



**Volume 1:**

## **DESIGN STANDARDS**

*December 2019*

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## STREETS AND ROADWAY DESIGN STANDARDS

### I. DEFINITIONS

**“Alley”** means any street contained in the private property or in a common owned parcel or easement(s), used primarily for vehicular service access to the back or side of residential properties, and for which normal building setbacks may not or do not apply.

**“Avenue”** is a transitional street connecting residential neighborhoods to commercial centers, shopping centers, and other neighborhoods.

**“Bike lane”** means those on-street bikeways which are part of the normal street section and provide marked bike lanes which delineate the separate rights-of-way assigned to bicyclists and motorists.

**“Bike Path”** means a separate, off-street bike path which is not part of the normal street section.

**“Boulevard”** is a regional street that provides multi-lane access to commercial and mixed-use land designations. Boulevards have medians and bike lanes.

**“City Engineer”** shall be a civil engineer registered by the State of California and shall be designated by the City Manager to discharge those duties prescribed hereinafter to be performed by the City Engineer.

**“Cul-de-sac Street”** shall have the primary purpose of serving abutting land use and connecting to the nearest appropriate local street. It is a minor street with only one outlet.

**“Curb Cut”** shall mean an opening or depression in the street curb installed and intended for pedestrian or vehicular use. Curb cuts shall be measured across the “flat bottom” width of the opening or depression.

**“Development”** means and includes, but is not limited to, the subdivision of land, the construction of new structures or buildings, and changes or renovations to existing structures or buildings and the attendant construction of improvements, either of public or private nature, for which approval by the City of Rohnert Park is required prior to commencement.

**“Driveway”** For the purposes of single-family detached housing, “driveway” means a way for vehicular traffic providing access to four or fewer lots or units over a common parcel or easement(s), and necessary service and emergency vehicles, but from which the general public may be excluded, and which are not maintained by a public agency. Driveways shall meet all provisions of the California Fire Code, as adopted by the City, with respect to Fire Department access where such serve as Fire Department access.

**“Industrial Street”** shall be public and private streets located within industrial areas as defined on the current City zoning map or roadways that primarily serve large trucks transiting to and from retail centers.

**“Lane”** is a public or private access to 10 residential units or less (see City Std. 102).

**“Local Streets”** means a street that provides access to individual sites. Local streets include Minor Streets, Neighborhood Streets, Lanes, Alleys, Utility Access Roads, Trails, Loop Streets and Cul-de-sac Streets. On street parking is required on Minor Streets and Neighborhood Streets.

**“Loop Street”** shall be a one-way street providing access to a very limited number of residential houses. Use is extremely limited.

**“Main Street”** provides access to neighborhood commercial and mixed-use districts.

**“Major Arterial”** means a street whose primary purpose is to facilitate movement of heavy traffic between major residential areas, or major residential areas and commercial areas with minimal access. Major Arterial streets may consist of 2-, 4-, or 6-lanes. Intersections with local streets are permitted, provided that they are right-turn-only and at least 200 feet apart, or that they include a left-turn pocket. Driveways are generally not permitted. Driveways are permitted to major traffic generators, provided they are right-turn-only. A deceleration lane must be provided for each driveway. *Major traffic generators include areas designated for Regional Commercial, Office, Mixed Use, and High-Density Residential uses.* No on-street parking is allowed. Major Arterial streets include Parkways.

**“Minor Arterial”** means to provide circulation between neighborhoods, activity centers, and highways and other regional routes. Also provides circulation in rural and open space areas. Intersections with local streets are permitted, provided that they are right-turn-only and at least 200 feet apart, or that they include a left-turn pocket. *This provision is intended to maximize access between neighborhoods.* Driveways are permitted, provided they are right-turn-only and at least 100 feet apart. A deceleration lane must be provided for each driveway. No on-street parking is allowed. Minor Arterial streets include Parkways.

**“Major Collector”** means to provide circulation within and between neighborhoods. Driveways are permitted, provided they are right-turn-only and at least 50 feet apart, or that they include a left-turn pocket. No on-street parking is allowed. Major Collector includes Boulevards.

**“Minor Collector”** means to provide circulation within and between neighborhoods. Minor Collector streets shall have the primary purpose of intercepting traffic from intersecting local streets and handling traffic to the nearest arterial/regional street or intercepting traffic from one Collector Street and handling traffic to another collector street. It shall serve as an access to abutting properties. Minor Collector streets connect residential neighborhoods to commercial centers and service commercial districts. On-street parking is required on both sides of each segment of a one-way couplet. Minor Collector streets include Avenues, Main Streets, and Industrial Streets.

**“Minor Street”** shall have the primary purpose of serving abutting land use and handling traffic to the nearest collector street.

**“Neighborhood Street”** shall have the primary purpose of providing access to small residential areas and shall specifically not be used for through traffic. The various streets within this designation are the one-way loop street, the lane, and the neighborhood street.

**“Parkway”** is a connection between towns or through a natural area and are not designed to accommodate adjoining development.

**“Private Street”** means a way for vehicular traffic providing access to lots or units over a common parcel or private easement, primarily by the owners or occupants of the common parcel, and necessary service and emergency vehicles, but from which the general public may be excluded, and which are not maintained by a public agency.

Such streets may be designed and constructed to different standards than public streets in the following areas: surface treatment, street lighting hardware, signing, and entry islands. Private streets should not connect two or more public streets (except when necessary for internal circulation or emergency vehicle access) and shall be designed and constructed to the standards of public streets in terms of minimum width (may be reduced when meeting specific criteria – see City Std. 101, 102, 103) structural section, curb, gutter, sidewalk, and all other aspects not specifically referenced above. No City enforcement of “no parking” signs or other such regulatory signs shall be provided for such streets. Access shall be through a standard curb cut.

**“Public Street”** means a way for vehicular traffic, whether designated as a local, transitional, regional/major thoroughfare, freeway, or other designation, which is improved to City standards, dedicated for general public use and maintained by a public agency.

**“Public way”** shall mean any street, channel, viaduct, subway, tunnel, bridge, easement, right-of-way or other way in which a public agency has a right of use.

**“Regional Streets”** (equivalent to Arterial or Major Streets; includes Parkways and Boulevards). See “Arterial/Regional Streets.”

**“Sidewalk”** shall mean a Portland Cement Concrete (PCC) surfaced area for pedestrian usage located within the public or private street right-of-way or sidewalk easement and included as a standard element of a street section.

**“Street”** shall include avenues, highways, lanes, alleys, crossings or intersections and courts which have been dedicated and accepted according to the law or which have been in common and undisputed use by the public for a period of not less than five years next preceding, or which have been dedicated to a semi-public use.

**“Street Right-of-Way Width”** shall mean the shortest distance between the lines delineating the public right-of-way of a street.

**“Street Width”** shall mean the distance between the curb faces of a street or edge of pavement where a curb face may be omitted by approval of the City Engineer.

**“Transitional Streets”** (equivalent to Collector Streets) connect residential neighborhoods to commercial centers and service commercial districts. Streets in this category are the Avenue and the Main Street.

**“Walkway/Trail (mixed use)”** shall mean a public or private paved or rock-surfaced path, excluding sidewalks, for the use of pedestrians, bicycles and horses.

**“Walkway/Trail (pedestrian)”** shall mean a public or private paved or rock-surfaced path, excluding sidewalks, for the use of pedestrians.

## **II. GENERAL**

A. For purposes of street layout and design, streets shall be classified as:

### **Major Arterial**

1. Parkway

### **Minor Arterial**

1. Parkway

### **Major Collector**

1. Boulevard

### **Minor Collector**

1. Avenue
2. Main Streets
3. Industrial

### **Local**

1. Minor Street
2. Neighborhood Street
3. Lanes
4. Alleys
5. Utility Access Road, Trails
6. Loop Street
7. Cul-de-sac Street

B. Street design standards shall be used for the design and construction of all private and public streets.

C. Deviations from these standards may be granted by approval of the City Engineer.

D. The standards are considered minimum and do not preclude the use of a higher standard.

- E. Reference Attachment 4: City amended California Fire Code, California Code of Regulations, Title 24, Part 9. Two entrances required for the following:
  - a. Building exceeding 62,000-square-foot area
  - b. 30 units or more
- F. No half streets will be allowed.

### III. STREET DESIGNS

- A. Geometric Standard Cross Sections

Item	Minimum Width/Length	Street Classification
Center median	12-16 feet	Parkway
	12-16 feet	Boulevard
	12-16 feet	Avenue
Travel lane	11 feet	Industrial
	11 feet	Parkway, Boulevard
	11 feet	Avenue, Main and Minor Street
	8 feet	Neighborhood Street
	10 feet (two-way)	Lane
Parking lane or shoulder	8 feet	Industrial
	7 feet	All others except Neighborhood Street
	7 feet	Neighborhood Street
Curb lane (no Parking or Bike lane)	2 feet increase to curb face	Local streets
	1-foot increase to curb face	All other streets
Bike lane	4-6 feet	All streets
Divider between frontage road and paralleling road	8 feet, curb to curb	All streets
Left turn lanes: Double Single Two-Way	Two 11-foot lanes 10 feet 14 feet	All streets where required All streets All streets
Right turn lanes	10 feet	All streets
Curb radius for cul-de-sac	48 feet (w/parking and no island)	Cul-de-sac
	48 feet (no parking and with an island)	Cul-de-sac
	48 feet (no parking and no island)	Cul-de-sac

Note: An island in a cul-de-sac (other than those shown in Standard Drawings, when proposed, will require review and approval by the City Engineer, who shall determine the

use of the correct turning radius, compliance with required access for emergency vehicles, and any other required design criteria.

Item	Minimum Width/Length	Street Classification
Maximum length from projected curb or edge of pavement line of intersecting street to center of turnaround	500 feet (or as approved by the City Engineer)	Cul-de-sac
Length of streets allowed with no Fire Department-approved turnaround	150 feet from the projected curb or edge of pavement line of the cross street to end of dead-end street	All streets
Planter strip	8 feet	Parkway All streets other than Parkway.
Sidewalk	5 feet	All Local Streets (*see Lane note below), Avenue
	6 feet	Parkway, Boulevard
Sidewalks – contiguous without tree wells (where permitted or required per Standards)	8-12 feet	Main streets – required on both sides (widen at obstructing locations to provide 4.5-foot minimum clear sidewalk)
Sidewalks – contiguous without tree wells (where permitted or required per Standards)	12-16 feet	Main streets – required on both sides (widen at obstructing locations to provide 4.5-foot minimum clear sidewalk)
Sidewalks – contiguous	5 feet	All streets in PD, one-way loop streets, as approved by Planning Commission – required on both sides (widen at obstructing locations to provide 4-foot minimum clear sidewalk)
Sidewalk – meandering (where permitted by Standards)	5 feet	Where applicable
Sidewalk easement	To back of sidewalk	All streets where applicable
Public utility easement	5 feet behind right-of-way	All streets where required
*Lane requires sidewalk for 5 or more homes, one side minimum. Note: Sidewalk one side as approved by Planning Commission.		

\*In accordance with Cotati Details

B. Access to Public Right-of-Way Curb Cuts

1. Each vehicular passageway to any parking or loading facility to or across a public right-of-way shall comply with the following requirements:
  - a) Curb cuts shall be a maximum of 41 feet in width for non-residential uses, except as otherwise approved by Conditional Use Permit. Minimum of 12 feet for one-way, 24 feet for two-way.
  - b) Driveway widths, within residential areas, shall be a minimum of 12 feet in width for single driveways, a minimum of 16 feet for double or triple driveways up to a maximum of 24 feet, except as otherwise approved by Conditional Use Permit.
  - c) Wherever feasible, curb cuts serving adjacent uses shall be combined to minimize the number of entrances onto a public right-of-way on any block. No curb cut is allowed when it is less than 6 feet from an existing curb cut.
  - d) Only one curb cut may be installed for any parking or loading facility, except that one or more additional curb cuts may be allowed if the City Engineer determines that each additional curb cut is necessary for the efficient operation of the facility and will not significantly reduce street capacity and traffic safety. Twenty feet top to top on the curb island is required between driveways on a single parcel.
  - e) Any curb cut in a residential area on a corner lot shall be located at the farthest point possible from the curb return and outside of the sight vision triangle.
  - f) In commercial/industrial area, a minimum of 200 feet required separation between driveway and the intersection of two arterial and/or collector streets.
  - g) Except as otherwise approved by the City Engineer, curb cuts for any circular or "through" driveway must meet the following requirements:
    - The curb cuts for such driveway shall be at least 20 feet apart top to top and a minimum of 5 feet from the side property line.
    - The combined width of the curb cuts shall not exceed 50% of the lot frontage.

**IV. STREET ALIGNMENT**

A. Street alignment shall generally conform to the circulation element of the City's General Plan. Streets shall be aligned with adjacent existing streets by continuations of the centerlines thereof or by adjustment by curves, and shall be laid out for the most advantageous development of the entire area.

1. Minimum centerline horizontal curve radii shall be as follows:
  - a) Parkway ..... 500 feet
  - b) Boulevard ..... 500 feet
  - c) Industrial Street ..... 300 feet
  - d) Main Streets..... 300 feet
  - e) Avenues..... 300 feet
  - f) Minor Street ..... 150 feet
  - g) Neighborhood Street ..... 100 feet
  - h) Lane ..... 90 feet
  - i) Alley ..... 40 feet

2. Lesser radii may be used only when sufficient evidence is presented to the City Engineer to show that radii described above are not practicable. Any deviations require specific City Engineer's approval.
  3. Super elevations are required on curves for the design of all major streets and for any other street with a design speed above 25 miles per hour.
- B. Where necessary to give access to or permit satisfactory future subdivision of adjoining land, streets shall extend to the boundary of the property and resulting dead-end streets greater than 150 feet (measured from the projected curb or edge of pavement line of the cross street) shall have a temporary turnaround.

**V. STREET GRADES**

- A. All street grades shown on improvement plans shall refer to the NGVD 1929 benchmarks as accepted by the City of Cotati.
1. All Arterial and Industrial Streets shall have no grade rate in excess of 6%.
  2. Collector and Local Streets shall have no grade rate in excess of 10%.
  3. Minimum grade rate for all streets shall be 0.5%; 1% for curves equal to or less than 100 feet radius.
  4. The grade of the pavement surface across an intersection shall not be more than 4%.
  5. The gradient of each street entering an intersection shall not be more than 4% within a distance of 25 feet from the near curb line of the crossing street.
  6. Vertical parabolic curves shall be used to connect grade profiles where the algebraic difference in grade rates exceeds 1% (does not apply at intersecting streets). The length of vertical curve required shall be determined by the following:

	Minimum Stopping Sight Distance	Minimum Length of Curve
Regional/Major and Industrial Streets	350 feet	200 feet
Transitional/Collector Streets	200 feet	100 feet
Local Streets	100 feet	100 feet

7. Minimum cross-slope for all streets shall be 2%. Maximum cross-slopes shall be 5% (offset crown may require tilt section, minimum 2% cross-slope).
8. Maximum cross-slopes in cul-de-sac bulbs shall be 5%.

**VI. INTERSECTIONS**

- A. All streets entering upon any given street shall have their centerlines directly opposite each other or separated by at least 200 feet.
- B. All streets shall intersect at right angles or along radial lines when the intersection is within a curve, and shall have at least 50 feet of centerline tangent adjacent to the intersection.
- C. Curb return radii:

Industrial	35 feet
Boulevard, Parkway	20 feet
Main Street, Avenue	20 feet
Minor	20 feet
Neighborhood Street, Lane	20 feet

At all intersections, the curb return radius to be utilized will be determined by the highest street classification

A 15 feet radius is allowed on Local Roads with parking on both streets. The street frontage area 15 feet on either side of the curb return shall be properly marked "No Parking".

## VII. TYPICAL SECTIONS

- A. Typical sections for the improvement of streets and alleys shall be shown on the improvement plans. Curb and gutter sections, curb return radii, parking strip widths, and sidewalk widths may be modified where these improvements have been constructed in a portion of a block to other than the typical sections shown. However, any modifications require the specific approval of the City Engineer.
- B. Typical sections are shown in Volume II Standard Plans 100 Series: Streets. Landscape strips are required on Parkways. Landscape strips are encouraged on Boulevards. Landscape strips are allowed on other roadways as approved by the City Engineer. The minimum width of a Parkway Landscape strip is 10 feet. Landscape strips on other roadways shall be consistent with the Street Tree Table and Section XI.

## VIII. PAVEMENT DESIGN

Design of the structural section for all streets shall be in accordance with the following criteria:

- A. Design pavement per Caltrans Highway Design Manual Chapter 610 and 630 using a 20-year design life.
- B. Traffic Index
  - 1. Street classification shall be determined by the City Engineer.
  - 2. For Major Arterial and Industrial streets with high truck volumes, the City Engineer may increase the minimum T.I. to 11.0.
  - 3. In no instance will the T.I. be less than the following:
 

Major Arterial and Industrial	a minimum T.I. of 10.0
Major Collector and Minor Arterial	a minimum T.I. of 10.0
Minor Collector	a minimum T.I. of 8.0
Local (excludes roads w/commercial traffic/busses)	a minimum T.I. of 7.0
  - 4. For all street design, use Chart No. 2 (3 sheets), "Structural Design Chart for Flexible Pavements."
- C. Soils Reports

1. Resistance "R" Values

- a) A qualified Soils Engineer shall obtain sufficient soils samples within the proposed street construction to permit determination of the "R" Value of the various materials which lie immediately under the planned structural section. The cost of sampling and testing shall be at the owner's expense.
- b) The basement soil shall be tested according to California Test 301 "Method for Determination of the Resistance 'R' Value of Treated and Untreated Bases, Sub-bases, and Basement Soils by the Stabilometer" in use by the California Department of Transportation, Transportation Laboratory. Design of the structural section for a particular street will normally be based on the lowest "R" Value material encountered.
- c) If the engineer elects to utilize an "R" Value of 5, then "R" Value tests will not be required.
- d) The owner's soil engineer shall submit to the City a Materials Report showing the location and elevation of sampling points, "R" Value data, and Expansion Index Tests. The owner's soils engineer may be required to make a field survey of soil conditions when rough subgrade has been cut to verify data presented in the Materials Report. The cost of any additional sampling and testing shall be at the owner's expense.

2. Expansive Soils

- a) Irrespective of the "R" Value used, an Expansion Index Test shall be required.
- b) A soil will be classified as expansive unless the Expansion Index is less than 50 as measured by ASTM D 4829. In addition, soils meeting all four of the following provisions shall be considered expansive.
  - Plasticity Index (PI) of 15 or greater, determined in accordance with ASTM D 4319.
  - More than 10 percent of the soil particles pass a No. 200 sieve (75  $\mu$ m), determined in accordance with ASTM D 422.
  - More than 10 percent of the soil particles are less than 5 micrometers in size, determined in accordance with ASTM D 422.
  - Expansion Index greater than 20, determined in accordance with ASTM D 4829.
- c) All expansive soils shall be lime treated based on site specific tests and in conformance with the recommendations of a geotechnical engineer.
- d) Lime treatment shall be a minimum of 18 inches thick and extend to the edge of the back of the curb at a minimum.

D. Gravel Equivalents

1. Structural sections are to be determined from Chart No. 2 utilizing traffic indexes and known basement soil "R" Values. Gravel equivalents are to be

converted into structural sections using gravel equivalent factors (Gf) for the various construction materials as shown on Chart No. 2.

2. All streets shall have a safety factor included in the design. Structural sections using aggregate base shall have the gravel equivalent of the asphalt concrete layer increased by 0.2 feet.

E. Other Design Considerations

1. For roadway section design the maximum R-value of lime treated soils will be 40.
2. The structural section required, in some cases, may be governed by the expansion-shrinkage properties of the soil rather than traffic and soil-bearing criteria.
3. The design of all streets must include moisture barriers designed by a geotechnical engineer and shown on improvement plans. Acceptable moisture barriers include:
  - a) Horizontal moisture barrier of lime treated soil extending to the outside edge of a sidewalk that is contiguous to the roadway. (no planter strip between roadway and sidewalk)
  - b) A vertical moisture barrier consisting of plastic sheeting (10 mil minimum) lining a joint trench under a sidewalk.
  - c) A vertical moisture barrier consisting of plastic sheeting (10 mil minimum) lining the side of a bioretention planter strip.
  - d) A moisture barrier shall be placed at the back of curb where landscape strips are provided and at the back of sidewalk where the sidewalk is contiguous to the road. Cut off walls shall extend to a depth of 6 inches below the aggregate base.

F. Minimum Structural Section: In no instance shall the asphalt thickness in a structural section be less than as follows:

Major Arterial and Industrial Streets	0.50 feet asphalt concrete
Major Collector and Minor Arterial Streets	0.50 feet asphalt concrete
Minor Collector Streets	0.42 feet asphalt concrete
Local Streets	0.42 feet asphalt concrete

G. Improvement Plan Notation

1. All improvement plans shall include the design "R" Value, Expansion Index, and the Traffic Index. This information shall be included in the typical section or in a note or table on the same sheet as the typical sections.

**IX. REQUIREMENTS FOR EMERGENCY ACCESS DURING CONSTRUCTION**

A. Subgrade Conditions

Summer April 1 – September 30	Excavated and drained subgrade
----------------------------------	-----------------------------------

Winter October 1 – March 31	6 inches Class II AB and fabric
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1. For structures with a ridge line of at least 35 feet above adjacent rough fire access grade, or for structures with three or more stories, 50,000 square feet, 1.5 inches of asphalt base over 4 inches of aggregate base shall be provided in all proposed and approved fire access areas.
2. Winter conditions shall take effect and be enforced by the City Engineer on October 1. The City Engineer shall have the authority to move this date up to as early as September 1, depending on the particular season's rainfall and projections.
3. Subgrade defined as native soil at bottom of street section (base and paving), excavated to the approximate lines and grades shown on the project grading plan, and provided with a discharge for collected water, as approved by the City Engineer.
4. Base shall be Class II aggregate base or alternative recommended by the soils engineer and approved by the City Engineer.
5. Poor subgrade is defined as "R" Value of 10 or less.
6. Base shall be placed only on an unyielding excavated and drained subgrade, and to be compacted to at least 90% relative compaction.
7. Fabric to be a ground stabilization fabric such as Mirafi 600X or equivalent.

## **X. COMPLETION OF ROADWAYS**

- A. Plans shall include a note requiring a slurry seal on all streets in a development or public project. All roadways shall be slurry sealed after completion of all roadway infrastructure and prior to the last certificate of occupancy or acceptance of the project. Any subdivision improvement bond shall include this requirement.
- B. Striping and marking may be masked for the application of this slurry seal.
- C. Slurry seal shall carry a warranty covering a period of two years.

## **XI. STREET TREES**

- A. Acceptable street trees are listed in Attachment 5: Street Tree List. Only trees listed for use in streets shall be used in street planter strips or medians.
- B. No tree shall be placed in a planter strip narrower than the dimension listed. The minimum distance from any paved surface shall be half the minimum planter strip dimension. Root barriers are required between all planters and paving. Trees placed behind a sidewalk shall be a minimum of 5 feet behind the sidewalk.
- C. No tree shall be placed in a tree well that is smaller than the dimension listed. Trees shall be centered within a planter strip. Where planter strips vary in size due to meandering sidewalks the narrowest planter strip dimension in 20 feet either side of the tree shall govern.
- D. Only trees listed for use along streets shall be placed adjacent to streets and walkways. Trees listed for use in parking areas only shall not be used along streets.

- E. All trees shall be a minimum of 12 feet high and have a minimum trunk diameter of 1 inch in a 15 gallon can or larger.
- F. Tree Stakes shall be 2 inch in diameter and 10-foot-long copper naphthenate treated lodgepole pine stakes driven 30 inches into the ground.

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ATTACHMENT 1

STRUCTURAL DESIGN CHART  
FOR FLEXIBLE PAVEMENTS

EQUATION:

$$G.E. = 0.0032 (T.I.) (100 - R)$$

G.E. = GRAVEL EQUIVALENT  
T.I. = TRAFFIC INDEX  
R. = RESISTANCE VALUE

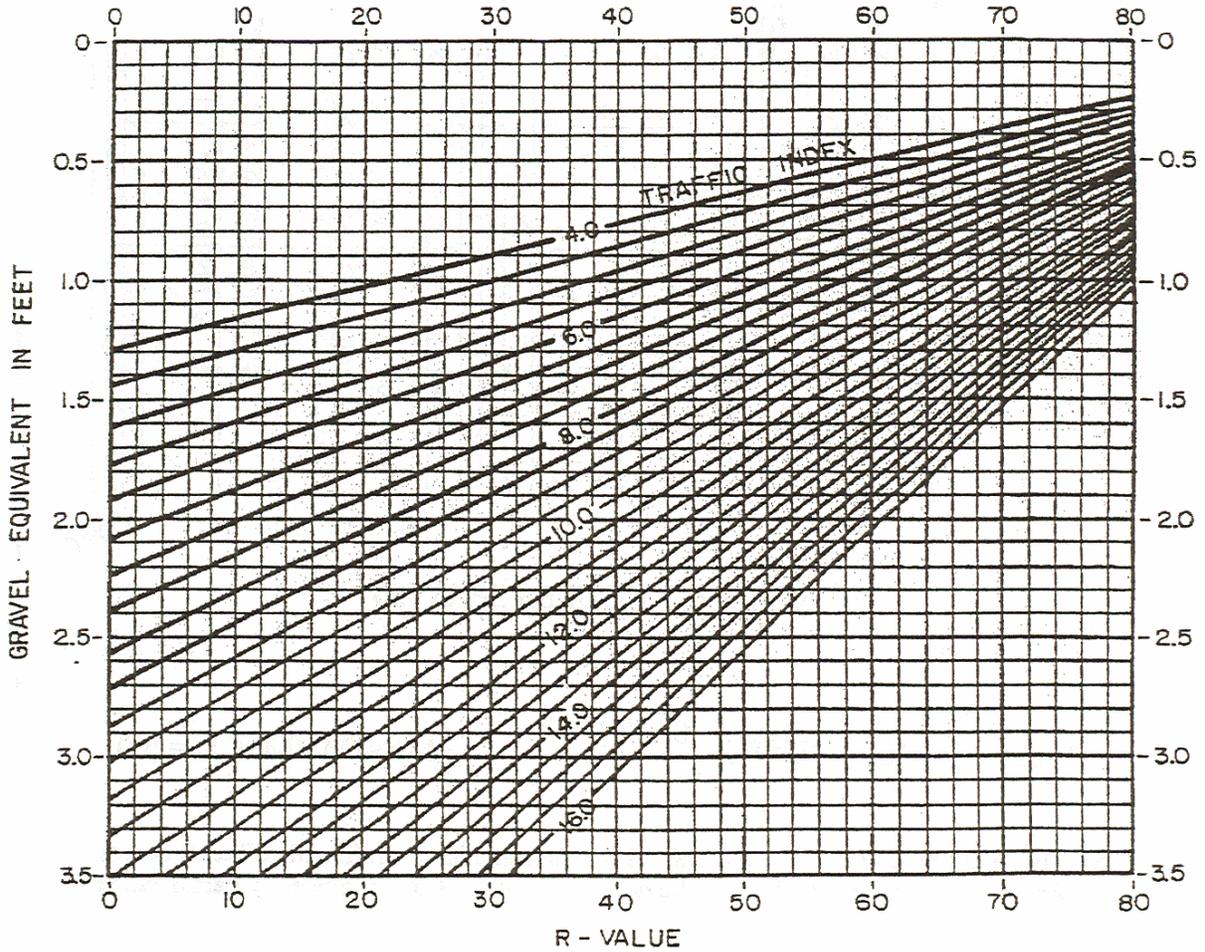


CHART 2.  
Structural Design Chart for Flexible Pavements  
( 1 of 3)

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**ATTACHMENT 2**

**HIGHWAY DESIGN MANUAL**

630-13

July 1, 2008

**Table 635.1B**

**Gravel Equivalence Needed for Deflection Reduction**

Percent Reduction In Deflection (PRD or PRM) <sup>(1)</sup>	GE (in feet) For HMA Overlay Design	Percent Reduction In Deflection (PRD or PRM) <sup>(1)</sup>	GE (in feet) For HMA Overlay Design
5	0.02	46	0.55
6	0.02	47	0.57
7	0.02	48	0.59
8	0.02	49	0.61
9	0.03	50	0.63
10	0.03	51	0.66
11	0.04	52	0.68
12	0.05	53	0.70
13	0.05	54	0.72
14	0.06	55	0.74
15	0.07	56	0.76
16	0.08	57	0.79
17	0.09	58	0.81
18	0.09	59	0.83
19	0.10	60	0.85
20	0.11	61	0.87
21	0.12	62	0.89
22	0.14	63	0.91
23	0.15	64	0.94
24	0.16	65	0.96
25	0.18	66	0.98
26	0.19	67	1.00
27	0.20	68	1.02
28	0.21	69	1.04
29	0.23	70	1.06
30	0.24	71	1.09
31	0.26	72	1.11
32	0.28	73	1.13
33	0.29	74	1.15
34	0.31	75	1.17
35	0.33	76	1.19
36	0.35	77	1.22
37	0.37	78	1.24
38	0.38	79	1.26
39	0.40	80	1.28
40	0.42	81	1.30
41	0.44	82	1.32
42	0.46	83	1.34
43	0.48	84	1.37
44	0.51	85	1.39
45	0.53	86	1.41

Note: (1) PRD is Percent Reduction in Deflection at the surface.  
PRM is Percent Reduction in deflection at the Milled depth.

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**ATTACHMENT 3**

**GRAVEL EQUIVALENT FACTORS**

<u>MATERIAL</u>	<u>GRAVEL EQUIVALENT FACTOR (Gf)</u>
Lean Concrete Base (LCB)	1.9
Class A Cement Treated Base (CTB)	1.7
Asphalt Treated Permeable Material (ATPM)	1.4
Open Graded Asphalt Concrete (OGAC)	1.4
Class B Cement Treated Base (CTB)	1.2
Asphalt Treated Base	1.2
Soil Cement	1.2
Aggregate Base	1.1
Aggregate Subbase	1.0
Lime Treated Base (LTB)	0.9 + (unconfined compressive strength in psi ÷ 1000)

Gravel Equivalents of Full Depth Asphalt Concrete

AC Thickness (Ft.)	Traffic Index *								
	6	7	8	9	10	11	12	13	14
0.55	1.30	1.20	1.12	1.05	1.00	0.95	0.92	0.87	0.85
0.60	1.44	1.33	1.24	1.17	1.10	1.06	1.02	0.97	0.94
0.65	1.60	1.48	1.38	1.30	1.23	1.17	1.13	1.08	1.05
0.70	1.79	1.65	1.54	1.45	1.37	1.31	1.26	1.20	1.17
0.75	1.97	1.82	1.70	1.60	1.52	1.45	1.39	1.33	1.29
0.80	.....	1.99	1.86	1.75	1.66	1.59	1.53	1.46	1.41
0.85	.....	2.14	2.00	1.88	1.78	1.70	1.64	1.56	1.52
0.90	.....	2.31	2.17	2.04	1.93	1.84	1.77	1.69	1.64
0.95	.....	.....	2.35	2.21	2.09	2.00	1.92	1.83	1.78
1.00	.....	.....	2.51	2.36	2.23	2.13	2.05	1.96	1.90
1.05	.....	.....	2.67	2.51	2.38	2.27	2.18	2.08	2.02
1.10	.....	.....	.....	2.68	2.54	2.42	2.33	2.22	2.16
1.15	.....	.....	.....	2.83	2.68	2.56	2.46	2.35	2.38
1.20	.....	.....	.....	.....	2.82	2.70	2.59	2.48	2.40
1.25	.....	.....	.....	.....	2.98	2.85	2.74	2.62	2.54
1.30	.....	.....	.....	.....	3.15	3.00	2.89	2.76	2.68
1.35	.....	.....	.....	.....	.....	3.16	3.03	2.90	2.81
1.40	.....	.....	.....	.....	.....	3.31	3.18	3.04	2.95
1.45	.....	.....	.....	.....	.....	3.47	3.33	3.18	3.09
1.50	.....	.....	.....	.....	.....	.....	3.48	3.32	3.22
1.55	.....	.....	.....	.....	.....	.....	3.62	3.46	3.36
1.60	.....	.....	.....	.....	.....	.....	3.77	3.61	3.50
1.65	.....	.....	.....	.....	.....	.....	.....	3.76	3.65
1.70	.....	.....	.....	.....	.....	.....	.....	3.90	3.78
1.75	.....	.....	.....	.....	.....	.....	.....	4.06	3.94

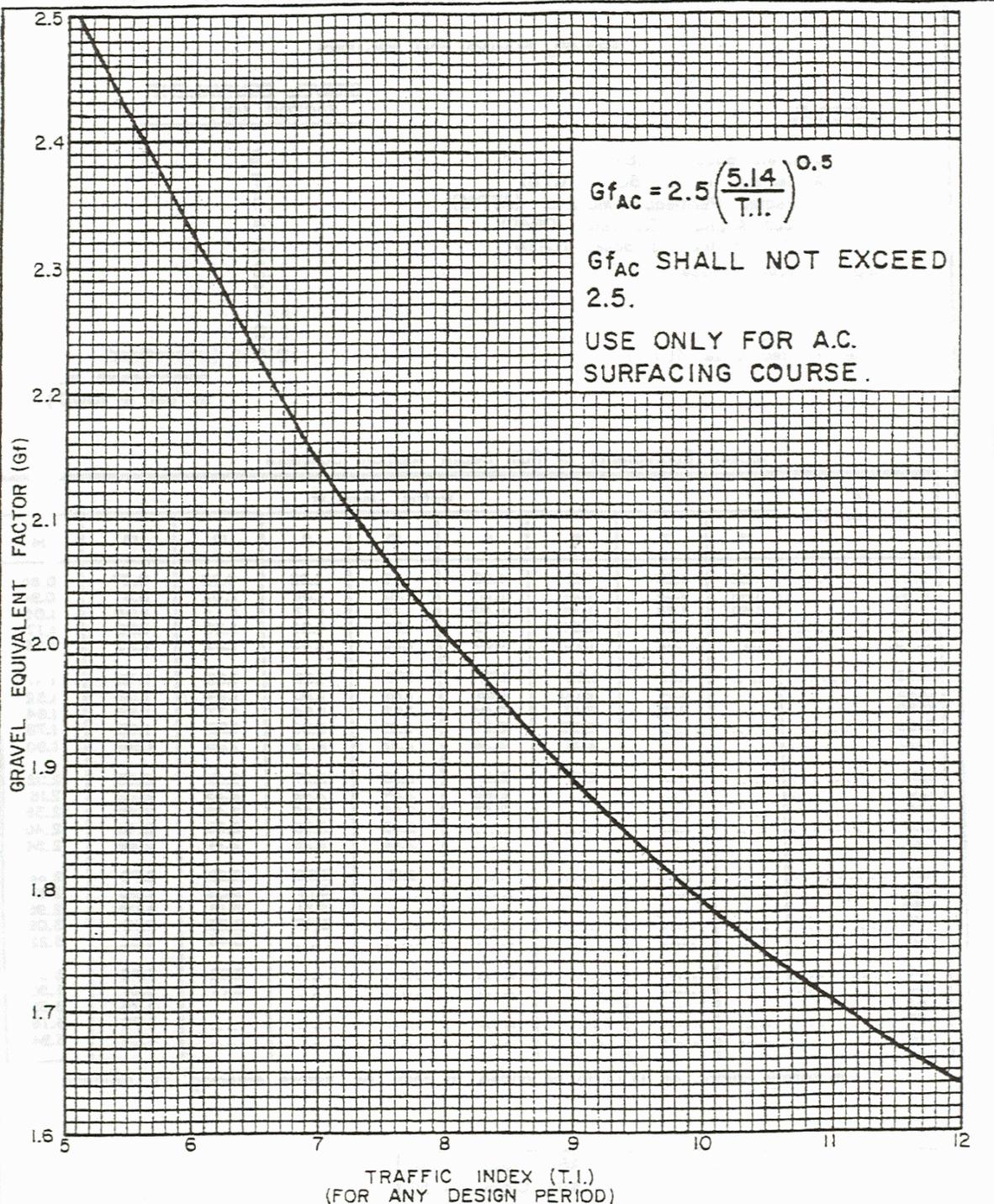
\* Safety Factor of 0.10 to be added to total GE before entering TI Column.

R-value : Class B CTB = 80	ASB Class 1 = 60
AB = 78	ASB Class 2 = 50
	ASB Class 3 = 40
	ASB Class 4 = 50

CHART 2.  
(3 of 3)

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ATTACHMENT 4



RELATIONSHIP BETWEEN  
GRAVEL EQUIVALENT FACTOR  
FOR ASPHALT CONCRETE  
AND TRAFFIC INDEX

CHART 2.  
(2 of 3)

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**ATTACHMENT 5: STREET TREE LIST**

Botanical Name	Common Name	Size	Crown Diameter	Evergreen	Flowering	Drought Resistant	Growth Rate	Street Tree	Parking Lot	Well	Landscape Strips	Medians	Spacing	Comments
Acer buergerianum	Trident Maple	M	20				M	X		4'x4'	6'		30'	Native to China. Small tree with a height of 20-25 feet. Adaptable to urban conditions. Good tree for light locations and under utility lines. Displays a nice red or orange fall color.
Acer campestre	Hedge Maple	S	30				M	X	X	No	10'		34'	*
Acer freemanii	Maple, "Autumn Blaze"	M	30				F	X	X	No	10'		35'	
Acer palmatum	Japanese Maple	M	20		X		S	X		4'x4'	10'		30'	
Acer platanoides	Norway maple, Easy	M	20				M		X	4'x4'	10'		30'	*
Acer rubrum	Street Maple, "Ezestree"	M	30				M	X	No	No	10'		35'	*
Acer truncatum x Plat.	Maple, "October Glory"	M	25				M		X	No	10'		30'	*
Arbutus undoe	Sunset Maple Strawberry Tree, "Marina"	S	20		X		M	X		4'x4'	10'		30'	*
Brachychiton populneus	Bottle Tree	M	25	X	X		M	X		No	10'		30'	*
Carpinus betulus	European Hornbeam	M	25				M	X			10'		30'	*
Catalpa x chitalpa	Chitalpa	S	20		X		F		X	4'x4'	10'			*
Teschkentensis														
Cedrus deodara	Deodar Cedar	L	30	X		Y	M	X		No	10'	16'	40'	Mediterranean native. The Asian woolly aphid is a new pest as of summer 2002. Do not plant in areas where aphid drip would be a problem. Until recently this tree has been free of problems. A good large growing shade tree well adapted for urban use. This is a large tree that can reach 70'. No fall color. Prefers more water than K. paniculata
Cellis Australis	European Hackberry	L	35				M	X	X	6'x6'	8'	16'	40'	
Cercidium x "Desert Museum"	Desert Museum Palo Verde	M	25	X		X	M		X					
Cercis reniformis	Redbud, "Oklahoma"	S	20		X		M	X		4'x4'	10'		30'	*
Chilopsis linearis	Desert Willow	S	20		X	X	M	X		4'x4'	6'			
Cornus controversa	Giant Dogwood	M	30				S		X					
Diospyros virginiana	Persimmon (male clones)	M	20				M		X					
Ginkgo biloba	Ginkgo, "Autumn Gold" (male clones)	L	30				S	X	X	4.5'x4.5'	6'		30'	Native to China but once grew world wide. Great street trees with great fall color. Leaves turn gold and drop all at once. They work well around hardscape, are adaptable to urban conditions and there are not currently any disease or pest problems.
Koeleruteria elegans	Formosan	M	25				M		X					

Botanical Name	Common Name	Size	Crown Diameter	Evergreen	Flowering	Drought Resistant	Growth Rate	Street Tree	Parking Lot	Well	Landscape Strips	Medians	Spacing	Comments
Koeleruteria paniculata	Flame Tree / Flametree Goldenrain Tree	M	30		X	X	M	X		4.5'x4.5'	6'		30'	Native to China. This is a small, slow growing tree around 25' that flowers in the summer. Avoid planting in litter sensitive areas. This tree is drought tolerant. Good under utility lines. High water needs. Does poorly in heavy clay or compacted soils.
Lagerstroemia indica	Crape Myrtle	S				X		X		4'x4'	5.5'		30'	Native to China. Showy summer flowers. Different cultivars have flower colors red, pink and white. Good as a multi-trunk and standard form. Good tree for tight spots and utility lines. Use mid/low resistant hybrids Lagerstroemia x faurieri cultivars typically with Indian names, such as 'Tuscatoro'.
Laurus nobilis	Grecian Laurel	S	25	X			M	X		4'x4'	10'			*
Liriodendron tulipifera	Tulip Tree	L	30		X		F	X		5'x5'	10'	16'	40'	Native to the Eastern USA. A large, fast growing tree that flowers in late spring. Aphids can be a problem but all in all a good street tree.
Malus Arnoldiana	Arnold Crabapple	S	20		X		M	X		4'x4'	10'			*
Metasequoia glyptostroboides	Dawn Redwood	M	25				M		X					
Olea europaea	Fruitless Olive, "Swan Hill"	M	25	X		X	S	X		4'x4'	8'	16'	40'	
Pinus canariensis	Canary Island Pine	L	30	X		X	F	X		No	8'	16'	40'	
Pistacia chinensis	Chinese Pistache - "Keith Davey" (male clones) Chinese Pistache - Fruitless Varieties Only, "Pearl Street", "Red Push" (female clones)	L	30				M	X	X	4.5'x4.5'	6'		30'	Native to China. This is a medium to large growing shade tree. Height is generally around 40' but can reach 50'. It's a great street tree that is well behaved around concrete. The fall color is great. This tree does not like soggy, poorly drained soils.
Prosopis alba	"Colombia" Colorado Mesquite, "Colorado"	M	25	X		X	M		X					
Prunus	Cherry, "Cascade Snow"	S	20		X		M		X					
Prunus cerasifera	Plum, "Thundercloud"	S	20		X		F		X					Large shrub, good screen, not typically a street tree, produces fruit
Quercus agrifolia	Coast Live Oak	L	35	X		X	M	X	X	No	10'	16'	40'	Native to California. Evergreen of variable size 40'-70' and equal in width. Smooth, dark gray bark and dark green leaves that are glossy on the surface. This tree does not like to be over watered and likes areas without turf.
Quercus buckleyi	Texas Red Oak	L	35			X	M	X		No	10'	16'		

Botanical Name	Common Name	Size	Crown Diameter	Evergreen	Flowering	Drought Resistant	Growth Rate	Street Tree	Parking Lot	Well	Landscape Strips	Medians	Spacing	Comments
Quercus Frainetto	Forest Green Oak	L	35			X	M	X	X	No	10'	16'	40'	This is an upright growing, vigorous oak with a strong central leader. Drought resistant and adaptable, its glossy deep green foliage and strong symmetrical shape make it one of the best looking trees all summer.
Quercus illex	Holly Oak	L	35	X			M		X					May produce fruit. 'Krauter Vesuvius' is fruitless
Quercus Lobata	Valley Oak	L	35			X	M	X	X	No	10'	16'	40'	Native to California. This is a large drought tolerant deciduous tree. It is considered to be the monarch of the oak species. This tree can reach 70' or greater with an equal spread. Does not like to be over watered.
Quercus Robur	English Oak	L	35				M	X		No	10'	16'	40'	Native to eastern USA. Medium to large tree can reach 70'. Leaves are matte dark green and has a wonderful red fall color. Deep rooted.
Quercus Shumardii	Shumard Red Oak	L	35			X	M	X		5'x5'	8'		40'	Native to eastern USA. Medium to large tree can reach 70'. Tolerates urban conditions. Has a dependable fall color in orange and reds.
Quercus Shumardii	Shumard Red Oak	L	35			X	M	X		5'x5'	8'		40'	Native to eastern USA. Medium to large tree can reach 70'. Tolerates urban conditions. Has a dependable fall color in orange and reds.
Quercus Suber	Cork Oak	L	35	X		X	M	X	X	5'x5'	8'		40'	Native to the western Mediterranean and North Africa. Evergreen tree of moderate growth rate to 70'. Trunk and main limbs covered with thick, corky bark which add a lot of interest. Leaves are shiny dark green.
Quercus Virginiana	Southern Live Oak	L	35	X			M		X					Native to southern coast plains in the US. Large growing evergreen tree with waxy dark green leaves. This is a moderate to fast grower that handles turf well.
Quercus Wislizenii	Interior Live Oak	L	35	X		X	M	X		5'x5'	8'	16'	40'	Native to interior California and southern Oregon. An evergreen tree of medium size up to 50'. Wide-spreading branches with attractive green foliage.
Robinia Ambigua	Locust, "Purple robe"	L	30		X	X	F	X				16'		
Sapinum Sebiferum	Chinese Tallow	L	30				F		X		6'			
Sequoia Sempervirens	Coast Redwood	L	25	X			F							

Botanical Name	Common Name	Size	Crown Diameter	Evergreen	Flowering	Drought Resistant	Growth Rate	Street Tree	Parking Lot	Well	Landscape Strips	Medians	Spacing	Comments
Syringa Reticulata	Ivory Silk Japanese Tree <i>Ulic</i>	M	20		X		M		X					
Taxodium Distichum	Montezuma Bald Cypress	L	30				M	X	X		No	16'		
Tilia Cordata	Littleleaf Linden	M	30				M	X			10'	16'	40'	
Ulmus Parvifolia Sempervirens	Chinese Elm, Upright	L	30			X	F	X	X	No		16'	40'	
Ulmus Wilsoniana	Varieties, "Athena", "Allee" Hybrid Elms, "Frontier", "Prospector"	M	25				M	X	X	4'x4'	10'			
Vitex Agnus-Castus	Chaste Tree	S	20		X	X	S	X		4'x4'	10'			
Xylocopa Congestum	Shiny Xylocopa	S	20	X			F		X					

SECTION 2

**STORM DRAIN  
Design Standards**

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## PREFACE

### Quick Reference Sheets

These standards have been prepared to assist developers and their engineers in the design of public storm drain facilities. To assist those engineers who are familiar with these standards, quick reference sheets are provided in this Preface section. The quick reference sheets contain design criteria and data from the standards which are most commonly used in the design of public storm drain facilities. Unless otherwise noted, hydrological and hydraulic standards are consistent with the Sonoma Water Flood Management Design Manual, Revised August 2019.

Quick reference sheets are provided for the following subjects:

1. Hydrology
2. Hydraulics
3. Design Requirements

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**QUICK REFERENCE SHEET  
HYDROLOGY**

<i>Waterway Type</i>	<i>Drainage Area, Square Miles</i>	<i>Recurrence Interval, Years</i>
Minor waterway	1 sq mi or less	10-year peak flow
Secondary waterway	Between 1 and 4 sq mi	25-year peak flow
Major waterway	4 sq mi or more	100-year peak flow

Notes: In all cases, the 100-year flow condition must also be analyzed to assess flood hazards.

Q = CIAK

Where:

Q = flow (cubic feet per second)

C = runoff coefficient

I = rainfall intensity

A = drainage area (acres)

K = mean seasonal precipitation = 1.1 for small Cotati drainage areas. For large drainage areas, minor and above, see Sonoma County Water Agency Standards.

**Estimated Overland Flow Travel Time**

<b>Description</b>	<b>Time of Concentration for overland flow</b>	<b>Maximum size</b>
<b>Commercial</b>	<b>0.117 hr (7 min)</b>	<b>2.0 ac</b>
<b>Lot sizes &lt; ½ acre</b>	<b>0.167 hr (10 min)</b>	<b>2.0 ac</b>
<b>Lot sizes ≥ ½ acre</b>	<b>0.250 hr (15 min)</b>	<b>2.0 ac</b>

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**QUICK REFERENCE SHEET  
HYDRAULICS**

<i>Design Waterway</i>	<i>Downstream Waterway</i>	<i>Design Flow in Downstream Waterway, Years</i>
Secondary	Major	25
Minor	Major or secondary	10
Surface (ground)	Major or secondary	100
Diversion	Not applicable	100

Manning's Formula

$$Q = \left(\frac{1.49}{n}\right)AR^{2/3}S^{1/2}$$

Manning's formula coefficient (*n*)

**Material**

**Manning's "n"**

Storm drain pipe [high density polyethylene pipe (HDPE) and reinforced concrete pipe (RCP)]	0.014
Concrete-lined channel	0.015
Asphaltic concrete	0.017
Grouted rock rip rap	0.030
Loose rock rip rap	0.035 <i>Minimum</i>
Grass-lined channel	0.035 <i>Minimum</i>
Constructed natural waterway	0.050 <i>Minimum</i>

Minimum Design Flow Velocity = 2.5 feet per second

<b>Waterway Classification</b>	<b>Waterway Type</b>	<b>Minimum Freeboard</b>
All	Open channel	1.5 feet or 20% of specific energy (whichever is greater)
Major and secondary	Closed conduit	0.2 x diameter
Minor	Closed conduit	1 foot below top of curb or adjacent ground
Gutter	Open channel with 6-inch curb	0.4 feet maximum depth

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**QUICK REFERENCE SHEET  
DESIGN REQUIREMENTS**

Minimum pipe diameter:	15 inches				
Pipe materials:	Reinforced concrete pipe (RCP) or high-density polyethylene (HDPE) pipe that conforms to these specifications; use of cast-in-place concrete is not allowed				
Horizontal separation from sewer lines:	5 feet clear				
Horizontal separation from water lines and other utilities:	4 feet clear				
Vertical curves:	Not allowed				
Horizontal curves:	<table border="0" style="width: 100%;"> <tr> <td style="width: 30%; vertical-align: top;">RCP:</td> <td style="vertical-align: top;">300 feet minimum radius (allowed at catch basins and when pipeline is installed under the pavement parallel to the concrete gutter)</td> </tr> <tr> <td style="vertical-align: top;">HDPE:</td> <td style="vertical-align: top;">765 feet minimum radius for 20-foot sections</td> </tr> </table>	RCP:	300 feet minimum radius (allowed at catch basins and when pipeline is installed under the pavement parallel to the concrete gutter)	HDPE:	765 feet minimum radius for 20-foot sections
RCP:	300 feet minimum radius (allowed at catch basins and when pipeline is installed under the pavement parallel to the concrete gutter)				
HDPE:	765 feet minimum radius for 20-foot sections				
Pipe slope:	10% maximum				
Minimum cover:	12 inches for class III RCP and HDPE (outside of pipe to road subgrade).				
Maximum distance between structures:	400 feet				

New development and redevelopment projects may be required to implement storm water quality source and treatment controls and trash removal. Refer to the City of Santa Rosa and County of Sonoma Storm Water Low Impact Development Technical Design Manual for design criteria; available at the following link, <https://srcity.org/1255/Low-Impact-Development>

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## STORM DRAIN DESIGN STANDARDS

### **I. GENERAL AND DESIGN CRITERIA**

All design shall conform to Sonoma County Water Agency design standards and review process.

All storm drainage facilities constructed within the City of Cotati shall comply with the Sonoma County Water Agency master plan.

There shall be no lot-to-lot drainage.

### **II. PURPOSE**

The purpose of this document is to provide standards for design of public storm drain system improvements in the City of Cotati (City). These standards consist of:

- (1) Hydrologic design criteria,
- (2) Hydraulic design criteria, and
- (3) Physical design requirements.

These standards do not include (but may reference) additional requirements established by other departments of the City and other government agencies. These standards are intended to impose **minimum** acceptable design criteria. More stringent requirements may be imposed by the City Engineer based on specific project conditions. Developers and their design engineers are responsible for complying with these standards and all other requirements for design of storm drain facilities within the City. Design engineers are responsible for initiating written requests for approval of any design concepts that differ from these standards, verifying additional requirements set forth by other departments of the City or other government agencies, performing any necessary calculations or studies, and resolving any problems with the appropriate department or agency. Developers and design engineers should be aware that Section 402(p) of the federal Clean Water Act establishes requirements for National Pollutant Discharge Elimination System permits for certain industrial and construction-related storm water discharges.

### **III. POLICY**

The policy of the City is to safely collect and convey storm water to the nearest public flood control facility in a storm drain system approved by the City of Cotati Engineering Department, while achieving water quality objectives to the maximum extent practicable in the City's creeks as prescribed by the City's Storm Water NPDES Permit.

### **IV. HYDROLOGY CONCEPTS**

The Rational Method is widely used for determining design flows in urban and small watersheds.

The method assumes that the maximum rate of runoff for a given rainfall intensity occurs when the duration of the storm is such that all parts of the watershed are contributing to the runoff at the interception point. The formula used is an empirical equation that relates the quantity of runoff from a given area to the total rainfall falling at a uniform rate on the same area and is expressed as:

$$Q = CIAK$$

in which

- Q** is the design flow in cubic feet per second.
- C** is a dimensionless runoff coefficient based upon type of ultimate development (i.e., land use) from Table I-1 for the drainage area.
- I** is the intensity of rainfall in inches per hour from Figure I-1 or computed as:

$$I = 5.12Y^{0.1469} t^{-0.528}$$

in which

**Y** = recurrence interval (10, 25 or 100 year, etc.) **t** = time of concentration (duration in minutes)

- A** is the tributary drainage area in acres.
- K** is the dimensionless ratio of the average annual rainfall for the drainage area to the average annual rainfall for the overall area for which the rainfall intensity/duration/recurrence interval relationships have been established.
- K** = 1.1 for small Cotati drainage areas. For large drainage areas, minor and above, see Sonoma County Water Agency Standards.

The runoff coefficient **C**, the drainage area **A**, and the average annual rainfall ratio **K** are all constant for a given area at a given time. (Note that some agencies do not include the factor **K** when using the Rational Method.) Rainfall intensity **I**, however, is determined by using an appropriate storm frequency (i.e., recurrence interval) and duration which are selected on the basis of economics and engineering judgment. Storm drains are designed on the basis that they will flow nearly full during the design storms. Storm frequency is selected through consideration of the size of drainage area, probable flooding, possible flood damage, and anticipated future development for the drainage area.

**Runoff Coefficient:** The runoff coefficient **C** normally ranges between 0.30 and 0.90. The soil characteristics, such as porosity, permeability, and whether or not it is saturated from preceding storms are important considerations. Another factor to consider is ground cover, i.e., whether the area is paved, grassy or wooded. In certain areas, the coefficient depends upon the slope of the terrain. Duration of rainfall and shape of area are also important factors in special instances. Of primary importance is the percent of land covered with impervious surfaces such

as asphalt.

**Table I-1 Rational Method Runoff Coefficients (C)**

Land Use	Average Slope, Percent			
	0-2	>2-7	>7-15	>15
Residential, Rural (1 unit per 5+ acres)	0.35	0.39	0.43	0.45
Residential, Very Low Density (1 unit per .5 to 5)	0.40	0.43	0.46	0.50
Residential, Low Density (2 to 4 units per	0.45	0.49	0.56	0.59
Residential, Medium-Low Density (4 to 8 units per acre)	0.50	0.56	0.64	0.70
Residential, Medium Density (8 to 18 units per	0.70	0.74	0.77	0.80
Residential, Medium-High Density (18 to 30 units per acre)	0.90	0.90	0.90	0.90
Business, Commercial, Institutional and Schools	0.90	0.90	0.90	0.90
General Industrial	0.90	0.90	0.90	0.90
Parks and Recreation	0.31	0.37	0.42	0.45
Agricultural and Open Space	0.30	0.35	0.41	0.45

Note: Coefficients for developments with more than one land use shall be weighted in proportion to the areas of each land use using either the values from Table I -1 or the following formula in on-site design calculations. Off-site design calculations shall use the values from Table 1-1.

$$C = Cv(Av/At) + 0.9(Ap/At)$$

Where:

**Cv** = value from the vegetated area curve, SCWA Plate No. B1

**Av** = vegetated area

**Ap** = impervious area

**At** = total area

**Rainfall Intensity:** Rainfall intensity  $I$  is the amount of rainfall measured in inches per hour that would be expected to occur during a storm of a certain duration. The storm frequency is the time in years in which a certain storm would be expected again and is determined statistically from available rainfall data. (See Figure I-1)

**Time of Concentration:** The time of concentration at any point in a storm drain segment is the time required for runoff from the most hydraulically remote portion of the drainage area to reach that point. The most hydraulically remote portion provides the longest time of concentration but is not necessarily the most distant point in the drainage area. Since a basic assumption of the Rational Method is that all portions of the area are contributing runoff, the time of concentration is used as the storm duration in calculating the intensity. The time of concentration consists of the initial time of concentration, which depends on the anticipated future land use for the drainage area, plus the sum of the additional overland flow time, if any, and the times of travel in street gutters, roadside swales, storm drains, drainage channels, and other drainage ways. The time of concentration is affected by the rainfall intensity, topography, and ground conditions.

## V. HYDROLOGIC DESIGN

Hydrologic design shall be based on the ultimate development and slope of the tributary watershed. All storm drain facilities shall be designed for flows resulting from 100 percent build-out of the land uses designated in the latest adopted edition of the City's General Plan in effect at the time the proposed development is approved by the appropriate City approval body. Drainage boundaries and basin slope shall be determined from the most current topographic information available. In flat areas, drainage basin boundaries shall be verified with those for other adjacent developments to eliminate gaps or overlaps and maintain consistency. Only areas which do not flow towards the proposed development may be excluded. The design must demonstrate that the excluded areas do not flow into the proposed development.

Flows from tributary areas upstream of the proposed development shall be included in the hydrologic design for the proposed development. The hydrology for the proposed project will be based on a pattern of upstream development which delivers the ultimate development storm runoff to the proposed project. Upstream area flows shall be based on 100 percent build-out of the land uses designated in the latest adopted edition of the City's General Plan in effect at the time the project is designed. Rezoning often results in significantly higher densities than were used in design calculations for existing downstream storm drain facilities. The design of the storm drain system for the proposed development shall be based on the assumption that storm flows from upstream areas will be conveyed in conduits, thereby resulting in lower times of concentration than for undeveloped conditions. The design of the storm drain facilities for the proposed development shall be such that the design flow from the proposed development and the upstream areas is less than or equal to the hydraulic capacity of the downstream storm drain facilities unless otherwise approved. In cases where the design flow exceeds the hydraulic capacity of the downstream storm drain facilities, improvements to the downstream facilities may be required as part of the development.

Developed public areas, including but not limited to public parks and golf courses, may be considered to be vegetated to the extent that they are actually vegetated, unless publicly proposed plans indicate that the governing body having jurisdiction over the area intends to alter the existing use of the area so as to make the surface less pervious. The developer shall confirm future plans for park lands with the City Planning Department.

Drainage systems shall be designed to accommodate flows from storms with specific recurrence intervals. Recurrence interval is defined as the average number of years, over a long period of time, in which the magnitude of discharge from a given flood event is equaled or exceeded. Flows to be used for the design of waterways shall be calculated using the following minimum recurrence intervals:

<i>Waterway Type</i>	<i>Drainage Area, Square Miles</i>	<i>Recurrence Interval, Years</i>
Minor waterway	1 sq mi or less	10-year peak flow
Secondary waterway	Between 1 and 4 sq mi	25-year peak flow
Major waterway	4 sq mi or more	100-year peak flow

Notes: In all cases, the 100-year flow condition must also be analyzed to assess flood hazards.

A given waterway, therefore, will be classed as minor in its upper reaches, then change to the secondary classification at a point where the drainage area exceeds 1 square mile, and then change again to the major classification at a point where the drainage area exceeds 4 square miles.

Design flow shall be determined by the use of the Rational Method formula:  $Q = CIAK$

To use Figure 1-1, determine the proper duration of the design storm event. The proper duration is equal to the time of concentration, which is the time required for flow from the most distant location in a drainage basin to reach the point of discharge from the basin.

Drainage areas larger than 2 acres are too large for application of the Rational Method formula in an initial step. The designer shall compute the time of concentration by determining the initial time of concentration. This is the time of concentration at the basin(s) which is furthest upstream.

It is based on land use according to the table below. The Rational Method formula shall be applied to each subarea, step by step, and the flow shall be hydraulically routed from sub-basin to sub-basin to properly accumulate the design discharge for the entire watershed. For further details and sample calculations, refer to the latest edition of the SCWA Flood Control Design Criteria Manual.

<i>Land use</i>	<i>Initial time of concentration*, minutes</i>
Commercial, industrial, and residential with more than eight units per acre	7
Residential, two to eight units per acre	10
Residential, less than two units per acre	15
Open Space	15

\*initial basins shall be of two acres or less

## VI. HYDRAULIC DESIGN CRITERIA

**General:** For hydraulic design for commonly encountered situations, refer to the latest edition of SCWA Flood Control Design Criteria Manual and supplemental information. For hydraulic design for situations not covered by the SCWA manual, the design engineer shall provide specific references, model study reports, or prototype test results, as necessary to confirm the hydraulic design. Design engineers shall submit design calculations for all public storm drain facilities. As a minimum, the submittal shall include the items shown on the checklist in SD24. Examples of acceptable calculations are included in the appendix to the SCWA Flood Control Design Criteria.

Secondary waterways discharging into major downstream waterways shall be designed to operate while discharging into a 25-year flow in the major downstream waterways. Minor waterways discharging into secondary downstream waterways shall be designed to operate while discharging into a 10-year flow in the secondary downstream waterways. In such cases, the ground elevation along the secondary or minor system shall be above the 100-year water surface elevation in the major or secondary downstream waterway.

If a closed conduit (i.e., pipe or culvert) is used as a secondary or minor waterway, sufficient additional surface routes for flood flows shall be made available to carry the added flow increment up to the 100-year design flow with no more than nuisance damage to improvements or proposed improvements and with no flooding of finished floor of present and proposed future buildings. If such surface routes cannot be made available, the secondary or minor conduit shall be designed to carry the 100-year design flow.

The Manning equation shall be used for hydraulic design of storm drain facilities. The Manning equation is stated as follows:

$$Q = \left(\frac{1.49}{n}\right)AR^{2/3}S^{1/2}$$

Where:

- Q*** flow in cubic feet per second
- A*** cross-sectional area of flow in square feet
- R*** hydraulic radius in feet
- S*** slope of the pipe or channel (dimensionless)

***n*** Manning equation roughness coefficient (dimensionless)

The values of the Manning equation roughness coefficient "*n*" shall be as follows:

<b>Material</b>	<b><i>n</i></b>
Storm Drain Pipe Smooth walled high-density polyethylene, or reinforced concrete	0.014
Concrete-lined channel	0.015
Asphaltic concrete	0.017
Sack concrete and grouted rock rip rap	0.030
Loose rock rip rap	0.035
Grass-lined channels	0.035 minimum
Constructed natural waterways	0.050 minimum

For materials other than those stated above, "*n*" values shall be those presented in the latest edition of the *Handbook of Hydraulics* by King and Brater. The use of  $n = 0.012$  may be allowed for smooth walled high-density polyethylene pipe (HDPE) design purposes when the construction drawings clearly indicate the pipe material shall be HDPE and there is no suitable substitute.

Storm drains shall be designed for a minimum velocity of 2.5 feet per second at design flow rates unless otherwise specifically authorized by the City Engineer.

**Open Channels.** The maximum allowable depth for flows with 10-year recurrence interval in gutters is 0.4 feet. Valley gutters are unacceptable across through streets. Valley gutters may be authorized for use in alleys on a case-by-case basis.

The use of berms, levees, or other facilities along the channel that create potential hydraulic grade lines higher than abutting lands are unacceptable unless specifically authorized by the City Engineer. This requirement is intended to prevent the need for storm water pump stations.

Open channels shall be designed to SCWA design criteria standards with minimum freeboard between design water surface and the top of bank of 1.5 feet or 20 percent of the specific energy, whichever is greater. Where this minimum freeboard does not provide the necessary differential head to allow gravity flow for the projected development of the tributary areas, the design water surface shall be lowered sufficiently to allow such areas to drain by gravity.

Roadside ditches shall be designed so that the water surface for the design discharge will be at or below the outside edge of the road shoulder such that there is no flood water in the normal travel-way of the road and below adjacent ground level.

The design flow in natural creeks and constructed natural waterways may be allowed to overflow into an area above the defined banks provided that the flow is contained within a defined overflow area. Freeboard shall be provided, as specified above, between the design water surface and the adjacent ground surface or finished grade of lots or areas on which improvements are to be constructed. Less than 1.5 feet of freeboard may be considered for small natural swales and creeks through open space such as parks and golf courses. In any

event, sufficient freeboard shall be provided to retain the 100-year design flow within the right-of-way of the channel.

Channels shall be designed taking into account the energy losses due to existing and proposed future road crossing structures or other obstructions within the channel. Refer to the latest edition of the SCWA Flood Control Design Criteria Manual for required allowances and other design considerations for obstructions within open channels.

Bridges, culverts and utility crossings which span major and secondary open channels and which are existing, planned or projected at the time of channel design shall have a minimum clearance from soffit to design water surface of 1.0 foot and shall cause no encroachment on the specified minimum freeboard in the upstream channel or waterway.

Constructed natural waterways shall be excavated as required to pass the design flow through interim and ultimate conditions of natural plant and tree growth and of other natural channel characteristics. Trees and other plants and grasses shown on the proposed development plans shall be planted as a part of initial construction to promote and encourage ultimate natural appearance.

Constructed natural waterways, in their final development and growth stages, shall satisfy the freeboard requirements for open channels described above. Constructed natural waterways are appropriate in any situation where right-of-way space can be provided.

Open channels which will be maintained by the SCWA must be designed as specified in the SCWA Flood Control Design Criteria Manual.

**Closed Conduits:** The design depth in circular conduits shall not exceed 0.80 of the diameters of the conduit for major and secondary waterways. Closed conduits used as minor waterways may be designed to flow full or surcharged. The hydraulic entrance condition at a closed conduit used as a minor waterway will be designed so that the required freeboard in the upstream channel is provided for the 10-year design flow and the 100-year design flow is contained within the banks of the upstream channel. The entrance to the closed conduit may be submerged provided the above criteria are satisfied.

At inlets, catch basins, and non-pressure type manholes within a closed conduit system, the design flow hydraulic grade line shall be at least 1.0 foot below the top of curb or of adjacent ground surface if the area is unpaved unless otherwise approved. At locations where conduits are stubbed out for future extension, the design hydraulic grade line shall be low enough to allow proper drainage of the future tributary area and shall be a minimum of 1.5 feet below general existing ground level unless otherwise approved. For closed conduits designed for supercritical flow, the energy grade line shall not be above ground level at inlets, catch basins, and non-pressure type manholes. Where the energy grade line is above the existing ground elevation bolt down manhole covers shall be used.

Energy losses due to debris load caused by splitting flow at the entrance to or within a closed conduit system shall be computed in the same manner as obstruction losses in open channels. In addition to normal friction losses, energy losses due to entrance and exit

conditions, bends, and transitions shall be computed and considered.

## **VII. DETENTION BASINS**

The following section on detention basins is not included in the Sonoma County Water Agency Flood Control Design Criteria.

Detention basins are natural or constructed basins that receive and hold storm water runoff to reduce downstream peak flows for flood control purposes and/or to enhance water quality.

Detention basins are allowed only with the approval of the City Engineer. Publicly maintained storm water ponds with permanent pools of water are prohibited. However, approval may be granted provided the applicant/developer executes a binding agreement to provide funding, in perpetuity, for the maintenance costs associated with these facilities.

Detention basins should be designed to be multipurpose wherever possible and designed to enhance storm water quality. Detention basins whose primary purpose is water quality enhancement will be considered during planning for storm drain system improvements.

Publicly maintained detention facilities for flood control purposes may be permitted, with the approval of the City Engineer, when it is more cost-effective than providing storm drains. An analysis, which justifies the financial need for the detention basin by presenting both the estimated capital cost and the estimated annual operation and maintenance costs of the basin as well as comparable costs for an underground closed conduit storm drain system, shall be prepared under the direction of a civil engineer and submitted for approval by the City Engineer prior to approval of a tentative map. The City Engineer may prohibit or restrict the use of detention basins based on specific site conditions such as insufficient depth to bedrock; extreme community disruption; need for extensive relocation of existing improvements and utilities; or lack of sufficient, available, suitable land.

The design of detention basins for flood control purposes shall be based on the size of the basin; the maximum allowable depth of temporary ponding; the recurrence interval of the storm being considered; the peak rate, total volume, and timing of the inflow; the maximum allowable outflow rate; and the length of time water is allowed to remain in the basin. The design shall be accomplished through the development of three items: an inflow hydrograph, a depth-storage relationship, and a depth-outflow relationship. These three items shall be combined in a routing routine to obtain the outflow rate, depth of stored water, and volume of storage at any specific time as the design storm flow passes through the detention basin. Pumped discharges from publicly maintained detention facilities are prohibited.

The design considerations cited above determine the detention basin volume required for flood control purposes only. Design of detention basins should also take into consideration other benefits that can be achieved, such as water quality enhancement, recreational opportunities, and open space aesthetic enjoyment. Public health and safety needs should be considered, such as the need for vector control and fencing in particular applications. Detention basin designs must promote personal safety by locating basin along public streets to assure visual access to basin area. Site, street and basin design should be coordinated to orient

buildings and streets for good surveillance of basin area.

The design of detention basins shall include the recommendations, considerations and procedures discussed in *Design and Construction of Urban Stormwater Management Systems*, Chapter 6, WEF Manual of Practice FD-20, latest edition, and ASCE EWRI *Guidance for Protection of Public Safety at Urban Stormwater Management Facilities*.

The geometry of the basin should be designed to reduce dead zones and increase detention times. Inlet and outlet structures must be carefully designed to reduce turbulence that could resuspend settled solids. Consideration should be given to installation of energy dissipaters, stilling basins, berms, and separation walls.

To prevent erosion during large storm flows, unprotected side slopes shall be no steeper than 3 horizontal:1 vertical. Lesser slopes as described *Design and Construction of Urban Stormwater Management Systems*, Chapter 6, WEF Manual of Practice FD-20, latest edition, and ASCE EWRI *Guidance for Protection of Public Safety at Urban Stormwater Management Facilities* are preferred. Slopes of 3:1 shall include a discussion of maintenance and safety provisions.

Detention basins shall be designed and constructed for easy access to the basin itself and all inlet and outlet structures. Access to the bottom of the basin is necessary. Basins to be maintained by City staff must meet City accessibility criteria discussed below under "Design Requirements."

## DESIGN REQUIREMENTS

### **VIII. CONNECTION TO THE EXISTING STORM DRAIN SYSTEM**

- A. New storm drain systems must connect to an existing City or County of Sonoma storm drain facility, a channel or creek maintained by the SCWA, or an approved natural waterway. Storm drain designs shall incorporate the design of any off-site storm drain improvements required to accommodate flow from the storm drain system for the proposed development. A structure must be installed at each connection (i.e., no "blind" connections) except as otherwise approved by the City Engineer.
- B. Where public storm drains must traverse private property, inlets necessary to drain the private property are permitted to connect to the public storm drain. These inlets and connecting pipes shall be clearly delineated as private on the improvement plans.
- C. Sump pumps for nonresidential or mixed land uses shall not discharge to gutters or sidewalk drains. Sump pumps shall discharge into closed conduit systems or open channels, if permitted by the North Coast Regional Water Quality Control Board. Sump pumps for nonresidential land uses shall discharge at a structure (i.e., no blind connections). Sump pumps which may discharge liquids other than uncontaminated water (e.g., oil, grease, solvents, etc.) shall discharge to sanitary sewers, if approved by the City's Utilities Department; industrial pretreatment of these discharges may be required. Sump pumps for single-family residences shall be allowed to discharge to sidewalk drains or gutters by gravity flow only. (For instance, by pumping to a box and then allowing the water to gravity flow through curb into the gutter.)
- D. Concentrated drainage flows in pipe systems from private property shall not flow over public sidewalks. Sidewalk drains or other means of collection and conveyance to a proper discharge location shall be provided.

### **IX. MATERIALS**

- A. Storm drain pipes 15 inches in diameter or larger shall be reinforced concrete pipe (RCP), or annular high-density polyethylene (HDPE) pipe.
- B. RCP shall be Class III, IV, or V as specified in Part 3, Public Storm Drain Construction Standard Specifications, of these standards.

Typical total effective loads on buried pipe, expressed in pounds per linear foot of pipe, are shown in Table I-3. The design engineer shall determine the D-load for the depth and diameter of pipe from the table and select the class of RCP with a D-load rating equal to or greater than the value in Table 1-3. The design engineer shall interpolate between the values in Table I-3 for conditions not presented in the table.

- C. HDPE pipe shall be smooth interior, corrugated exterior pipe with bell-and-spigot joints, Type S, per AASHTO Designation M294. HDPE pipe shall only be used in sizes of 36-inch or smaller diameter with cover of less than 30 feet. The design engineer shall determine flotation restraint per manufacturer's recommendations. Minimum cover over pipe shall be 12 inches from the outside top of pipe to subgrade. HDPE pipe shall only be used under pavement areas.
- D. Sidewalk drains shall be per Standard 210.

**X. SIZE**

- A. Storm drain pipe diameters within the public right-of-way, including driveway culverts, shall be 15 inches or larger, except sidewalk drains shall be per Standard 406.
- B. In new portions of the storm drain system, pipe sizes shall not decrease in the downstream direction.

**XI. ALIGNMENT**

- A. Storm drains shall be located within public streets unless otherwise authorized by the City Engineer.
- B. Storm drains traversing private property shall be straight between manholes (i.e., no horizontal curves) except when installed in a private street parallel to the centerline of the private street.
- C. In general, storm drains shall be installed parallel to the centerline of the street or right-of-way.
- D. Horizontal separation of storm drain line from sanitary sewer shall be a minimum of 5 feet clear (i.e., outside of pipe to outside of pipe), except at pipe crossings.
- E. Horizontal separation from water mains and other utilities, gas, underground electric, underground television cable, etc., shall be a minimum of 4 feet clear.
- F. Vertical curves are not allowed unless specifically authorized by the City Engineer.
- G. Horizontal curves with a minimum radius of 300 feet for RCP shall be provided at catch basins installed at curbs and gutters so as to locate as much of storm drain as possible under asphaltic concrete paving rather than concrete curbs and gutters.
- H. Horizontal curves concentric with public or private street centerlines may be permitted with RCP provided the radius is 300 feet or greater. The minimum allowable radius used with 20-foot sections of HOPE pipe is 765 feet.

- I. Horizontal curves can be installed in RCP by pulling pipe joints if the resulting deflections are not greater than the pipe manufacturer's recommendations. The design engineer shall use the following equation in designing horizontal curves for RCP with a diameter over 48 inches:

$$R = \frac{L}{2(\tan \frac{\Delta}{2N})}$$

Where:

- R** = radius of curvature of the centerline of the pipeline in feet
- L** = laying length of pipe section in feet, measured along centerline
- Δ** = total deflection angle of curve in degrees
- N** = number of pipe sections with pulled joints
- Δ/N** = deflection angle of each pipe in degrees

## **XII. SLOPE**

Maximum slope for storm drains shall be 10 percent or 10 feet per 100 feet.

## **XIII. COVER**

Minimum cover over storm drains shall be 12 inches (Class III RCP and HOPE). Cover is defined as the distance from the outside top of the pipe to the final subgrade (bottom of the structural section) in paved areas or finished grade in unpaved areas. See Table I-3.

## **XIV. MANHOLES AND STRUCTURES**

- A. A manhole or accessible structure shall be installed at every change in pipe size.
- B. The maximum distance between manholes and/or accessible structures shall be 400 feet.
- C. A manhole or accessible structure shall be installed at every horizontal angle point or vertical change in alignment.
- D. Sufficient drop shall be provided through manholes and accessible structures to compensate for energy loss caused by change of alignment.
- E. Manholes shall be 48 inches in diameter with storm drain pipes of 36 inches in diameter or less, and shall be 60 inches in diameter with storm drain pipes larger

than 36 inches in diameter. Manholes shall be designed to be large enough to accommodate all pipes connected to manhole with a minimum of 3 inches of manhole wall on both sides of all pipes. Reducer slabs may be provided as shown on Standard 203.

- F. An accessible structure shall be provided to connect private storm drains to the public storm drains (i.e., no blind connections) except as otherwise approved by the City Engineer. Structures shall be installed on the private side of the property line to distinguish the public system from the private system. Public and private storm drain facilities shall be clearly identified on the improvement plans. For residential land uses only, no structure is necessary for sump pump connections to public storm drain systems. Accessible structures are required for sump pump connections from nonresidential land uses.
- G. Headwalls or structures shall be provided where open ditches, channels, and creeks discharge into closed pipe conduits. Refer to Caltrans Standard Plans.

## **XV. CATCH BASINS**

- A. Catch basins shall be Type II (Standard 205) except as listed below or as otherwise approved by the City Engineer. Galleries per Standard 208 may be used on the upstream side of a Type II catch basin to increase inlet interception capacity or if their use reduces the number of catch basins requiring maintenance.
- B. Catch basins shall be installed at the following locations:
  - Such that gutter flows do not cross intersections except where valley gutters are allowed.
  - Upstream of bridge abutments.
  - The beginning of every roadway super elevation that reverses the cross-slope of the pavement.
  - The sags (i.e., bottoms) of vertical curves.
  - The low points of downhill cul-de-sacs.
  - As required so that water depth in gutter does not exceed 0.4 feet during the 100-year design storm event.
  - As required to maintain the following number of 8-foot-wide traffic lanes unimpeded by flowing or standing water during a 100-year design storm:
    - Two lanes for all regional streets.
    - One lane for transitional and industrial streets. This lane may be in the middle of the road, spanning the crown. This requirement does not apply to local streets.
    - One lane in each direction for transitional streets that are divided roads or roads with a median strip.
  - As required so that carry over flows (bypassing catch basins) shall not exceed 2 cubic feet per second.

- At a maximum spacing of 400 feet from another catch basin or manhole.
- C. Catch basin size and spacing shall be computed by the methods in Drainage of Highway Pavements, Federal Highway Administration, Hydraulic Engineering Circular No. 12, March 1984 or most current version.
- D. Storm drain labels shall be affixed in accordance with City Engineer's Standard 211.

## **XVI. EASEMENTS**

- A. An easement must be provided over any public storm drain when it is installed outside a public right-of-way.
- B. The easement must be a minimum of 15' wide if it only contains a publicly-maintained storm drain or 20' wide (or wider) if it contains another facility, such as water, sewer, or other utility. The easement will be dedicated as a "public drainage easement" if it contains storm drain only. It will be dedicated as a "public utilities easement" if it contains other facilities as well.
- C. Easements must be configured to encompass all publicly-maintained appurtenances and will be generally centered over the facility. Separate access easements may be required depending on site conditions. When storm drains are to be installed along a property line the easement will be wholly contained on one parcel.
- D. All property restrictions placed as a result of dedication of easements will be so noted on the supplemental sheet of the Subdivision Map, or on the Easement Deed if the easement is not dedicated as part of a subdivision. Typical required notes as applicable are:
1. No structures may encroach on, above, or below the surface of the ground in any public easement. This includes footings of foundations, eaves from the roof of any adjacent structure, pools, ponds or outbuildings on slabs or foundations.
  2. No trees may be planted in a public storm drain easement without first obtaining approval of the Director of Public Works. Trees may be allowed to the extent that damage to the drainage system does not occur from root intrusion and adequate access can be provided for maintenance and repair vehicles.
  3. The Public Works Department will take due caution when performing maintenance or repair of drainage systems in easements, but will not be responsible for repairs or replacement of trees, landscaping or structures not specifically approved by the Director of Public Works.

## **XVII. ACCESS ROADS**

- A. Clear access must be provided and maintained to all public structures on the drainage system.
- B. All-weather vehicle access roads are required to every structure on the storm drain system. Access roads must be a minimum of 12' in width and must be provided with turnarounds per City Standard 122 when the back-up distance for any maintenance vehicle exceeds 100'.
- C. The design of access roads must be included with the drainage system design plans. At a minimum, the design shall conform to the requirements of Standard 128. Include adequate drainage measures in the design to prevent damage to the access roads from storm water.
- D. Gates must be provided for access through any fence crossing a public storm drain easement. Where vehicular access is required for maintenance, minimum 14' wide gates must be provided with sliding gates preferred. Where vehicular access is not required, 4' wide gates for pedestrian access must be provided and will be located to permit visual access between storm drain structures.
- E. The maximum grade allowed at any point on an access road is 15%. The maximum cross-slope for any access is 5%.

## **XVIII. MAINTENANCE**

- A. Storm drains that convey public water, are designed and constructed to City standards, and are in a dedicated public easement or right-of-way accepted by the City shall be maintained for hydraulic capacity by the City. All other storm drains, including driveway culverts, shall be privately maintained.
- B. Sidewalk drains shall be privately maintained by the owners of the frontage property.

## **XIX. WATER QUALITY TREATMENT**

- A. Source controls designed or constructed to reduce the discharge of pollutants from the storm water conveyance system shall be designed and maintained as directed by Engineering.

## **XX. OTHER REQUIREMENTS**

- A. Sanitary sewer laterals and industrial process or waste pipelines shall not be connected to storm drains or allowed to discharge to waterways. Sanitary sewer laterals and industrial waste pipelines shall be connected to sanitary sewers in conformance with the latest edition of the City's Sewer Standards;

pretreatment of industrial wastes may be required.

- B. Driveway culverts shall be designed under the direction of a civil engineer to convey anticipated flow from future development and ensure hydraulic adequacy.

**Table I-1 Rational Method Runoff Coefficients (C)**

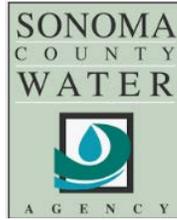
Land Use	Average Slope, Percent			
	0-2	>2-7	>7-15	>15
Residential, Rural (1 unit per 5+ acres)	0.35	0.39	0.43	0.45
Residential, Very Low Density (1 unit per .5 to 5	0.40	0.43	0.46	0.50
Residential, Low Density (2 to 4 units per	0.45	0.49	0.56	0.59
Residential, Medium-Low Density (4 to 8 units per acre)	0.50	0.56	0.64	0.70
Residential, Medium Density (8 to 18 units per	0.70	0.74	0.77	0.80
Residential, Medium-High Density (18 to 30 units per acre)	0.90	0.90	0.90	0.90
Business, Commercial, Institutional and Schools	0.90	0.90	0.90	0.90
General Industrial	0.90	0.90	0.90	0.90
Parks and Recreation	0.31	0.37	0.42	0.45
Agricultural and Open Space	0.30	0.35	0.41	0.45

Note: Coefficients for developments with more than one land use shall be weighted in proportion to the areas of each land use using either the values from Table I -1 or the following formula in on-site design calculations. Off-site design calculations shall use the values from Table 1-1.

$$C = C_v(A_v/At) + 0.9(A_p/At)$$

Where:

- C<sub>v</sub>** = value from the vegetated area curve, SCWA Plate No. BI
- A<sub>v</sub>** = vegetated area
- A<sub>p</sub>** = impervious area
- A<sub>t</sub>** = total area



FLOOD AND DRAINAGE REVIEW  
PLAN SUBMITTAL CHECKLIST

Project Name: \_\_\_\_\_ Date: \_\_\_\_\_  
SCWA File # \_\_\_\_\_

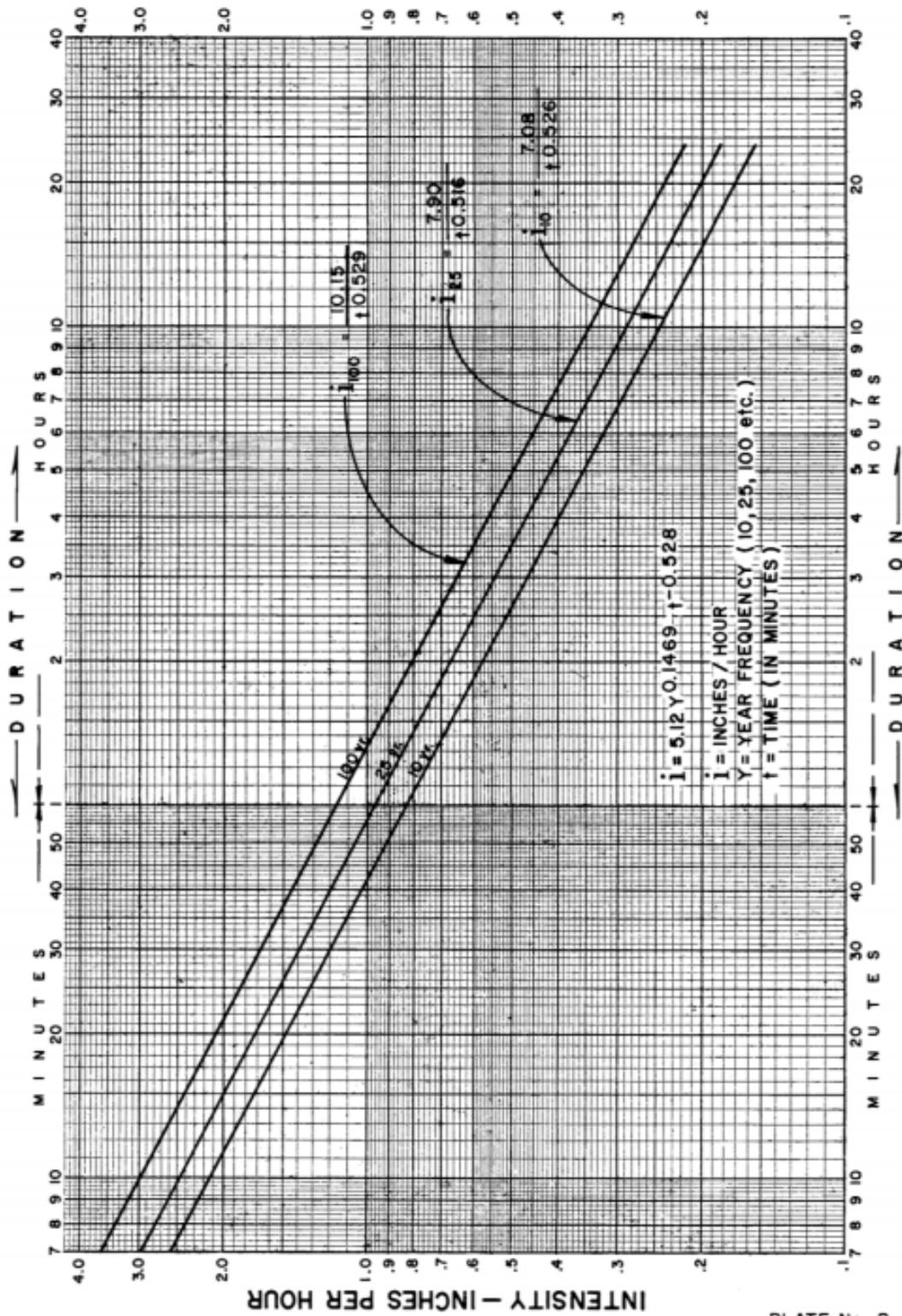
*All of the following items must be submitted before a flood and drainage review can be completed.*

***Please submit the following items or indicate why they are not necessary.***

- Transmittal Letter
- Explanation of Analysis Approach
- Submittal Information Sheet
- Plan Check Fee (minimum of ½ due; remainder due prior to final approval)
- Improvement Plans
- Final Map or Parcel Map (if applicable)
- Hydrology Map
- Establish Factors used in Analysis
- Hydrology Calculations  10-year Storm and  100-year Storm
- Hydraulic Calculations
- Establish Starting HGL
- EGL and  HGL Plots
- 100-year Storm Routing
- 100-year Storm Elevations vs. Finished Floor Elevations
- Inlet Capacity Calculations
- Curb Water Depth Calculations
- Assessor Parcel Map with Site Outlined
- Copy of the conditions of approval for the project

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Figure I-1 Rainfall Intensity vs. Duration



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**Figure I-3**  
**LOADS ON BURIED PIPES**  
**POUNDS PER LINEAR FOOT**

Cover to Subgrade In feet	Pipe Diameter In Inches																		
	15	18	21	24	27	30	36	42	48	54	60	66	72	78	84	90	96	102	108
1	*	*	*	*	*	*	*	*	*	*	2310	2475	2310	2169	2048	1944	1852	1778	1703
2	1632	1592	1549	1516	1491	1471	1474	1289	1148	1039	952	881	822	772	729	692	659	633	607
3	931	893	859	834	814	798	827	814	797	784	731	688	652	622	596	573	553	540	524
4	857	816	780	753	733	716	760	742	723	709	699	691	685	658	636	616	599	589	576
5	878	832	794	766	744	728	784	763	742	726	715	705	699	693	687	683	667	660	647
6	921	874	833	803	780	762	835	812	789	771	759	749	741	735	729	724	719	727	720
7	974	924	883	852	828	809	897	872	848	829	816	805	798	790	784	779	775	782	778
8	1029	978	935	904	880	861	964	939	913	893	880	869	861	853	847	842	837	846	842
9	1087	1036	993	961	937	918	1037	1011	985	964	951	940	932	924	918	913	906	918	914
10	1141	1090	1047	1015	992	973	1108	1082	1055	1034	1021	1011	1002	995	989	984	979	991	987
11	1191	1141	1098	1067	1043	1026	1177	1151	1123	1103	1090	1080	1072	1065	1059	1054	1050	1053	1059
12	1236	1187	1145	1115	1092	1075	1242	1217	1190	1170	1157	1148	1140	1134	1128	1124	1120	1135	1131
14	1315	1269	1229	1201	1181	1166	1365	1343	1317	1297	1287	1279	1272	1267	1263	1260	1257	1275	1272
16	1380	1338	1301	1276	1259	1247	1477	1458	1434	1417	1409	1403	1396	1395	1393	1391	1389	1411	1409
18	1433	1396	1363	1341	1327	1318	1578	1564	1543	1528	1523	1519	1517	1516	1516	1516	1516	1542	1542
20	1477	1445	1415	1397	1396	1380	1670	1661	1643	1631	1629	1629	1630	1631	1633	1635	1637	1668	1669
24	1542	1519	1496	1485	1482	1483	1828	1830	1820	1816	1821	1828	1835	1842	1850	1857	1863	1903	1908
28	1585	1570	1554	1550	1553	1560	1955	1969	1969	1973	1987	2002	2016	2030	2043	2056	2068	2118	2126
32	1613	1605	1595	1597	1606	1619	2058	2085	2094	2107	2130	2153	2175	2196	2216	2235	2253	2313	2326
36	1632	1629	1624	1631	1648	1664	2141	2180	2198	2220	2253	2285	2315	2343	2371	2396	2420	2490	2509
40	1644	1645	1644	1656	1675	1698	2208	2258	2266	2317	2359	2399	2437	2474	2508	2540	2571	2651	2675

Allowable Loads:

- Class III 1,350 Lbs./Linear Ft.
- Class IV 2,000 Lbs./Linear Ft.
- Class V 3,000 Lbs./Linear Ft.

The area within the heavy black line indicates situation where Class III RCP is acceptable.

\* Exceeds the capacity of Class V RCP. Special design required to be submitted to City Engineer.

Reference: Ameron Reinforced Concrete Pressure Pipe, 1971, for covers of 2 feet or greater. Loads are interpolated for covers of 1 foot.

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SECTION 3

**STREET LIGHTING  
Design Standards**

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## STREET LIGHTING DESIGN STANDARDS

### I. GENERAL

The purpose of the standards and specifications contained herein is to establish uniform standards for street lights on public streets in the City of Cotati, installed after the date of adoption of these standards. This document is not intended or designed as, nor does it establish, a legal standard for lighting.

- A. These Street Lighting Standards shall be used for all street lights on public streets in the City of Cotati. These standards shall apply as of the date of adoption and are not considered retroactive.
- B. Deviations from these standards shall require specific approval of the City Engineer.
- C. These standards do not preclude the use of a higher standard.
- D. Encroachment onto any City street, right-of-way, or public utility easement shall require an encroachment permit issued by the City of Cotati.
- E. Street light spacing shall be staggered and located at property lines when possible. Street light designs utilizing one side, median, or opposite configurations shall require specific approval of the City Engineer.
- F. Electrical service shall conform to the requirements of Standard Plans No. 304.
- G. The City Engineer shall designate specific connection points for connecting new street lights into the existing multiple street light system. The City shall only authorize energization after City acceptance of the installation.
- H. The developer shall verify available capacity when proposing to connect to an existing multiple street light system.
- I. The following additional requirements apply to street light systems installed by private developers:
  - 1. The developer shall make arrangements with PG&E for service points. Service points shall be shown on the improvement plans. The developer shall be responsible for all costs associated therewith which shall be paid directly to PG&E. The contractor shall verify the street light service point location(s) with PG&E prior to installation. The City will authorize and request energization from PG&E.
  - 2. The developer shall install the following in accordance with the Street Lighting Standard Plans: concrete foundations, galvanized steel poles, mast arms of the appropriate lengths, and wiring.
  - 3. The developer shall install the entire lighting system, including luminaire.
  - 4. All street light systems utilizing street light lamps up to, and including, 150 watts shall be designed for 120-volt service unless connecting to an existing system. In the latter case, the design shall conform to the system being connected to and must be specifically approved by the City Engineer. Street light systems utilizing street light lamps above 150 watts shall require 240-volt service.

## II. DEFINITIONS

**“Average Maintained Foot-candles”** is the average level of horizontal illuminance on the roadway pavement when the output of the lamp and luminaire is diminished by the maintenance factors; expressed in average foot-candles for the pavement area.

**“California Standard Plans”** shall mean the latest edition of the Standard Plans adopted by the California Department of Transportation.

**“California Standard Specifications”** shall mean the latest edition of the Standard Specifications adopted by the California Department of Transportation.

**“Candela”** is the luminous intensity. Formerly the term “candle” was used.

**“City Engineer”** for the purposes of the Streetlight Standards, shall mean the City Engineer of the City of Cotati.

**“City Traffic Engineer”** (See definition in the Traffic Standards).

**“Collector Street”** Major Collector or Minor Collector

**“Cul-de-sac street”** shall have the primary purpose of serving abutting land use and connecting to the nearest appropriate local street. It is a minor street with only one outlet.

**“Electrolier”** is the complete street light assembly consisting of street light pole, luminaire, ballast, and lamp.

**“Foot-candle”** is the illuminance on a surface one-square-foot in area on which there is uniformly distributed a light flux of one lumen.

**“Industrial Street”** shall be public and private streets located within industrial areas as defined on the current City zoning map, or roadways that primarily serve large trucks transiting to and from retail centers.

**“Illuminance”** is the density of the luminous flux incident on a surface; it is the quotient of the luminous flux divided by the area of the surface when the latter is uniformly illuminated.

**“Lateral Light Distribution”** is a pattern of light distributed upon a series of longitudinal and transverse roadway lines, based on the location of the luminaire as related to the area to be lighted.

**“Local Street”** means a street that provides access to individual sites. Local streets include Minor Streets, Neighborhood Streets, Lanes, Alleys, Utility Access Roads, Trails, Loop Streets and Cul-de-sac Streets. On-street parking is required on Minor Streets and Neighborhood Streets.

**“Luminaire”** is a complete lighting unit consisting of a lamp or lamps together with the parts designed to distribute the light, to position and protect the lamps and to connect the lamps to the power supply.

**“Major arterial”** means a street whose primary purpose is to facilitate movement of heavy traffic between major residential areas, or major residential areas and commercial areas with minimal access. Major arterial streets may consist of 2, 4, or 6 lanes. Intersections with local streets are permitted, provided they are right-turn-only and at least 200 feet apart, or they include a left-

turn pocket. Driveways are generally not permitted. Driveways are permitted to major traffic generators; provide they are right-turn-only. A deceleration lane must be provided for each driveway. *Major traffic generators include areas designated for Regional Commercial, Office, Mixed Use, and High-Density Residential uses.* No on-street parking is allowed. Major arterial streets include Parkways.

**“Major collector”** means to provide circulation within and between neighborhoods. Driveways are permitted, provided they are right-turn-only and at least 50 feet apart, or they include a left-turn pocket. No on-street parking is allowed. Major collector includes Boulevards.

**“Minor arterial”** means to provide circulation between neighborhoods, activity centers, and highways and other regional routes, and also to provided circulation in rural and open space areas. Intersections with local streets are permitted, provided they are right-turn-only and at least 200 feet apart, or they include a left-turn pocket. *This provision is intended to maximize access between neighborhoods.* Driveways are permitted, provided they are right-turn-only and at least 100 feet apart. A deceleration lane must be provided for each driveway. No on-street parking is allowed. Minor arterial streets include Parkways.

**“Minor collector”** means to provide circulation within and between neighborhoods. Minor collector streets shall have the primary purpose of intercepting traffic from intersecting local streets and handling traffic to the nearest arterial/regional street, or intercepting traffic from one Collector Street and handling traffic to another collector street. It shall serve as an access to abutting properties. Minor collector streets connect residential neighborhoods to commercial centers and service commercial districts. On-street parking is required on both sides of each segment of a one-way couplet. Minor collector streets include Avenues, Main Streets, and Industrial Streets.

**“Minor Street”** shall have the primary purpose of serving abutting land use and handling traffic to the nearest collector street.

**“Street Lighting Standard Plan”** shall mean a typical standard detail of the Street Lighting Standards and Details of the City of Cotati.

**“Uniformity Ratio”** is the ratio of average foot-candles of illuminance on the pavement area to the foot-candles at the point of minimum illuminance on the pavement.

<b>ASTM</b>	American Society for Testing and Materials
<b>FC</b>	Foot-candle
<b>IES</b>	Illuminating Engineering Society of North America
<b>NEC</b>	National Electric Code
<b>NEMA</b>	National Electrical Manufacturer’s Association
<b>PG&amp;E</b>	Pacific Gas and Electric Company
<b>PVC</b>	Polyvinyl Chloride
<b>UL</b>	Underwriter’s Laboratories, Inc.
<b>U/R</b>	Uniformity Ratio

### III. ROADWAY ILLUMINATION REQUIREMENTS

#### A. Design Conformity

1. The design of all street light systems shall conform to the average maintained foot-candle and uniformity ratio requirements of these specifications.

#### B. Area Classifications

1. Area classifications shall be used when determining the required illuminance levels for street lighting systems. The area classification selected for designing the street light system shall be determined by the City Engineer:
  - a. "Commercial" shall mean that portion of the City in a business development where ordinarily there are large numbers of pedestrians and a heavy demand for parking space during periods of peak traffic or a sustained high pedestrian volume and a continuously heavy demand for off-street parking space during business hours. This definition applies to densely developed business areas.
  - b. "Intermediate" shall mean that portion of the City which is within the zone of influence of a business or industrial development, often characterized by a moderately heavy nighttime pedestrian traffic and a somewhat lower parking turnover than is found in a commercial area. This definition includes densely developed apartment areas, hospitals, public libraries, and neighborhood recreational centers.
  - c. "Residential" shall mean a residential development, or a mixture of residential and commercial establishments, characterized by few pedestrians and a low parking demand or turnover at night. This definition includes areas with single family homes, townhouses, and/or small apartments. Regional parks, cemeteries, and vacant lands are also included.

#### C. Average Maintained Foot-candle Requirements

1. The design of all street lighting systems shall conform to these illumination requirements. Evidence that demonstrates that the street lighting system conforms to these requirements shall be submitted to the City with the proposed design.
2. The below-listed chart shall be used for determining the average maintained foot-candle (Avg. Maint. FC) and Uniformity Ration (U/R) requirements for the specific roadway and area types:

Roadway Classification	Area Classification	Avg. Maint. FC	U/R
Arterial	Commercial	.75	3:1
	Intermediate	.75	3:1
	Residential	.75	3:1
Collector	Commercial	.30	5:1
	Intermediate	.30	5:1
	Residential	.30	5:1
Minor	Intermediate	.20	4:1
	Residential	.20	4:1

D. Lateral Light Distribution

1. Lateral light distribution patterns shall conform to Illuminating Engineering Society of North America (I.E.S.) lateral light distribution patterns shown in Street Lighting Standard Plan 305.
  - a. Type 2 lights shall be used on local roadways.
  - b. Type 3 lights shall be used on major arterials and major collectors.
  - c. Type 4 lights shall be used at the terminus of cul-de-sacs.
2. Luminaires shall be full cutoff on all local roads and in all residential areas. Luminaires shall be cutoff or full cutoff in all other areas.
3. Design shall conform to these requirements except as specifically approved by the City Engineer.

**IV. STREET LIGHTS**

A. Cobra Style Streetlights

1. The luminaire shall be LED, produced by a manufacturer approved by the City of Los Angeles Bureau of Street Lighting. Color temperature shall be between 4000K and 4700K unless otherwise approved by the City Engineer. The luminaire shall have a minimum 5-year unconditional warranty on both the fixture and the bulb.
2. It is recommended that designers use the lowest wattage LED fixture that meets lighting criteria.
3. Street light poles and mast arms shall be galvanized steel.
4. The street light poles shall be an Ameron Series PL, Landmark Lighting S3508, Pacific Union Metal LA 10120 or an approved equal.
5. Street light pole heights shall conform to the applicable standard plan. Alternate pole heights shall require specific approval of the City Engineer by variance.
6. Street light mast arm lengths shall conform to the applicable standard plan. Alternate mast arm lengths shall require specific approval of the City Engineer by variance.
7. The concrete foundation requirements shall conform to the requirements of Street Lighting Standard Plan No. 301.
8. The base leveling requirements shall conform to the requirements of Street Lighting Standard Plan 301.

9. The wiring for the electrolier shall conform to the requirements of Street Lighting Standard Plan No 303.
- B. Decorative Street Light (Residential Streets)
1. Decorative street lighting in residential areas is generally discouraged due to glare and light spillage onto residential property. Decorative lighting in residential areas must be specifically approved by the Engineer and Planning Director.
  2. If decorative street lighting is to be installed, luminaire shields shall be required, unless waived by the City Engineer and Planning Director.
- C. Decorative Street Light (City Center Area)
1. Street lights installed within the current boundaries of the City Downtown Specific Plan area shall conform to the requirements of Street Lighting Standard Plan 302.
  2. Alternate street light installations shall require the specific approval of the City Engineer and Planning Director by variance.
  3. Each luminaire shall have installed an individual photocell control.
  4. Base and concrete footing details shall conform to the requirements of Street Lighting Standard Plan 302. The base leveling requirements shall conform to Street Lighting Standard Plan 302.
  5. At the discretion of the City Engineer, luminaire shields may be required.

## V. WIRING

- A. Except as noted, all wiring methods and equipment construction shall conform to the National Electric Code (NEC) and applicable sections of the California Standard Specifications.
- B. All splices shall be made with solderless and waterproof connectors.
- C. Unless authorized otherwise, all wiring shall be THW A.W.G. stranded, copper only. Unless otherwise specified on the Street Lighting Standard Plans, all wiring shall be of the following sizes:
1. All field wiring: #8 minimum (NEC)
  2. Pullbox to electrolier: #10 minimum (NEC)
  3. All wire in pole: #10 minimum (NEC)

## VI. PHOTOCELLS

- A. All street lights shall be equipped with photoelectric control. The photocell shall be Type IV consisting of a photoelectric unit which plugs into an EEL-NEMA twist lock receptacle integral with the luminaire and shall conform to the provisions of the California Standard Specifications. The photoelectric controls shall be operable within a minimum voltage range between 105 and 280 volts. All photoelectric controls shall be oriented to the north.

## VII. CONDUIT

- A. All conduit to be used shall be a minimum of 2-inch diameter, schedule 40 PVC,

except from each street light to the adjacent pull box which shall be 1-1/2-inch diameter galvanized steel.

All conduits shall have a 2-foot minimum cover from the top of conduit to the finished grade of the sidewalk, parkway, or roadway.

- B. All steel conduit and other metal parts, including bonding bushing, shall be NEC-approved parts and shall be continuously bonded and grounded per NEC requirements.
- C. All bends and/or offsets shall be made with factory sections using approved couplers per NEC requirements.
- D. All empty conduits shall have a one-quarter-inch polypropylene pull rope provided inside and sealed with a duct seal, approved by the City Engineer, on both ends of the conduit.
- E. The ends of all conduits installed shall be sealed with a duct seal approved by the City Engineer. Conduits stubbed for future extension shall be capped.
- F.

#### **VIII. PULL BOXES**

- A. Unless specifically approved by the City Engineer by special request, a No. 5 concrete pull box (California State Standard ES-8) shall be installed within five feet of the base of all street light poles.
- B. All pull boxes shall be installed per Street Lighting Standard Plan 301.
- C. Pull boxes shall not be more than 250 feet apart on long runs.
- D. Pull boxes shall not be placed where they will be subject to vehicular traffic. Exceptions shall require specific written approval of the City Engineer.
- E. All pull box covers shall be inscribed with "Street Lighting" and be secured with 3/8-inch bolts, cap screws, or studs and nuts that meet the provisions of the California Standard Specifications.
- F. Poles shall be stenciled with "RP (Pole No.) W (Wattage)" with 2-inch black numbers at 8 feet above the ground to designate the assigned pole number and wattage. Numbers shall be on the street side of the pole.

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SECTION 4

**TRAFFIC  
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## TRAFFIC DESIGN STANDARDS

### I. GENERAL

- A. Traffic Standards shall be used for all public streets in the City of Cotati.
- B. The purpose of the standards and specifications contained herein is to establish uniform policies and procedures for traffic engineering functions of the City of Cotati. It is neither intended as, nor does it establish, a legal standard for these functions.
- C. The following Traffic Standards designated for use in the City of Cotati substantially comply with the California Manual on Uniform Traffic Control Devices (also known as the California MUTCD), the State of California Standard Specifications, and the State of California Standard Plans; they are to be used in conjunction with the named references for any project within the public right-of-way. Deviations from these standards shall be granted only upon specific written approval of the City Engineer.
- D. The latest version of the California MUTCD shall be assumed whenever referenced.
- E. These standards are considered minimum and do not preclude the use of a higher standard as directed or approved by the City Engineer.
- F. Encroachment onto any City street or right-of-way shall require an encroachment permit issued by the City of Cotati.

### II. DEFINITIONS

**"Bike Lane"** (see definition in Street Design Standards).

**"CAMUTCD"** shall mean the California Manual on Uniform Traffic Control Devices, latest edition as adopted by the California Department of Transportation, found on the internet at the following address:

<http://www.dot.ca.gov/trafficops/camutcd/>

**"City Traffic Engineer"** shall mean the City Engineer.

**"Collector Street"** (see Major Collector & Minor Collector definitions in Street Design Standards).

**"FHWA"** shall mean Federal Highway Administration.

**"Public Street"** (see definition in Street Design Standards).

**"Sidewalk"** (see definition in Street Design Standards).

**"Street"** (see definition in Street Design Standards).

**"Traffic Standard Plan"** shall mean a typical traffic standard detail of the Traffic Standards and Details of the City of Cotati and Caltrans Standard Plans.

**"Traveled Way"** means a way or place of whatever nature publicly maintained and open to the use of the public for purposes of vehicular travel.

### III. TRAFFIC SIGNS

#### A. General

1. The base metal of all signs shall conform to ASTM designation B209, of either 5052-H38 or 6061-T6 alloy, and shall conform to all other applicable current Caltrans specifications for sign materials.
2. Unless otherwise specified by the City Engineer, the thickness of all roadside signs shall be .080 inches, except for mast-arm overhead mounted signs which shall be 0.125 inches.
3. Unless otherwise specified by the City Traffic Engineer, the follow dimensions shall be used for all warning and regulatory signs:
  - a) Federal sign specifications as found in the FHWA Sign Specifications, and California sign specifications as found in the California Sign Specifications.
    - FHWA signs shall conform to the dimensions for Conventional Road signs indicated by a C, unless otherwise specified in the City of Cotati Traffic Standards or directed by the City Traffic Engineer.
    - California signs shall conform to the dimensions for STANDARD sizes when more than one set of dimensions are offered. In some instances, STANDARD is not specified, and the size of the sign shall then be approved by the City Traffic Engineer.
  - b) All Stop Signs shall be 36"x36" in size. At All-Way-Stop controlled intersections the stop sign shall be accompanied with RI -3P "All-Way" plates.
  - c) The Standard Size Dimension shall be used for the R73 series.
  - d) The R81 Bike Lane sign shall be 18"x24" in size.
  - e) The FHWA sign for School Pedestrians (S1-1) shall be 30"x30" in size.
  - f) The R49 shall be used for pedestrian barricades, in accordance with California Sign Specifications.
  - g) RI -5 signs shall be 30"x30".
  - h) Signs larger than the standard sign may be required or may be granted by written approval by the City Engineer.
4. For No Parking, No Stopping, and Bike Lane signs, the words "Begin" and "End" shall be used in place of arrows.
5. Regulatory, warning and guide signs shall be retroreflective to show the same shape and similar color by both day and night, pursuant to California Manual of Uniform Traffic Control Devices latest edition. The retroreflective sheeting

and retroreflective lettering shall be warranted for a minimum of 10 years. Retroreflective sheeting and lettering of other traffic signs may be required, as specified by the City Engineer.

6. Reflective sheeting shall be used in construction of traffic signs according to the following:
  - a) Engineer Grade (Table A)  
All signs not indicated below.
  - b) Long Distance Performance Grade (Table B)  
Stop signs, yield signs, stop ahead signs, speed limit signs, keep right signs, no U-turn signs, mast-arm mounted street name signs, street name signs, chevrons, wrong way signs, end-of-road signs, and type 1, 2 and 3 object markers.
  - c) Visual Impact Performance Grade (Fluorescent Yellow Green) (Table C)  
Pedestrian crossing signs, school pedestrian signs, bicycle warning signs, and associated supplemental arrows.
  - d) High Intensity  
All warning signs shall use at minimum high intensity sheeting (Table B).

**TABLE A**

Minimum Coefficient of Retroreflection RA (cd/lux/m<sup>2</sup>) for Engineer Grade Reflective Sheeting

Observation Angle	Entrance Angle	White	Yellow	Red	Green	Blue	Brown
0.2°	-4°	70.0	50.0	14.5	9.0	4.0	2.0
0.2°	30°	30.0	22.0	6.0	3.5	1.7	1.0
0.5°	-4°	30.0	25.0	7.5	4.5	2.0	1.0
0.5°	30°	15.0	13.0	3.0	2.2	0.8	0.5

**TABLE B**

Minimum Coefficient of Retroreflection RA (cd/lux/m<sup>2</sup>) for High Intensity Grade Retroreflective Sheeting

Observation Angle	Entrance Angle	White	Yellow	Red	Green	Blue	Brown
0.2°	-4°	250	170	45	45	20	12
0.2°	30°	175	135	30	30	11	8.5
0.2°	40°	95	50	12	12	6	2.8
0.5°	-4°	95	62	15	15	75	5.0
0.5°	30°	70	60	12	12	5.0	3.5
0.5°	40°	55	40	10	10	4.0	2.5
1.0°	-4°	10	9.0	2.0	1.0	0.5	0.5
1.0°	30°	9.5	8.5	1.5	0.8	0.3	0.3
1.0°	40°	9.0	8.0	1.0	0.5	0.1	0.1

**TABLE C**

Minimum Coefficient of Retroreflection RA (cd/lux/m<sup>2</sup>) for Visual Impact Performance Reflective Sheeting

Observation Angle	Entrance Angle	Fluorescent Yellow	Fluorescent Yellow Green
0.2°	-4°	240	325
0.2°	30°	150	200
0.2°	40°	55	75
0.5°	-4°	165	236
0.5°	30°	75	100
0.5°	40°	15	23
1.0°	-4°	45	65
1.0°	30°	24	35
1.0°	40°	6	8

B. Traffic Sign Installation

1. All poles shall be 2-inch square Unistrut galvanized steel, in conformance with the City Standard Plans STD-401 & STD-402.
2. Where poles are to be installed in finished surfaces, a minimum 4-inch diameter hole shall first be core drilled to a depth of 36 inches, in conformance with City Standard 402. The pole shall be set using a 1/3 cement to 2/3 sand mix.

3. Where poles are to be installed in unfinished surfaces, an 8-inch diameter hole shall first be dug to a minimum depth of 36-inches. The pole shall be set using 1-part cement to 2 parts sand mix and 3 parts gravel.
4. Signs shall be installed in accordance with the following specifications and facing traffic in the lane adjacent to which the sign is installed.
  - a) "No parking" signs shall be installed at a 30-degree angle toward the traveled way. All other signs shall be installed at an angle toward the traveled way per the sign manufacturer's reflective requirements.
  - b) Signs in the median area shall be placed mid way between curbs. These signs shall be mounted no closer than six inches from the edge of traveled way, and no farther than six feet from the edge of the traveled way which the sign faces.
  - c) Typical installations shall conform to the requirements of Traffic Standard Plan 401.
  - d) The minimum mounting height for signs shall be seven feet, measured from the bottom of the sign to the near edge of the pavement, except as otherwise noted below.
  - e) The height to the bottom of a secondary sign mounted below a primary sign shall be a minimum of seven feet, measured from the bottom of the sign to the near edge of the pavement.
  - f) In areas not subject to pedestrian traffic, the CHEVRON (W8 I) and ONE WAY (R I 0) signs shall be mounted at a height of three feet, measured from the bottom of the sign to the near edge of the pavement.
  - g) Bicycle Wrong Way R5-1h signs shall be installed at the approach to intersections and facing opposite to traffic. They should be installed approximately 100 feet from the intersection or as directed by the City Traffic Engineer.
5. Street Name Signs
  - a) Overhead street name signs shall be mounted at all signalized intersections.
  - b) Signs shall conform to the requirements of Traffic Standard Plan 403.
  - c) Street name signs installed at signalized intersections shall be mounted to the mast arm per Traffic Standard Plans 403. One overhead sign shall be mounted on each mast arm.
  - d) Single-sheet, double-faced signs shall be used.
  - e) Where the street changes names at the intersection, the far side mast arm shall display the name of the street to the right and the near-side mast arm shall display the name of the street to the left.
  - f) When the street name sign is to be mounted on a portion of the mast arm that is level, Hawkins M I OJ-OCB250FL sign brackets or approved equal shall be used.
  - g) When the street name sign is to be mounted on a portion of the mast arm that is curved, Hawkins M I OJ-OCB250AL adjustable sign brackets or approved equal shall be used.

- h) Three-quarter (3/4) inch wide heavy duty stainless steel .032" thick straps shall be used for street sign installation.
  - i) With the written permission of the City Engineer, where mast arm mounted signs cannot be used, street name signs installed at signalized intersections shall conform to the requirements of Traffic Standard Plan 405 and the following requirements:
    - Street name signs shall be mounted to the traffic signal standard by the use of a heavy-duty arm bracket for electrolier mounting.
    - Two sets of street name signs shall be mounted at each signalized intersection.
  - j) The mounting location at non-signalized intersections shall conform to Traffic Standard Plan 406.
6. Advance Street Name Signs
- a) Advance street name signs shall be placed on all arterial streets and collector streets as required by the City Traffic Engineer. Advance street name signs shall be installed in advance of the street in accordance with California MUTCD guidelines for advance placement of warning signs, Condition A. No advance street name signs shall be placed where the distance between side streets is shorter than 200 feet curb return to curb return.
  - b) Advance street name signs shall conform to the requirements of Traffic Standard Plan 404A.
  - c) Advance street name sign installation shall conform to the requirements of these Traffic Sign Installation Design Standards and Traffic Standard Plan 404A & 404B.
  - d) On streets without a raised median, the advance street name sign shall be mounted on luminaire poles where possible. If luminaire poles are not available, the advance street name sign shall be pole-mounted on the right side of the traveled way.
  - e) When mounted on luminaire poles or in a sidewalk setting, the advance street name sign shall be mounted off-center, if necessary, to achieve the minimum setback from the edge of the traveled way per these Design Standards and Traffic Standard Plan 404C.
  - f) Sign braces shall be used on pole-mounted advance street name sign installations per Traffic Standard Plan 404B.

#### **IV. PAVEMENT MARKINGS**

- A. The following City Standards and Specifications are in substantial conformance with the CA MUTCD and the State of California Standard Plans and Specifications, and are to be used in conjunction with these named references.
- B. Lane widths as shown on design documents shall be measured from centerline to centerline of adjacent striping patterns, or, from face of curb to the centerline of the striping pattern.

- C. Unless otherwise specified by the City Traffic Engineer, the following State of California Standard Plan details shall be used for all pavement marking installed in Cotati. The CA MUTCD details are indicated for cross referencing.
1. Centerlines shall conform to Caltrans Standard Plan A20A Detail 1 or 2. Refer to CA MUTCD figure 3A-101.
  2. Lane lines shall conform to Caltrans Standard Plan A20A Detail 8 or 9. Refer to CA MUTCD figure 3A-102.
  3. No-passing zones shall conform to Caltrans Standard Plan A20A Detail 21 or 22. Refer to CA MUTCD figure 3A-104.
  4. Left edge lines adjacent to raised medians shall conform to City of Cotati Traffic Standard 407.
  5. Striped median islands shall conform to Caltrans Standard Plan A20B Detail 28 or 29.
  6. Two-way left turn lanes shall conform to Caltrans Standard Plan A20B Detail 31 or 32. Refer to CA MUTCD figure 3A-108.
  7. Channelizing lines shall conform to Caltrans Standard Plan A20D Detail 38. Refer to CA MUTCD figure 3A-1 12. Channelizing lines with bike lanes shall conform to Caltrans Standard Plan A20D Detail 38A. Refer to CA MUTCD figures 9C- 1, 9C-4, 9C-5, and 9C-6.
  8. The 8-foot Type IV arrow shall be used for left- or right-only lanes, and the 10-foot Type I arrow shall be used for through-only lanes. Arrows shall conform to Caltrans Standard Plan A24A. Refer to CA MUTCD figure 3B-24.
  9. For all markings relating to bicycle facilities, refer to the CA MUTCD Part 9, Traffic Controls for Bicycle Facilities.
  10. Bicycle detector pavement markings shall conform to Caltrans Standard Plan A24C and as shown in CA MUTCD figure 9C-7 shall be installed at signalized intersections at all approaches that have bicycle detection, as directed by the City Traffic Engineer. The specific location shall be determined by the City Engineer.
  11. Unless otherwise specified by the City Engineer, the design width for all Class 2 bicycle lanes shall be a minimum of six feet wide or as required by City Street Standard Plans, STD-101 & STD-102, as measured from the face of curb to the center of the bicycle lane line.
  12. There shall be a minimum of three feet between the lip of the gutter and the 6-inch bike lane line.
  13. Bike lanes where parking is permitted shall include the optional 4-inch white marking shown in the MUTCD, figure 9C-1 02 for applications without parking stalls.
  14. The standard pavement marking shall be the words BIKE LANE with an arrow indicating the direction of travel, placed in the center of the bicycle lane. BIKE LANE shall be located 40 feet beyond the curb return. On long blocks the BIKE LANE shall be repeated every 1500 feet.
  15. The solid bike lane line shall be dropped 96 feet in advance of the intersection, and a broken line carried to the intersection.

16. When installing an intersection limit line, the location shall correspond with possible future crosswalk alignment.
17. Crosswalks installed at a controlled intersection (stop control or signalized) shall use the standard two-bar design. For uncontrolled locations, the continental design shall be used. Two-foot by ten-foot blocks shall be centered on each lane line, centerline, and center of each lane (except bike lanes), to avoid wheel path of vehicles.

D. Pavement Marking Lines and Legends

All pavement markings shall be thermoplastic pavement markings, on both public and private improvements. At the discretion of the City Engineer, pavement marking paint may be substituted for thermoplastic.

1. Traffic striping shall conform to the applicable provisions of Section 84 of the California Standard Specifications and as directed by the City Engineer.
2. All paint and thermoplastic shall be lead-free.
3. The furnishing and applying of thermoplastic pavement marking material shall conform to the requirements of the modified California State Specification No. 8-10-41G-21.
4. Glass beads applied to the surface of the molten thermoplastic material shall conform to the requirements of the modified California State Specification No. 8010-5 IJ-22 (Type II).
5. The following markings shall be installed with the indicated materials:
  - a) 4" edge lines shall be thermoplastic with 1.9 and 2.4 index microcrystalline ceramic beads.
  - b) 6" bicycle lane lines shall be thermoplastic with 1.9 and 2.4 index microcrystalline ceramic beads.
  - c) 8" channelizing lines shall be raised pavement markers and extruded thermoplastic. When adjacent to a bike lane, the raised pavement markers shall be excluded. In existing pavement, they shall be thermoplastic with 1.9 and 2.4 index microcrystalline ceramic beads.
  - d) Crosswalks, legends, symbols and arrows shall be extruded thermoplastic.

E. Raised Pavement Markings

1. Raised pavement markers shall conform to the shape, types and dimensions of State of California Standard Plan A20A.
2. All non-reflective raised pavement markers (RPMs) shall be ceramic and shall conform to the requirements and applicable provisions of Section 85 of the most recent State of California Standard Specifications.
3. All retroreflective pavement markers shall conform to the requirements and applicable provisions of Section 85 of the most recent State of California Standard Specifications.

4. The contractor shall provide manufacturer's specifications for all materials prior to the start of work.
5. For application of the raised pavement marker to the pavement surface, the adhesive shall completely surround the perimeter of the marker after the marker has been pressed into place.

F. Temporary Pavement Markings

1. When pavement markings have been obliterated or damaged in construction work zones, temporary pavement markings shall be installed in accordance with these specifications.
2. At the end of each day's work, temporary pavement markings shall be in place on each paving lift that is open to normal traffic flow.
3. Temporary pavement marking materials shall be approved by the City Engineer prior to installation.
4. Temporary pavement marking configurations shall be designed and installed in accordance with the most current California Department of Transportation *Traffic Manual* or as specified by the City Engineer.
5. Temporary pavement markings shall be maintained and replaced by the Contractor until removed in preparation for the next paving course or replaced with durable pavement markings applied on the final wearing course.
6. The Contractor shall remove all temporary pavement markings prior to the next pavement course being applied.
7. Temporary pavement markings shall be applied to clean; dry surfaces in accordance with the manufacturer's recommendations.

G. Pavement Markings Notes

1. Words, symbols, and traffic striping shall conform to the applicable shape, sizes, and colors as outlined in the most current California Department of Transportation *Traffic Manual* or as required by the City Engineer.
2. Existing pavement markings conflicting with the proposed striping shall be removed immediately prior to the placement of the new markings.
3. Eradication of pavement markings (paint and thermoplastic) shall be completed by means mechanical grinding. Painting over as a means of pavement marking eradication shall not be permitted. All holes left in the pavement due to the removal of raised pavement markers shall be filled with enough adhesive to leave a level surface.
4. All pavement markings damaged by a contractor during construction shall be replaced in kind. Temporary markings shall be used until permanent markings are applied.
5. Temporary pavement markers shall be installed prior to the removal of any temporary work zone traffic controls, to provide delineation until the permanent pavement markings are installed or replaced. Damaged or missing temporary markers or markings shall be replaced daily until the

permanent markings are installed. Any asphalt concrete dikes installed for pedestrian paths must be painted white with retroreflective beads applied per Caltrans Standard Specification, section 84. The top surface and both sides shall be painted.

6. Crosswalk markings which are trenched through or partially removed due to construction shall be ground out in their entirety and replaced according to current City of Cotati Traffic Standards, or as directed by the City Traffic Engineer.

## **V. TRAFFIC SIGNALS**

### **A. General**

1. The following City Standards and Specifications are in substantial conformance with the CA MUTCD and the State of California Standard Plans and Specifications, and are to be used in conjunction with these named references.
2. Traffic signal and safety lighting equipment shall comply with the requirements of the applicable provisions of Section 86 of the most recent California Standard Special Provisions, Standard Specifications, Standard Plans and Transportation Electrical Equipment Specifications (TEES), these traffic standards, and as required by the City Engineer. All traffic signals shall use LED lighting.
3. Foundations for traffic signal standards shall be constructed per the applicable California State Standard Plans and as required by the City Engineer.
4. All Traffic Signal designs in Cotati shall be approved by the City Traffic Engineer.
5. All deviations from these Specifications shall be approved in writing by the City Traffic Engineer.

### **B. Traffic Signal Poles, Steel Pedestals and Posts**

1. Traffic signal poles, arms, and related appurtenances shall be installed in accordance with the requirements of the California State Standard Plans or as required by the City Engineer.
2. The chase outlet shown on the California State Standard Plans in the mast arm mounting plate, and in the mast arm mounting plate on the pole, shall be 2-inch minimum diameter and shall be smoothed after galvanizing to facilitate installation of conductors without damaging the insulation.
3. Each pole shall include one 3-inch x 5-inch minimum hand hole for wiring, located within one foot of the base and on the same side of the pole as the mast arm.

### **C. Model I70E or 2070E Traffic Signal Controller - Supplemental to California**

Specification Section 86.

1. Controller assemblies shall include Model I 70E traffic signal controller units and shall conform to the requirements of the most current edition of the "Traffic Signal Control Equipment Specifications," issued by the California Department of Transportation, and to all addenda thereto and be furnished by the contractor. If specified by the City Traffic Engineer, a Type 2070E controller may be required, which shall conform to the most current Caltrans "Traffic Control Equipment Specification" and all addenda, and as specified on the Engineer's List of Approved Items for Use with the City of Cotati Traffic Standards.
  2. A listing of field conductor terminations for each contractor-furnished controller cabinet shall be provided to the City at the job site.
  3. The power supply shall be a ferro-resonant type of transformer. Linear and switching power supplies shall not be acceptable.
  4. The controller shall have a minimum of eight kilobytes of battery-backed RAM memory on the CPU board.
  5. The CPU power control circuitry shall be located on the CPU board.
  6. The ACIA baud rates shall be jumper selectable from 19.2 KHz to 307.2 KHz.
  7. The controller shall be designed to support three additional ACIA auxiliary communication adaptor ports at addresses 6002/6003.
  8. The standby battery assembly shall be located on the front panel swing-out assembly, and shall be easily accessible for maintenance and testing purposes.
- D. Traffic Signal Controller Cabinet - Supplemental to California Specification Section 86-1.02Q
1. The controller cabinet shall be a Type 332L as specified and shown in the Caltrans Traffic Signal Control Equipment Specification, and as specified on the plans and approved by the City Engineer.
  2. When the controller is not used, conduit shall run directly to the pull box.
  3. The controller cabinet shall be constructed of anodized aluminum and mounted no closer than four feet from the service cabinet.
  4. The foundation for the Type 332L cabinet shall conform to the Caltrans Standard Plan ES-3C, Detail D.
  5. Design shall conform to these requirements except as otherwise approved in writing by the City Engineer.
  6. The cabinet shall provide for housing of a battery backup system (BBS) in conformance with Caltrans Standard Specifications.
- E. Traffic Signal Service Cabinet - Supplemental to California Specification Section 86-1.02P
1. The traffic signal service cabinet shall be a Type III-BF, in accordance with Caltrans Standard Plan ES-2E, and shall meet the following requirements:

a) Inside dimensions:

	Minimum	Maximum
Height	41"	45"
Width	11-3/4"	19"
Depth	8-1/4"	10-1/2"

- b) 12-gauge steel treated with primer and two coats of baked- on enamel or electrostatically applied thermosetting polyester.
  - c) A provision for reading the service meter through a window without opening any doors shall be provided. The window shall be clear glass, Lexan or plastic.
  - d) The cabinet shall be watertight with a weatherproof door and window.
- 2. The foundation shall be a Type III-B, in accordance with Caltrans Standard Plan ES-2E, and shall be 24 inches deep below ground level and constructed in accordance with Section 86 of the California State Specifications.
  - 3. The cabinet shall be located no closer than six feet from the distribution pole or pull box.
  - 4. The cabinet shall be mounted no closer than four feet from the traffic signal controller cabinet.

F. Conduit

- 1. Conduit shall comply with Section 86-1.02 of the California Standard Specifications and the following requirements:
  - a) Service run conduit shall be 2-inch minimum diameter.
  - b) Any signal run and interconnect conduit shall be 2-inch minimum diameter.
  - c) Conduit under sidewalk or planter areas shall have a minimum of 24 inches of cover.
  - d) All signal interconnect conduit runs shall contain two (2) 2 inches minimum diameter conduit, one with signal interconnect cable and one spare. Signal interconnect conduit shall connect with the main traffic signal pull box for each traffic signal in the run. For signal modifications, the signal interconnect conduit should run exclusively to the 48" box.
  - e) Conduits from the main pull box to the controller shall be two (2) 3-inch diameter.
  - f) Conduits under any street shall be 3-inch minimum diameter and

shall have a minimum of 24 inches of cover.

2. All conduits shall be Schedule 40 PVC, except pole risers, which shall be Schedule 80 PVC.
3. All underground conduits and metal parts shall be continuously bonded and grounded.
4. All bends and/or offsets shall be made with factory-manufactured sections.
5. All conduits shall have a flat, woven, lubricated soft fiber polypropylene tape (per Caltrans Specifications) provided inside along its entire length and extending 24 inches out of each end.
6. After conduits, wire and tape have been installed, the ends of all conduits terminating in pull boxes shall be sealed with an approved type of sealing compound. Conduits stubbed for future extension shall be capped.
7. There shall be no cutting of existing conduit to create a window for viewing the contact of the conduit. Any conduit that is cut or broken, whether intentionally or not, shall be replaced at the contractor's expense.
8. Design shall conform to these requirements except as otherwise approved in writing by the City Engineer.

#### G. Pull Boxes

1. All pull boxes shall be #5 concrete (California Standard Plan No. ES-8), except the main pull box which shall be a 30-inch x 48-inch minimum size concrete pull box and shall have double covers. Covers shall be marked "Traffic Signal."
2. Traffic signal interconnect conduit shall be installed in separate concrete pull boxes and their covers shall be marked "LC.".
3. Pull boxes subjected to vehicular travel shall be installed with one-quarter inch steel plate covers (galvanized after fabrication) with a diamond-type cover surface.
4. All pull boxes shall be bolted.
5. Bottoms of pull boxes shall be grouted prior to the installation of conductors. A layer of roofing paper shall be placed between the grout and the crushed rock sump. A one-inch drain hole shall be provided in the center of the pull box through the grout and the roofing paper.
6. Design shall conform to these requirements except as otherwise approved in writing by the City Engineer.

#### H. Conductors

1. All conductors for traffic signal or street lighting systems shall conform to the requirements of Section 86 of the California State Standard Specifications, or as specified herein.
2. All conductors shall be copper and be rated for 600-volt operation.
3. All conductors shall conform to the most current requirements of the National Electric Code (NEC) and shall be labeled by Underwriter's

Laboratories, Inc.

4. Colored stripes shall be placed on conductor insulation to identify each phase of vehicle signals, pedestrian signals, pedestrian push buttons, and detectors.
5. All conductors shall be pulled by hand and shall be installed in conduit runs in one operation. The use of winches or other power-actuated equipment shall not be permitted.
6. The maximum number of wires in the conduit shall conform to the specifications of the National Electric Code.
7. #14 A WG conductors shall be used for the following:
  - a) Each traffic signal lamp on each phase.
  - b) Each pedestrian signal indication on each phase.
  - c) Each pedestrian push button and a pedestrian push button common installed into the controller.
  - d) Three for spares under each street.
8. Signal Interconnect cable shall be 19AWG, 25-pair (branches) or 50-pair (main run), and meet IMSA Spec. 40-2 requirements, or as determined by the City Engineer.
9. #8 AWG conductors shall be used from the utility service point to service cabinet for traffic signals and safety lights.
10. All signal interconnect cable shall be run exclusively in signal interconnect conduit until the 48" box near the controller cabinet. Signal interconnect cable shall never be run with signal cable.

#### I. Wiring

1. There shall be no splices of the conductor hot leads for traffic signal light, pedestrian signal light and pedestrian push button in any pull box. There shall be no splicing of interconnect cable and video cable in any pull box. Ground wires may be spliced in pull boxes. All terminal crimps and splices shall be soldered.
2. Subject to Manufacturers recommendation, splicing in pull boxes shall be allowed for the traffic signal neutral, pedestrian push button commons, ground wires and multiple lighting conductors. These shall be straight splices in conformance with Method "A" as shown on California State Standards Plan ES-13A. Tap splices for signal neutral and multiple lighting conductors shall be Type "C" as shown on California State Standard Plan ES-13A.
3. Conductors shall be permanently identified as to function. Identification shall be placed on each conductor or each group of conductors comprising a signal phase in each pull box and near the end of the conductor termination.
4. Identification shall be made by tags or bands fastened to the conductors, using nylon wire ties in such a manner that they will not move along the conductors. Conductors comprising a single signal phase may be grouped

together and tagged with a single band provided the band is designed to tie conductors together as well as tag them.

5. Marking on tags shall be by mechanical methods (scribing, etc.) and shall be permanent.
6. Design shall conform to these requirements except as otherwise approved in writing by the City Engineer.

J. Detection

1. Video detection shall be used for all approaches. Unless otherwise specified by the City Engineer, video detection equipment shall be selected from the Engineer's List of Approved Items.
2. The detection zone shall extend from the limit line to 60 feet back.
3. Inductive loops shall be used for all advance loops.

K. Loop Detector Wiring

1. All loops shall be type E in accordance with California State Standard Plan No. ES-SB unless otherwise noted, and shall be installed in accordance with the details shown on the most current California State Standard Plans.
2. Each lane shall have one shielded cable pair lead-in continuous to controller.
3. Splicing of shielded cable pair lead-in is prohibited.
4. Loop wire shall be #12 AWG stranded conductor with USEXLP insulation or Caltrans Type 2.
5. Detector lead-in cable shall be Type B in accordance with the most recent California State Specifications.
6. Detector lead-in cables shall be permanently and clearly marked at cabinet and pull boxes.
7. All advance loop detectors shall have their own detector lead-in cable per approach lane.
8. Type "A" detector hand holes shall be installed per California State Standard Plan No. ES-5D.
9. Design shall comply with these requirements except as otherwise approved by the City Engineer.

L. Detector Loop Wire Sealant

1. The sealant shall be the Elastomeric type as specified in Caltrans Standards Specifications 86-1.02W

M. Pedestrian Signals - Traffic Signal Heads - Supplemental to California Standard Specification Section 86-1.02R

1. All signal head sections shall be constructed of metal, not plastic.
2. All visors shall be constructed of metal and shall be the full circle type.

3. Countdown pedestrian signals shall conform to Section 4E.07 of the California MUTCD and shall incorporate the international hand and walking person symbols, illuminated by LEDs to form a solid, filled shape. The numbers shall be illuminated by a double row of LEDs to create a block or bold shape. The hand and walking person symbols shall be the overlaid configuration.
4. Messages shall be lunar white WALKING PERSON and Portland Orange UPRAISED HAND (symbol type) in accordance with California State Standard Plan No. ES-3B and the Institute of Traffic Engineers, Standards: "Adjustable Face Pedestrian Signal Head Standard."
5. One of the following types of screen shall be provided, at the discretion of the contractor:
  - a) An alum in um honeycomb screen with 3/16-inch cells, 3/8-inch thick, shall be installed tilting downward, at an angle of 15 degrees (+/-2 degrees) out from the top, and shall completely cover the message plate.  
The honeycomb screen shall be covered with a clear, 1/8-inch minimum thickness, acrylic plastic cover supported in an aluminum frame, or with a 1/16-inch nominal thickness, formed, polycarbonate plastic cover. Screen and cover shall be held firmly in place by the use of stainless steel or aluminum clips or stainless-steel metal screws.
  - b) A 1-112-inch deep egg crate-type screen and mounting frame of 0.032-inch minimum thickness 5052-H32 aluminum alloy shall be provided to cover the message plates. The screening shall be mounted in a frame constructed of 0.04-inch minimum thickness aluminum alloy.  
The egg crate-type screen shall be installed parallel to the face of the message plate and shall be held in place by the use of stainless-steel screws.
6. The screen and frame shall be fabricated from aluminum anodized flat black or may be finished with flat black enamel as specified in Section 91-4.01 of the California State Standard Specifications.
7. Alternate methods may be substituted by the contractor for the above screens providing the results are equal to or superior to those obtained with the above-specified screens as determined by the City Engineer.
8. The pedestrian control system shall consist of the Polara Engineering EZ Communicator Navigator APS or approved equal to be installed at the location shown on the plans. The system shall consist of pedestrian push button stations (EN2 PBS), one Central Control Unit (CCU2EN) and a Configurator. Pedestrian signals shall include ADA-compliant vibrating arrow push buttons and audible sounds. The "cuckoo" output shall be used with pedestrian phases north & south. The "peep-peep" output shall be used with pedestrian phases east & west. Any variation from these phases shall be approved by the City Traffic Engineer.
9. Design shall conform to these requirements except as otherwise approved

in writing by the City Engineer.

N. Signal Preemption

All traffic signals shall provide for preemption by emergency vehicles. Traffic signals near a railroad crossing shall also provide for preemption by the railroad. Refer to Engineer's List of Approved Items for preemption equipment.

**VI. CONSTRUCTION AREA TRAFFIC CONTROL**

A. General

The following City Standards substantially conform to the California MUTCD and the State of California Standard Plans and Specifications, and are to be used in conjunction with these named references.

B. When normal operation of any City street or sidewalk is impacted by any construction and/or maintenance operation, compliance with appropriate temporary traffic controls used in work zones shall be required as follows:

1. All contractors, permittees, or agencies doing work in public streets or public right-of-way shall:
  - a. Obtain all necessary permits.
  - b. Install and maintain required traffic control devices.
  - c. Provide flaggers when required.
  - d. Provide adequate safeguards for workers and the general public.
  - e. Assure that survey crews and other employees working in or adjacent to a traveled roadway wear flagging garments as required for flaggers.
  - f. Patrol the construction site as required to ensure that all devices are in place and operating *at all times*.
2. A temporary traffic control plan shall be required for all road closures, detours, lane closures, or other work within the public right-of-way. All Temporary Traffic Control Plans shall conform to the most current version of the California MUTCD and all provisions included in this City of Cotati Standard, and be approved in writing by the City Engineer.

A temporary traffic control plan may reference a Typical Application in the California MUTCD if the work zone conditions are identical to those of the Typical Application. If more than one Typical Application is referenced, the temporary traffic control plan shall describe each work zone condition and note when each of the Typical Applications will be used. When deviation from the Typical Application is necessary, a site-specific design shall be prepared by a person knowledgeable (trained and/or certified) in the fundamental principles of Temporary Traffic Controls and the work activities to be performed, and shall be approved by the City Traffic Engineer. Such plans shall include coning placement, type, and location of all signs

(construction signs, detour signs, street name plates, etc.), barricade placement, flaggers, temporary pavement markings, and any other pertinent information.

3. The most recent edition of the California Department of Transportation's *Manual of Traffic Controls for Construction and Maintenance Work Zones* shall be used as references for determining appropriate signage. Consideration shall be given to such items as bus routes and locations of bus stops, school walking routes and school crossings; and work hour restrictions such as not allowing work during peak commute hours.
4. Work within the public right-of-way requiring lane closures, flagging, or any other activities that may impact the flow of traffic shall not be permitted during periods of peak traffic, i.e., from 7:30 AM to 8:30 AM and from 4:00 PM to 6:00 PM. Work within these specific hours shall be permitted only through written authorization of the City Traffic Engineer.
5. Flagging against a functioning traffic signal indication is prohibited.

C. Private Development Projects

1. All private development referrals shall be reviewed by the City Engineer to determine if a traffic handling plan is required for the proposed project.
2. If a traffic handling plan is required, the following paragraph shall be included in the response to the referral: "The City Engineer has determined that a Traffic Handling Plan is required for this project. This Plan shall conform to the most current California Department of Transportation's *Manual of Traffic Controls for Construction and Maintenance Work Zones*. This Plan shall detail all methods, equipment, and devices to be implemented for traffic control upon City streets within the work zone and other impacted areas. This Plan shall be included as part of the improvement plans".
3. Projects not requiring a traffic control plan shall be required to follow standard practice for construction zone signing and traffic control during construction as per the most current edition of the California Department of Transportation's *Manual of Traffic Controls for Construction and Maintenance Work Zones*.

D. Encroachment Permits

1. Encroachment permit applications for projects requiring road closures, lane closures or detours shall be reviewed for conditions.
2. If a traffic control plan is deemed necessary for the road closure, lane closure, and/or detour, the plan shall be approved in writing by the City Engineer prior to approval of the encroachment permit.

SECTION 5

**SEWER  
Design Standards**

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## **SEWER DESIGN STANDARDS**

### **I. PURPOSE**

To provide guidelines for design of sewer utilities projects and thereby reduce the time required for processing the plans. These guidelines do not include, but may reference, additional conditions which may be promulgated by all other pertinent ordinances, codes and official policy set forth by the City, or other government agencies. These guidelines establish minimum acceptable design criteria. More Stringent requirements may be imposed by the City based on specific project conditions.

It is the responsibility of the design engineer to initiate written request for approval of any design concepts that differ from these criteria, to verify additional requirements imposed, to perform any necessary calculations or studies, and to resolve specific design problems with the appropriate agency, department, or division.

### **II. REQUIREMENTS FOR IMPROVEMENT PLANS AND SUBDIVISION MAPS**

- A. Provide a detailed utility plan showing onsite and offsite sewer systems, and their connections to existing City maintained sewer facilities. Show all existing septic systems in addition to those that will be abandoned.
- B. For subdivisions, annotate the local agency information sheet of the Subdivision Map with information that is needed to notify property owners of requirements for connection to City Sewer System. These include, but are not limited to:
  - 1. Lots requiring installation of sewer backflow protection;
  - 2. Private sewage grinder pumps; and
  - 3. Public sewer access requirements, such as gates or access roads.

The appropriate information may be obtained from City Engineering.

- C. It is common for a project on one property to be dependent on the construction of sewer by another project or phase of the same project. Sewer system designs will incorporate any off-site sewer that is required for the connection to an existing public main.
- D. The maintenance agreement requirements for any private sewer shall be recorded prior to recordation of the Final Map or Parcel Map. If a private sewer will be installed and there will be no subdivision (and so no Final Map or Parcel Map) then a Maintenance Agreement shall be recorded against the properties having interest in the sewers.

### **III. SEWER MAINS - GENERAL**

- A. Sewer systems will be designed in public streets whenever possible. When not in public streets, the following conditions must be met:

1. Ductile iron pipe must be used from manhole to manhole when outside of roadways except PVC may be used for gravity mains located between 5 and 12 feet below the surface; and
  2. In general, lateral connections will not be allowed in easements except where authorized by the City Engineer. Any lateral connections in easement must be accessible and easy to locate; and
  3. Lockable lids are required on all manholes.
- B. Private sewer systems vs. public sewer systems:
1. In general, private sewer systems will be used on private property and public sewers will be used on public property.
- C. Extent of sewer main improvements will be as follows:
1. Any offsite, downstream sewer system improvements needed to serve the project must be shown on the improvement plans, including upgrades to existing mains that may be required as a result of an approved capacity study or modeling effort.
  2. In general, sewer mains must be designed across the full property frontage.
  3. When a sewer main extension ends at a manhole and the sewer will be extended further in the future, include in the design a 3-foot long stub-out of the manhole with a plug or cap.
- D. Gravity sewer mains within 50 feet of a well or 200 feet from a stream shall be constructed to Waterworks Standards using AWWA C900 PVC, Fusion Welded HDPE or Ductile Iron Pipe. Ductile Iron Pipe will be used in areas outside of roadways except PVC may be used for gravity mains located between 5 and 12 feet below the surface.

#### **IV. CONNECTION TO AN EXISTING PUBLIC SEWER MAIN**

- A. Except where an existing stub-out exists for future connections, connect new mains to existing at existing manholes or by constructing a new manhole over the point of connection. When making a connection to an existing manhole, reconstruct and form channel and bench for smooth flow transition and maintenance access.
- B. There are locations in the City where mains have been extended for future use. Where connecting to such a main, remove the existing plug, cleanout, or rodding inlet and install a manhole. The designer is responsible for inspecting the existing main prior to use. If the main does not meet City standards it must be replaced to the first existing manhole in accordance with City standards. The main must be videotaped prior to connecting to verify condition. Submit disc to Engineering Department.
- C. Where an existing sewer main manhole stub-out is to be extended, the designer

is responsible for inspecting the existing stub-out prior to use. The stub-out must be on the same line and grade, the same size and the same material as the new sewer main. Any existing stub-out not meeting City standards must be replaced in accordance with City standards.

- D. Elevations of mains connecting to existing sewer mains at manholes will be as follows:
  - 1. Side sewer mains connecting to an existing main will be at least 0.1-foot higher than the existing.
  - 2. Connect sewer mains so that the crown of the smaller main is no lower than the crown of the larger main.
- E. Where laterals are the same size as the main, connection must be made with a manhole. Use a wye for all other lateral connections except as in "F" below.
- F. For lateral connections to existing mains 12 inches and larger, use taps and saddles per City Standard 513. Taps and saddle shall have watertight gaskets and 316 stainless steel hardware. If existing laterals are to be utilized, they shall be videotaped prior to connection as to verify their condition. If defects are observed, the lateral shall be repaired or replaced per City Standards.
- G. Lateral connections to trunk sewers 15 inches and larger are generally not allowed except with the specific approval of the City Engineer. When allowed, connections shall be at a manhole.
- H. Approved alternatives for multiple connections, such as for grouped flag lots or multiple lots off private driveways, are:
  - 1. Up to 2 joint trenched sewer laterals may be connected to the main using wyes at least 1-foot apart. (Taps or saddles where allowed must be a minimum 1-foot apart.)
  - 2. A private 6-inch main may connect to the public main at a manhole and extend to the services onsite. This alternative requires a joint maintenance agreement or homeowner's association, if serving more than one property.
  - 3. Up to 4 laterals may connect to a junction structure similar to Standard 502.
- I. Where the street surface is less than 5 years old, installation methods other than open cutting shall be required. For major streets, installation methods other than open cutting may be required. The City Engineer will determine the requirements based on the condition of the existing street.

## **V. MATERIALS**

- A. Street laterals shall be Polyvinyl Chloride (PVC) or ductile iron pipe.
- B. Gravity sewer mains up to and including 18 inches will be PVC (SDR 26 minimum), or fusion-welded HDPE. PVC joints shall be wrapped with 60 mil 6- inch wide corrosion

tape. Exceptions must be approved by the City Engineer.

- C. Materials for pipes larger than 18 inches must be approved by the City Engineer.
- D. Sewer force mains shall be constructed to Waterworks Standards using AWWA C900 PVC, Fusion Welded HDPE, or a Polyurethane or Epoxy lined Ductile Iron Pipe.
- E. If a gravity sewer main is installed outside of a paved roadway, ductile iron pipe and sewer identification tape is required.
- F. In general, use the same pipe material from structure to structure.
- G. Use of Asbestos Cement Pipe is not allowed under any circumstances.
- H. Gravity sewer mains within 50 feet of a well or 200 feet from a stream shall be constructed to Waterworks Standards using AWWA C900 PVC, Fusion Welded HDPE or Polyurethane or Epoxy lined Ductile Iron Pipe in areas outside of roadway.

## **VI. ALIGNMENT**

Any deviation in clearances from the requirements of the Standard Drawings, the "California Waterworks Standards" and criteria for water main separation set forth under Title 22 of the California Code of Regulations, must be approved in advance of the plan submittal by the California Department of Public Health (CDPH) and the City Engineer. Additional requirements may be imposed for such deviations.

### **A. Horizontal**

1. Horizontal separation from other utilities, such as gas, underground electric, underground television cable, etc., will be a minimum of four feet clear between the pipes except at crossings. Horizontal separation from other sewer lines and storm drains shall be 5 feet.
2. In general, design public sewer mains in straight street sections to run parallel to the street centerline. All public mains must be a minimum five feet clear from all structures, building overhangs, gutters, property lines or edge of easements and 3 feet clear from all monuments, and/or lips of gutters. The alignment will be designed so that any 48-inch manhole shall be centered a minimum of 3 feet from the lip of gutter and any 60-inch manhole shall be centered a minimum of 4-foot from lip of gutter.
3. In curved streets, design the sewer alignment generally on one side of the centerline to allow installation of other facilities such as water, storm drains, etc. without using transverse crossings. Provide an alignment such that no part of the sewer main is less than 1 foot from the lip of gutter.
4. Horizontal curves in gravity sewer mains are not allowed. Sewers and manholes must be designed in accordance with subsection VI-A (2) above.
5. All sewer main trenches that are parallel to and deeper than the footing of any adjacent structure must be at least 45 degrees from the footing as

required in the Uniform Plumbing Code. Any exceptions must be approved in writing by the City.

B. Vertical

1. Vertical curves in gravity sewer mains are not allowed.

C. Potholing

1. Pothole of all existing utilities to verify minimum separation requirements are satisfied shall be performed during the design stage of a project.
2. Potholing must be performed during the design-phase to minimize unforeseen subsurface conditions during construction. Verification of horizontal and vertical locations, by the design engineer, by surveying junction structures may be accepted in lieu of potholing.
3. Provide a schedule on the design drawings that shows the following pothole/survey information:
  - a) Horizontal coordinates that reference the same datum used on the design drawings.
  - b) Depth to existing utility.
  - c) Size and type of existing utility.

## VII. MAIN SIZING CRITERIA

- A. Public mains will be sized to serve the entire tributary area at buildout densities conforming to the General Plan. Engineers for large developments may be required to provide trunk or collection system calculations or have a wastewater model run performed.
- B. The design flows will be based on the following criteria:
1. Population density for multi-family units will be 2.0 people per unit and 3.2 people per single-family residential home. Average domestic flow will be 100 gallons per person per day.
  2. Non-residential use: flows as presented in Attachment 1.
  3. Peaking factor: the ASCE 1986 Standards used in the Water Agencies Standards (San Diego). Refer to Attachment 2.
  4.  $I/I=1.4$  gpm/acre.
- C. The minimum nominal sewer diameter is 8 inches. For mains over 8 inches, design all gravity sewers to achieve a minimum velocity of 2 fps at average dry weather flow (ADWF) and a maximum velocity of 10 fps using design flows. Less than 2 fps velocities require the approval of the City Engineer. When analyzing the existing or proposed sewer systems, use Manning's Formula to determine the design flow and velocity. Use  $n = 0.013$ .

## VIII. SLOPE OF SEWER MAINS

- A. The sewer must be designed with a slope to be able to serve its entire tributary area. The preferred minimum slope for gravity sewers is 0.005. When conditions require, flatter slopes may be approved as an exception by the City Engineer with engineering calculations. Calculations shall show a minimum of 2 fps velocity is achieved daily.
- B. The maximum slope for gravity sewers is 0.15, or 15-foot per 100-foot. Considering relevant factors such as steep terrain, steeper sewers may be allowed with the following conditions:
  - 1. Use of restrained joints.
  - 2. Provide trench dams and drainage measures to prevent a buildup of hydrostatic pressure in trenches.
  - 3. When a sewer with a slope greater than 0.15 passes through a structure with a horizontal change of direction in excess of 30 degrees, a special design of the base channelization is required to prevent overflows and yet allow for routine maintenance operations.
- C. Slopes through manholes:
  - 1. When sewers of uniform slope pass through a manhole, the slope will be maintained and the invert at the center of the manhole will be given.
  - 2. When sewers change slope at a manhole, incoming and outgoing invert elevations will be given, in addition to the center of the manhole.
  - 3. Provide sufficient drop through a manhole to compensate for energy loss caused by change of alignment. A minimum drop of 0.1 foot is required for a change of alignment greater than 30 degrees.
  - 4. When pipe sizes change at structures, design the inlet crown at least as high as the outlet crown.

## **IX. MAIN/LATERAL COVER**

- A. Cover is the distance from the top of the pipe to final finished grade measured directly over the pipe.
- B. Minimum cover for all sewer mains and laterals will be three feet. Maximum cover shall be 20 feet. The City Engineer may approve shallower installations but in no case will cover be less than 24 inches.
- C. Where cover is less than 36 inches, special construction techniques must be approved such as concrete encasement, use of ductile iron pipe, or concrete cap over the trench.
- D. All sanitary sewer trenches in roadways or paved areas shall be bedded with approved bedding and backfilled using City approved CDF or Class II Aggregate Base Rock with compaction test results by a Geotechnical Engineering firm. Developers/Contractors shall provide a submittal of proposed backfill material for

city review & approval prior to start of trenching.

## **X. MANHOLES AND RODDING INLETS**

- A. A manhole is required at every horizontal or vertical change in alignment, and at changes in pipe size or pipe material.
- B. Maximum distance between manholes is 350 feet. Spacing of 500 feet is allowed with permission of the City Engineer for lines over 15 inches in diameter.
- C. A manhole is required at the end of every main in excess of 200 feet in length.
- D. Rodding Inlets may be installed in lieu of manholes at the end of a sewer main where the distance is less than 200 feet to the nearest manhole and the main size is 10 inches or less. The rodding inlets shall be furnished with a shallow manhole per City Standard 505.
- E. 60-inch diameter manholes are required for mains 21 inches or larger in diameter.
- F. The manhole will be designed such that the angle in the horizontal plane between the downstream and any incoming sewer is a minimum of 90 degrees.
- G. Stubs provided out of manholes for future extension will have rodding inlets provided, per City Standard 505, when more than one length of pipe is installed or where service laterals are connected to the stub. Where the extension will be used in a future phase of construction, scheduled within two years, City Standard 506 may be used.
- H. Standard inside drop manhole installations are required when the difference in elevation between the incoming and outgoing sewer is greater than 2 feet. While not encouraged, drop manholes may be required because of some physical restraints. They may not however, be used to merely avoid extra depth of trenching unless unusual circumstances exist. Upstream slope changes should be used to avoid the need for a drop manhole.
- I. When one drop connection is required, use a 60-inch diameter manhole. When two or more drop connections are required, use a 72-inch diameter manhole.
- J. Minimize the number of drop manholes.

## **XI. SEWER LATERALS**

- A. Definitions:
  - 1. "Building sewer" means a sewer serving a specific building or property extending from 2 feet outside the building to either the street lateral or the private sewer.
  - 2. "City sewer" means any public sewer located within an easement or public

- right-of-way which is maintained by the City.
3. "Private sewer" means a common sewer privately owned that connects one or more building sewers to the public sewer. A private sewer includes sewer main, manholes and all appurtenances.
  4. "Sewer lateral" means all or part of the sewer service lateral.
  5. "Sewer main" means the portion of the sewer that collects and conveys flow from the sewer laterals to the City's terminal pump station. A sewer main can be a "public sewer" or a "private sewer."
  6. "Sewer service lateral" means that portion of the sewer system which connects the user's premises to the public sewer or a private sewer. This includes the building sewer and the street lateral.
  7. "Street lateral" means the portion of the City sewer that connects the sewer main to the building sewer at the property line.
- B. Provide a separate sewer service lateral for each lot.
  - C. The minimum sewer service lateral size is 4 inches.
  - D. Sewer service laterals will have a two-way cleanout at the property line.
  - E. Sewer service laterals will be sized according to requirements of the Uniform Plumbing Code, the City Engineer and determinations by the Design Engineer.
  - F. Sewer service laterals will be located on the property frontage, defined as either the front or side boundary line of a parcel which abuts on a street.
  - G. Sewer service laterals will not be located in easements when gravity service can be provided to the property frontage.
  - H. Multiple lots may be served by a private main, providing approval by the Building Official and the City Engineer is received and appropriate maintenance agreements are approved by the City Engineer. Private mains must connect to the public main at a manhole.
  - I. The minimum slope of sewer service laterals is 2% or 1/4 inch per foot for 4-inch laterals and 1% or 1/8 inch per foot for 6-inch laterals, unless otherwise approved by the Building Department, and will be designed at a depth sufficient to serve the entire building envelope of the parcel. Provide the slope and/or invert grade at the cleanout for any service lateral that must be installed at a slope and/or depth different from the minimums shown on the City Standard Plans.
  - J. All street laterals, from property line or edge of easement to the point of connection with the main line or a manhole, will generally be perpendicular to the curb alignment or easement and will have an angle of intersection with the downstream section of sewer of no less than 90 degrees. No lateral alignments adverse to the flow of the main will be permitted.

- K. Locate sewer laterals outside of driveway areas where possible and where driveway locations are known. In general, sewer laterals will be in the center third of lots when driveway locations are unknown and a minimum of 10 feet from trees whenever possible. For hillside development, place sewer laterals on the low side of property frontages when not in proposed driveway.
- L. Sewer service laterals serving lots, buildings or parts of buildings with a potential for plumbing fixtures below the nearest upstream sewer manhole rim require an approved backwater valve device. Multi-level buildings require the upper floors to be drained and connected to the downstream side of the backwater valve device, pursuant to 2007 California Plumbing Code section, 710.0 and 710.1

## **XII. EXISTING SEWER LATERAL INSPECTION AND TESTING**

- A. Sewer laterals for this section are defined as that portion of pipe running from the building to the sewer main. As part of any project, existing sewer laterals shall be inspected and tested as required in the municipal code, conditions of approval, or as directed by the City Engineer. Sewer laterals which fail to meet minimum standards shall be repaired or replaced. Testing shall be as described herein.
- B. CCTV Inspection:
  - 1. Prior to performing the CCTV inspection, the sewer lateral shall have been cleaned by flushing the lateral with water. Grease, oil, sediment, or solids shall be removed to permit the visual review and recording of the inside wall of the sewer lateral. The cleaning work is to be performed by a licensed contractor pursuant to the provisions of Section 7026 of the State of California Business and Professions Code.
  - 2. Sewer lateral CCTV inspection recordings that are to be submitted to the City for review and the eventual issuance of a Sewer Lateral Certificate of Compliance are to be performed by contractors who are licensed and experienced to perform CCTV inspections or other inspection service providers and technicians who are permitted by law to perform such inspections.
  - 3. CCTV sewer lateral inspection recordings shall be DVD format and shall be in color. All recordings shall be in focus, properly illuminated with good contrast, adequate color and tint, if colored recording, without distortion or outside interference. The camera lens must be kept clean and clear. Any other unidentified defect such as equipment interference or malfunction causing blurred or obscured images that detracts from the ability to completely and with reliable accuracy read the recording shall constitute a basis for rejection.
  - 4. CCTV inspection personnel shall coordinate the work of the CCTV inspection with the property owner or resident to minimize or temporarily stop sewer discharge into the sewer lateral while recording in order to show the whole periphery of the sewer lateral. If a bypass conduit is necessary, it must receive

- prior approval from the City inspector, and it shall be used as the last alternative.
5. A data view display feature shall be provided capable of showing, on the DVD, the following information:
    - a) Physical address of property which the sewer lateral serves
    - b) Date and time of inspection
    - c) Name of company, firm or technician performing the CCTV inspection
    - d) Inside diameter of sewer lateral and type of pipe material
    - e) Continuous footage counter accurate within 3 percent
    - f) Identification of access and starting point for video inspection such as upstream cleanout and location of cleanout. Vent lines will not be acceptable as access points.
  6. The preferred direction of the CCTV inspection is forward from upstream to downstream.
  7. The CCTV inspection DVD shall show the whole periphery of the pipe. Video televising of the entire length of the sewer lateral is required. Inability or failure to do so because of obstructions in the line, collapsed pipe, out of alignment joint offsets, or lack of acceptable access points will result in the rejection of the CCTV inspection report.
  8. An acceptable access point is defined as a cleanout constructed in accordance with the plumbing code and City of Cotati Standards. If there are no acceptable access points, installation of new sewer lateral cleanout meeting the requirements of the adopted plumbing code and the City of Cotati Standards will be required in order to perform a video inspection of the sewer lateral.
  9. The DVDs shall be labeled and the labels shall be typewritten or legibly hand printed and shall include the following information:
    - a) A "CCTV Sewer Lateral Inspection" title
    - b) Street address of the property to which the sewer lateral serves
    - c) Date of inspection
    - d) The name of the Company, Firm or Individual responsible for the CCTV Inspection.
  10. The CCTV inspector or operator shall identify all illicit connections to the sewer lateral observed in the CCTV inspection such as roof drains, area drains, French drains, swimming pool drains, basement drains, and footing drains by physically inspecting the property for visible evidence. The findings shall be noted in the CCTV Inspection Report.
  11. Sewer lateral lengths shall be measured from cleanout to sewer main.
  12. The camera shall be moved through the sewer lateral at a uniform rate not exceeding 30 feet per minute. The camera shall be stopped for a minimum of 5 seconds at broken or cracked pipe sections, root intrusion, miss aligned joints, connections to the lateral or other pipe defects. The camera shall be stopped for a full minute at any flowing connections and if necessary, pulled back and re-televised to ensure a clear recording of the connection. Camera units shall have adjustable supports and shall be set so the camera

- axis is generally at the centerline of the pipe.
13. The operator shall clearly identify the location of all wye or tee connections, taps, breaks, roots, or other defects.
  14. An inspection report is to be submitted with the CCTV inspection recording. General information including property address, date, time, operator name, and recording ID shall be provided. A diagram or a drawing showing the street, approximate location of the cleanout(s) and building face is to be provided. Pipe diameter, pipe material, shape of the pipe, pipe length, and televised footage.
  15. Continuous footage readings for identifying the location of defects must be accurate to within 3 percent tolerance. The following defect identifications are to be called out and recorded to the nearest full foot:
    - a) Cracked Pipe (longitudinal, radial, spiral, multiple)
    - b) Broken Pipe, Hole in Pipe, Deformed Pipe, Collapsed Pipe
    - c) Separation in Pipe Joint (roots, earth movement, collapsed pipe section)
    - d) Pipe Obstruction (cause for failed inspection)
    - e) Infiltration (observable, evidence of, seeps into line, runs into line)
    - f) Debris or Sediment in the Pipe (flow undisturbed or disturbed, unable to continue)
    - g) Grease (flow undisturbed or disturbed, unable to continue)
    - h) Scaling (flow undisturbed or disturbed, unable to continue)
    - i) Side Connections (attempt to identify)
    - j) Cleanouts (existing or missing and location)
    - k) Settlement of pipe (sags or bellies)

C. Sewer lateral testing:

1. Sewer laterals requiring pressure testing are as follows:
  - a) All pressure laterals shall be pressure tested at 1.5 times the operating pressure and no pressure loss shall be detected within a 10-minute test.
  - b) Gravity lateral testing will be accomplished by either a water exfiltration test or an air test.
  - c) Smoke tests are also required for private gravity sewers.
2. Exfiltration Pressure Test:
  - a) To perform a pressure test using the Exfiltration Pressure Test, the sewer lateral must have a cleanout located near the building footing which is served by the sewer lateral. If the cleanout does not exist, one must be installed by a licensed contractor under a plumbing permit issued by City Building Department. The contractor may perform preliminary pressure tests prior to completing the backfill operations; however, the final pressure test shall be performed after the completion of the backfill operations.
  - b) The contractor shall plug the sewer lateral and riser at the City cleanout and then surcharge the line with water to a point equal to

the foundation grade (floor joist level) or slab floor level. The minimum height of the water level shall be two feet (2'-0") above the lateral at the City cleanout. If necessary, a stand pipe shall be fitted to the top of the cleanout to achieve the required testing water level. If there is any fixture inside the structure lower than the testing water level, the contractor shall have to either plug the fixture or the lateral at the building. An approved backwater valve shall be installed if there are any plumbing fixtures below the level of the City cleanout. A Plumbing Permit is required for this work. The contractor may also install or use an existing cleanout near the structure at the foundation grade (floor joist level) or slab floor level to establish the minimum two feet (2'-0") water level.

- c) The building sewer will have passed the pressure test if the testing water level within the testing standpipe does not drop more than the indicated rate for the given diameter of testing standpipe indicated below. The allowed leakage per sewer lateral is 85 gpd or 3.54 gph or .059 gpm or 13.63 cubic inches per minute. No increase or allowance is allowed for long laterals or for laterals larger than the 4-inch minimum size.
  - 1. 3" Diameter: 2 inches per minute
  - 2. 4" Diameter: 1 inch per minute
  - 3. 6" Diameter: 0.5 inch per minute

3. Air Pressure Test

- a) Air test equipment shall be approved by the City. The contractor shall clean the pipe and plug the lateral at the building line and the end of the sewer lateral. (If a cleanout is within two feet (2'-0") of the building, the lateral may be plugged at the cleanout.)
- b) Air shall be slowly supplied to the plugged lateral until the internal air pressure reaches 4.0 pounds per square inch greater than the average back pressure of any groundwater that may submerge the pipe. The air pressure shall be regulated by a suitable regulator valve. Gauges shall be 10 psi maximum with increments of 0.2 psi.
- c) At least two minutes shall be allowed for temperature stabilization before proceeding further. The rate of air loss shall then be determined by measuring the time interval for the internal pressure to decrease from 3.5 to 2.5 pounds per square inch greater than the average back pressure of any groundwater that may submerge the pipe.
- d) The lateral shall be considered acceptable if the time interval measured for the internal pressure to drop from 3.5 to 2.5 pounds per square inch is 10 seconds or greater.

### **XIII. EXISTING SEWER LATERAL REPAIR OR REPLACEMENT**

- A. Materials used in the repair or replacement of existing sewer laterals which have failed to pass an inspection and/or test shall be made of pipe materials, fittings, couplings, and

other joining materials which have been approved for use pursuant to the Plumbing Code adopted by the City and as modified and specified in the City of Cotati Manual of Standards Details and Specifications.

B. The approved pipe materials, fittings and joining methods for the street lateral are:

1. Approved Pipe Materials:
  - a) Polyvinyl chloride (PVC) plastic pipe type Drain-Waste-Vent (DWV), SDR26 minimum; manufactured in accordance with ASTM D 2241.
  - b) Cast Iron Pipe conforming to ASTM A 888 or CISPI 301 when the lateral is outside paved areas.
2. Approved Pipe Fittings:
  - a) PVC conforming to ASTM D 2665; ASTM D 3311; ASTM F 1866
  - b) Grey or ductile iron conforming to AWWA C 110
3. Approved Pipe Joining:
  - a) Joints between PVC pipe and between pipe and fittings shall be made with mechanical joints having an elastomeric seal conforming to ASTM C 1173, ASTM D 3212, or CSA B602.
  - b) Joints between cast iron pipe and between pipe and fittings shall be made with compression gaskets for hub and spigot pipe and fittings conforming to ASTM C 564 and shall be compressed when the pipe is fully inserted or joined with mechanical joint couplings for hubless pipe and fittings conforming to CISPI 310, ASTM C 1277 or ASTM C 1540. The elastomeric sealing sleeve shall conform to ASTM C 564 or CSA B602 and shall be provided with a center stop.
  - c) Joints between different pipe materials shall be made with a mechanical joint of the compression or mechanical sealing type conforming to ASTM C 1173, ASTM C 1460 or ASTM C 1461. Connectors and adaptors shall be approved for the application and such joints shall have an elastomeric seal conforming to ASTM C 443, ASTM C 564, ASTM C 1440, ASTM D 1869, ASTM F 477, CSA A257.3M or CSA B602.

C. The approved pipe materials, fittings and joining methods for the building sewer shall comply with the California Plumbing Code adopted by the City of Cotati with the following exceptions as stated herein and as described in the City of Cotati Manual of Standards, Details and Specifications.

1. The following pipes materials are prohibited for new construction. If the below pipe types are damaged or fail to pass inspection or pressure tests, they shall be removed in their entirety from the wye at the sewer main to a cleanout located near the footing of the structure being served.
  - a) Asbestos Cement Pipe
  - b) Vitrified Clay Pipe
  - c) Orangeburg pipe
  - d) Hubless concrete

- e) Pipes without gasketed or glued bell and spigot joints
- f) ABS glued or gasketed couplings
- g) Grey iron drainage pipe with gasketed couplings.

2. The following Joints and Connections are prohibited:

- a) Cement, cement mortar, or concrete joints
- b) Mastic or hot pour bituminous joints
- c) Caulked joints
- d) Oakum or hemp joints filled with lead
- e) Lead joints
- f) Joints made with fittings not approved for the specific installation
- g) Joints between different diameter pipes made with elastomeric rolling O-rings.
- h) Solvent cement joints between different types of plastic pipe.

- D. Sewer laterals may be repaired with an approved cured in place pipe lining system. At the conclusion of relining the sewer lateral must pass specified pressure tests.
- E. Sewer laterals may be replaced in their entirety with approved pipe materials. At the conclusion of the replacement, the sewer lateral must pass specified pressure tests.
- F. The replacement of damaged pipe sections with approved materials, fittings, and couplings is only acceptable if the sewer lateral can pass the required pressure test after the repairs are complete.
- G. Whenever a sewer lateral is either repaired, replaced, or re-lined, cleanouts shall be provided at the property line, within 2 feet of the structure being served by the lateral, at intervals not to exceed 100 feet in straight runs, and for each aggregate horizontal change in direction exceeding 135 degrees in accordance with the City Standards.
- H. Approved trenchless technologies such as "pipe bursting" may be utilized to replace sewer laterals. Pipe bursting shall not be used for pipes containing asbestos. Asbestos cement pipes shall be removed and replaced with approved materials.
- I. Spot repairs consisting of the placement of metal or other sheeting materials and concrete or mortar will not be accepted.
- J. Re-mortaring of joints as a repair method is not acceptable.
- K. Pipe and pipe couplings shall be joined and installed in accordance with the manufacturer's recommendations. Pipe repairs shall be made in a manner which provides the least number of pipe joints.
- L. Sewer laterals with the following types of pipe damage must be repaired or the pipe sections must be replaced:

1. A separation or offset in the pipe joint including any fish mouth condition at the joint.
  2. Holes or cracks in the pipe bell, barrel, or coupling
  3. For PVC pipe, a deflection in the pipe cross-section exceeding 1/4".
  4. Root penetration into the pipe.
  5. Infiltration
- M. Where the sewer pipe repair option selected is pipe lining, repairs shall be made to the lateral prior to the installation of the liner and shall correct the following deficiencies:
1. A separation or offset in the pipe joint including any fish mouth condition at the joint which the lining system cannot bridge based on the liner manufacturer's recommendations.
  2. Holes in the pipe bell, barrel, or coupling that the lining system cannot bridge.
  3. For PVC pipe, a deflection in the pipe cross-section exceeding 1/4".
  4. Other lateral defects which the manufacturer of the lining system recommended are corrected prior to the placement of the liner.

#### **XIV. INSPECTION AND REPAIR OF PRIVATE SEWERS**

- A. When new development, buildings or changes in use create the need to tie into existing private sewers, the private sewer shall be inspected and, if necessary, repaired.
- B. When existing private sewers require inspection and testing, they shall be inspected using the procedure for video inspection for new construction in Standard 530A. Private sewers shall also be smoke tested to detect cross connections or excessive inflow and infiltration.
- C. Private sewers shall be repaired in accordance with the City Standards for new sewer construction if the following defects are noted except that the infiltration quantity can be up to 200 gallons/inch-mile/day:
1. Smoke testing indicates any cross connections or excessive inflow or infiltration.
  2. Television inspection notes any of the following defects:
    - a) Excessive inflow or infiltration
    - b) Joint separations
    - c) Damaged joints that expose the gasket
    - d) Cracks
    - e) Root intrusion
    - f) Substantial deterioration of the lines
    - g) Improper pipe grade leading to clogging of the line, inflow, infiltration of extraneous water.
- D. After repair or replacement of the defects, the entire section (from manhole to

manhole) where the repair was made shall be inspected and tested in accordance with City Standards for new sewer construction. Any defects will require correction.

#### **XV. ABANDONMENT OF SEWER MAINS AND SERVICES**

- A. Any existing sewer mains and service laterals that will not be used will be abandoned and the following must be noted on the Improvement Plans:
  - 1. Sewer mains that are to be abandoned will be securely closed at all pipe ends and at manholes with a concrete plug or masonry plug if 12" or larger per current City Standard 507. Further, mains 8 inches and larger must be broken every 50 feet, filled with sand slurry or other suitable material per current City Standard 507.
  - 2. Sewer laterals in streets that have been constructed or overlain within the last five (5) years will be plugged behind the curb line or outside the edge of pavement.
  - 3. Sewer laterals in streets that have not been constructed or overlain in the last five (5) years will be abandoned by excavating at the main, removing the wye, and repairing the main. If the connection to the main is a tap or saddle, it will be removed and a full circle repair clamp installed. When a wye is removed that is within 18 inches of a pipe joint, the repair will be extended to include the joint.

#### **XVI. EASEMENTS**

- A. An easement must be provided over any public sanitary sewer when it is installed outside a public right-of-way.
- B. The easement must be a minimum of 20-foot wide (or wider if directed by City Engineer). The easement will be dedicated as a "public sewer easement."
- C. Easements must be configured to encompass all publicly-maintained appurtenances, such as street laterals up to the cleanout, and will be generally centered over the facility. Separate access easements may be required depending on site conditions. When sanitary sewers are to be installed along a property line the easement will be wholly contained on one parcel.
- D. All property restrictions placed as a result of dedication of easements will be so noted on the supplemental sheet of the Subdivision Map, or on the Easement Deed if the easement is not dedicated as part of a subdivision. Typical required notes as applicable are:
  - 1. No structures may encroach on, above, or below the surface of the ground in any public easement. This includes footings of foundations, eaves from the roof of any adjacent structure, pools, ponds or outbuildings on slabs or foundations. Decks, sheds, or other structures which may be easily removed for maintenance of the sewer system may be allowed at the discretion of the

- City Engineer.
2. No trees may be planted in a public sewer easement without first obtaining approval of the City Engineer. Trees may be allowed to the extent that damage to the sewer system does not occur from root intrusion and adequate access can be provided for maintenance and repair vehicles.
  3. The Public Works Department will take due caution when performing maintenance or repair of sewer systems in easements, but will not be responsible for repairs or replacement of trees, landscaping or structures not specifically approved by the City Engineer.

## **XVII. ACCESS ROADS**

- A. Clear access must be provided and maintained to all structures on the sewer system:
  1. All-weather vehicle access roads are required to every structure on the sewer system. Access roads must be a minimum of 12 feet in width and must be provided with turnarounds as directed by City Engineer. City Standard 108 AND City Standard 110 may be required when the back-up distance for any maintenance vehicle exceeds 100-foot.
  2. The design of access roads must be included with the sewer system design plans. At a minimum, the design will conform to the requirements of City Standard 128. Include adequate drainage measures in the design to prevent damage to the access roads from storm water.
  3. Gates must be provided for access through any fence crossing a public sewer easement. Minimum 14-foot wide gates shall be provided, with sliding gates preferred. For secondary entrances where vehicular access is not required, 4-foot wide gates for pedestrian access shall be provided and will be located to permit visual access between sewer structures.
  4. The maximum grade allowed at any point on an access road is 15%. The maximum cross-slope for any access road is 5%.

## **XVIII. SEWER FORCE MAINS**

- A. Locator boxes will be placed at every horizontal change in alignment and a maximum of every 500 feet. No. 12 insulated copper wire will be laid on top of and along the entire length of all nonmetallic pipe and will be extended to the surface at all box locations and manholes sufficiently for locator equipment to be attached. Fasten the wire to the top of the pipe so as not to be displaced or broken during backfilling, such as by affixing the wire to the pipe with duct tape at approximately 10 feet intervals.
- B. Boxes will conform to valve box requirements per City Standard 877 with the lids clearly marked "sewer."
- C. Private force mains must connect to the City sewer system per City Standard 515, and may not discharge directly into sewer manholes. Public force main connections must be detailed on the plans. Public force mains will drop down into gravity flow

prior to connection to main at a manhole.

- D. Provide details for a swab launching station for force main preventative maintenance. Launching facility will be detailed on lift station plans and must accommodate using lift station pumps for propulsion. Provide necessary valving. Contact Engineering for suggested design requirements.
- E. Force main pipes must be marked or labeled as sewer in a permanent fashion.
- F. Sewer force mains shall be equipped with dual Vent-O-Mat type RBX ARV's for waste water force mains at all high points per City Standard Detail 534.
- G. Sewer force mains shall be equipped with blow offs at all low points.

#### **XIX. INDUSTRIAL WASTE DISCHARGE PERMITS**

- A. Most commercial uses require Industrial Waste Discharge Permits which may be obtained from the Environmental Services Division of the Water Department of the City of Santa Rosa.
- B. Grease traps, grease and sand traps, grease interceptors, and sampling structures as may be required by the Division of Environmental Services must be shown on the plans submitted for permit approval, or referred to appropriate City Standard Plans.
- C. Trash enclosures and other outdoor pad areas used for washing will be plumbed to the sanitary sewer system at grease interceptor or other connection point approved by the Division of Environmental Services. Preventive measures shall be taken to eliminate the intrusion of any rainwater or surface runoff from trash enclosure area to the storm drainage system.
- D. Wash pad areas will be diked and/or sloped so that the smallest area possible drains to the sewer.
- E. A fixed roof will be installed over the wash area. The Division of Environmental Services may consider alternatives to a roof where it is not feasible.

#### **XX. LIFT STATIONS (For Force Mains 3-inches and larger)**

- A. General

Plans and specifications for all lift stations are to be prepared by a Registered Professional Engineer and submitted to the City for review and approval. Lift stations that will be owned, operated and or maintained by the City shall also be required to meet the design standards herein.

- B. Hydraulics

- 1. Firm-capacity for the lift station is defined as the pumping capacity for the

- facility with the largest pump out of service.
2. The preferred-operating-region (POR) for a given pump is between 70% and 120% of the flow at the best-efficiency-point (BEP). Use the pump- speed affinity relationships to estimate the BEP at reduced speeds.
  3. Design the lift station to serve the entire tributary area using build-out densities that conform to the City's latest General Plan.
  4. The lift station must be capable of operating within the POR at all flows between the firm-capacity and one quarter of the firm-capacity.
  5. The ratio of minimum net positive suction head available (NPSHa) to net positive suction head required at BEP (NPSHr) must be 2.0 or greater.
  6. Pump station design calculations shall address surge and "water hammer," and, if required, surge control shall be provided.
  7. Unless waived by the City Engineer, a hydrogen sulfide study will be required. Corrosion control and odor control may be required based on the results of the hydrogen sulfide study.

#### C. Pumps and Motors

1. All pumps shall be designed to handle solids, and must be capable of passing a minimum 3-inch diameter sphere.
2. All pumps shall be identical.
3. All pumps shall be fitted with 460 VAC, 3-phase, premium-efficiency, inverter-duty motors except as approved by the City Engineer.
4. Brake horsepower shall not exceed the nominal rating of the motor between shutoff and the maximum flow shown on the manufacturers' published performance curves.
5. The service factor for all motors shall be 1.15.
6. Provide thermal overload protection for all pump motors.
7. Provide a spare mechanical seal and other spare parts as recommended by the pump manufacturer.

#### D. Wet Well

1. Working capacity of the wet well is defined as the volume between the maximum and minimum normal operating levels.
2. Wet well shall have enough working capacity to prevent any pump from starting more than four times per hour.
3. Wet wells shall be designed in accordance with Hydraulic Institute Standard No. 9.8 (Pump Intake Design), except as noted otherwise in this standard.
4. Set the high-level alarm at the invert elevation of the nearest upstream manhole. Provide a minimum clearance of 6-inches between the maximum normal operating level and the high-level alarm.
5. Set the low-level alarm at least one foot above the motor (for submersible pumps), and at least three feet above the suction bell. Provide a minimum clearance of 6-inches between the minimum normal operating level and the low-level alarm.

6. Design the wet well to counteract the effects of buoyancy due to high groundwater conditions. The groundwater elevation used for design shall be determined by a licensed geotechnical engineer. Ground surface may be used as groundwater level in lieu of a Geotechnical Report.
7. Wet well shall be constructed using reinforced concrete. Concrete mix design shall be suitable to resist damage from sulfides.
8. Wet wells shall be lined with GSE 5 mm HDPE studliner.
9. Penetrations into the wet well shall resist infiltration and exfiltration, and conform to City Standard 533.

#### E. Piping and Valves

1. Provide a control gate or plug valve on the wet well inlet to permit isolation of the wet well.
2. Provide a plug valve and rubber-flapper style check valve on the discharge of each pump. Plug valves shall be non-lubricated neoprene faced eccentric. Check valves shall be installed in the horizontal plane.
3. Buried pressure piping shall be AWWA C151 ductile iron or C900/C905 PVC with AWWA C110 mechanical joint fittings.
4. Provide mechanical joint restraint at all fittings and pipe joints. Thrust blocks are permitted only if mechanical joint restraint is not feasible.
5. Design pressure piping to maintain velocities between 2 ft/s and 8 ft/s.
6. Design gravity piping in accordance with the City's standard for sewer construction.
7. Provide a connection to the forcemain to permit bypass pumping. Coordinate sizing and connection details with City staff.
8. Provide restrained flanged coupling adapters to permit removal of all valves, meters, and other mechanical equipment connected to the piping.
9. City Engineer will determine if swabbing or pigging facilities are required at the lift station. If so, all downstream piping and related equipment shall be designed to accommodate this appurtenance. Launching facility will be detailed on lift station plans and must accommodate using lift station pumps for propulsion. Provide all necessary valving. Contact Engineering for suggested design requirements.

#### F. Electrical Equipment

1. Install all major electrical equipment including utility meter and main circuit breaker enclosures, panelboards, control panels, and motor control centers outside of hazardous areas as defined in the National Electric Code, Article 500.
2. Provide utility meter and main circuit breaker in an overall 316 stainless steel enclosure rated NEMA 4X with a viewing window centered on the utility meter.
3. Provide NEMA 3RX, 316 stainless steel enclosures for electrical equipment and control devices where ventilation or air conditioning of the devices is

required. Provide NEMA 4X, 316 stainless steel enclosures for all other equipment and devices.

4. Provide OSHA approved rubber mat in front of all indoor control panels.
5. Provide industrial fluorescent strip fixtures in the building interior.
6. Provide an exterior light in accordance with STD #301. Provide 12-inch diameter pole-mounted luminaires at 120V, 70W HPS.
7. Provide a 6-pulse variable-speed drive for each pump. Manufacturer: Allen Bradley, or equal.

#### G. Instrumentation and Controls

1. Provide a magnetic flowtube (Rosemount Model No. 8705) on the lift station discharge. Connect flowtube to remotely mounted transmitter (Rosemount Model No. 8712) using manufacturer's cable.
2. Provide guided-wave radar or ultrasonic level transmitter or level transducer for continuous level monitoring in the wet well.
3. Provide discrete level float switches for high-high level and low-low wet well level alarms.
4. Provide a programmable logic controller (PLC) and human-machine interface (HMI) for monitoring all instrumentation signals, alarm conditions, and pump control. Provide a minimum of 20% spare I/O capacity. Manufacturer and model shall be approved by the City Engineer.
5. Develop Wonderware screens for the Central SCADA computer, located at the Public Works office. Coordinate screen development with City staff.
6. Use a proportional-integral-derivative (PID) control loop to maintain a user-specified setpoint level in the wet well. The process variable will be the level transmitter output; the control variable will be the pump speed signal that is transmitted to the variable-frequency drives.
7. Provide back-up float switch for pumps on/off time controlled.

#### H. Telemetry

##### 1. Control Panels

All control panels will have the following general features.

##### a) Panel design will incorporate the following features:

- Provide a lamp with switch.
- Provide a 120 VAC duplex convenience outlet.
- Provide 120 VAC uninterruptible power supply (UPS) or an equivalent DC voltage subsystem sized for 150% of peak load for all internal panel components for a minimum of 30 minutes run time.
- Provide an 800MHz-band spread-spectrum radio to interface with the City's SCADA system. Perform radio signal strength study to verify antenna and signal transmission requirements.
- Provide a dial-up telephone line and an automatic alarm dialer to annunciate critical alarms. Provide a wall mounted

telephone using the same dial-up line for operator convenience.

I. Standby Generator

1. At the discretion of the City Engineer, a standby generator may be required. The following minimum requirements for the standby generator are as provided herein.
2. Provide permanently installed, diesel-fueled generator with an automatic transfer switch. The generator's engine must meet the Bay Area Air Quality Management District (BAAQMD) emission standards. Provide Crouse Hinds E0400-1686 Posi-lok load bank receptacles to test generator for load bank connection.
3. Generator sizing calculations shall assume loading based on lead pump running, lag pump starting and full operation of all electrical equipment at the site. Fuel tank sizing shall provide for minimum 24 hour run time.
4. Obtain Fire Department approval for fuel tank.
5. Provide instrumentation:
  - a) Generator voltage, frequency, and amp meters.
  - b) Oil pressure gauge.
  - c) Battery volt meter.
  - d) Water temperature gauge.
  - e) Hour meter.
  - f) External battery with trickle charge.
  - g) Dry contacts for telemetry - showing generator running.
  - h) All above instrumentation/information shall be available via SCADA system.
6. Provide automatic shut-off and alarms:
  - a) Low engine oil pressure.
  - b) High engine temperature.
  - c) Over speed.
  - d) Over crank.
  - e) All above information shall be available via SCADA system.
7. Provide sound attenuation as necessary to meet or exceed City noise standards for location. Attenuation may include silencers and/or insulation.

J. Details Required on Improvement Plans

1. Site Plan: Locations of power pole, transfer switch, emergency generator, grounding electrode, control panel, wet well, driveway, fencing, water service, emergency suction/discharge boxes. Provide site grading and drainage details.
2. Wet well: Influent piping (standard inside drop manhole); suction piping (min. 6 inches off bottom of manhole); emergency suction line; water/alarm levels (pump on, pump off, low level, high level), redundant high-water float switch.
3. Force main discharge details.

K. Record Drawings and Manuals

1. Provide three (3) copies of approved record drawings and electronic scan of the drawings in \*.TIF or \*.PDF format with a minimum 200 dpi resolution, and an electronic copy in AutoCAD latest version.
2. Provide three (3) copies of O&M Manuals plus an electronic copy when available.

L. Building Structure

1. Pump station buildings shall be constructed of split-face concrete masonry unit (CMU) with standing-seam metal roofing.

**XXI. LIFT STATIONS (2-INCH FORCE MAINS)**

A. System Description

Provide packaged sewer lift station system, shop assembled with basin, submersible, non-clog grinder pumps and single automatic control for in ground installation. Provide duplex system (one operating pump and one installed spare pump).

B. General Requirements

1. Plans and specifications for lift stations shall be prepared by a California registered professional engineer and submitted to the City for review and approval.
2. Materials shall be corrosion resistant and rated for sewage service. Metal exposed to sewage environment must be stainless steel.
3. Manufacturer: Company specializing in manufacturing of packaged lift stations with minimum three years' experience.
4. Environmental: Comply with State of California, Department of Public Health Water Main Separation Criteria (Title 22).
5. Provide and install an approved reduced pressure (RP) backflow assembly for potable water service line to lot in conformance with STD-876.

C. Hydraulics

1. Firm-capacity for the lift station is defined as the pumping capacity for the facility with the largest pump out of service.
2. Design the lift station to serve the lot at the maximum planned occupancy.
3. Design Conditions:
  - a) Minimum force main velocity: 2 fps
  - b) Maximum force main velocity: 8 fps
  - c) Minimum inlet pipe slope: 2%

D. Product Requirements

1. General

- a) Packaged sewer lift station must have a cartridge type, easily removable core assembly containing: pump, motor, grinder, motor controls, check valve, anti-siphon valve, electrical quick disconnect and wiring. Provide lifting hooks, mechanical and electrical disconnects with easy disconnect accessibility.
  - b) Packaged sewer lift station must be maintainable without entry. Entrance is not permitted without appropriate OSHA confined space permits.
  - c) Packaged sewer lift station shall be free from electrical and fire hazards.
  - d) Packaged sewer lift station shall be free from noise, odor or health hazards and shall have been tested by an independent laboratory to certify its capability to perform in sewer system applications. Provide NSF International seal on product as evidence of compliance.
2. Pump
- a) Provide identical, submersible, non-clog grinder pumps with stainless steel impellers, shredding rings, cutters, shafts and hardware.
  - b) Pump capable of delivering negative total dynamic head without overloading the motor(s). Use of in-line piping or valves to create false apparent head is not permitted.
3. Motor
- a) 120/240V, 60Hz, single phase, 1800rpm max, non-overloading.
  - b) Service factor: 1.15
  - c) Provide thermal overload protection.
4. Basin
- a) Working capacity of the basin is defined as the volume between the maximum and minimum normal operating levels.
  - b) Basin shall have enough working capacity to prevent pumps from starting more than four times per hour.
  - c) Basin shall have capacity for emergency storage to accommodate a 1-day (24-hour) lift station outage during maximum day demand.
  - d) Design basin to counteract the effects of buoyancy due to high groundwater conditions. The groundwater elevation used for design shall be determined by a licensed geotechnical engineer. Ground Surface may be used as groundwater level in lieu of a Geotechnical Report.
  - e) Basin shall be suitable to prevent damage from sulfides and use custom molded HDPE or fiberglass reinforced polyester resin.
  - f) Penetrations into the basin shall resist infiltration and exfiltration.
  - g) Basin shall be dual contained with a smooth internal wall to promote scouring.
  - h) Basin seams shall be thermally welded, factory tested and leak-proof.
  - i) Basin shall be sufficient to withstand saturated soil loads at maximum burial depth.

- j) Basin Cover must be lockable and sufficient to withstand live load of 150 psf minimum. If basin cover potentially accessible to vehicular traffic, provide HS20 rated cover.
  - k) Basin shall have integral bug-free vent, an inlet piping connection and a discharge piping connection
5. Packaged Lift Station Piping and Valves
- a) Provide stainless steel discharge piping and hardware.
  - b) Provide non-clog check valve.
  - c) Provide anti-siphon valve.
  - d) Provide full port, stainless steel isolation valve.
6. Site Piping and Valves
- a) Force main piping: HDPE (SDR 11) or PVC (Schedule 80) with a minimum depth of cover of 3 feet.
  - b) Provide plug-style isolation valves for buried service with corrosion resistant valve stem extension, riser and cover plate labeled "sewer" for basin inlet and force main to permit isolation of the basin.
  - c) Provide non-clog check valve immediately upstream of force main plug valve.
  - d) Connect to inlet and force main piping to basin with flexible connector.
  - e) Valves and appurtenances shall use either of the following bolts and nuts:
    - Fluoropolymer coated carbon steel: bolts (ASTM A307, Gr. B) and nuts (ASTM A563, Gr. A)
    - 304 stainless steel: bolts (ASTM A193 Gr. B8M) and nuts (ASTM A194 Gr. 8).
  - f) Refer to STD-515 for force main discharge.
7. Operations
- a) Level control: non-fouling level detection with no moving parts in direct contact with wastewater.
  - b) Level control points: "pump on," "pump off," and "high level" in basin. Start pump automatically when "pump on" setpoint is activated. Stop pump automatically when "pump off" setpoint is activated. Signal alarm condition automatically when "high level" setpoint is activated.
  - c) "High level" alarm shall be visual and audible.
    - Audible alarm to be silenced with externally mounted push-button.
    - Visual alarm to remain illuminated until sewage level drops below the "pump off" setting. Mount visual alarm in top of enclosure. Maintain NEMA 4X rating.
  - d) Sound, Vibration, and Thermal Control: Dampen or suppress noise, absorb vibration, accommodate thermal expansion and stresses, and

adjust or correct for misalignment in piping systems.

8. Electrical
  - a) Power/Alarm cable:
    - Provide NEMA 6P quick disconnect.
    - Provide cable shroud and strain relief cord connector.
    - Provide cable for direct burial use.
  - b) Back-up power: As an alternate to providing emergency storage within the basin, provide back-up power source to ensure continuous operations in the event of a power outage.
  - c) Alarm/Disconnect Panel
    - Corrosion resistant NEMA 4X rating
    - UL listed.
  - d) Wiring: in accordance with requirements of National Electrical Code.

E. Installation Requirements

1. Install per manufacturer's standard printed instructions.
2. Seal cover penetrations with manufacturer's recommended sealant.
3. Set cover frames and covers level without tipping, to correct elevations.
4. Provide Basin anchorage.

F. Startup, Initial Testing and Operations

1. Notify City Public Works Department three days prior to testing. Coordinate and operate pumps in conjunction with City.
2. Provide startup and initial testing of system. City must be present to observe testing (including retests).
3. Hydraulically test station to performance requirements by receiving, pumping and discharging 500 gallons of water to/from basin.
4. Correct failures during test by repairing or replacing malfunctioning parts or equipment or faulty workmanship.
5. After correcting failures, re-test until failures are eliminated.
6. Confirm general sequencing of pump and level control operations at basin and control panel are in accordance with performance requirements.
7. Document and certify lift station system startup and initial testing results in startup report. Submit startup report to City for review and permitting approval. Do not operate lift station without a City approved permit.

G. Protection of Finished Work: Do not allow access to general public. Provide secure, lockable access.

H. Details Required on Improvement Plans

1. Site plan: Location of packaged sewer lift station, driveway, fencing, water services within 120 ft and at site with sizes shall be review & approved by the City Engineer. Provide site grading and drainage.
2. Basin inlet piping and force main discharge details.

I. Record Drawings

1. Provide three (3) copies of approved record drawings and electronic scan of the drawings in \*.TIF or \*.PDF format with a minimum 200 dpi resolution and an electronic copy in AutoCAD latest version.

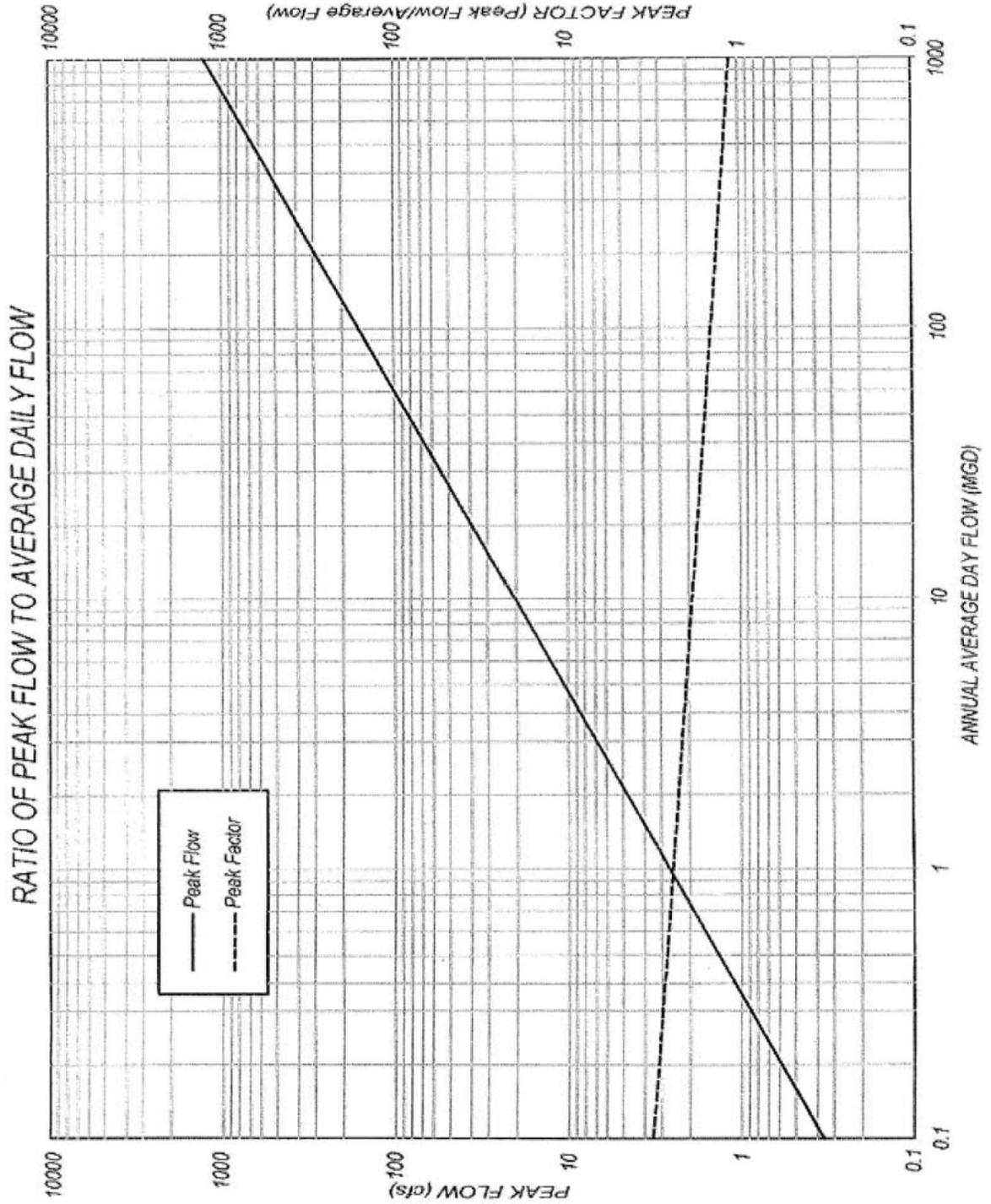
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**Attachment 1: Non-Residential Sewer Flow**  
**Rates**

<b>Assumed Sewer Generation for Non-Residential Uses</b>		
	<b>Flow (gpd)</b>	<b>Unit</b>
Assembly Hall	5	Seat
Auditorium, Halls, Lodges	120	1000 GSF
Auto Dealership	100	1000 GSF
Bakery	300	1000 GSF
Bar	20	Seat
Bowling Alley	200	Alley
Cafeteria	66	Seat
Car wash self-serve	280	Stall
Commercial (other)	100	1000 GSF
Commercial (service)	150	1000 GSF
Dry Cleaners	300	1000 GSF
Garages	100	Bay
Grocery	240	1000 GSF
Gyms/Health Clubs	240	1000 GSF
Hotel	125	Room
Laundromat	280	Washer
Motel	125	Room
Offices	110	1000 GSF
Offices: Medical, Dental, Massage	160	1000 GSF
Places of Worship	80	1000 GSF
Restaurant	66	Seat
Restaurant take out	570	1000 GSF
Retail Area	112	1000 GSF
Service Stations	40	Pump
Schools	14	Student
Theater	5	Seat
Warehouse	40	1000 GSF

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Attachment 2: Peaking Factor Rates



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SECTION 6

**PARK AND LANDSCAPE  
Design Standards**

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III. Water Conservation Practices.....	PL-3
IV. Guarantees.....	PL-3

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## PARK AND LANDSCAPE DESIGN STANDARDS

### GENERAL

The developer shall be required to provide and plant street trees per the following standards and specifications and in accordance with all City tree ordinances.

Approval of tree species is by the planning Department and must be in conformance with the Street Tree List (Section 1: Attachment 5) approved by the City.

### DESIGN CRITERIA

#### I. Requirements

- A. A minimum 48-hour notification shall be given to the Planning Department prior to installation of parkway trees. Planning Department will verify that the genus, species, material quality, planting location and method of planting trees is consistent with the Street Tree List (Section 1: Attachment 5), tentative subdivision map, site plan and architectural review approval and any other pertinent project condition.
- B. To avoid conflicts with public utilities, lines of sight and streetscape features, trees shall be located as follows:
  - 1. Thirty (30) feet in back from beginning of curb returns at intersections (visual triangle).
  - 2. Ten to fifteen (10-15) feet from lamp standards, depending on species size.
  - 3. Four (4) foot minimum from driveways, 6 foot normally.
  - 4. Six (6) feet from all utilities, sewer, water, cable, gas lines and fire hydrants.
  - 5. Each residential lot shall have at least one (1) tree, corner lots two (2) trees, except where not possible. Normally there will be a tree every 30 feet as feasible. In small lot subdivisions the intent is that reasonable concessions should be made regarding these standards to maximize the number of street trees planted.
  - 6. Twenty (20) foot minimum spacing in commercial zones.
  - 7. Where there are power or service lines above planter areas, tree selection must be appropriate for the limited overhead space restrictions. No single leader trees will be accepted except for very high wires (exceeding 30 feet).
- C. Trees shall have a minimum size of 12 feet, including root ball, a good height to trunk caliper ration, with a minimum caliper of 1 inch at 12 inches above the top of the root ball, and a minimum container size of fifteen (15) gallons.
  - 1. Condition of the plants shall be symmetrical with well distributed branches, typical for variety and species, structurally sound, healthy, vigorous, free from plant disease, insect pests or their eggs, and shall have a healthy, normal root system, with no girdling or circling roots, well filling their

containers but not to the point of being root bound. Trees shall not have leaders cut or be topped prior to delivery. Trees must be able to stand upright when nursery stake is removed.

2. Inspection. All plant material shall be subject to the inspection and approval of the City. The City has the right to reject any item offered.
  - a) A forty-eight (48) hour notification shall be given prior to **any** inspection.
  - b) Upon initial notification, the Contractor shall indicate the number and sequences of planting phases necessary to complete the entire project.
  - c) A twenty-four (24) hour notice shall be given the City prior to starting any additional phase. Instructions regarding the proper method of staking and tying shall be given upon initial notification of planting.
  - d) At the time of final inspection, the City may select at random one (1) tree from each planting phase to be removed and inspected for compliance with planting specifications.

## II. Parkway Tree Planting Operations

- A. All holes shall be dug with bottoms level, the width equal to 1-1/2 times the diameter of the root ball, but no deeper than height of root ball. The City, upon notification, shall inspect holes prior to planting of trees.
- B. Holes shall be backfilled with 100% approved planting material.
- C. Removal of all nursery training stakes is required at the time of planting. Any tree that cannot stand upright without its nursery stakes will be rejected.
- D. Turf shall be at least 18 inches away from the trunk of trees in all directions.
- E. Set trees in center of hole in vertical position, with the root ball crown at least 1-inch to 1-1/2 inches higher than the final grade. Tamp soil, add fertilizer tablets, add water halfway through the backfill process to eliminate air pockets and insure good soil contact with the root ball.
- F. Construct a 4-foot high earth water basin capable of holding ten (10) gallons of water just outside the root ball. Water sufficient to fill the basin shall be applied immediately after planting.
- G. If houses and/or other buildings are not occupied, trees shall be watered by the developer at least twice a week until such buildings are occupied, except during rainy season.
- H. Root barriers are required in cutouts of 4 feet or smaller; root barrier strips will be used in parkway plantings in new subdivisions.

- I. Each tree must be properly supported by two (2) Lodgepole Pine stakes. Stakes shall be a minimum of 2-inch x 2-inch and not less than 8 feet in length. Stake all trees at time of planting by placing stake in prepared hole just outside the root ball and driving stake a minimum of 12 inches into soil. (See detail for final height of stake and vertical location of tree tie.)
- J. All trees shall be secured to stakes as detailed (or approved equal).
  - 1. Chain lock plastic or rubber ties screwed or nailed into the stakes.

### III. Water Conservation Practices

- A. Landscape and planting materials will be designed in accordance with the City's water conservation stages Municipal Code 13.
- B. For commercial developments and residential subdivisions, a water conservation plan shall be submitted to the Planning Director and City Engineer for review and approval. Said plan shall identify areas to be landscaped, use of drought-tolerant plants, native grasses and other low water use landscaping. The use of turf shall be discouraged and will only be allowed as approved by the Planning Director.

### IV. Guarantees

- A. A fifteen (15) gallon tree shall be guaranteed as to growth and health for a period of one year after final acceptance by the City.
- B. Trees that fail to grow or are injured or damaged during planting operations shall be replaced within fifteen (15) days after notification. Replacement material shall be guaranteed as specified as original material.
- C. **TREES NOT INSTALLED ACCORDING TO CITY REQUIREMENTS WILL BE REJECTED BY THE CITY.**

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SECTION 8

**WATER  
Design Standards**

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## **WATER DESIGN SPECIFICATIONS**

### **I. PURPOSE**

To provide guidelines for the design of water utilities projects and thereby reduce the time required for processing the plans. These guidelines do not include, but may reference, additional conditions which may be promulgated by all other pertinent ordinances, codes, and official policy set forth by the Utilities Department or other departments of the City of Cotati or other government agencies. These guidelines establish minimum acceptable design criteria. More stringent requirements may be imposed by the City Engineer based on specific project conditions.

Portions of these standards apply to fire systems, both public and private, and are intended as general reference to aid in the design of the public water system. Final designs are subject to approval of the Fire Department.

It is the responsibility of the design engineer to initiate written requests to the City Engineer for approval of any design concepts that differ from these criteria, verify additional requirements imposed, perform any necessary calculations or studies, and resolve specific design problems with the appropriate agency, department or division.

### **II. REQUIREMENTS FOR IMPROVEMENT PLANS AND SUBDIVISION MAPS**

- A. Provide a detailed utility plan showing onsite and offsite public and private water and fire protection systems, including mains, services, hydrants, and all other required appurtenances, and their connections to existing City-maintained water facilities. Show the location, type, and diameter of public and private water mains. Reference any existing fire hydrants within 300 feet of the project boundary. Show any wells existing or to be abandoned. When a separate irrigation service is necessary, an irrigation plan is required per Section X. N. of these standards. (See Section XI for submittal of plans for private fire systems.)
- B. Annotate the local agency information sheet of the Subdivision Map with any information that is needed to notify property owners of requirements for connection to the City water system. These include, but are not limited to:
  - 1. Payment of fees prior to issuance of Building Permits,
  - 2. Lots requiring pressure regulating valves or booster pumps,
  - 3. Backflow protection,
  - 4. Public water access requirements, such as gates or access roads.

The appropriate information may be obtained from Public Works and Engineering.

- C. Miscellaneous specific items required on improvement plans are indicated throughout these Standards.
- D. Before combustible materials may be delivered, stored or constructed on site, fire flow and access must be provided and approved by the Fire Department per

current City Fire Code. In addition, public and/or private fire hydrants must be installed, flushed, tested, and operational. This information must be included on all improvement plans. Provide any necessary calculations with the submittal of improvement plans or with the Tentative Map submittal to demonstrate adequate fire flows are available.

### **III. WATER MAINS - GENERAL**

- A. Public water mains may not be designed outside the street right-of-way without City Engineer approval.
- B. In general, publicly maintained water systems will be designed only where they serve multiple ownership lots and where appropriate access for maintenance can be provided.
- C. Water mains installed at a slope of 15% or greater will be designed with restrained joints. The Design Engineer must provide adequate drainage measures to protect the trench from erosion.
- D. Water mains installed outside of any roadway, called "cross-country mains," must be Ductile Iron Pipe and will have suitable access. In general, cross-country mains must be isolated with valves in the public right-of-way and must be identified with blue locating posts (Carsonite 492 CW-112 or approved equal) at approximate 500-foot intervals, at any angle point, and at the entrance to an easement. Identifying posts should have vandal-proof metal bottoms. Access requirements as established in Section XIV of the Sewer System Design Standards may be imposed on a project based on site conditions.
- E. For system reliability, to minimize pipe size, and to minimize the number of people affected by a system shutdown, either for domestic or fire protection purposes, no more than 100 residential units may be served by a single-feed water system, providing it is hydraulically adequate. Where more than 100 units are to be served, a dual-feed (or "looping") public water system must be designed to provide a secondary source of water to the project. Onsite private fire requirements, such as dual fire services and looping mains, will be determined by the Fire Department for residential and nonresidential developments.
- F. For purposes of leak detection and maintenance access, no reinforced concrete may be designed over publicly maintained water facilities. Unreinforced concrete will be allowed under special circumstances such as crosswalks.
- G. Extent of water main improvements will be as follows:
  - 1. Any offsite water main improvements needed to serve the project must be shown on the improvement plans, including upgrades to existing mains that may be required as a result of a flow analysis or modeling effort.

2. In general, water mains must be designed to cross the full property frontage or to the limits of the street improvements, whichever is greater.
- H. Streets with both water and sewer mains must be at least 20 feet wide, face-of-curb to face-of-curb. Streets with only a water or sewer main must be at least 20 feet wide.

#### **IV. MATERIALS**

- A. Service laterals will be polyvinyl chloride (PVC), Polyethylene (PE), or Ductile Iron Pipe (DIP) per applicable City Standards.
- B. 8-inch to 12-inch public water mains and 6-inch to 12-inch private fire mains will be Polyvinyl Chloride (PVC) Pressure Class 150, DR18 per AWWA Standard C900, minimum or Ductile Iron Pipe Pressure Class 350 per AWWA Standard C151 minimum. Where the normal mainline static pressure exceeds 100 psi, Ductile Iron Pipe or PVC Pressure Class 200, DR14 must be used.
- C. 16-inch diameter water mains will be Ductile Iron Pipe per AWWA Standard C151, or as shown on plans and specifications. Where the normal mainline static pressure exceeds 100 psi, AWWA Standard C905, DR18 with a pressure rating of 235 psi or Ductile Iron Pipe must be used.
- D. 20-inch diameter and larger water mains shall be wrapped AWWA C200 ductile iron pipe.
- E. Asbestos cement pipe will not be allowed under any circumstances.
- F. Ductile Iron Pipe shall be polyethylene encased at the discretion of the City Engineer and have approved cathodic protection. (See Part XVIII Special Conditions)
- G. Mains outside the paved roadway or crossing a delineated fault zone (See Part XVIII Special Conditions) shall be Ductile Iron Pipe.

#### **V. CONNECTION TO AN EXISTING PUBLIC WATER MAIN**

- A. Indicate a "hot tap" for connection of service laterals 4-inch in diameter and smaller.
- B. Indicate connection of pipes 4-inch to 12-inch in diameter with a hot tap or a cut-in tee in conformance with the provisions of Detail STD-850. Hot taps will be allowed only when no main line valves are required.
- C. Design a cut-in tee if additional valves are required on the existing main. If the new main/lateral is larger than the existing main, the tee and main/lateral valve will be

the size of the existing main unless it is hydraulically necessary to increase the tee and valve to the size of the new main/lateral. Cut-in tee should not be closer than 3 feet from a joint on existing pipelines.

- D. Tie-ins to the existing City water system must be inspected by a Public Works Inspector and the improvement plans must be so annotated.
- E. Size-on-size taps are not allowed, except with specific approval of the City Engineer. Hot taps shall be two nominal sizes smaller than the main.
- F. Where the street surface is less than five years old, installation methods other than open cutting may be required. The City Engineer as appropriate will determine the requirements based on the condition of the existing street.
- G. Twelve-inch size-on-size taps may be allowed only under emergency situations and with the specific approval of the city engineer.

## VI. ALIGNMENT

- A. Horizontal
  1. Alignment will be in accordance with the provisions of Detail STD- 871.
  2. The minimum allowable radius of curvature for an 8-inch water main is 250 feet, for 10-inch diameter water mains is 300 feet and for a 12-inch water main is 350 feet (or manufacturer's recommended minimum radius, whichever is greater). In situations such as streets that have smaller radius curves, the water system will be designed in straight segments parallel to the sewer or storm drain system so that future locating is simplified.
  3. Conform to the California Department of Public Health Drinking Water-Related Regulations found in the California Code of Regulations, Title 17 and Title 22.  
<http://www.cdph.ca.gov/certlic/drinkingwater/Pages/Lawbook.aspx> for the Separation of Water Mains and Non-Potable Pipelines, **§64572. Water Main Separation** and Detail STD-516.
  4. The minimum horizontal separation between water mains and storm drains monuments, gas, electrical, and telephone lines is 4 feet clear except at crossings.
  5. The minimum clear horizontal separation from a metallic pipeline with an induced current or from an anode field will be 5 feet. Where the new water main will be in proximity to an anode field, special design will be required for approval by the City Engineer.
  6. All public water mains must be designed a minimum 5 feet from all structures, such as manholes or drop inlets. Provide a minimum of 3 feet from the lip of gutter for service connections and repairs. Water mains will be designed a minimum of 5 feet from the edge of easements.
  7. All water main trenches that are parallel to and deeper than the footing of any adjacent structure must be designed at least forty-five (45) degrees

from the footing as required in the Uniform Plumbing Code. Any exceptions must be approved in writing by the City Engineer. (See City Std. 517)

8. Where dual water mains are designed, a minimum 5 feet clear horizontal separation will be maintained.
9. In general, water main crossings over or under other underground facilities will be designed as close as 90° to that facility as possible. Crossings of less than 45° are not allowed.

B. Vertical

1. Conform to the California Department of Public Health Drinking Water-Related Regulations found in the California Code of Regulations, Title 17 and Title 22.  
<http://www.cdph.ca.gov/certlic/drinkingwater/Pages/Lawbook.aspx> for the Separation of Water Mains and Non-Potable Pipelines, **§64572. Water Main Separation** and Detail STD-516.
2. Where dual water mains are designed, a minimum 1-foot clear vertical separation will be maintained.
3. Install felt expansion material between pipes with 1 inch or less vertical clearance.

## VII. MAIN SIZING CRITERIA

- A. A hydraulic analysis is required for all water system design projects. The hydraulic analysis shall be used to verify flow demands and pressure availability for the proposed project. The analysis shall also demonstrate the effect the proposed project will have on the existing distribution system. The hydraulic analysis shall include, as a minimum, the following:
  1. Under peak hour demands (excluding fire demands), the water distribution system shall maintain pressures above 40 psi.
  2. Under peak hour demand plus fire demands, the water system shall maintain pressures above 20 psi. Hydrant flow test data (static pressure, residual pressure and flow) used for design shall be reduced by 10 percent.
  3. Looping of water lines shall be used in design to avoid dead-end water lines.
  4. Velocity in any pipe line shall not exceed 10 fps under any condition.
  5. Head losses in any pipe line shall not exceed 20 psi per 1,000 feet of pipe line.
  6. Provide a separate hydraulic analysis for each phase of the project to confirm adequate system design.
- B. Allowable nominal sizes for public water mains are 8-inch, 12-inch, and 16-inch. Mains larger than 16-inch must have specific approval of the City Engineer.
- C. Public water mains must be sized to meet minimum Fire Code requirements in addition to domestic and irrigation demands. Private fire protection mains must be

sized to meet minimum Fire Code requirements (see Section XII for fire flow requirements).

- D. The minimum new public main size is 8 inches. New public mains serving commercial, industrial and/or multi-family residential developments greater than two units must be a minimum of 12 inches. Existing mains that will serve such proposed uses must be upgraded as needed to meet the current Fire Code.
- E. Analysis and design of water systems will be based upon the criteria listed in the City's Water System Master Plan where applicable. The City Engineer may require increased pipe size for overall system benefit. When the project is required to provide larger water mains than needed for the development, the applicant may apply to the City for oversize reimbursement.

**VIII. MAIN/LATERAL COVER**

- A. Cover is the distance from the top of the pipe to final finished grade measured directly over the pipe.
- B. Typically, the minimum standard depths of cover for public water mains and private fire protection mains are:

Pipe Size	6-inch	8-inch	12-inch	14-inch or Larger
Cover (in.)	36-inch	36-inch	44-inch	48-inch

Ten-inch mains must be specifically approved by the Public Works Department. Sixteen-inch and smaller main line valves shall be resilient seat gate. Eighteen-inch and larger mainline valves shall be butterfly valves. Blow-off valves shall be 2" or 3" ball valves with rotation stops. Standard cover shall be in accordance with Detail STD-850, Note 3.

- C. Where minimum cover is less than standard or greater than 8 feet, special permission from the City Engineer is required. Show mains with nonstandard cover in a profile on the Improvement Plans or Encroachment Permit applications. Where cover is less than the standard, Pressure Class 350 Ductile Iron Pipe is required. (A two-sack sand slurry mix or Control Density Fill (CDF) shall be used in paved sections where trenching within existing streets is being performed.)
- D. Under no condition will cover be less than 36 inches.
- E. The minimum cover for service laterals will be as shown on the appropriate City Standard Plan. Where service laterals have conflicts with other facilities, a detail or profile must be shown on the plans, or the plans must be sufficiently annotated to give clear direction for the installation.

- F. When designing a cut-in tee for a service or main connection that is larger than the existing main, the new assembly must be shown at a depth sufficient to allow the valves to remain below the street subgrade, which may necessitate lowering the existing main.
- G. Service laterals must have minimum cover in accordance with Details STD-863, STD-865, STD-866, STD-867, and STD-868.

**IX. VALVING**

- A. Valving at intersections will be in accordance with the provisions of Detail STD-871. A minimum of three (3) mainline valves are required for "T" intersections and four (4) valves are required for cross intersections.
- B. All hydrants must be on separately valved sections of the public main, including fire lines serving private hydrants.
- C. Any water main which does not have a fire hydrant or lateral connection will have valves designed at approximately 1,000-foot intervals or as required by the City Engineer. Valves shall be spaced so that not more than two fire hydrants are out of service at one time.
- D. Water main valves must be designed outside of concrete areas wherever possible to facilitate repairs.
- E. Main line valves within 250 feet of an intersection may be considered as part of the intersection.

**X. SERVICE LATERALS AND METERS FOR DOMESTIC AND IRRIGATION SERVICE**

- A. Developments shall be provided City domestic and/or irrigation water service via water meters located at the frontage of a public street.
- B. Design meter boxes out of traveled ways and a minimum of 10 feet from street trees whenever possible. On narrow lots, the minimum separation between meter boxes and street trees shall be 6 feet.
- C. Base any required hydraulic calculations for the water meter and service lateral sizes on criteria from AWWA Manual M22 and submit to the City Engineer for approval.
- D. The maximum velocity in domestic, irrigation, fire line, or combination water service laterals from the main to the meter is 15 feet per second.

- E. Maintain a minimum 5 feet horizontal separation between water and sewer laterals.
- F. Meter manifolds other than those shown in various City Detail Drawings will be detailed on the plans and approved by the City Engineer.
- G. Residential (single units).
  - 1. One meter per lot.
  - 2. Provide an individual 1-inch service lateral for a 1-inch meter for each lot.
  - 3. Each lot with fire service to be served by a 1-inch minimum or 1-1/2-inch service per Std. 875. A backflow device shall be required to separate the systems on the site.
- H. Residential with second unit (as defined in the City Zoning Code Section 17.42.170 Second Dwelling or Residential Unit), two SFDs on one lot, and Duplexes.
  - 1. Lot may be served with 1 meter.
  - 2. If a new second unit is constructed and the total water flow for both units exceeds the capacity and allowable velocity of an existing service lateral, based on the criteria established in AWWA Manual M22, the service lateral must be upsized. Otherwise, the existing lateral may be utilized.
  - 3. If the primary unit and the second unit are to be constructed at the same time, design a 1-inch minimum service lateral for the site.
  - 4. The appropriate service lateral must be shown on the Public Improvement Plans and/or Encroachment Permit submitted for approval.
- I. Multi-Family Residential (3 or more units)
  - 1. Each building may be individually metered.
  - 2. For multi-family developments of 4-99 units, whether rental units or separate ownership units, design for individual meters for each unit or master meters with submeters on each unit. Submeters shall be privately owned and maintained.
  - 3. For complexes of 100 units or more, metering will be designed as in (2) above, except that at least two metered connections are required if the project is to be master-metered.
  - 4. See Section X. O. for irrigation meter requirements for any landscaped or common areas.
  - 5. All meters must be within public right-of-way or easements and multiple meters will be clustered where possible.

- J. Condominiums
1. Individual meters shall be clustered and located within the public right-of-way.
  2. A maximum of six meters per manifold.
  3. Separate irrigation meters for common areas are required.
  4. Separate meter for commercial uses (e.g. laundry facilities, clubhouse, etc.) are required.
  5. Condominiums converted from apartments may follow provisions stated in paragraph I, above for existing buildings.
- K. Mobile Home Parks
1. Mobile home parks that have rental spaces shall have a master meter (two master meters if more than 100 spaces) or each unit may have an individual meter. Parks with individually-owned lots must have individual meters. When master meters are used, the mobile home park owner shall sub-meter to the tenants at their own expense, and must comply with PUC Requirements.
  2. Individual City meters must be clustered and located within the public right-of-way or easement.
  3. See Part X. O. for common area irrigation meter requirements.
- L. Mixed residential and commercial uses must have separate meters.
- M. Commercial
1. See Part X. O. below for irrigation requirements.
  2. Size of the meter and service shall be based on calculations made by the Developer's Engineer in accordance with AWWA standards and approved by the City Engineer.
  3. A minimum 1-inch service shall be required.
  4. A minimum 8-inch service for industrial lots and shopping centers on lots of 1 acre or larger.
  5. Commercial installations shall require backflow prevention devices.
- N. Combination Services for Private Fire Service with Domestic and/or Irrigation Service
1. Only 6-inch, 8-inch and 12-inch combination service laterals are allowed.
  2. The combination service lateral must equal or exceed the size of the required fire line and must be hydraulically sized to provide adequately combined domestic, irrigation, and fire flows without exceeding allowable velocity of 15 feet per second.
  3. A minimum 8-inch combination service lateral is required for lots with unknown commercial, multi-family, industrial and shopping centers uses where onsite hydrants are not likely to be required for development.
  4. A minimum 12-inch combination service lateral is required for lots with unknown commercial, multi-family, industrial or shopping center uses where onsite hydrants are likely to be required for development.

O. Irrigation

1. Provide separate irrigation meters for landscaped areas of all commercial or multi-family uses.
2. Provide separate irrigation meters for common areas of all condominium, town home, PUD, apartment complexes, and mobile home parks.
3. Provide reduced pressure backflow devices for all irrigation services. Backflow devices must be specified on the irrigation plan and must conform to Detail STD-876 and current USC Approved List of Devices.
4. Sizing of irrigation meters will be determined by the design professional subject to approval by City Engineer. Irrigation meter size will be determined by the maximum flow required at the meter and will be based on AWWA criteria for meter sizing. Along with landscape and irrigation plans, the applicant must submit the planned square footage of planted areas and categories of plants to be used as selected from the following:
  - a) High water-use plants: turf, annuals, and container plants;
  - b) Moderate water-use plants: ornamental trees, shrubs ground covers, and perennials primarily irrigated by sprinklers. (Note that there may be some use of drip or bubblers in this category but not a predominance.)
  - c) Low water-use plants: drought tolerant plants recognized as having a plant factor of 0.3 or less and irrigated primarily through drip emitters.
5. Irrigation systems shall be constructed with purple pipe and fixtures.

XI. PUBLIC IMPROVEMENTS FOR PRIVATE FIRE SYSTEMS

- A. Design plans showing private fire systems must be submitted to the appropriate Fire and/or Building jurisdiction for approval and may be included with the Public Improvement Plans for the project.
  1. Before combustible materials may be stored or constructed on site, the Fire District must approve fire flow and access.
- B. Generally, the lateral size must be designed the same size or larger than the size required for the fire sprinkler system and/or the private hydrant system. **Caution** - onsite fire system design may necessitate changes to pre-approved public improvements. The hydraulic calculations for laterals serving private fire systems shall be based on the required fire flow per City fire code.
- C. All private fire systems that only serve onsite hydrants require above-ground approved backflow device double check valves in accordance with Detail STD-880. Below-grade devices such as detector checks or backflow devices are not approved.
- D. Double-check detector backflow assemblies are required for:

1. All connections serving commercial fire sprinkler systems; or
  2. Any property with multiple fire service connections; or
  3. Any fire line connections to properties with auxiliary water supply (well).
  4. Private on-site fire hydrants.
- E. Reduced-pressure detectors are required for:
1. Any fire suppression system using chemical additives such as antifreeze or fire suppressants; or
  2. Any building where a potential hazard to the potable water system exists, as determined by the City Engineer.
- F. For one- and two-family detached (duplex) residential fire sprinkler systems:
1. Services shall be designed in conformance with and as shown on City Standard 875, shall be 1-inch minimum and must be located in the public right-of-way or the P.U.E. adjacent to the right-of-way, when required.
  2. Where a fire sprinkler system is to be installed in a single-family residential dwelling, design the service lateral from the street main to the water meter and the water meter to be 1-inch minimum. Larger size service laterals and meters may be permitted where hydraulic calculations indicate the need.
- G. The location of any Fire Department connection must be approved by the Fire Department.
- H. Critical uses such as hospitals, jails, elderly care facilities, and others as determined by the City Engineer and/or the Fire Marshal, require at least two fire line service connections to separately valved sections of the public water main, so that service can be maintained in the event of a main line or service lateral shutdown.
- I. The maximum length of a fire hydrant lateral from a private main to the hydrant bury is 40-feet.

## **XII. FIRE HYDRANTS**

- A. Before combustible materials may be stored or constructed on site, the Fire District must approve fire flow and access. Before a fire hydrant may be placed in service, a high velocity flush of the fire hydrant shall be observed and approved by Public Works Department Personnel.
- B. Design of hydrant locations must meet the Fire Code requirements and be approved by the Fire Department for logistics and by Public Works Utility Services for maintainability.
- C. Each hydrant must be on a separately valved main line section.
- D. Whenever possible, locate hydrants near street intersections.

- E. If it is not possible to locate near an intersection, locate the hydrant near a property line or where it will minimize interference with property use.
- F. Locate hydrants a minimum of 10 feet from roll down of driveways for commercial or multi-family sites and 5 feet from edge of single family detached residential driveway.
- G. On streets with raised medians or with four or more travel lanes, design hydrants on alternate sides of the street per current City Fire Code. Each side of the street will be considered independently relative to hydrant placement per subsections XII-H below.
- H. Residential property with one or two dwelling units per lot - Typical locations.
  - 1. Design hydrants with a maximum of 500 feet spacing, or as approved by the Fire Department.
  - 2. Generally, design hydrants at intersections and then evenly distribute hydrants throughout the project.
  - 3. No one or two-family dwellings may be more than 250 feet from the nearest hydrant.
- I. Commercial, Industrial, and Multi-family (3 or more units) per lot - Typical locations
  - 1. Generally, design hydrants at intersections or driveway entrances and then evenly distribute hydrants throughout the project.
  - 2. No portion of the exterior wall of the facility or building may be more than 150 feet from the nearest hydrant as measured by an approved route around the building per the City Fire Code.
- J. Minimum fire flow required at all hydrants:
  - 1. Fire flow as specified in the following subsections is defined as the amount of water supply available in the water main nearest the flowing hydrant with 20 psi residual pressure.
  - 2. Single- and two-family residential uses require 1,500 gallons per minute flow, except as in subsection I. 4. of this section below.
  - 3. The required fire flows for schools, commercial, industrial, and multi-family residential (3 or more units) uses will be based on the City Fire Code. The water system will be designed so that 1,500 gpm is available from the hydraulically most demanding hydrant and the remaining flow required is available at the next most demanding hydrant(s), up to a maximum of 1,500 gpm per hydrant.
    - a) Industrial areas – 2,500 gallons per minute with a 20-psi residual.
  - 4. Fire flow requirements are under the jurisdiction of the Fire Department. The guidelines given above are general. Actual flow requirements must be verified with the Fire Department prior to submittal of plans. Calculations may be required by the Fire Department to verify the adequacy of the proposed design. Mitigation measures may be required by the Fire Department if the minimum fire flow requirements cannot be met for a specific project.

5. The minimum hydrant lateral size is 6 inches and shall not exceed 50-feet in length without specific written approval of the City Engineer.

### **XIII. BACKFLOW PREVENTION ASSEMBLIES (EXCEPT FOR FIRE LINES)**

- A. Backflow prevention assemblies are required to be designed in accordance with State of California Title 17 and City of Cotati Ordinance.
- B. All backflow prevention assemblies must be listed on the latest revision of the approved USC Foundation for Cross-Connection Control and Hydraulic Research list. Additionally lists of approved backflow prevention devices may be obtained by consultants from the California Department of Public Health, see the following web-site <http://www.cdph.ca.gov/certlic/drinkingwater/Pages/Publications.aspx>
- C. Design backflow prevention assemblies as near as possible to the water meter as shown on Details STD-875, STD-876, STD-879, and STD-880.
- D. Backflow preventers will be designed in accordance with Attachment 1. For uses not listed contact Public Works Utilities or Water Quality.

### **XIV. PRESSURE**

- A. To obtain water system data for these calculations, contact City Public Works Department and Fire Department. A fee will be imposed if flow testing is required.
  1. Maximum allowable main line pressure is 120 psi measured at a fire hydrant.
  2. Fire flows must be calculated by the Engineer in areas of low pressure to determine that minimum fire flow requirements are met.
- B. Mainline
  1. The maximum allowable static pressure in the system is 80 psi. The minimum allowable residual pressure in the system is 35 psi.
  2. The maximum allowable pressure in a high-level zone is calculated by assuming the reservoir full. In the Aqueduct zone or other reduced pressure zones, calculate the pressure by using the high setting of the pressure regulating valve at the nearest aqueduct connection or system regulator.
  3. The minimum allowable pressure in a high-level zone is calculated by assuming the reservoir drawn down 10 feet from the high-water level. In the Aqueduct zone or other reduced-pressure zones, use the low setting of the pressure regulating valve at the nearest aqueduct connection or system regulator.
- C. Domestic service
  1. The minimum allowable pressure is 35 psi measured at the meter. If pressure measured at any faucet is less than 35 psi, a pressure booster system is required.

2. If service pressure measured at any faucet exceeds 80 psi, a private pressure regulating device is required.

## **XV. SPECIALTY VALVES AND WATER SAMPLING STATIONS**

- A. Specific locations will be reviewed for each project by the City Engineer and Public Works Utility Services.
- B. Air release and vacuum relief valves are required that are one pipe diameter or more higher than the remainder of the system, at substantial high points in the system such as over a hilltop or at the upper end of a dead end main.
- C. Design pressure reducing valves to maintain overall system balance and to maintain service pressure levels within the parameters established within these system design standards.
- D. Typically surge or pressure relief valves are to be located near the low points of any high-level pressure zone where discharge may be directed to an approved disposal system.
- E. Water sampling stations are required to provide representative sampling within each pressure zone. At a minimum, eight water sample stations are required in each pressure zone, one at each reservoir, at pump stations, and dead ends.
- F. Fire hydrants shall be used in lieu of blow-off valves at dead ends. Blow-off assemblies in other locations are allowed.

## **XVI. EASEMENTS**

- A. A Public Water System easement must be dedicated to the City over any public water system when it is designed to be installed outside a public right-of-way.
- B. The easement must be a minimum of 15 feet wide. The pipe shall be centered within the easement. Where more than one utility is in an easement, the minimum width shall be increased to a minimum of 20 feet. Additional width may be required by the City Engineer. The easement will be dedicated as a Public Water System easement if it contains water only. It will be dedicated as a public utilities easement if it contains other facilities as well.
- C. Easements must be configured to encompass all publicly maintained appurtenances, such as water service laterals, meters and fire hydrants and will be generally centered over the facility. Separate access easements may be required depending on site conditions. When water mains are to be installed along a property line the easement will be wholly contained on one parcel.

- D. All property restrictions placed as a result of dedication of easements will be so noted on the Subdivision Map or on the Easement Deed if the easement is not dedicated as part of a subdivision. Required notes are:
1. No structures may encroach on, above or below the surface of the ground in any public water easement. This includes footing of foundations or eaves from the roof of any adjacent structure, pools, ponds or outbuildings on slabs or foundations. Decks, sheds, or other structures which may be easily removed for maintenance of the water system may be allowed at the discretion of the City Engineer.
  2. No trees may be planted in a public water easement without first obtaining approval of the City Engineer. Trees may be allowed to the extent that damage to the water system does not occur from root intrusion and adequate access can be provided for maintenance and repair vehicles.

## **XVII. ABANDONMENT OF WATER MAINS AND SERVICES**

- A. Any existing water mains and service laterals that will not be used must be abandoned and must be shown on the Improvement Plans with appropriate notation.
1. For lines 1 inch or smaller, expose lateral at the main, close the corporation stop, disconnect the service and plug or cap the corporation stop, or as directed by City, based on actual field conditions.
  2. For lines 1-1/2 inch or larger, remove the valve and plug the main, or as directed by City, based on actual field conditions.
- B. For all abandoned water services up to and including 2-inch, annotate to remove the valve and saddle and install a full circle clamp on main under Engineering Department/City inspection.
- C. For flanged, tapping tees or mechanical joint tees up to and including 2-inch, annotate the Improvement Plans to remove the valve and install a blind flange or mechanical joint plug under Engineering Department/City inspection.
- D. For all abandoned water services greater than 2-inch annotate on the plans to remove tee, valve and concrete thrust block and the main repaired with approved pipe and suitable couplings under Engineering Department/City inspection.
- E. Valve boxes for abandoned valves must be removed and so noted on the Improvement Plans.
- F. Abandoned mains, valves and risers located within any street structural section or within any new trench must be shown on the Improvement Plans to be removed.
- G. Show all water mains to be abandoned within the public right-of-way as removed or broken every 50 feet and filled with sand slurry pursuant to City Standard 507.

- H. Show all pipes 4 inches and over to be abandoned as removed or plugged every 50 feet.
- I. Where a fire hydrant is to be abandoned, note that the hydrant barrel, break off riser, and check valve are to be removed, the bury is to be capped or plugged, and the lateral abandoned at main as stated above. Abandonment of fire hydrants must be approved by the Fire Department.

## **XVIII. SPECIAL CONDITIONS**

- A. The need for cathodic protection will be determined by the Engineer in coordination with the City Engineer for each project based on soils reports or other additional information.
- B. Delineated Fault Zones
  - 1. Ductile iron pipe must be installed in delineated fault zones and extend to 100 feet outside each side of the delineated fault boundaries.
  - 2. Pumper connections or fire hydrants shall be installed approximately 50 feet outside each side of the delineated fault zone.
  - 3. FLEX-TEND assembly, as manufactured by EBAA Iron, Inc. of Eastland Texas, or City approved alternative, with valve must be installed adjacent to and on the fault side of the pumper connection or fire hydrants.
  - 4. A valve must be located between the FLEX-TEND assembly and the fire hydrant or pumper connection.
- C. Private Water Mains Vs. Public Water Mains
  - 1. Public water mains may not be constructed outside the street right-of-way without specific City Engineer approval.
  - 2. Fire hydrants required on site to serve two or more lots, or properties, will be public systems.
  - 3. Normally, where the water mains are publicly maintained, the sewer mains should also be publicly maintained.
- D. Water mains installed at a slope of 12 percent or greater shall be constructed with restrained joints.
- E. Water mains installed outside of the paved roadway shall be ductile iron pipe and shall have suitable access.

**ATTACHMENT 1: BACKFLOW DEVICE REQUIREMENTS**

<b>APPLICATION</b>	<b>TYPE OF ASSEMBLY</b>
Auto Sales, Painting, Repair, Radiator work	RP
Auxiliary Water Supply (Contaminated Wells, etc.)	RP
Barber Shops	RP
Blood Banks	RP
Boiler Systems (any)	RP
Buildings with Booster Systems	RP
Buildings with 3 or more Stories or with fixtures 30 feet above the service	RP
Buildings with Sewage Ejectors	RP
Buildings with Storage Tanks	RP
Homes with Sewage Lift Stations	RP
Car Wash	RP
Camp Grounds / Trailer Parks	RP
Cement, concrete, Sand & Gravel Plants	RP
Chemical Storage or Processing Facilities	RP
Dairy or Cold Storage	RP
Film Processing	RP
Fire Systems - Business/Residential (sprinklers with or without hydrants or private hydrants)	DC w/Det.Ck.
Fire Systems - w/Sprinkler in Hazardous Locations	RP
Gas Stations	RP
Gray Water System	RP
Heating & Air Conditioning (Using Water)	RP
Hospital or Medical Facility (any) Convalescent or Long Term Care	RP
Irrigation Systems	RP
Irrigation System w/Chemical Feed	RP
Laboratories (Commercial or Research)	RP
Laundry or Dry Cleaner	RP
Manufacturing or Processing (with Toxic Chemicals)	RP
Medical or Dental Facility (any)	RP
Mobile Home Park	DC w/Det. Ck./RP
Ornamental Pools, Ponds or Fountains	RP
Painting Auto Shops	RP
Printing Shops	RP
Radiator Shops (all)	RP
Radioactive Materials	RP
Restaurant	RP
Restricted or Classified Facilities	RP
Schools	RP
Sewage or Storm Drain Facilities	RP

APPLICATION	TYPE OF ASSEMBLY
Steam Cleaning Equipment (any type)	RP
Steam Generation	RP
Swimming Pools (Public and Commercial)	RP
Tank Trucks or Spray Rigs	RP
Veterinary Clinics	RP
Warehousing & Storage	RP
KEY: RP = Reduced Pressure DC w/Det. Ck. = Double Check w/Detector Check	



## APPENDIX A

# ENGINEER'S LIST OF APPROVED ITEMS

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# ENGINEER'S LIST OF APPROVED ITEMS

For use with Storm Drain Standards

## GENERAL

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- Advanced written approval from the City Engineer is required to use "Approved Equal" products.

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### **Standard 202 – Standard Concrete Storm Drain Precast Manhole**

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APPROVED PRODUCTS:

- Central Precast Products Drawing No. 20-48C, 20-48E, and 20-60EC
- KriStar Enterprises, Inc., Model No. DD-48 & DD-60 series bases, riser and cones
- Or “Approved Equal”

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### **Standard 203 – Concrete Storm Drain Precast Manhole Reducer Slabs**

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APPROVED PRODUCTS:

- Central Precast Products Drawing NO. 20-48ERS, 20-60ERS, and 20-60CRS
- KriStar Enterprises, Inc., Model No. DD-48 & DD-60 series slab reducers
- Or “Approved Equal”

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### **Standard 205 – Curb Opening Catch Basin**

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APPROVED PRODUCTS:

- Central Precast Products Model NO. 4A and 3L
- KriStar Enterprises, Inc., Model No. P2448CI & DD P2448B
- Or “Approved Equal”

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### **Standard 206 – Catch Basin for Pipes Larger than 24”**

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APPROVED PRODUCTS:

- Central Precast Products Model No. 3K base and 3K frame and grate (H20, bicycle proof)
- Central Precast Products Model A2 or A4
- Or “Approved Equal”

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### **Standard 208 –Storm Drain Gallery**

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APPROVED PRODUCTS:

- Central Precast Products Model 6Y and 12Y
- Or “Approved Equal”

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### **Standard 210B – 3” x 12 ½” Cast Iron Sidewalk Drain**

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APPROVED PRODUCTS:

- Alhambra Foundry Model A-470 size - 3" x 12 ½"
- Or “Approved Equal”

### **Standard 211 – Storm Drain Marker**

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APPROVED PRODUCTS:

- Almetek's METAL Storm Drain Markers SDS4R0331 BLNAH;
- Or "Approved Equal"

USE: "No Dumping" Label

SPECIFICATIONS:

Blue  
Stainless Steel  
All copy embossed  
Square punched center hole

### **Standard 213 – Side Opening Drop Inlet**

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APPROVED PRODUCTS:

- Central Precast Products Drawing NO. DI-SO (model 2K or larger) H<sub>2</sub>O rated with side openings and ¼" galvanized checker-plate cover
- KriStar Enterprises, Inc., P24 or larger drop inlets with side openings and ¼" galvanized check- plate cover
- Or "Approved Equal"

# ENGINEER'S LIST OF APPROVED ITEMS

For use with Traffic Standards

## PLACEMENT CONSIDERATIONS

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- **Minimum Fixed Objects:** As far away from active travel lane as possible. (General): 1.5 feet from face of curb (road) or 3.0 feet from face of curb at intersections, per AASHTO Roadside Design Guide, Section 10.0. With vertical curbs, 4 feet minimum recommended, 6 feet at outside of curves per AASHTO 10.1.3.1. For urban locations without a vertical curb, lateral offsets of 3.6 m [12 ft] on the outside of horizontal curves and 2.4 m [8 ft] at tangent locations are reasonable goals when the clear zone widths suggested in AASHTO Chapter 3 cannot be achieved.
- **Ped Push Buttons:** Per MUTCD Figure 4E-4
- **Controller Cabinets:** Per MUTCD 4D.33, AASHTO
- **Signal Poles:** At back of sidewalk, unless approved by City Engineer.

## Traffic Signal Standards

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### **POWER SERVICE PEDESTAL**

#### APPROVED PRODUCTS:

- Tesco: 26-000
- Or "Approved Equal"

USE: Power connection and electric meter housing.

#### SPECIFICATIONS:

Caltrans Type III-AF

Type V photoelectric unit (PEU)

12-gauge steel enclosure

Hot dipped galvanized with powder finish coat

- Finish: Dark Olive Green or ANSI 61 Grey, as directed by the City Engineer

NEMA 3R, Raintight

Enclosure shall be factory wired and conform to required NEMA and UL 580A standards.

Plastic covered wiring diagram shall be attached to the inside of the front door.

All nuts, bolts and screws shall be stainless steel, and not visible from the outside.

Control wiring shall be marked at both ends by permanent wire markers.

### **SIGNAL CONTROLLER**

#### APPROVED PRODUCTS:

- McCain
- Or "Approved Equal"

USE: Traffic signal control module.

#### SPECIFICATIONS:

Model 2070E /170E Controller Unit

- Program: 233 (for 170E controllers)

### **SIGNAL CONTROLLER PROGRAM MODULE (PROM MODULE)**

#### APPROVED PRODUCTS:

- Safetran
- Or "Approved Equal"

USE: Platform to interchange programs or data.

#### SPECIFICATIONS:

412C (for 170E controllers)

### **SIGNAL CONTROLLER CABINET**

#### APPROVED PRODUCTS:

- McCain: 332L
- Or "Approved Equal"

USE: Cabinet to house signal controller and related signal equipment.

#### SPECIFICATIONS:

Caltrans Type 332

- Conforms to latest Transportation Electrical Equipment Specifications (TEES)
- Finish: Dark Olive Green or ANSI 61 Grey, as directed by the City Engineer
- High efficiency power supply and mercury free
- Interior lighting when access door(s) are open.

### **SIGNAL BATTERY BACKUP (UPS)**

#### APPROVED PRODUCTS:

USE: Backup power for signals during power outages.

#### SPECIFICATIONS:

### **SIGNAL BATTERY BACKUP (UPS) CABINET**

#### APPROVED PRODUCTS:

- McCain M34196 (Anodized, Caltrans)
- Or "Approved Equal"

USE: Cabinet to house signal controller and related signal equipment.

#### SPECIFICATIONS:

56x26x12, Side mounted cabinet

0.125-inch aluminum

3-point lock

4 shelves

Nema 3R

Thermostatically controlled fan, with louvered vents

Conforms to latest Transportation Electrical Equipment Specifications (TEES)

Powder coated or Anodized

## Traffic Signal Standards

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### PEDESTRIAN PUSH BUTTON SYSTEM

#### APPROVED PRODUCTS: Pedestrian Push Button System

- Polara EZ Communicator Navigator APS (CCU2EN, EN2 PBS), Sign Option V (800H-86).
- Or "Approved Equal"

#### APPROVED PRODUCTS: Pedestrian Signs

- Polara: 800-87 or 800-88
- Or "Approved Equal"

#### USE: Crosswalk pushbuttons.

#### SPECIFICATIONS:

Conforms to MUTCD 2009-4E

Meets ADA guidelines

2 wire system

Ethernet interface

Multiple auditory indications

Custom messages

Vibro-tactile indication

Faceplate:

- MUTCD R10-3
- 5" x 7 ¾"
- Hi-Intensity Retroreflective
- Powder coated aluminum
- Braille

Housing Finish: Green

Other Options:

- Right, Left or Bi-Directional arrows, as applicable
- External button option

### VEHICLE SIGNAL HOUSING, BACKPLATE, VISORS

#### APPROVED PRODUCTS:

- McCain
- Or "Approved Equal"

USE: Signal Housing, backplate and visors for intersection traffic signal heads.

#### SPECIFICATIONS:

##### Housing

- 12-inch diameter
- Aluminum body, type 360
- Glass lens
- Reflector: Aluminum
- Finish: Powder coat, Dark Olive Green (FS595A 14056)

##### Backplate

- 5-inch border
- Aluminum, no louvers
- Finish: Powder coat, Flat black (front), Signal Green (back)

##### Visors

- Tunnel style
- 12-inch diameter
- Aluminum, type 3003
- Finish: Powder coat, black (exterior), flat black (interior)

### SIGNAL FRAMEWORK

#### APPROVED PRODUCTS:

- McCain
- Or "Approved Equal"

USE: Framework to mount traffic signal and pedestrian heads.

#### SPECIFICATIONS:

Schedule 40 wall thickness

Steel

Caltrans standard, configuration as required for application

Adaptors and mounts: Bronze, color to match framework

Finish: Powder coat, Signal Green

## Traffic Signal Standards

---

### **SIGNAL MODULES**

#### APPROVED PRODUCTS:

- General Electric: RX11
- Or "Approved Equal"

USE: Framework to mount traffic signal and pedestrian heads.

#### SPECIFICATIONS:

12-inch diameter  
LED  
On Caltrans qualified product list

### **PEDESTRIAN SIGNAL HOUSING**

#### APPROVED PRODUCTS:

- McCain
- Or "Approved Equal"

USE: Housing for pedestrian signal modules.

#### SPECIFICATIONS:

16-inch housing  
Aluminum type 360  
Finish: Powder coat, signal green

### **PEDESTRIAN MODULES**

#### APPROVED PRODUCTS:

- General Electric      GT1 (PS7-CFF1-26A-J)
- Or "Approved Equal"

USE: Pedestrian crossing signals.

#### SPECIFICATIONS:

16 x 18-inch  
LED  
Overlay Countdown style  
MUTCD and ITE PTCSI Compliant  
On Caltrans qualified product list

## Traffic Signal Standards

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### STREET SIGNS

#### APPROVED PRODUCTS:

- 3M Reflective Sheeting: DG<sup>3</sup> Sheeting 4090 White

USE: Street name signs, regulatory signs.

#### SPECIFICATIONS: Post Top Mounted Street Name

Sign Panel Height: 6-inch

Sign Panel Length (Max): 36-inch

Material: 0.080 Aluminum, Flat

Corner Radius: 0.75-inch

Sheeting: ASTM D4956 and CA MUTCD Section 2 Compliant, Type IX.

Sides: 2

Font Color: White

Back Color: Green

Border: 0.25-inch

Font: FHWA, Uppercase

Letter Series: B-Series

Letter Height (Street Name): 4-inches

Letter Height (Street Type): 2-inches

Private Streets: Include "PVT" at 1.5-inch height under street type (Drive, Avenue, etc.).

#### SPECIFICATIONS: Mast Arm Mounted Street Name

Sign Panel Height: XX-inch

Sign Panel Length (Max): XX-inch

Material: 0.080 Aluminum, Flat

Corner Radius: 0.75-inch

Sheeting: ASTM D4956 and CA MUTCD Section 2 Compliant, Type VII.

Sides: 2

Font Color: White

Back Color: Green

Border: 0.25-inch

Font: FHWA, Uppercase

Letter Series: B-Series

Letter Height (Street Name): XX-inches

Letter Height (Street Type): XX-inches

Private Streets: Include "PVT" at XX-inch height under street type (Drive, Avenue, etc.).

#### SPECIFICATIONS: Regulatory

Sheeting: ASTM D4956 and CA MUTCD Section 2 Compliant, Type IX

# ENGINEER'S LIST OF APPROVED ITEMS

For use with Sewer Design Standards

## **GENERAL**

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- Advanced written approval from the City Engineer is required to use "Approved Equal" products.

## Standard 500 – Standard Precast Concrete Manhole for Sanitary Sewer

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### COVER AND FRAME

#### APPROVED PRODUCTS:

- CertainTeed: PAMREX Manhole Cover
- Or “Approved Equal”

USE: Secure access for sanitary sewer manhole.

#### SPECIFICATIONS:

Ductile iron, ASTM A536  
Hinged Lid with Sanitary Sewer Badge  
AASHTO H-20 load rated  
Elastomeric seating gasket  
Slip resistant, ASTM C1028  
Hinge infiltration plug, closed pick holes

### GRADE RINGS

#### APPROVED PRODUCTS:

- LADTECH, Inc: LADTECH HDPE Adjusting Rings
- Or “Approved Equal”

USE: Adjust manhole frame to street grade.

#### SPECIFICATIONS:

Injection molded HDPE, ASTM D-4976  
AASHTO HS-20 load rated

### EXPANDING ADHESIVE SEALANT

#### APPROVED PRODUCTS:

- SealGuard Inc: X-Seal
- Or “Approved Equal”

USE: Water sealant between cone/grade ring and grade ring/manhole frame.

#### SPECIFICATIONS:

Single component, closed cell, hydrophobic polyurethane  
Water activated  
Expanding foam to fill voids  
Designed for sanitary sewer environment

## Standard 500 – Standard Precast Concrete Manhole for Sanitary Sewer

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### **ADHESIVE TAPE WRAP**

#### APPROVED PRODUCTS:

- Chase Corporation: Tapecoat M50 RC
- Or “Approved Equal”

USE: Water sealant for horizontal concrete and HDPE grade ring joints.

#### SPECIFICATIONS:

Pre-formed, cold-applied, self-adhesive pipe wrap  
Elastomer and resin bonded to a woven highly puncture-resistant polymer  
Adhesive impregnated with an integrated primer  
Thickness: 50 mil ± 2 mils  
Conforms to ASTM C209

### **MANHOLE BASE, BARREL AND CONE STRUCTURE**

#### APPROVED PRODUCTS:

- Oldcastle Precast Inc.
- Jensen Precast
- Cook Concrete Products, Inc.
- Piranha Pipe

USE: Manhole structural components to access sanitary sewer system.

#### SPECIFICATIONS:

Reinforced precast concrete, ASTM C478  
Conforms to type V cement, ASTM C150  
Cast in pipe to manhole connectors  
Match incoming pipe material  
Loading: AASHTO H-20, soil, groundwater

### **MANHOLE INTERIOR COATING**

#### APPROVED PRODUCTS:

- Xypex: Xypex Concentrate
- BASF: MasterSeal 500 (Tegraproof)
- Or “Approved Equal”

USE: Protective coating to reduce groundwater infiltration and corrosion.

#### SPECIFICATIONS:

Concrete coating for sanitary sewer environment

## Standard 500 – Standard Precast Concrete Manhole for Sanitary Sewer

---

### PIPE TO MANHOLE CONNECTORS

#### APPROVED PRODUCTS:

- A-LOK Products: A-LOK X-CEL Compression Connector
- Or “Approved Equal”

USE: Connection for sanitary sewer pipe to manhole.

#### SPECIFICATIONS:

Flexible watertight connector, ASTM C923  
Integrally cast in manhole base or barrel, as applicable  
Nitrile or equivalent if groundwater contamination

### MANHOLE JOINT SEALING COMPOUND

#### APPROVED PRODUCTS:

- Henry Company: RU106 – Rub’R-Nek LTM
- Hamilton Kent: Kent Seal No 2
- Or “Approved Equal”

USE: Apply two continuous rings at manhole horizontal joints to seal for water.

#### SPECIFICATIONS:

Low permeability water sealant for horizontal joints  
Conform to ASTM C990  
Designed for sanitary sewer environment  
Pre-formed, cold applied, adhesive rope-like butyl rubber gasket

### MANHOLE INTERIOR PATCH MATERIAL

#### APPROVED PRODUCTS:

- Xypex: Xypex Patch’n Plug
- Sika Corporation: SikaSet Mortar
- Or “Approved Equal”

USE: Repair interior, horizontal joints, interior lifting rings.

#### SPECIFICATIONS:

Non-shrink  
Non-metallic  
Designed for sanitary sewer environment

## Standard 500 – Standard Precast Concrete Manhole for Sanitary Sewer

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### TRANSITION COUPLINGS

#### APPROVED PRODUCTS:

- Romac Industries, Inc: 501
- Or “Approved Equal”

USE: Slip coupling to protect sewer pipe material transitions from differential settlement at manholes.

#### SPECIFICATIONS:

304 Stainless steel hardware  
Nitrile or equivalent if groundwater contamination  
Designed for sanitary sewer environment

# ENGINEER'S LIST OF APPROVED ITEMS

For use with Water Design Standards

## **GENERAL**

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- All products must be NSF 61 approved for potable water service
- All products with brass or bronze must be Lead free
- Advanced written approval from the City Engineer is required to use "Approved Equal" products.

## Standard 857 - Fire Hydrant and Lateral / Fire Hydrant Location

---

### HYDRANTS

#### APPROVED PRODUCTS:

##### Residential

- Clow Valve Co: #75 (One 4 ½-inch and one 2 ½-inch outlets)

##### Commercial

- Clow Valve Co: #76 (One 4 ½-inch and two 2 ½-inch outlets)

USE: Active fire protection measure.

SPECIFICATIONS: All areas

Maximum distance from fire hydrant to all sides of structure:

Commercial: 450 feet (300-foot supply, 150-foot hose)

Residential: 650 feet (500-foot supply, 150-foot hose)

Color:

Body: "Cotati Green" to match existing City fire hydrants.

Top/Nozzle Caps: Reflective paint color to match NFPA 291 designation, as follows:

Light Blue: 1,500 GPM or greater (Class AA)

Green: 1,000 – 1,499 GPM (Class A)

Orange: 500 – 999 GPM (Class B)

Red: Less than 500 GPM (Class C)

Testing: All hydrants shall be flow tested in a manner acceptable to the City, including collection of static and residual system pressures.

## Standard 863 – 3/4" & 1" Water Service for 5/8" x 3/4" & 1" Meters

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### TRACER WIRE

#### APPROVED PRODUCTS:

- PRO-LINE: Pro-Trace
- or "Approved Equal"

USE: To assist in locating pipes and service lines after they have been buried in the ground.

#### SPECIFICATIONS:

TWHN Solid Core  
Blue  
Insulated Copper Wire #14  
Fasten to pipe  
UL Listed, CSA Certified

### TRACER WIRE SERVICE SPLICE

#### APPROVED PRODUCTS: Split-Bolt Connector

- Grainger: 6CZY5
- Or approved equivalent

#### APPROVED PRODUCTS: Splice Protector

- UraSeal: ES200SV
- Or "Approved Equal"

USE: Splicing the copper service tracer wire into the water main copper tracer wire.

#### SPLIT NUT SPECIFICATIONS:

High strength bronze alloy split nut with copper pressure bar  
Sized to accommodate splice of two 14 AWG wires  
UL Listed, CSA Certified

#### SPLICE PROTECTOR SPECIFICATIONS:

Clamshell-like outer plastic closure to encapsulate the splice  
UL Approved  
Specifically designed for electrical applications up to 600 volts or equivalent by providing a permanent water tight seal.

## Standard 863 – 3/4" & 1" Water Service for 5/8" x 3/4" & 1" Meters

---

### WATER SERVICE LINE

APPROVED PRODUCTS: HDPE Only

- Performance Pipe: Driscoplex 5100 Series Ultraline
- Centennial: CenCore
- Or "Approved Equal"

USE: Customer water service line from water main.

SPECIFICATIONS: HDPE Only

Blue

AWWA C901 / ASTM D2737

PE4710 High Density Polyethylene (HDPE)

SDR 9 (250 psi pressure class)

Copper Tube Size (CTS)

### WATER SERVICE INSERT (HDPE Service Only)

APPROVED PRODUCTS:

- A.Y. McDonald: 6133T
- Or "Approved Equal"

USE: Insert for connections on both ends of HDPE water service lines.

SPECIFICATIONS:

Stainless Steel

### TAPPING SERVICE SADDLE

APPROVED PRODUCTS: ACP/DIP Only

- Mueller Co: BR2B
- Jones: J-979
- Ford: 202B
- Or "Approved Equal"

APPROVED PRODUCTS: C-900 Only

- Mueller: BR2S
- Jones: J-969
- Ford: 202BSD
- Or "Approved Equal"

USE: Tap for customer water service line.

SPECIFICATIONS: HDPE Only

Female Iron pipe Thread (FIPT)

200 psi working pressure

Sealed EPDM O-ring outlet

Brass or bronze body / flattened silicon bronze double straps (**ACP/DIP ONLY**)

Brass or bronze body / 304L stainless steel double straps (**C900 ONLY**)

## Standard 863 – 3/4" & 1" Water Service for 5/8" x 3/4" & 1" Meters

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### **BALL CORPORATION VALVES**

#### APPROVED PRODUCTS:

- Mueller: B-25028N
- Or "Approved Equal"

USE: Customer water service line shut off at water main.

#### SPECIFICATIONS:

Male Iron Pipe Thread (MIPT) for Service Saddle  
Copper Tube Size (CTS) Compression Connection for *new* water services  
Copper Tube Size (CTS) Pack Joint Connection for *retrofit* water services  
100 psi working pressure  
ANSI/AWWA C800  
Brass alloy body (ASTM B62)

### **ANGLE METER BALL VALVES**

#### APPROVED PRODUCTS: Street Side

- Mueller: B-24258N
- Jones: E-1963WSG
- Or "Approved Equal"

#### APPROVED PRODUCTS: House Side

- Mueller: B-24265N
- Jones: E-1966W
- Or "Approved Equal"

USE: Customer water service shut off on both sides of water meter.

#### SPECIFICATIONS:

Female Iron Pipe Thread (FIPT) for house side connection  
Copper Tube Size (CTS) Compression Connection for water service  
Meter swivel nut for meter connections  
100 psi working pressure  
ANSI/AWWA C800  
Brass alloy body (ASTM B62)

## Standard 863 – 3/4" & 1" Water Service for 5/8" x 3/4" & 1" Meters

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### METER BOXES AND COVERS

#### APPROVED PRODUCTS: Boxes (3/4" Meter)

- Oldcastle Precast Inc: B12 Box (Christy)
- Or "Approved Equal"

#### APPROVED PRODUCTS: Boxes (1" Meter)

- Oldcastle Precast Inc: B16 Box (Christy)
- Or "Approved Equal"

#### APPROVED PRODUCTS: Lids (3/4" Meter)

- Oldcastle Precast Inc: B12P / B12-61G (Traffic)
- Or "Approved Equal"

#### APPROVED PRODUCTS: Lids (1" Meter)

- Oldcastle Precast Inc: N16RP / B16-61G (Traffic)
- Or "Approved Equal"

USE: Vault to access angle meter stops and customer meters.

#### SPECIFICATIONS:

High density reinforced concrete box  
Non-settling shoulders  
Reinforce concrete lid with Probe Hole (Non-Traffic Only)  
Polypropylene face: ASTM D1693  
Steel Checker Plate Cover, 6-inch round self-closing reading lid (Traffic Only)

## Standard 864 – 1" Dual Water Service

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### U BRANCH CONNECTION

#### APPROVED PRODUCTS:

- Mueller: H-15363N
- or "Approved Equal"

USE: Yoke to split service at property line for 2 customer meters

#### SPECIFICATIONS:

Copper Tube Size (CTS) Compression Connection for water service  
Male Iron Pipe Thread (MIPT) for meter connection  
Bronze / Brass

### ANGLE METER BALL VALVES

#### APPROVED PRODUCTS: House Side

- Mueller: B-24265N
- Jones: E-1966W
- Or "Approved Equal"

USE: Customer water service shut off on both sides of water meter.

#### SPECIFICATIONS:

Female Iron Pipe Thread (FIPT) for house side connection  
Copper Tube Size (CTS) Compression Connection for water service  
Meter swivel nut for meter connections  
100 psi working pressure  
ANSI/AWWA C800  
Brass alloy body (ASTM B62)

## Standard 883 – Air and Vacuum / Air Release Valve

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### **AIR/VACUUM RELIEF VALVE**

#### APPROVED PRODUCTS:

- Vent-O-Mat: RBX 1621
- Or “ Approved Equal”

USE: Release air, break vacuum on water main line.

#### SPECIFICATIONS:

Solid cylindrical HDPE floats  
Barrel: Stainless Steel AISI 304L  
Top/Bottom Flange: Stainless Steel AISI 304  
National Pipe Thread (NPT) screwed inlet/outlet  
Minimum pressure rating: 276 psi

### **ANGLE BALL VALVE – INLET TO AIR/VACUUM RELIEF**

#### APPROVED PRODUCTS:

- Mueller: B-24274N
- Or approved equivalent

USE: Shut off for air/vacuum relief valve at utility vault.

#### SPECIFICATIONS:

Copper Tube Size (CTS) Compression Connection for water service  
Female Iron Pipe Thread (FIPT) for air/vacuum valve  
100 psi working pressure  
ANSI/AWWA C800  
Brass alloy body (ASTM B62)

### **TRACING WIRE SERVICE**

See Engineering approved Standard 863 for details.

### **TRACING WIRE SERVICE SPLICE**

See Engineering approved Standard 863 for details.

### **WATER SERVICE LINE**

See Engineering approved Standard 863 for details.

### **WATER SERVICE INSERT (HDPE SERVICE ONLY)**

See Engineering approved Standard 863 for details.

### **BALL CORPORATION VALVES – MAINLINE SHUTOFF**

See Engineering approved Standard 863 for details.

## Standard 601 & 604 – Street Tree Planting, Median Island Tree Planting

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### ROOT BARRIER/BIO BARRIER

#### APPROVED PRODUCTS:

- “Deep Root” Universal Barrier UB 24-2, high impact or approved equal.

## **APPENDIX B**

### **CITY OF COTATI - CONSTRUCTION NOTES**

(REQUIRED ON ALL PLANS)

#### **GENERAL NOTES:**

1. ALL MATERIAL WORKMANSHIP AND CONSTRUCTION SHALL CONFORM TO THE CITY OF COTATI STANDARD SPECIFICATIONS AND STANDARD PLANS.
2. FOR ANY WORK IN THE PUBLIC RIGHT OF WAY CONTRACTOR SHALL OBTAIN AN ENCROACHMENT PERMIT FROM THE CITY OF COTATI, 201 WEST SIERRA AVE., COTATI, CA 94931, BEFORE START OF WORK. CONTRACTOR SHALL COMPLY WITH ALL REQUIREMENTS OF THE PERMIT.
3. CONTRACTOR SHALL OBTAIN REQUIRED PERMITS FROM ALL AGENCIES AND PAY ALL FEES PRIOR TO COMMENCEMENT OF ANY WORK.
4. CONTRACTOR SHALL GIVE THE CITY OF COTATI PUBLIC WORKS DEPARTMENT 48 HOURS NOTICE BEFORE STARTING WORK. CALL (707) 792-4610 OR CONTACT AT 201 WEST SIERRA AVE, COTATI, CA. 94931 FOR INSPECTION SERVICES.
5. A PRE-CONSTRUCTION MEETING IS REQUIRED PRIOR TO BEGINNING OF WORK. CONTACT THE CITY ENGINEER TO SCHEDULE SUCH MEETING.
6. WORK HOURS ARE LIMITED TO FROM MONDAY THROUGH FRIDAY 7:00 A.M. TO 7:00 P.M., UNLESS AMENDED BY PROJECT CONDITIONS, INSPECTION WILL BE AVAILABLE MONDAY THROUGH THURSDAY FROM 8:00 A.M. TO 4:30 P.M. CONTRACTORS SHALL SCHEDULE INSPECTIONS 48 HOURS IN ADVANCE BY CALLING (707) 792-4610.
7. ANY DISCREPANCY DISCOVERED BY CONTRACTOR IN THESE PLANS OR ANY FIELD CONDITIONS DISCOVERED BY CONTRACTOR THAT MAY DELAY OR OBSTRUCT THE PROPER COMPLETION OF THE WORK PER THESE PLANS SHALL BE BROUGHT TO THE ATTENTION OF THE CITY ENGINEER AND THE OWNER IMMEDIATELY UPON DISCOVERY. SAID NOTIFICATION SHALL BE IN WRITING.
8. GRADE BREAKS ON CURBS AND SIDEWALKS SHALL BE ROUNDED OFF IN FORMS AND SURFACE FINISHING.
9. SIDEWALK WARPS AND RIGHT OF WAY SHALL BE PROVIDED TO ALLOW A MINIMUM CLEAR 5-FOOT WALKWAY IN ALL LOCATIONS INCLUDING WHERE MAILBOXES, UTILITY POLES, FIRE HYDRANTS, AND GUY WIRES ARE TO BE INSTALLED.
10. THE DEVELOPER ASSUMES ALL RESPONSIBILITY FOR THE APPROVAL OF MAIL BOX LOCATIONS BY THE LOCAL BRANCH OF THE UNITED STATES POST OFFICE.
11. ITEMS SPECIFIED ON THE STANDARD PLANS ARE APPROVED FOR USE BY THE CITY OF COTATI. ALL SUBSTITUTES OR ALTERATIONS SHALL BE SUBMITTED TO THE CITY OF COTATI FOR APPROVAL.

**NOTIFICATION FOR INSPECTIONS:**

APPROVAL OF ALL WORK SHALL BE NECESSARY AT THE COMPLETION OF EACH OF THE FOLLOWING STAGES OF WORK AND SUCH APPROVAL MUST BE OBTAINED BEFORE SUBSEQUENT STAGES OF WORK MAY BE COMMENCED. ADDITIONALLY, THE INSPECTOR SHALL BE NOTIFIED AT LEAST 48 HOURS IN ADVANCE OF ANY OF THE FOLLOWING STAGES OF WORK.

ANY CONSTRUCTION OR EXCAVATION REQUIRING INSPECTION THAT IS UNDERTAKEN WITHOUT INSPECTION IS SUBJECT TO RECONSTRUCTION AND RE-EXCAVATION AT THE CONTRACTOR'S EXPENSE. INSPECTION MUST BE SCHEDULED FOR THE FOLLOWING WORK:

1. COMPACTION AND PREPARATION OF EMBANKMENTS, EXCAVATIONS, AND SUB-GRADE.
2. CONSTRUCTION OF FORMS FOR ALL CONCRETE STRUCTURES, INCLUDING CURBS, GUTTERS, AND SIDEWALKS.
3. PLACING OF CONCRETE IN STRUCTURES, INCLUDING CURBS, GUTTERS AND SIDEWALKS.
4. EXCAVATION AND BEDDING FOR STRUCTURES AND PIPES AND PUBLIC UTILITIES, STORM DRAIN, WATER, AND SEWER FACILITIES, INCLUDING SERVICES AND LATERALS, MUST BE INSPECTED BY THE CITY PRIOR TO BACKFILL.
5. CONSTRUCTION OF ROADSIDE DITCHES AND OTHER DRAINAGE WAYS.
6. PLACING AND COMPACTING OF BASE MATERIAL. IF MORE THAN ONE COURSE OR TYPE OF BASE OR SUB-BASE IS TO BE USED, APPROVAL SHALL BE NECESSARY FOR EACH COURSE AND/OR TYPE.
7. PLACING OF PAVEMENT OR SURFACING. WITHIN 48 HOURS OF PAVING, ALL WATER VALVE BOXES, CLEANOUTS AND MANHOLE FRAMES AND COVERS SHALL BE BROUGHT TO GRADE AND INSPECTED.
8. STRIPING & SIGNING LAYOUT AND PLACEMENT.
9. FINAL CLEAN-UP.

**GRADING NOTES:**

1. A GRADING PERMIT SHALL BE ISSUED BY THE CITY OF COTATI PRIOR TO ANY GRADING SHOWN ON THESE PLANS IN ACCORDANCE WITH CITY GRADING ORDINANCE.
2. THE CONTRACTOR SHALL BE RESPONSIBLE FOR COORDINATING HIS WORK WITH THE GEOTECHNICAL ENGINEER (FILL IN GEOTECHNICAL ENGINEER'S NAME, REPORT TITLE, PROJECT NUMBER AND DATE OF REPORT. INCLUDE SUPPLEMENTARY REPORTS IF THEY EXIST.) ALL GRADING SHALL BE PERFORMED TO THE SATISFACTION OF THE GEOTECHNICAL ENGINEER AND SHALL BE IN CONFORMANCE WITH THE GEOTECHNICAL REPORT AND CHAPTER 33-APPENDIX AND 70-APPENDIX OF THE ADOPTED UNIFORM BUILDING CODE.
3. STREET SUB-GRADE SHALL BE COMPACTED TO 95% RELATIVE COMPACTION TO A DEPTH OF NO LESS THAN 6" IN THE ROADWAY SECTION. ASPHALT CONCRETE AND CLASS 2 AGGREGATE BASE SHALL BE COMPACTED TO 95% RELATIVE COMPACTION.
4. THE USE OF THE SAND CONE METHODS (SUCH AS ASTM 1557 OR CAL 216) FOR DETERMINING FIELD DENSITIES WILL NOT BE ALLOWED AS A SUBSTITUTE FOR NUCLEAR GAUGE TESTING.
5. ALL EXISTING WELLS, SEPTIC TANKS AND/OR UNDERGROUND FUEL STORAGE TANKS SHALL BE ABANDONED UNDER PERMIT AND INSPECTION OF THE SONOMA COUNTY ENVIRONMENTAL HEALTH DEPARTMENT OR OTHER DESIGNATED AGENCY.
6. ANY EXCESS MATERIALS SHALL BE CONSIDERED THE PROPERTY OF THE CONTRACTOR AND SHALL BE PROPERLY DISPOSED OF AWAY FROM THE JOB SITE IN ACCORDANCE WITH APPLICABLE LOCAL, STATE AND FEDERAL REGULATIONS.
7. TESTING AND OBSERVATION SHALL BE DONE IN ACCORDANCE WITH THE CITY'S QAP OR THE SOIL ENGINEERS RECOMMENDATIONS, WHICHEVER IS MORE RESTRICTIVE. REPORTS SHALL BE SUBMITTED WEEKLY TO THE CITY.

**GENERAL UNDERGROUND NOTES:**

1. UNDERGROUND OBSTRUCTIONS MAY BE ENCOUNTERED THAT ARE NOT SHOWN ON THESE PLANS. THOSE SHOWN ARE BASED ON THE BEST INFORMATION AVAILABLE AND THE CONTRACTOR IS CAUTIONED THAT THE OWNER, THE ENGINEER, AND THE CITY OF COTATI ASSUME NO RESPONSIBILITY FOR ANY OBSTRUCTIONS EITHER SHOWN OR NOT SHOWN ON THESE PLANS. THE CONTRACTOR SHALL COOPERATE WITH ALL UTILITY COMPANIES WORKING WITHIN THE LIMITS OF THIS PROJECT.
2. CONTRACTOR SHALL NOT BEGIN EXCAVATION UNTIL ALL EXISTING UTILITIES HAVE BEEN MARKED IN THE FIELD BY THE APPLICABLE ENTITY RESPONSIBLE FOR THAT PARTICULAR UTILITY. THE CONTRACTOR SHALL NOTIFY EACH APPLICABLE ENTITY AT LEAST 48 HOURS BEFORE STARTING WORK. HAND DIGGING IS REQUIRED IF TRENCH IS WITHIN 12" OF ANY EXISTING UTILITY.
3. UNDERGROUND SERVICE ALERT: CALL TOLL FREE (800) 227-2600 OR 811 AT LEAST 48 HOURS PRIOR TO EXCAVATION.
4. PRIOR TO CONSTRUCTION CONTRACTOR SHALL POTHOLE EXISTING BURIED UTILITIES WITH UTILITY OWNER TO VERIFY LOCATIONS AND ELEVATIONS OF UTILITIES IF WITHIN 1 FT HORIZONTAL/VERTICAL OF NEW UTILITIES. BURIED UTILITIES INCLUDE BUT ARE NOT LIMITED TO WATER MAINS AND SERVICES, SEWER MAIN AND LATERALS, STORM DRAINS, GAS MAINS AND LATERALS, ELECTRICAL DISTRIBUTION LINES AND TELEPHONE LINES. ALL UTILITIES CONFLICTING WITH THE PROPOSED CONSTRUCTION SHALL BE RESOLVED PRIOR TO THE START OF CONSTRUCTION.
5. THE CONTRACTOR SHALL VERIFY EXISTING INVERTS PRIOR TO THE COMMENCEMENT OF ANY CONSTRUCTION. DISCREPANCIES SHALL BE BROUGHT TO THE CITY ENGINEER'S ATTENTION IMMEDIATELY.
6. DISTANCES AND INVERTS ARE TO AND AT THE CENTER OF THE MANHOLES, CLEANOUTS, DROP INLETS, CATCH BASINS, AND YARD DRAINS OR AS MARKED ON THE DRAWINGS.
7. ALL EXISTING OVERHEAD UTILITIES AND RELATED ABOVE GROUND FEATURES ON SITE AND ALONG PROJECT BOUNDARIES SHALL BE PLACED UNDERGROUND UNLESS OTHERWISE APPROVED BY THE CITY.
8. ALL UNDERGROUND IMPROVEMENTS SHALL BE INSTALLED AND ACCEPTED BY THE CITY PRIOR TO PAVING. FINAL PAVING AND STRIPING ONLY AFTER SITE IMPROVEMENTS ARE COMPLETED.
9. THE CONTRACTOR SHALL STAMP THE LETTER "S" ON THE FACE OF CURB DIRECTLY ABOVE THE SEWER LATERAL, AND THE LETTER "W" ON THE FACE OF CURB DIRECTLY ABOVE WATER SERVICES, AND "B" ON FACE OF CURB DIRECTLY ABOVE A BLOW OFF OR AIR RELIEF VALVE. AT A DRIVEWAY THE STAMP SHALL BE PLACED AT THE LIP OF GUTTER. THE LETTERS SHALL BE 4" HIGH AND COMPLETELY LEGIBLE.
10. ALL MATERIAL, WORKMANSHIP AND CONSTRUCTION DETAILS SHALL CONFORM TO THE CITY OF COTATI DESIGN AND CONSTRUCTION STANDARD SPECIFICATIONS, INCLUDING ALL ADDENDA, STANDARD PLAN REVISIONS AND SPECIAL PROVISIONS.
11. SURFACE MOUNTED TRANSFORMERS SHALL NOT BE USED UNLESS LOCATION OF SUCH UTILITIES ARE SHOWN ON THE PLANS AND APPROVED BY THE CITY.
12. ALL UTILITY CONDUITS SHALL BE PLACED BENEATH THE STRUCTURAL SECTION OF THE ROADWAY. TRAFFIC DETECTOR LOOPS ARE EXEMPTED.

**DUST CONTROL NOTES:**

1. THE CONTRACTOR SHALL BE RESPONSIBLE TO PROVIDE DUST CONTROL MEASURES FOR THE ENTIRE CONSTRUCTION PERIOD OF THIS PROJECT TO THE SATISFACTION OF THE CITY ENGINEER.
2. CONSTRUCTION EQUIPMENT SHALL BE MAINTAINED IN PROPER WORKING ORDER AND SHALL NOT BE ALLOWED TO IDLE FOR A PERIOD OF LONGER THAN 30 MINUTES.
3. TO MINIMIZE FUGITIVE DUST AND THE RELEASE OF PM10, THE CONTRACTOR SHALL IMPLEMENT A DUST CONTROL PROGRAM. DUST CONTROL MEASURES SHALL INCLUDE, BUT ARE NOT LIMITED TO, THE FOLLOWING:
  - A. ACTIVE CONSTRUCTION SITE SHALL BE WATERED AS NEEDED, PREFERABLE IN THE LATE MORNING AND WHEN WORK HAS CEASED FOR THE DAY.
  - B. STOCKPILES OF LOOSE MATERIAL SHALL BE COVERED AT ALL TIMES, EXCEPT WHEN THIS WOULD INTERFERE WITH IMMEDIATE CONSTRUCTION ACTIVITIES.
  - C. ALL CLEARING, GRADING, EARTH MOVING OR EXCAVATION ACTIVITIES SHALL CEASE WHEN THE AVERAGE WIND SPEED FOR ONE HOUR EXCEEDS 20 MILES PER HOUR (MPH).
  - D. THE AREA DISTURBED BY EXCAVATION OR GRADING SHALL BE KEPT TO THE MINIMUM REQUIRED TO IMPLEMENT THE PROJECT.
  - E. WHEN TRAVELING ON EXPOSED SOILS, CONSTRUCTION SITE VEHICLE SPEED SHALL BE LIMITED TO 15 MPH.
  - F. HAUL VEHICLES SHALL BE COVERED WHEN NOT ACTIVELY ENGAGED IN SITE CONSTRUCTION ACTIVITY.
  - G. STREETS SHALL BE SWEPT REGULARLY AND KEPT FREE OF DIRT AND DEBRIS.
4. ANY PROJECT RELATED DEBRIS AND WASTE SHALL BE DISPOSED OF IN ACCORDANCE WITH APPLICABLE FEDERAL, STATE AND LOCAL STATUTES AND REGULATIONS.

### **EROSION CONTROL NOTES:**

1. A NOTICE OF INTENT SHALL BE FILED BY THE OWNER FOR ALL PROJECTS OVER ONE (1) ACRE IN AREA, OR IF OTHERWISE REQUIRED BY THE STATE GENERAL CONSTRUCTION STORM WATER PERMIT. THE CONTRACTOR SHALL PROVIDE THE NUMBER TO THE CITY PRIOR TO ANY CONSTRUCTION, AND SHALL COMPLY WITH ALL REQUIREMENTS OF THE PERMIT.
2. EROSION CONTROL MEASURES SHALL BE INSTALLED AND IN PLACE BETWEEN OCTOBER 1 AND APRIL 30. INSTALLATION SHALL BE IN ACCORDANCE WITH THE APPROVED EROSION CONTROL PLAN AND MODIFIED AS NEEDED OR DIRECTED BY THE CITY.
3. THE CONTRACTOR SHALL BE RESPONSIBLE FOR CONSTANT MAINTENANCE OF EROSION CONTROL MEASURES. SITE EROSION CONTROL SHALL BE INSPECTED BY THE CONTRACTOR AND CLEANED IF NECESSARY, AFTER EVERY STORM.
4. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE CLEANUP OF MUD AND DEBRIS CARRIED ONTO SURROUNDING STREETS TO THE SATISFACTION OF THE CITY ENGINEER.
5. ALL GRADED AREAS AND EXPOSED SOIL WITHIN THIS PROJECT SHALL BE SEEDED FOR EROSION CONTROL BY THE CONTRACTOR. SEED AND MULCH WILL BE APPLIED BY OCTOBER 1ST TO ALL CUT AND FILL SLOPES WITHIN OR ADJACENT TO PROJECT ROADS. SEED AND FERTILIZER WILL BE APPLIED HYDRAULICALLY OR BY HAND AT THE RATES SPECIFIED BELOW. ON SLOPES, STRAW WILL BE APPLIED BY BLOWER OR BY HAND AND ANCHORED IN PLACE BY PUNCHING.
6. ALL CRITICAL EARTHWORK OPERATIONS SHALL BE PERFORMED DURING THE DRY WEATHER SEASON, FROM MAY 1ST TO OCTOBER 1ST OR AS OTHERWISE APPROVED BY THE CITY ENGINEER. THE CLEARING OF EXISTING VEGETATION SHALL BE CONFINED TO WITHIN THE LIMITS OF ACTUAL EARTHWORK. INCREMENTAL DEVELOPMENT SHALL BE REQUIRED TO ENSURE THAT THE AMOUNT OF LAND CLEARED AT ANY TIME IS LIMITED TO THE AREA THAT CAN BE DEVELOPED DURING THE CONSTRUCTION PERIOD. STORM WATER SHALL NOT BE ALLOWED TO FLOW DIRECTLY DOWN UNPROTECTED SLOPES. ENERGY DISSIPATING STRUCTURES AND EROSION CONTROL DEVICES SHALL BE PLACED AT ALL DRAINAGE OUTLETS WHICH DISCHARGE TO THE STORM DRAIN AS SHOWN ON THESE PLANS. ALL SEDIMENT TRAPS SHALL BE MAINTAINED BY THE OWNER UNTIL SUCH TIME AS THE CITY ACCEPTS MAINTENANCE RESPONSIBILITY.

**STORM DRAIN NOTES:**

1. STORM DRAIN PIPE SHALL BE REINFORCED CONCRETE, HIGH DENSITY POLYETHYLENE, OR CAST IN PLACE CONCRETE PIPE CONFORMING TO CALTRANS STANDARD SPECIFICATIONS. CAST IN PLACE PIPE MAY NOT BE USED IN EXISTING STREETS WITHOUT THE EXPRESS AUTHORIZATION OF THE CITY ENGINEER.
2. THE MINIMUM COVER OVER STORM DRAIN PIPE SHALL BE 24" MEASURED FROM SUB GRADE AND THE MAXIMUM ALLOWABLE COVER SHALL BE LIMITED TO 11 FEET MEASURED FROM FINISHED SURFACE.
3. TRENCHING, BACKFILL AND RESURFACING FOR STORM DRAIN PIPE SHALL BE IN ACCORDANCE WITH CITY STANDARD 201.
4. ALL STORM DRAIN MANHOLES SHALL BE A MINIMUM OF 48" IN DIAMETER PER CITY STANDARD 202. UNLESS OTHERWISE NOTED, MANHOLE FRAME AND COVER SHALL HAVE 24" CLEAR OPENING, AND BE HEAVY DUTY NON-ROCKING. RAISED LETTERS ON TOP OF THE COVER SHALL READ "STORM DRAIN". PIPES SHALL NOT PROTRUDE INSIDE THE MANHOLE AND PIPE ENDS SHALL BE ROUNDED.
5. STORM DRAIN WITHIN CITY MAINTAINED ROADS SHALL BE MINIMUM 18 INCH DIAMETER, WITH THE EXCEPTION OF LATERALS WHICH MAY BE 15 IN. DIAMETER.
6. PRIOR TO ACCEPTANCE OF THE STORM DRAIN SYSTEM, THE CONTRACTOR SHALL VIDEO ALL STORM DRAIN LINES TO ENSURE THEY ARE FREE AND CLEAR OF ALL DEBRIS AND SILT. ALL VIDEO SHALL BE SUBMITTED TO THE CITY WITH WRITTEN REPORTS AND SHALL BE SUBJECT TO REVIEW AND APPROVAL. IF CLEANING OF THE PIPES IS NEEDED, THE CONTRACTOR SHALL NOT BE ALLOWED TO WASH SILT AND/OR DEBRIS INTO THE EXISTING CITY STORM DRAIN SYSTEM INCLUDING ANY CREEKS OR OPEN WATERWAYS.

## **SIGNING, STRIPING AND PAVEMENT MARKINGS:**

1. CONTRACTOR SHALL NOTIFY THE CITY PUBLIC WORKS DEPARTMENT AT (707)792-4610, OF HIS INTENT TO PLACE ANY PAVEMENT MARKER, TRAFFIC STRIPE, PAVEMENT MARKING, AND PAVEMENT LEGEND LAYOUT LINES 10 WORKING DAYS BEFORE THE MARKER AND STRIPING WORK IS TO BE PERFORMED. ALL LABOR EQUIPMENT AND MATERIALS SHALL BE PROVIDED BY THE CONTRACTOR.
2. ALL LAYOUT WORK IS TO BE PERFORMED BY THE CONTRACTOR AND SHALL BE FIELD APPROVED BY A CITY INSPECTOR BEFORE THE ACTUAL WORK BEGINS.
3. PAVEMENT MARKERS AND TRAFFIC STRIPE DETAIL REFERENCE NUMBERS ARE SHOWN ON CALTRANS STANDARD PLAN SHEETS A20-A, A20-B, AND A20-C.
4. ROADSIDE SIGNS: ROADSIDE SIGNS SHALL BE AS SHOWN ON THE PLANS, IN ACCORDANCE WITH THE PROVISIONS OF SECTION 56, "SIGNS", OF THE STATE STANDARD SPECIFICATIONS, AND AS DIRECTED BY THE CITY.
5. SIGN PANELS SHALL CONFORM TO THE CURRENT CALTRANS SIGN PANEL SPECIFICATIONS.
6. LOCATIONS OF ALL SIGNS, MARKERS, AND DELINEATIONS SHALL BE AS SHOWN ON THE PLANS AND AS DIRECTED BY THE CITY.
7. MARKERS AND DELINEATORS: MARKERS AND DELINEATORS SHALL BE AS SHOWN ON THE PLANS AND IN ACCORDANCE WITH THE PROVISIONS OF SECTION 82, "MARKERS AND DELINEATORS" OF THE STATE STANDARD SPECIFICATIONS AND AS DIRECTED BY THE CITY ENGINEER.
8. TRAFFIC STRIPES AND PAVEMENT MARKINGS: TRAFFIC STRIPES AND PAVEMENT MARKINGS SHALL BE AS SHOWN ON THE PLANS, IN ACCORDANCE WITH THE PROVISIONS OF SECTION 84, "TRAFFIC STRIPES AND PAVEMENT MARKINGS" OF THE STATE STANDARD SPECIFICATIONS AND THESE SPECIAL PROVISIONS, AND AS DIRECTED BY THE CITY.
9. ALL TRAFFIC STRIPES AND PAVEMENT MARKINGS, INCLUDING STOP LINES, AND ALL CHANNELIZING LINES SHALL BE THERMOPLASTIC.
10. THERMOPLASTIC TRAFFIC STRIPES AND PAVEMENT MARKINGS: THERMOPLASTIC TRAFFIC STRIPES AND PAVEMENT MARKINGS SHALL CONFORM TO THE PROVISIONS OF SECTION 84-2, "THERMOPLASTIC TRAFFIC STRIPES AND PAVEMENT MARKINGS" OF THE STATE STANDARD SPECIFICATIONS.
11. THERMOPLASTIC MATERIAL SHALL BE APPLIED AT A MINIMUM THICKNESS OF 0.125 INCH.
12. PAVEMENT MARKERS: PAVEMENT MARKERS SHALL BE IN ACCORDANCE WITH THE PROVISIONS OF SECTION 85, "PAVEMENT MARKERS" OF THE STATE STANDARD SPECIFICATIONS. PAVEMENT MARKERS SHALL BE PLACED TO THE LINE ESTABLISHED BY THE CITY.
13. PAINTED/THERMOPLASTIC STRIPES AND PAVEMENT MARKINGS: EXISTING PAINTED/THERMOPLASTIC TRAFFIC STRIPES AND PAVEMENT MARKINGS WHICH CONFLICT WITH THE NEW TRAFFIC STRIPING AND PAVEMENT MARKING PLANS SHALL BE REMOVED BY THE CONTRACTOR, IN ACCORDANCE WITH SECTION 15 OF STATE STANDARD SPECIFICATIONS, EXCEPT THAT BLAST CLEANING SHALL NOT BE PERMITTED.
14. RAISED PAVEMENT MARKER REMOVAL: EXISTING RAISED PAVEMENT MARKERS WHICH CONFLICT WITH THE NEW TRAFFIC STRIPING AND PAVEMENT MARKING PLAN SHALL BE REMOVED BY THE CONTRACTOR IN ACCORDANCE WITH SECTION 15 OF THE STATE STANDARD SPECIFICATIONS.

#### **ENVIRONMENTAL CONDITIONS NOTES:**

1. DURING CONSTRUCTION, THE CONTRACTOR SHALL BE RESPONSIBLE FOR CONTROLLING NOISE, ODORS, DUST AND DEBRIS TO MINIMIZE IMPACTS ON SURROUNDING PROPERTIES AND ROADWAYS. CONTRACTOR SHALL BE RESPONSIBLE TO ASSURE THAT ALL CONSTRUCTION EQUIPMENT IS EQUIPPED WITH MANUFACTURERS APPROVED MUFFLER'S AND BAFFLES. FAILURE TO COMPLY MAY RESULT IN THE ISSUANCE OF A STOP WORK ORDER.
2. IN THE EVENT THAT ARCHEOLOGICAL SITE INDICATORS (CHIPPED CHERT, OBSIDIAN TOOLS, WASTE FLAKES, GRINDING IMPLEMENTS, DARKENED SOIL CONTAINING BONE FRAGMENTS AND SHELLFISH REMAINS, OR CERAMICS, GLASS OR METAL FRAGMENTS) ARE UNCOVERED, THE CITY ENGINEER SHALL BE CONTACTED IMMEDIATELY. ALL GROUND DISTURBING WORK SHALL CEASE IN THE VICINITY OF ANY DISCOVERY UNTIL AN ARCHEOLOGIST COMPLETES AN EVALUATION OF SIGNIFICANCE.
3. IF HAZARDOUS MATERIALS ARE ENCOUNTERED DURING CONSTRUCTION, THE CONTRACTOR SHALL HALT CONSTRUCTION IMMEDIATELY, NOTIFY THE CITY, AND IMPLEMENT REMEDIATION (AS DIRECTED BY THE CITY OR ITS AGENT) IN ACCORDANCE WITH ANY REQUIREMENTS OF THE SONOMA COUNTY ENVIRONMENTAL HEALTH DEPARTMENT AND THE NORTH COAST REGIONAL WATER QUALITY CONTROL BOARD.
4. THE CONTRACTOR SHALL BE REQUIRED TO MAINTAIN TRAFFIC FLOW ON AFFECTED ROADWAYS DURING NON-WORKING HOURS, AND TO MINIMIZE TRAFFIC RESTRICTION DURING CONSTRUCTION. NO EXITING STREET SHALL BE ALLOWED TO BE COMPLETELY CLOSED WITHOUT THE EXPRESSED WRITTEN PERMISSION OF THE CITY ENGINEER. THE CONTRACTOR SHALL BE REQUIRED TO FOLLOW TRAFFIC SAFETY MEASURES IN ACCORDANCE WITH THE CALTRANS "MANUAL OF TRAFFIC SAFETY CONTROLS FOR CONSTRUCTION AND MAINTENANCE WORK ZONES." THE CITY'S EMERGENCY SERVICE PROVIDERS SHALL BE NOTIFIED OF PROPOSED CONSTRUCTION SCHEDULED BY THE CONTRACTOR(S). THE CONTRACTOR(S) SHALL NOTIFY EMERGENCY SERVICE PROVIDERS IN WRITING AT LEAST 48 HOURS IN ADVANCE OF ITS PROPOSED SCHEDULE OF WORK.
5. A TRAFFIC HANDLING PLAN SHALL BE DELIVERED TO THE CITY ENGINEER FOR REVIEW 10 WORKING DAYS BEFORE CONSTRUCTION BEGINS.
6. CONSTRUCTION TRAFFIC SHALL BE LIMITED TO THE FOLLOWING HAUL ROUTE: (THE ENGINEER SHALL FILL IN THE HAUL ROUTES TO BE USED. CONSTRUCTION TRAFFIC SHALL BE CONFINED TO MAJOR STREETS.)
7. ALL TREE PROTECTION FENCING MUST BE INSTALLED AND INSPECTED PRIOR TO COMMENCEMENT OF GRADING OPERATIONS. FENCING SHALL BE MAINTAINED THROUGHOUT THE CONSTRUCTION PERIOD.

### STREET LIGHTING NOTES:

1. ALL WIRING METHODS AND EQUIPMENT CONSTRUCTION SHALL CONFORM TO THE CURRENT NATIONAL ELECTRICAL CODE.
2. ALL WIRING SHALL BE IN APPROVED CONDUIT. ALL CONDUITS SHALL BE A MINIMUM OF 2" DIAMETER, SCHEDULE 40 P.V.C. (POLYVINYL CHLORIDE), EXCEPT FROM EACH STREET LIGHT TO THE ADJACENT PULL BOX WHICH MAY BE 1" DIAMETER PVC OR METAL, AND SHALL HAVE THE FOLLOWING COVER FROM TOP OF CONDUIT.
  - A. WITHIN SIDEWALK OF PARKWAY AREAS: 2' - 0" MIN.
  - B. WITHIN ROADWAY AREAS: 4' - 0" MIN.
3. ALL METAL CONDUIT AND OTHER METAL PARTS SHALL BE CONTINUOUSLY BONDED AND GROUNDED.
4. ALL BENDS AND/OR OFFSETS SHALL BE MADE WITH FACTORY SECTIONS.
5. UNLESS OTHERWISE APPROVED BY THE CITY ENGINEER, OLDCASTLE B16 PULL BOX SHALL BE USED AT ALL STREET LIGHT STANDARDS.
6. ALL PULL BOXES SHALL BE PER STD. 303
7. JUNCTION BOXES SHALL BE NOT MORE THAN 250' APART ON LONG RUNS.
8. WHEN PULL BOXES ARE SUBJECT TO VEHICULAR TRAFFIC, THEY SHALL BE SET ON CONCRETE FOOTINGS AND CAST IRON TRAFFIC COVERS SHALL BE INSTALLED.
9. ALL SPLICES SHALL BE MADE WITH APPROVED SOLDERLESS WATERPROOF CONNECTORS OF THE PROPER SIZE PER NEC 300-15. (EXAMPLE: WIRENUT OR SPLIT BOLT PLUS TAPE PLUS COATING.) ALL SPLICES SHALL BE LOCATED IN AN APPROVED BOX.
10. ALL EMPTY CONDUITS SHALL HAVE A 1/4" NYLON PULL ROPE PROVIDED INSIDE.
11. ALL CONDUITS SHALL BE SEALED WITH AN APPROVED DUCT SEAL. CONDUITS STUBBED FOR FUTURE EXTENSION SHALL BE CAPPED.
12. ALL STREET LIGHTING PROJECTS ARE SUBJECT TO APPROVAL BY THE CITY ENGINEER.
13. ALL PULL BOX COVERS SHALL BE SECURED WITH BRASS HOLD DOWN BOLTS AND INSCRIBED, "STREET LIGHTING".
14. STREET LIGHT SPACING SHALL BE A MAXIMUM OF 200' FOR MINOR/COLLECTOR STREETS, 100' FOR MAJOR STREETS, OR LESS TO MEET CITY'S STREET LIGHTING REQUIREMENTS. STREET LIGHT SPACING SHALL BE STAGGERED AND LOCATED AT PROPERTY LINES WHEN POSSIBLE.
15. ALL STREET LIGHTS EQUIPPED WITH A PHOTOCELL CONTROL SHALL HAVE THE PHOTOCELL ORIENTED TO THE NORTH.
16. ALL WIRE SHALL BE THHN A.W.G. THE MINIMUM SIZE SHALL BE #8.
17. PROPERTY-SIDE SHIELDS SHALL BE PROVIDED ON ALL STREETLIGHTS WITH ADJACENT RESIDENTIAL UNITS, AND ARE SUBJECT TO APPROVAL BY THE CITY ENGINEER.

18. THE CITY SHALL PROVIDE NUMBER SEQUENCE FOR SIGNAL AND STREET LIGHTS.
19. THE DEVELOPER/ENGINEER SHALL MAKE ARRANGEMENTS FOR SERVICE POINTS WITH P.G. & E. THE DEVELOPER SHALL BE RESPONSIBLE FOR ALL COSTS ASSOCIATED THEREWITH WHICH SHALL BE PAID DIRECTLY TO P.G. & E. THE CONTRACTOR SHALL VERIFY THE STREET LIGHT SERVICE POINT LOCATION(S) WITH P.G. & E. PRIOR TO CONSTRUCTION.
20. ALL STREET LIGHT SYSTEMS SHALL BE DESIGNED FOR 120 VOLT SERVICE UNLESS CONNECTING TO AN EXISTING SYSTEM. IN THE LATTER CASE, THE DESIGN SHALL CONFORM TO THE SYSTEM BEING CONNECTED TO AND MUST BE SPECIFICALLY APPROVED BY THE CITY ENGINEER.
21. THE CURRENT TO BE USED TO DETERMINE CONDUCTOR SIZES SHALL BE DETERMINED AS FOLLOWS:

$$\frac{\textit{Total Wattage of Fixtures Served}}{\textit{Service Voltage}} \times 3.5$$