limited to pavement, building, and structures.
- The system capacity calculations need to be shown. Capacity is based on three factors:
  - Inlet control.
  - Outlet control.
  - Outlet control with tail water effects.
- Minimum design pipe size is 12 inch diameter
- The minimum pipe size under a public street or within a public system shall be fifteen inches in diameter.
- Each conveyance element of the stormwater drainage system (whether enclosed or open) shall include an overflow system having sufficient hydraulic capacity when combined with the capacity of the conveyance elements to convey the peak discharge generated by a 100-year return period storm without damage to land or buildings, defined as:
  - 100-year stage, plus one foot freeboard, at an elevation equal to or greater than the lowest elevation at which water may enter any proposed or existing building or structure
- Gutter flow: Inlets shall be located to limit the width of flow in street gutters at the time of peak discharge of a 10-year return period storm to the following limits:

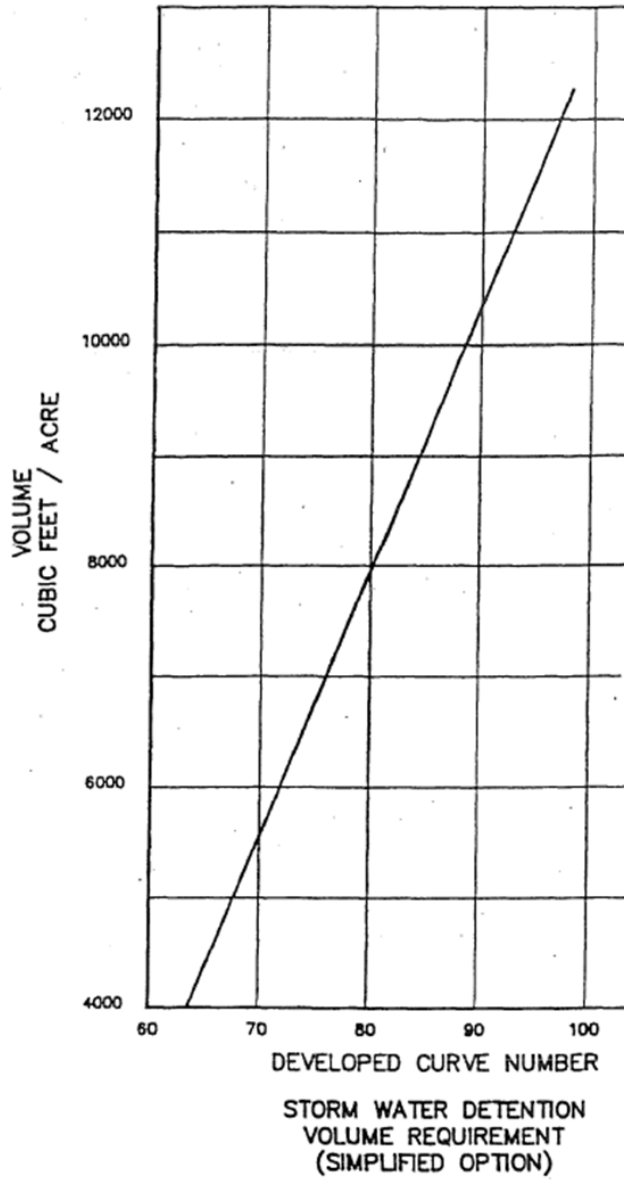
BACK TO BACK OF CURB STREET WIDTH IN FEET	MAXIMUM ALLOWABLE SPREAD IN EACH OUTSIDE CURB LANE FROM BACK OF CURB IN FEET
28 or less	10.5
Over 28 to 36	11.5
Over 36	12.0
Divided Roadways	As above for each direction roadway
Arterial and Collector Street Intersections and Pedestrian Crosswalks	6.0

- The combined capacity of the overflow channel and in-system conveyance element shall be sufficient to convey the 100-year storm at all locations; except that an overflow depth not exceeding seven (7) inches at the lowest point of the travelled way will be permitted where culverts cross streets

- Inlet design: only curb opening inlets are used on public streets with proposed or existing curbs, except as approved by the City Engineer
- Inlet capacity is rated at 80% of the theoretical capacity indicated by Tables 8-1 through 8-3 and Figures 8-1 through 8-3 to allow for partial obstruction and clogging (APWA 5600-1990)
- The velocity within an enclosed system is between 3 and 20 feet per second. Velocity must be calculated using the universally accepted Manning's Equation with the wetted perimeter of the pipe.
- Minimum depth of cover for an enclosed system is 18 inches, or as required by the manufacturer.
- The crown(s) of pipe(s) entering a structure shall be at or above the crown of the pipe exiting from the structure and provide a minimum fall of the invert in the structure of 0.2-feet for straight flow through the structure or 0.5-feet fall for all other types of flow (bends more than 22.5 deflection angle, multiple lines entering, enlargement transition, etc.) through the structure. The desirable minimum fall across the invert is 0.5-feet.
- HDPE (high-density polyethylene) and RCP (reinforced concrete pipe) are accepted pipe materials. Watertight joints are required.
  - Reinforced Concrete Pipe and Fittings shall conform to ASTM C 76 except as otherwise specified under Section 20.02.003 B.
- Effective energy dissipation is required at the outfall of all enclosed systems
- The post-development peak discharge rate from the site shall not exceed 1.8 cfs per site acre for the 100-year storm.

**Detention Requirements:**

- See APWA Section 5606 for volume calculations. Simplified Method is as follows:



- Type 2 twenty-four hour rainfall distribution shall be used for all computations that employ the use of rainfall mass:

<u>TIME IN HOURS</u>	<u>ACCUMULATED RAINFALL IN PERCENT OF 24-HOUR RAINFALL</u>
0	0
2.0	2.22
4.0	4.80
6.0	8.00
8.0	12.00
9.0	14.70
9.5	16.30
10.0	18.10
10.5	20.40
11.0	23.50
11.5	28.30
11.75	38.70
12.0	66.30
12.5	73.50
13.0	77.20
13.5	79.90
14.0	82.00
16.0	88.00
20.0	95.20
24.0	100.00



- Rainfall intensity shall be determined from Figure 1 or Table C in the APWA using a Calculated Time of Concentration (TC). TC is determined through the following formula, where TI is Inlet Time, or the overland flow time to the most upstream inlet or other point of entry to the system, and TT is the time for flow in the system to travel to the point under consideration, Travel Time. (TC = TI + TT)
- TI is calculated by the following formula or determined graphically from Figure 2 in the APWA, but shall not be less than 5.0 minutes nor greater than 15.0 minutes:

$$T_I = 1.8 \frac{(1.1 - C) D^{1.49}}{S^{0.04}}$$

$T_I$  = Inlet Time in minutes.

$C$  = Rational Method Runoff Coefficient as determined in accordance with paragraph 5602.2

$D$  = Overland flow distance parallel to slope in feet.  
(300-feet shall be the maximum distance used for overland flow)

$S$  = Slope of tributary area surface perpendicular to contour in percent.

- Runoff Coefficients relative to development and land use shall have the following values:

<u>LAND USE/ZONING</u>	<u>AVERAGE PERCENT IMPERVIOUS</u>	<u>AVERAGE PERCENT PERVIOUS</u>	<u>RATIONAL METHOD "C"</u>	<u>S.C.S. CURVE NUMBER</u>
<b>a. Business</b>				
Downtown Area	95	5	0.87	96
Neighborhood Areas	85	15	0.81	94
<b>b. Residential</b>				
Single-Family Areas	35	65	0.51	83
Multi-Family Areas	60	40	0.66	88
Churches & Schools	75	25	0.75	92
<b>c. Industrial</b>				
Light Areas	60	40	0.66	88
Heavy Areas	80	20	0.78	93
Parks, Cemeteries	10	90	0.36	77
Railroad Yard Areas	25	75	0.45	80
<b>d. Undeveloped Areas</b>				
Permanent Unimproved Areas Greenbelts, etc.	0	100	0.3	75
<b>e. All Surfaces</b>				
Impervious: asphalt concrete, roofs, etc.	100	0	0.9	98
Turfed	0	100	0.3	75
Wet detention basins	100	0	0.9	98

- A composite runoff coefficient based on the actual percentages of pervious and impervious surfaces shall be used for areas not listed above.



### SANITARY SEWER

- Sanitary sewer systems are designed for the ultimate tributary population and are based on the best information available.
- Gravity sewer mains are not less than eight inches (8”) in diameter. The sewer is sized based on the criteria set forth in Section 20.09.001 and 20.09.002. Pipe sizing is based on the Manning formula.
- Sewers shall be designed to provide capacity based on the following criteria unless directed otherwise by the City Engineer:

A. Single Family Residential	.015 cfs/acre
B. Multi-Family Residential	.03 cfs/acre
C. Commercial	.02 cfs/acre
D. Industrial and High Rise (in excess of three stories)	A unit flow study is required

- Pipes meet the requirements for minimum slope:

SEWER SIZE	MINIMUM SLOPE IN FEET PER 100 FEET
8”	0.60
10”	0.44
12”	0.36
15”	0.28
18”	0.24
21”	0.20
24”	0.16

- Exceptions:
  - For sewers serving less than thirty houses: minimum slope of 0.76%
  - For lateral sewers serving less than ten (10) houses: minimum slope of not less than one percent (1%).
- Sewers are designed on straight alignment between manhole. The interior angle of the incoming and outgoing pipes in a manhole is not less than ninety degrees (90°).
- Sanitary sewers are located within street or alley rights-of-way, unless topography dictates otherwise. When located in easements on private property, access is provided from street or alley right-of-way.
- All sewer mains have a minimum of three feet (3') of cover, except for aerial creek crossings.
- Sewer mains under paved areas must have a minimum of six feet (6') of cover, or concrete encase, ductile iron, or the appropriate PVC pipe by manufacturer recommendation.
- Aerial crossings are ductile from pipe with mechanical joints.
- Support is provided for all joints utilized for aerial crossings.
- Accepted pipe materials:

- Acrylonitrile-Butadiene-Styrene (ABS) Composite Sewer Pipe and Fittings
- Acrylonitrile-Butadiene-Styrene (ABS) Sewer Pipe and Fittings
- Ductile-Iron Pipe and Fittings
- Poly (Vinyl Chloride) (PVC) Plastic Pipe (SDR-PR) and Fittings
- Type PSM Poly Vinyl Chloride (PVC) Sewer Pipe and Fittings
- Type PS 46 Poly Vinyl Chloride (PVC) Sewer Pipe and Fittings
- Reinforced Concrete Pipe and Fittings
- Vitrified Clay Pipe and Fittings
- Poly (Vinyl Chloride) (PVC) profile gravity sewer pipe and Fittings
- ADS 3000 Triple Wall HDPE Pipe and Fittings
- Expansion jointing is provided between above ground and below ground sewers.
- The bottom of the pipe is placed no lower than the elevation of the fifty (50) year flood.
- The location of sanitary sewers relative to water facilities is a matter of public health and accordingly is regulation by MDNR.
  - Vertical separations are at least eighteen inches (18") between the outside of the pipes.
  - Horizontal separations are at least ten feet (10') measured edge to edge.
- All easements have a minimum fifteen feet (15') width.
- The sewer is located in the center of the easement, unless approved otherwise by the Engineer.
- Wyes are placed to serve every building site.
- Service lines are required from the sewer main to the right of way or easement line adjacent to the property to be served. A two-way cleanout is required at the right-of-way line.
- The service line is designed at a minimum of one percent (1%) slope.
- Every building has a separate service line to the main. Service lines shall not tie to manholes.
- Service lines are marked in accordance with Article 8, Section 20.08.006.
- Service lines are perpendicular to the sewer main.

**Manholes:**

- Sewers are designed on straight alignment between manhole. The interior angle of the incoming and outgoing pipes in a manhole is no less than ninety degrees (90°).
- Manhole are installed at each of the following instances:
  - At the end of each line
  - At all changes in pipe size
  - Changes in alignment or grade
  - At distances not greater than 400 hundred feet (400') for sewers twenty-one inches (21") and smaller and five hundred feet (500') for twenty-four inches (24") and larger
- The difference in elevation between the invert of any incoming sewer and the invert of the outgoing sewer does not exceed twelve inches (12"), except where required to match crowns.
- Drop manholes have been approved by the City Engineer. Drop manholes are required when the difference in the invert elevations exceeds twelve inches (12").
- The minimum horizontal clear distance within the barrel of manholes is no less than four feet (4').
- Manholes subject to surface water inundation, such as manholes placed below the base flood elevation, are equipped with bolted pressure covers and frames that are bolted to manholes or imbedded in concrete where poured manholes are used.