	REGULATIONS FOR STREET DESIGN	Regulation No. 5-R-2

Issued: 1 May 1980 Revised: 20 Mar 2007 Approved:

1 GENERAL

A. Any variance from this document must be approved by the City Engineer or his/her legal representative.

2 DEFINITIONS

A. **APWA Standard Plans**: Standardized construction drawings published by Utah LTAP Center Utah State University in a document entitled “Manual of Standard Plans”.

B. **APWA Standard Specifications**: Standardized construction documents in written text form published by Utah LTAP Center Utah State University in a document entitled “Manual of Standard Specifications”.

C. **EASL**: Equivalent Single Axel Load.

3 SURVEY CONTROL

A. Establish a reference line (basis of bearing) to which the direction of all other lines is referenced. The control of the basis of bearing is the State Plane Coordinate system.

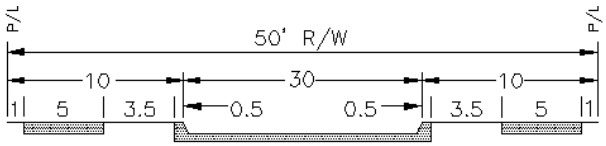
4 MAJOR STREET PLAN

A. Conform to the pattern of arterials designated in the Salt Lake City Major Street Plan and to any official street segment map approved by the City Council.

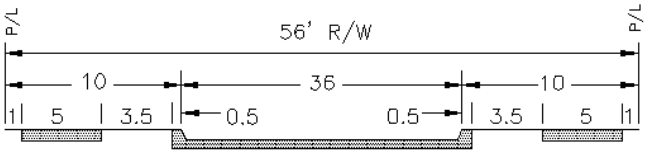
5 STREET DIMENSIONS

A. **General**: Typical local, collector and arterial cross-section are shown below. Existing thoroughfares, however, may not comply with the cross-sections shown if the existing thoroughfare has recently been upgraded to a higher type of street and the appropriate right of way has not been increased accordingly.

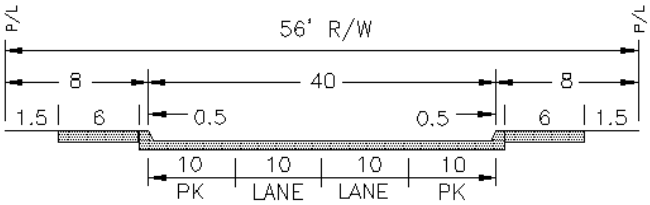
B. **Local Streets**:



RESIDENTIAL
SINGLE FAMILY

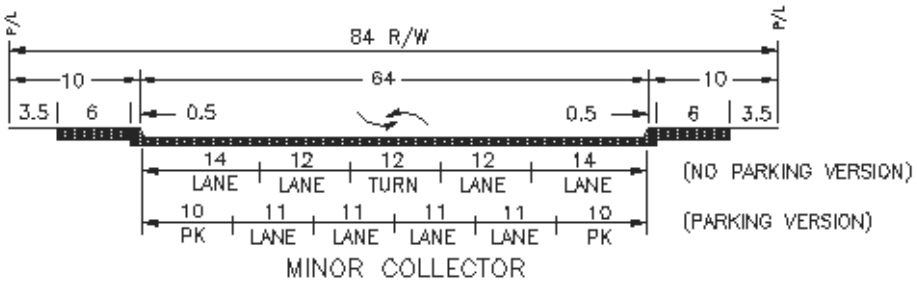


RESIDENTIAL
MULTI – FAMILY

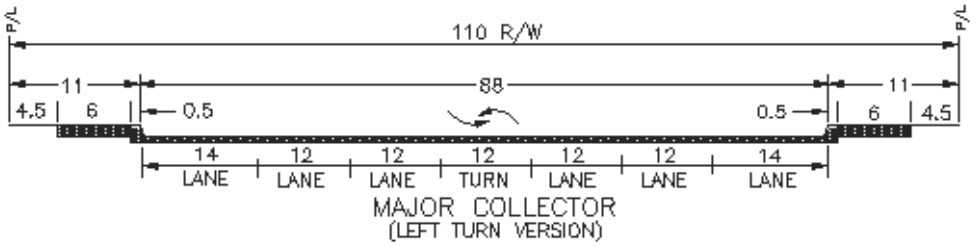


COMMERCIAL, INDUSTRIAL

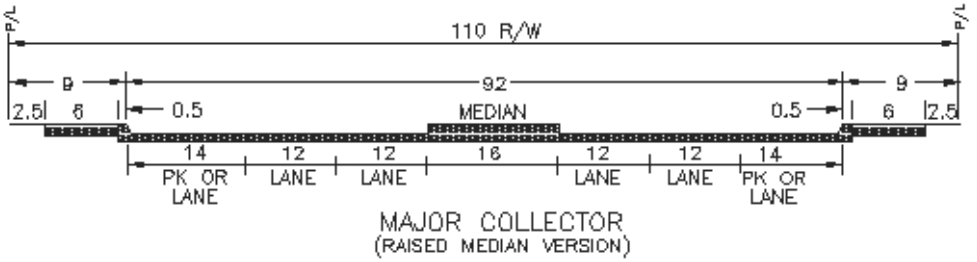
C. **Collector Streets**:



MINOR COLLECTOR

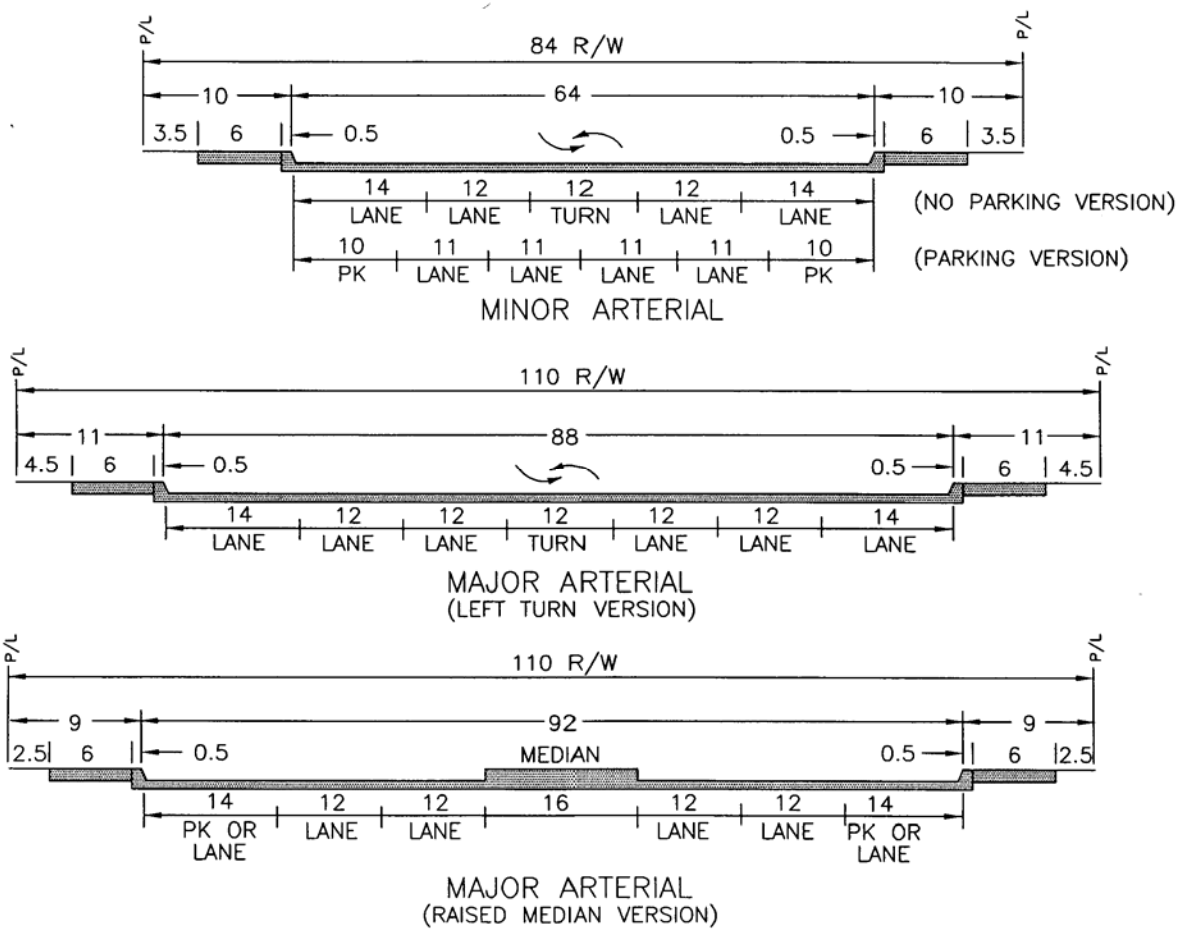


MAJOR COLLECTOR
(LEFT TURN VERSION)



MAJOR COLLECTOR
(RAISED MEDIAN VERSION)

D. **Arterial Streets**:



6 PAVEMENT STRUCTURAL SECTION DESIGN

A. **Select a traffic class**. Compare the number of ESAL's to the number of total heavy trucks using the thoroughfare during the design period. The higher number determines the traffic class.

TRAFFIC CLASSIFICATIONS

Traffic Class	Maximum ESAL *	Typical Type of Street	Total Heavy Trucks During Design Period
I	5×10^3	Residential (less than 40 residences)	#7,000
II * *	5×10^4	Residential (local access)	7,000 - 15,000
III * *	5×10^5	Minor collector	70,000 - 150,000
IV	5×10^6	Arterial/collector (commercial or light industrial)	700,000 - 1,500,000

* Equivalent axle load for 30-year design period.

* * Roadway serving as access for construction vehicles may require additional structural design

B **Determine the subgrade class**. Use the resilient modulus or the CBR value.

SUBGRADE SOIL CLASSIFICATIONS

Subgrade Class	Resilient Modulus (Mpa)	Characteristics of Soil	CBR Value
Very Poor	<30	Clay and fine silt - Extremely soft and plastic when wet.	<3
Poor	30 - 80	Clay, fine silt and sandy soils - soft and plastic when wet	3 - 8
Medium	80 - 170	Loams, silty sands and some clayey sand-gravel, retains moderate degree of firmness with moisture	8 - 17
Good to Excellent	170	Clean sands, sand-gravel and free of plastic materials - retains load-support capacity when wet	>17

C. **Select a grade of untreated base course material** per APWA Standard Specification Section 32 11 23 for the base course (and a sub-base if any is required).

D. **Minimum structural section**. Using the above data the minimum structural sections for asphalt concrete or Portland cement concrete surfacing will be the following.

1. **Asphalt Concrete Pavement Structural Section**

Subgrade Class	Pavement Section	Minimum Thickness based upon Traffic Classification			
		I	II	III	IV
Very Poor	Asphalt concrete surface	4.0”	4.0”	5”	6”
	Untreated aggregate base	*	*	*	*
	Aggregate sub-base	*	*	*	*
Poor	Asphalt concrete surface	4.0”	4.0”	5”	6”
	Untreated aggregate base	8.0”	8.0”	*	*
	Aggregate sub-base	* *	* *	*	*
Medium	Asphalt concrete surface	4.0”	4.0”	5.0”	6”
	Untreated aggregate base	8.0”	8.0”	*	*
	Aggregate sub-base	* *	* *	*	*
Good to Excellent	Asphalt concrete surface	4.0”	4.0”	5.0”	6.0”
	Untreated aggregate base	6.0”	6.0”	6.0”	*
	Aggregate sub-base	Not Required		*	*

* Road structural design completed by a licensed engineer must be submitted for approval.

* * Sub-base soil must be of sufficient depth for stabilization of road structural section. Minimum compaction of 95% relative to a modified Proctor is required.

2. **Portland Cement Concrete Pavement Structural Section**

Subgrade Class	Pavement Section	Minimum Thickness based upon Traffic Classification			
		I	II	III	IV
Very Poor	Portland cement concrete surface	6.0	6.0	8.0	8.0
	Untreated aggregate base	*	*	*	*
	Granular borrow	*	*	*	*
	Aggregate sub-base	* *	**	**	**

Poor	Portland cement concrete surface	6.0”	6.0”	8.0	8.0
	Untreated aggregate base	--	6.0”	*	*
	Granular borrow	*	*	*	*
	Aggregate sub-base	**	**	**	**
Medium	Portland cement concrete surface	6.0”	6.0”	8.0	8.0
	Untreated aggregate base	--	6.0”	*	*
	Granular borrow	--	*	*	*
	Aggregate sub-base	**	**	**	**
Good to Excellent	Portland cement concrete surface	6.0”	6.0”	8.0	8.0
	Untreated aggregate base	--	4.0”	*	*
	Granular borrow	--	**	*	*
	Aggregate sub-base	**	**	**	**

* Road structural design completed by a licensed engineer must be submitted for approval.

* * Sub-base soil must be of sufficient depth for stabilization of road structural section. Minimum compaction of 95% relative to a modified Proctor is required.

7 ROADWAY SURFACE DESIGN CRITERIA

A. **Street Grades**:

1. Longitudinal curb and gutter grade is 0.5% minimum. If storm drain catch basins (or drainage ditch turnouts) are provided, minimum curb and gutter grade is 0.3%.
2. Crown Line:
   a. For Residential Thoroughfares: 0.3% minimum.
   b. For Collector or Arterial Thoroughfares: Grade may be flat providing ride quality line abuts park strip (shoulder) drainage.
3. Steep grade of 12% to 14% are permitted at the crown line for short runs only. Grades exceeding 14% are not permitted.
4. When reconstructing, do not increase crown line grades of existing streets.

B. **Design Speed**

1. 25 mph for local streets.
2. 30 mph for collector streets.
3. 40 mph for arterial streets.

C. **Vertical Curves**: For road grades approaching intersections, determine the minimum vertical curve length using the equation L = 10a. “L” is the length of the curve in feet and “a” is the algebraic difference in grades. At least 35 feet of less than 2 percent grade from the curve line extended to the point of vertical curvature is required to provide smooth transitions of road grades to intersections. Use vertical curves where the rate of change in grade exceeds the following maximum allowable grade breaks on the following type of streets.

1. 1.5 % grade break on local street centerline
2. 1.0% grade break on collector and arterial streets centerline
3. 2.0 % grade break on curb and gutter.

D. **Sight Distances**: Stopping sight distance is the distance from a height of eye of 3.75 feet to a height of object 6-inches above the surface of the road. Measure corner sight distance at least 15 feet from the edge of the intersecting roadway

pavement.

1. Corner sight distance for local street, 300 feet minimum.
2. Corner sight distance for collector streets, 400 feet minimum.
3. Corner sight distance for arterial streets, 500 feet minimum.

E. **Horizontal Alignment**

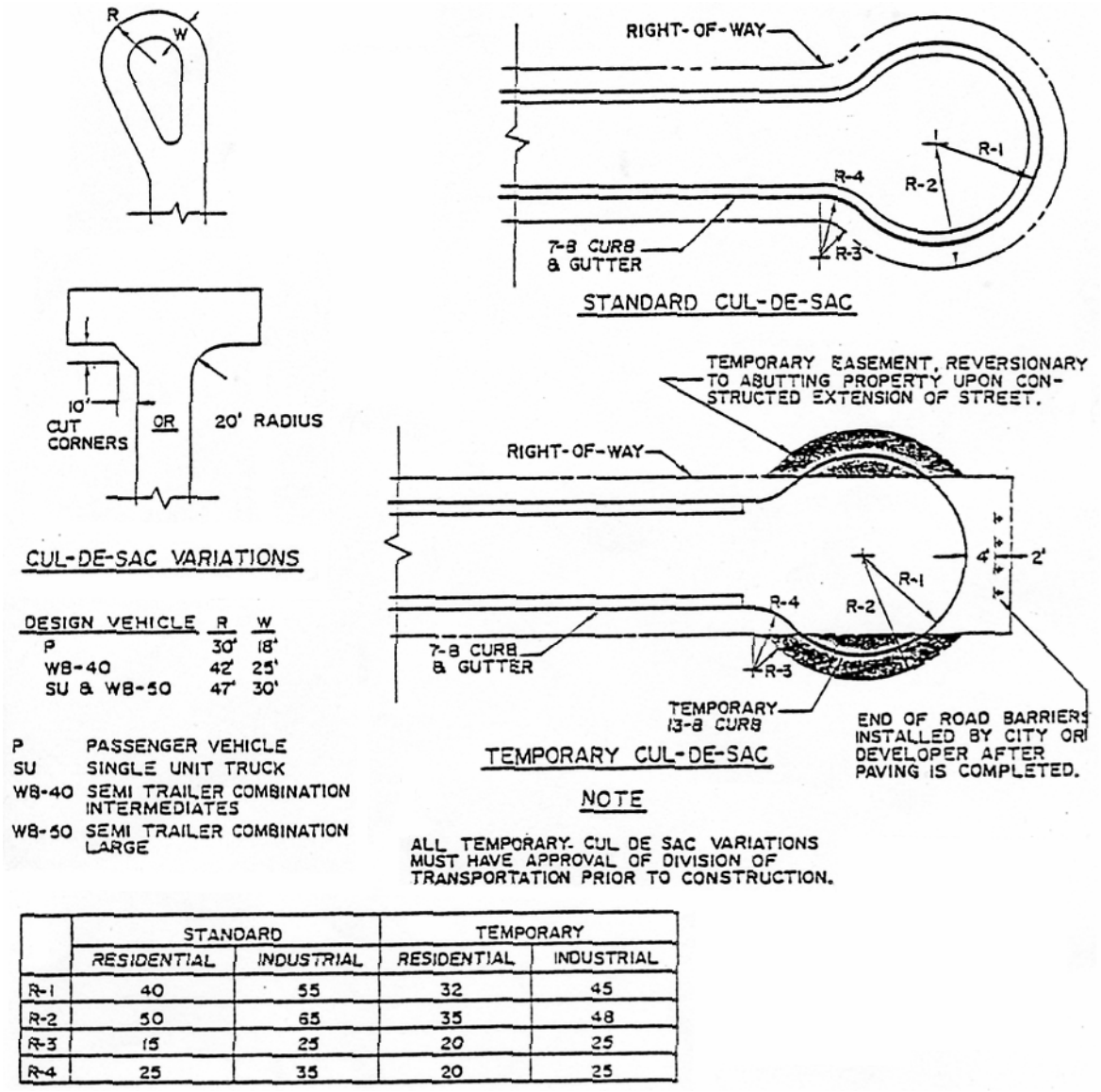
1. Make alignments as direct as possible and consistent with topography.
2. Avoid using maximum curvatures.
3. Avoid sharp curves at the end of long tangents or at the end of long flat curves.
4. Avoid short lengths of curves for very small deflection angles.
5. Avoid compound circular curves with large differences in radii.
6. Avoid the use of direct reverse curves. Use a tangent length between them.
7. Avoid the use of “broken-back curves” (two curves in the same direction on either side of a short tangent or large radius curve).

F. **Street Lighting**: Mount luminaires on brackets supported by wood, metal or concrete poles. From a safety standpoint, aluminum and stainless steel on breakaway hardware are the materials of choice. Many types and styles are available. Current emphasis is on taller poles, longer brackets or mast arms and breakaway capabilities.

1. Follow the American Standard Practice Recommendations for roadway lighting. At intersections provide 0.40 foot candles and 0.3 foot candles at all other parts of the traveled way.
2. Show on plan sheets the following: size, type, and locations of standards, fixtures, and buried conduit; foundation details of standards; wiring schematics; lighting contours showing right-of-way lighting coverage; and fixtures lumen value, type, and mounting height.

G. **Dead End Roadways**: Do not design dead end roadways so long that they inconvenience emergency vehicles.

1. In residential areas do not exceed 400 feet. Provide a cul-de-sac of 40 feet curb face radius, and 50 feet property line radius.
2. In commercial or industrial areas do not exceed 650 feet. Provide a cul-de-sac of 55 feet curb face radius and 63 feet property line radius.

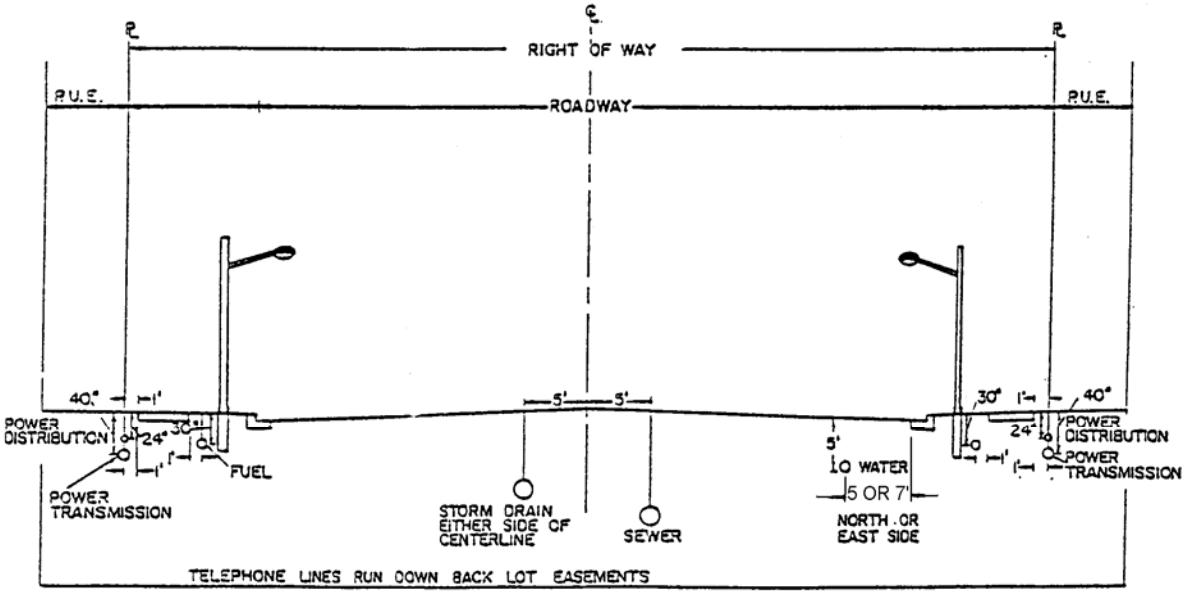


	STANDARD		TEMPORARY	
	RESIDENTIAL	INDUSTRIAL	RESIDENTIAL	INDUSTRIAL
R-1	40	55	32	45
R-2	50	65	35	48
R-3	15	25	20	25
R-4	25	35	20	25

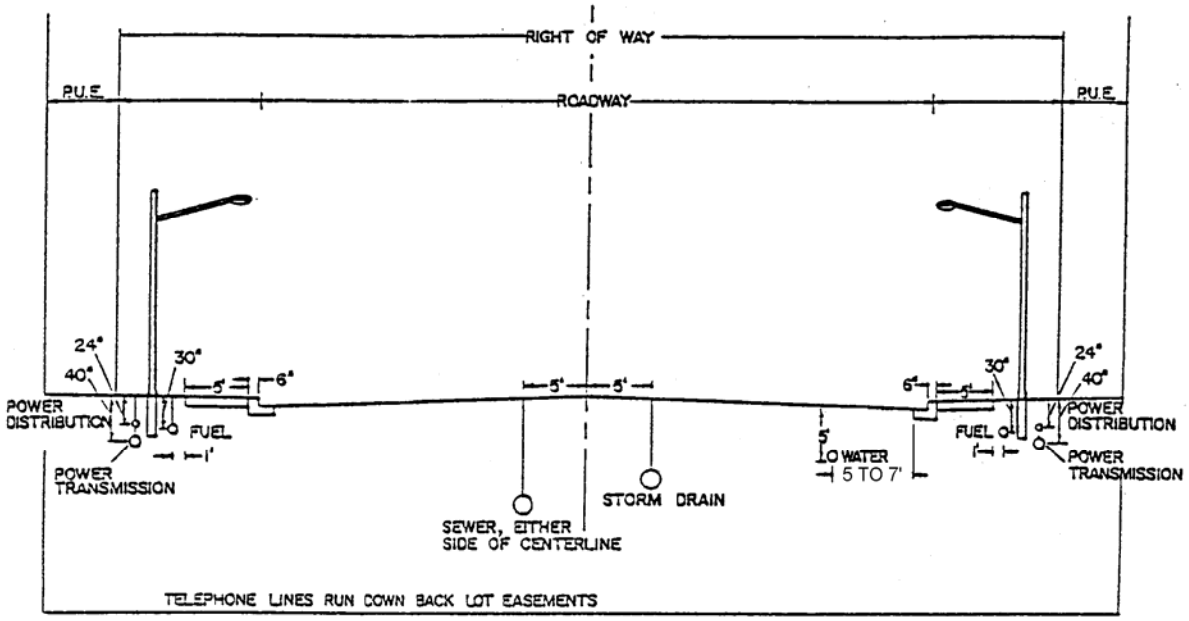
H. **Curbs, Gutters, Driveways, Pedestrian Ways, Sidewalks**: Curbs and gutters are required on ALL streets and must conform to the APWA Standard Plans.

1. Driveway aprons leaving a street surface should slope to match the standard plan. The slope selected must allow for emergency vehicle requirements.
2. Pedestrian rights-of-way between private property lines is 10 feet minimum in width with chain link fencing. Provide a Portland cement concrete surface from fence to fence with mow strip.
3. Locate sidewalks within the street right-of-way 1 foot from property line on both sides of the street. Omission of sidewalk requires City Planning Commission approval.
4. Sidewalk ramps are required at all intersections and mid-block crosswalks unless allowed otherwise by City Engineer. Any construction resulting in removal of either curb or sidewalk at intersections requires replacement with sidewalk ramps. All ramps must meet ADA requirements.

I. **Utility Locations**: Variance from the following dimensions requires City Engineer approval.



RESIDENTIAL SUBDIVISION



COMMERCIAL / INDUSTRIAL SUBDIVISION

J. **Other Criteria**:

ITEM	CRITERIA	SOURCE	REMARKS
HORIZONTAL STREET ALIGNMENT		AASHTO	
Centerline Radius			
Local Street	100 ft min	Pg 435	
Collector Street	302 ft min *	Pg 166	* Assumed 30mph; e max=0.04
Arterial Street	573 ft min *		* Assumed 40mph; e max=0.04
VERTICAL STREET ALIGNMENT		AASHTO or UDOT	
Minimum Curve Length:			
Local Street	100 ft	805-2 & 2A	
Collector Street	100 ft	805-2 & 2A	
Arterial Street	200 ft	305-2 & 2A	
Grade (%) of Street			
Local	Max = 5% (14% Abs) Min = 0.5% (0.3% Abs)	Pg 435	Abs means absolute
Commercial or Industrial	Max = 4% (9% Abs) Min = 0.5% (0.3% Abs)		
Collector	Max = 8% (12% Abs) * Min = 0.5% (0.3% Abs)	Pg 472 Pg 481	* Assumed 30mph; Mountainous terrain
Arterial	Max = 7% (10% Abs) * Min = 0.5% (0.3% Abs)	Pg 472 Pg 481	* Assumed 40mph; Mountainous terrain
STOPPING SIGHT DISTANCE		AASHTO	
Local Street			
General	* =>150 ft	Pg 284	* Assumed 25mph
Horizontal		Pg 223	
Vertical	K=>20*;K=>30**	Pg 284 & 293	* = Crest; ** =Sag
Collector Street			
General	* ∃200 ft	Pg 284	* Assumed 30 mph
Horizontal		Pg 223	
Vertical	K ∃ 30*; K ∃ 40**	Pg 284 & 293	*= Crest; **=Sag
Arterial Street			
General	* ∃ 325 ft	Pg 284	* Assumed 40mph
Horizontal		Pg 223	
Vertical	K ∃80*; K ∃70**	Pg 284 & 293	*= Crest; **=Sag
CROSS SLOPE SUPERELEVATION		AASHTO /UDOT	
Local Street			

ITEM	CRITERIA	SOURCE	REMARKS
Cross Slope (%)	New construction = 1.5 to 2 Existing construction <4	Pg 435 & 423 -	
Super-elevation (m/m)	Not applicable		
Collector Street			
Cross Slope (%)	New construction = 1.5 to 3 Existing construction <4	Pg 481 -	
Super-elevation (m/m)			
Max Rate	0.06 *	Pg 481	* No super-elevation is acceptable
Runoff Rate	1:150	Pg 177	* Assumed 30 mph
Arterial Street			
Cross Slope (%)	New construction = 1.5 to 3 Existing construction <4	Pg 525 -	
Super-elevation (m/m)			
Max Rate	0.04 to 0.06 *	UDOT Dwg 815-6	* No super-elevation is acceptable
Runoff Rate	1:175	Pg 177	* Assumed 40 mph
HORIZONTAL CLEARANCE		AASHTO	
Clear Zone	* 1.5 ft	Pg 443	* From Curb Face
SIDEWALK		APWA Standard Plans	
Width = W			
Residential area	4 feet (park strip > 1 ft) 5 feet (park strip < 1 ft)	231	Required
Commercial or Industrial area	5 feet minimum	231	Required unless waived by Engineer
Existing sidewalk greater than above	match existing	231	
Cross-slope	2% max. for new construction Match existing for spot repairs	231	
CURB AND GUTTER		APWA Standard Plans	
Normal or Typical (30” wide & 6” curb)	Type A*	205	* Type B-G may also be used

ITEM	CRITERIA	SOURCE	REMARKS
CURB RETURN			
Local Street	Curb Face Radius = 25 ft		Or approved by Engineer
Collector or Arterial Street	Curb Face Radius = 35 ft		Or approved by Engineer
DRIVEWAY		APWA Standard Plans	
Residential:			
Width = W+Y	Min 12.5 ft or Existing Max 30.5 ft	215, 221, 222, 225, 229	See standard plan break over angle
Commercial or Industrial			
Width = W+Y	Min 18.0 ft or Existing Max 32.0 ft **	215, 221, 222, 225, 229	** 42 feet if approved in writing by Engineer See standard plan break over angle
Piped Driveway Approach ***		229	*** May only be used with written approval from Engineer
PEDESTRIAN RAMP		APWA Standard Plans	
Ramp Slope	1:12 (8.33% maximum)	235, 236	
Landing Slope	1:50 (2% maximum)	235, 236	
Transition Slope	1:20 (5% maximum)	238	

END OF REGULATION