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**PURPOSE AND INTENT**

The purpose and intent of this document is to clarify and consolidate present design criteria in the City of Morgan Hill. These standards are understood to be the minimum acceptable and more rigorous standards may be required depending on the nature of the development.

SCOPE

The Design Standards as hereinafter specified shall be used as the basis of design for all development within the jurisdiction of the City of Morgan Hill.

FINAL AUTHORITY

The Director of Public Works is the final authority on all questions which may arise as to the interpretation of these standards.

GENERAL NOTES

Required City General Notes for all improvement plans are included as Appendix A of these Design Standards.

CHECK LIST

An Improvement Plan checklist is included as Appendix B of these Design Standards. Its purpose is to familiarize the development engineer with most of the items checked by the City to ensure compliance and completeness of improvement plans.

The development engineer shall provide a checked-off copy of the checklist when submitting the plans for initial review. Any areas not applicable, not in compliance or requiring a variance from these design standards shall be so noted.



STREET DESIGN STANDARDS

SECTION 1

1.100 GENERAL

All streets shall be designed in accordance with accepted engineering principles and shall conform to these Design Standards.

1.200 STREET RIGHTS OF WAY

Right-of-way widths and typical sections for various classes of streets, including private roads, shall conform to the latest edition of the City of Morgan Hill Standard Details For Construction.

1.300 ALLEY RIGHTS OF WAY

The minimum width of an alley shall be 20 feet with a 20-foot paved roadway.

1.400 STRUCTURAL SECTION

1.401 Subgrade Relative compaction for at least the top 8 inches of subgrade shall be 95%. In areas of fill, a minimum of 24 inches from finished grade shall be compacted to 95% relative compaction.

1.402 Pavement Pavement shall be designed in accordance with the procedures contained in the State of California Department of Transportation Highway Design Manual.

The Traffic Index shall be established by the Public Works Department.

A certified soils laboratory shall conduct the necessary soils report and shall recommend the pavement section and address the relative expansiveness of the soil.

The minimum structural section shall be 4-inches of asphalt concrete over 8-inches of aggregate base or an alternative full-depth asphalt concrete section of 7-inches, if approved by City.

1.500 HORIZONTAL ALIGNMENT

1.501 Intersection Angle Streets shall intersect at right angles. Curved streets shall have at least 50 feet of centerline tangent from the projected curb line of the intersecting street.

1.502 Opposing Streets All streets entering upon opposite sides of any given street shall have their centerline directly opposite each other or separated by at least 150 feet.

1.503 Street Curvature Design of curved arterial and collector streets shall be based on the State of California Department of Transportation Highway Design Manual. The minimum radius of curvature of centerline shall be 750 feet on arterials and 500 feet on collectors. Minimum radius on other streets shall be 250 feet, except hillside streets may have a minimum radius of 150 feet.

There shall be a tangent between reversing curves of at least 150 feet on arterial and collector streets, and 50 feet on all others streets.

1.504 Cul-de-sac The maximum length of a cul-de-sac street, from center of intersecting street to center of turn-around, shall be 600 feet.

1.505 Curb Return Radii

Residential and Non-Residential – Minimum radius shall be 30 feet.

Commercial – In the downtown area the minimum radius shall be 25 feet. In other areas the radius shall be determined by the City Engineer.

Industrial – Minimum radius shall be 35 feet.

1.506 Minor Streets Minor streets shall be laid out in such a way that their use by through traffic is discouraged.

1.600 VERTICAL ALIGNMENT

1.601 Top of Curb Grades Grades shall not be less than 0.25 percent and not greater than 20 percent point grade – 15 percent average. Where matching existing controls, the minimum grade may be reduced with the approval of the City Engineer.

Grades on opposite sides of the street shall be the same wherever practical.

1.602 Curves Where the curb radius is less than 100 feet it shall have a grade of not less than 0.50 percent.

1.603 Curb Returns The minimum fall around returns shall be 0.20 feet.

1.604 Cross Slope The standard cross slope of the street shall be 2.5 percent. Where necessary when matching existing facilities, the cross slope may vary between 2 percent and 4 percent.

1.605 Vertical Curves Vertical parabolic curves shall be used to connect grade profiles where the algebraic difference in grade rates exceeds one percent. The length of vertical curve required shall be determined by the following:

Class of Street	Minimum Stopping Sight Distance	Minimum Length of Curve
Arterial and Industrial	350 feet	200 feet
Collector	200 feet	100 feet
Minor	100 feet	100 feet
Cul-de-Sac	100 feet	100 feet

1.700 CURB, GUTTER AND SIDEWALK

Curb, gutter and sidewalk shall be installed in conformance with the City of Morgan Hill Standard Details For Construction.

1.701 Curb and Gutter

Square-type curb and gutter rather than rolled curb shall be installed along frontages.

Depressed-type curb and gutter, 1" minimum height, shall be installed at all driveway locations.

1.702 Sidewalk Minimum sidewalk widths shall be 5 feet (Monolithic curb, gutter and sidewalk; measured from face of curb) in residential and industrial/commercial areas and 10 feet in the downtown core, unless specified otherwise by the Planning Division. Sidewalk widths should provide a 4 foot clearance around street lights and fire hydrants for disability access.

1.703 Pedestrian Ramp for the Handicapped Pedestrian ramps for the handicapped shall be installed according to the latest Americans with Disabilities Act (ADA Standard).

1.704 Replacement and Repair Where existing curb, gutter, sidewalk and driveways do not meet the current City standards and are in need of repairs, it shall be the developer's responsibility to remove and replace the deficient curb, gutter and sidewalk. Where curb, gutter, sidewalk and/or driveways are removed, the concrete shall be removed to the nearest expansion, weakened plane or construction joint or sawed at the nearest score line to a minimum depth of 1-1/2 inches.

1.800 DRIVEWAY APPROACH STANDARDS

The following driveway approach standards are not applicable to freeway or controlled access highways where access is limited by deed restrictions or other controls.

The number and width of permitted driveway approaches is regulated by the Public Works Department and shall be based on the needs of the parcel served. They shall not be detrimental to the abutting street's capacity, safety, and/or efficiency. Secondary driveways shall not be permitted within cul-de-sacs. Secondary driveways are only allowed upon approval by the City Engineer.

Driveway approach width is measured at the curb line and includes only the width of the fully depressed section.

The City Engineer may modify any of the following standards to improve traffic flow or because of special or unusual conditions.

1.801 Width

Industrial/Commercial – Maximum driveway approach width is 36 feet. Minimum driveway approach width is 16 feet.

Residential – Maximum driveway approach width is 24 feet. Minimum driveway approach width is 16 feet.

1.802 Distance From Curb Returns

Intersecting Streets – Driveway transitions are not permitted closer than 10 feet from the nearest BCR/ECR on residential streets.

Industrial/Commercial – Driveway approaches on arterials may be prohibited within 100 feet from the projected right-of-way line of the intersecting street where the intersection is presently signaled or is planned for signalization, or where intersection capacity is critical.

1.803 Distance From Utility or Safety Devices The driveway transition shall clear all public facilities such as electroliers, traffic signal standards, utility poles, fire hydrants, and street trees by a minimum of 3 feet. Any relocation of public facilities required to maintain such clearance shall be at the expense of the owner who is installing the driveway.

1.804 Distance Between Driveways A minimum of 4 feet of full curb height shall be maintained between the transitions of adjoining driveways. No driveway approach shall be constructed which results in a curb length between transitions of 14 feet to 22 feet. Where practical, the total space between driveway transitions shall be in multiples of 22 feet, plus 4 feet ($S=22X+4$).

1.805 Distance From Property Line A minimum of 2 feet of full curb height shall be maintained between the property line and driveway transition.

1.806 Common Use Driveways Common use driveways may be permitted in special cases.

1.807 Parking Lots Parking lot driveways shall be designed in such a manner as to preclude the use of the abutting public street for vehicular circulation solely related to the parking lot.

1.808 Grade Driveway grades shall be designed to keep the automobile from dragging or “bottoming out” on the street or driveway. The algebraic sum of the street cross slope and driveway apron slope shall not exceed 15 percent.

1.900 STREET LIGHTING

All electroliers shall consist of a high pressure sodium luminaire with eletrolier ownership dedicated to the City of Morgan Hill. Any proposed deviation on street light type must be approved by the City.

1.1000 EROSION CONTROL

An erosion control plan shall be required prior to any physical development of a property planned between October 15th and May 1st. Said plan shall meet the minimum standards and specifications of the Loma Prieta Resource Conservation District.



WATER DESIGN STANDARDS

SECTION 2

2.100 GENERAL

Water facilities shall be designed in accordance with accepted engineering principles and shall conform to these Design Standards.

All materials shall conform to current American Water Works Association Standards.

All installations shall conform to the City of Morgan Hill Standard Details for Construction.

The latest edition of the California State Department of Health Services “Criteria for the Separation of Water Mains and Sanitary Sewers” shall take precedence in horizontal and vertical alignment issues.

2.200 VERTICAL ALIGNMENT

The minimum cover on water mains shall be 36 inches. When crossing a sanitary sewer it is desirable that the water main be installed above the sanitary sewer with a clearance of 12 inches.

2.300 HORIZONTAL ALIGNMENT

Water mains shall be installed within street rights-of-way unless an easement installation is specifically approved by the City Engineer. Alignment shall be parallel to the street centerline wherever possible.

The alignment may vary, but in no case shall there be less than 10 feet horizontal clearance to a sanitary sewer, or 6 feet horizontal clearance to a storm drain.

2.400 PIPE

Water mains shall be sized according to the City’s Master Water Plan and Grid system. For waterlines other than the 10 inch or 8 inch grid, a 6 inch size line may be used if looped.

All pipe shall be Ductile Iron Pipe Class 50. Cast iron pipe or mechanical joint cast iron pipe may be used with specific approval of the City Engineer.

2.500 WATER SERVICE

The minimum size service is 1 inch.

2.600 FIRE HYDRANTS

All fire hydrants must be supplied from the largest available main; minimum 8 inch.

Fire hydrant spacing and distribution shall be determined as follows:

1. The maximum hose lay shall be 150 feet in high density residential, commercial, industrial zoning or high-value districts, with a maximum fire hydrant spacing of 250 feet.
2. The maximum hose lay shall be 250 feet in residential areas with a maximum fire hydrant spacing of 500 feet.
3. On divided streets, planned divided streets or state highway, the above spacing shall apply to both sides of the street.
4. A fire hydrant shall be located within 200 feet of the radius point of all cul-de-sacs.
5. Distribution main, fire hydrant and fire flow requirements shall also conform to the recommended standards of Insurance Services Office and National Fire Code.
6. On-site hydrants may also be required in conformance with ISO-NFC.

Fire flow and fire hydrant distribution, including the number of hydrants required and specific locations, shall be approved by the City Engineer and the Fire Chief.

2.700 VALVES

Valves shall be spaced and located in conformance with the following criteria:

1. 500-foot maximum spacing.
2. Water mains shall be valved on each side of railroad, freeway and canal right-of-way crossings
3. At "tees", 3 valves will be required.
4. At "crosses", 4 valves will be required.
5. At locations so that future tie-ins will not interrupt service and provide isolation and pressure testing of new systems.

2.800 DEAD-END RUNS

Permanent dead-end runs shall be no longer than 600 feet unless specifically approved by the city Engineer. Eight inch mains shall be used on dead-end runs which serve fire hydrants. Reasonable looping of water mains will be required.

2.900 BLOW OFFS

Blow-offs shall be constructed at the end of all dead-end runs.

2.1000 AIR RELIEF VALVES

Air relief valves shall be installed at high points.

2.1100 THRUST BLOCKS

Thrust blocks shall be installed in conformance with the City of Morgan Hill Standard Details for Construction.

2.1200 WATER LINE ACCEPTANCE TEST

Water lines shall be pressure tested, disinfected, flushed, and tested for bacteria in conformance with the City of Morgan Hill Standard Details for Construction prior to final acceptance by the City.



SANITARY SEWER DESIGN STANDARDS

SECTION 3

3.100 GENERAL

Sanitary sewers shall be designed in accordance with accepted engineering principles and shall conform to these Design Standards.

Storm water shall not be connected or discharged into a sanitary sewer.

The latest edition of the California State Department of Health Services “Criteria for the Separation of Water Mains and Sanitary Sewers” shall take precedence in horizontal and vertical alignment issues.

Engineering calculations used for the design of all proposed sanitary sewer systems, shall be submitted to the City Engineer. The calculations shall include the following items:

1. A plan, preferably 1" = 100' scale, showing the proposed street system, tributary sub-areas, existing and future tributary areas, outside the project limits, zoning, projected land use, and any features affecting the system design.
2. Design flows at major junction points including flows coming from outside the project limits.
3. Size, length, slope, and invert elevations of all proposed lines and locations of manholes.

3.200 AVERAGE FLOW

Where possible, the average residential flows shall be computed on a per capita basis using a minimum of 90 gallons per capita per day. Commercial and light industrial shall be computed at 1500 gallons per acre per day. All other industrial shall be computed utilizing 2500 gallons per acre per day. When the exact density is not known, the zoning map and the general plan shall be used to determine the appropriate densities. Multi family residential (\leq 2 bedroom/unit) shall be 2.75 persons per unit. All other residential uses shall be 3.25 persons per unit.

Schools shall be computed at 45 gallons per capita per day. Churches shall be computed at 23 gallons per capita per day.

The averages indicated above are minimum flows and in some situations may have to be increased due to higher densities or differing land uses.

3.300 DESIGN FLOW

The total design flow shall be determined by multiplying the average design flow by a peak factor obtained from the following graph:

Peak Factor Table (cfs)	
Qav	Pf
0 – 0.1	3.50
0.1 – 0.3	2.80
0.3 – 0.6	2.60
0.6 – 1.9	2.50
0.9 – 1.2	2.40
1.2 – 1.5	2.35
1.5 – 1.9	2.30
1.9 – 2.4	2.25
2.4 – 3.0	2.20
3.0 – 3.8	2.15
3.8 – 4.9	2.10
4.9 – 6.3	2.05
6.3 – 7.5	2.00
7.5 – 8.3	1.90
8.3 – 9.2	1.98
9.2 – 10.3	1.96
10.3 – 11.4	1.94
11.4 – 12.7	1.92
12.7 – 14.2	1.90
14.2 – 15.9	1.88
15.9 – 18.0	1.86
18.0 – 20.0	1.84

Note: The accuracy of hydraulic calculations does not warrant interpolation of Peak Factor.

3.400 VERTICAL ALIGNMENT

The minimum cover on sanitary sewer lines shall be 3 feet. When minimum cover cannot be achieved, polyurethane-lined ductile iron shall be used, or PVC C900 upon City Engineer Approval.

When crossing a water main, the sanitary sewer shall be installed below the water main with a minimum clearance of 12 inches.

At points of convergence of pipes of various sizes, the tops of the pipe elevations shall match within a manhole structure.

3.500 HORIZONTAL ALIGNMENT

Sanitary sewers shall be placed within street rights-of-way unless placement in an easement is specifically approved by the City Engineer.

Alignment shall be parallel to the street centerline wherever possible.

Curved sewers are allowed in curved streets when curvature does not exceed pipe manufacturer's recommendations.

Sanitary sewers shall not be constructed within 50 feet of any existing or proposed well site. Installations within 200 feet of an existing well or future well site shall be brought to the attention of the City Engineer and shall be designed under his direction and in accordance with the California State Department of Public Health recommendations.

3.600 SLOPE

Sanitary sewers shall be designed to flow at, $d/D=0.7$, with a minimum velocity of 2.0 feet per second. Minimum slope shall be .002. Use of lower velocities shall have the specific approval of the City Engineer. The maximum velocity shall be 10 feet per second.

3.700 PIPE

Pipe used for sanitary sewers shall have a minimum diameter of 6-inches when located in the street right-of-way. The pipe shall have rubber gasket joints and shall conform to the latest edition of the following ASTM Standards:

1. ABS SOLID WALL PIPE D 2751 (SDR 26)
2. ABS or PVC COMPOSITE PIPE (TRUSS) D 2680 (SDR 23.5 min.)
3. PVC SEWER PIPE D 3034 (SDR 26)
4. DUCTILE IRON PIPE (Gravity or Force) Class 50 Polyurethane-Lined
5. PVC C 900 (Gravity or Force) AWWA C 900

6. VITRIFIED CLAY PIPE (Extra Strength) Compression joint for Bell & Spigot Pipe (15" and larger)	C 700 (use of VCP must be approved by City)
Compression Couplings for Plain End Pipe (15" and larger)	C 425

Note: Polyurethane-Lined Ductile Iron Pipe shall be used for all Force Mains, or PVC C900 upon City Engineer approval. The minimum cover for ductile iron pipe and PVC C900 is 2 feet.

3.800 BUILDING LATERAL

The minimum size lateral shall be 4 inches and installed per Standard Detail S-2.

3.900 MANHOLES

Manholes shall be placed at the intersections of all sanitary sewers, at all locations where there is change in size, grade or direction and at the ends of all permanent lines.

Manhole spacing shall not exceed the following limits:

<u>Diameter</u>	<u>Maximum Spacing</u>
10" and under.....	400 feet
12" to 18".....	600 feet
21" and over.....	900 feet

Precast manhole bases may be permitted subject to City Engineer approval.

Manholes shall be constructed at all service lateral connections where the main line is not at least 1.5 times the size of the service lateral.



STORM DRAIN DESIGN STANDARDS

SECTION 4

4.100 GENERAL

All drainage facilities shall be designed in accordance with accepted engineering principles, and shall conform to these Design Standards.

4.200 SUBMITTAL OF DRAINAGE CALCULATIONS

Drainage calculations are required for any new subdivision of development. Submittal of drainage calculations shall include the following items:

1. Hydrology and hydraulic calculations together with assumptions, charts, tables, references and methods used.
2. A plan, preferably 1" = 100' scale, showing the proposed street system, existing and proposed drainage system, tributary sub-areas (including offsite drainage), and peak flow in all pipes.
3. A plan showing the hydraulic grade line (HGL), the proposed storm drain including slopes and sizes and top of curb in profile. Elevations should be shown at all changes in slope of the HGS, proposed storm drain and top of curb.

4.300 DESIGN FLOW

The Rational Method ($Q=CiA$) or SCS method shall be used to determine the quantity of runoff (Q) in designing a storm drain system as determined by the City Engineer.

Values for the coefficient of runoff (C) area as follows:

Parks and natural ground	0.1
RE	0.3
R-1 (Residential)	0.5
R-2 (Residential)	0.6
R-3	0.70
Schools & Churches	0.50
Industrial	0.90
Commercial	0.80

Values for rainfall intensity (I) for corresponding time of concentration shall be taken from the following Rainfall Intensity table. Maximum roof to gutter time of 20 minutes shall be used.

The Area (A) shall be the tributary drainage area in acres.

Manning's formula shall be used to determine the relation of design flow, slope, velocity and pipe diameter. The friction factor, "n", shall be 0.013 for concrete pipe.

The underground system shall be designed to handle a 10-year storm.

The streets shall be designed to carry a 100-year storm. The streets should carry this water to a release point where the water can get back into the natural water course of flood control facility. These overland flows should be kept in their original drainage basin if possible.

RAINFALL INTENSITY TABLE							
TC MIN	I ₅	I ₁₀	I ₁₀₀	TC MIN	I ₅	I ₁₀	I ₁₀₀
20	0.897	1.244	1.897	90	0.495	0.696	1.111
21	0.880	1.221	1.864	100	0.475	0.668	1.070
22	0.860	1.195	1.828	110	0.458	0.645	1.035
23	0.851	1.183	1.811	120	0.442	0.623	1.002
24	0.834	1.159	1.778	140	0.416	0.587	0.949
25	0.818	1.138	1.747	160	0.394	0.557	0.904
26	0.811	1.127	1.733	180	0.376	0.535	0.868
27	0.796	1.108	1.705	210	0.354	0.502	0.821
28	0.783	1.089	1.679	240	0.336	0.477	0.783
29	0.776	1.081	1.666	300	0.308	0.437	0.723
30	0.764	1.064	1.642	360	0.286	0.408	0.678
32	0.747	1.040	1.608	420	0.269	0.384	0.642
34	0.725	1.011	1.567	480	0.256	0.365	0.612
36	0.711	0.991	1.539	540	0.244	0.349	0.587
38	0.697	0.973	1.512	600	0.234	0.335	0.565
40	0.682	0.952	1.482	660	0.225	0.323	0.546
45	0.651	0.910	1.421	720	0.218	0.312	0.530
50	0.624	0.873	1.369	840	0.205	0.294	0.501
55	0.600	0.841	1.322	960	0.194	0.279	0.478
60	0.581	0.814	1.283	1080	0.186	0.267	0.459
70	0.546	0.766	1.213	1200	0.178	0.256	0.442
80	0.519	0.728	1.158	1320	0.171	0.247	0.427

Note: Formulas used for rainfall intensity data on following page.

TC = Time of concentration (Minutes)

I_5 – 5 Year Storm Intensity (Inches/Hour)

$I = K/TN$ where: I = Rainfall Intensity (in/hr)

T = Duration (hours)

K = Function of Mean Annual Precipitation and Frequency

N = Function of Mean Annual Precipitation

K and N Values for the City

5 year	$K = 0.581$	$N = 0.395$
10 year	$K = 0.814$	$N = 0.386$
100 year	$K = 1.283$	$N = 0.356$

4.400 STREET DESIGN FOR FLOOD CONTROL

The lowest street within a drainage basin shall be designed with a minimum overall gradient of 0.25 percent toward the nearest existing or proposed 100 year design capacity flood control facility.

4.500 PAD ELEVATION AND LOT GRADING

House pad elevations shall be determined by the following criteria while assuming construction of a slab on grade foundation (first floor 7 inches above pad). The latest Flood Insurance Rate Map shall be used.

1. In a AO zone, the lowest floor shall be at least 1 foot higher than the depth number specified on the FIRM or 1 foot above the nearest high point in the drainage release path, or 2% higher than lowest top of curb, whichever is highest.
2. In an A zone, the lowest floor shall be at least 1 foot higher than the base flood elevation, as determined by this community or 1 foot above the nearest high point in the drainage release path, or 2% higher than lowest top of curb, whichever is highest.
3. In all other zones, the lowest floor shall be at least 1 foot higher than the base flood elevation, or 1 foot above the nearest high point in the drainage release path, or 2% higher than lowest top of curb, whichever is highest.

Minimum grade of lots shall be 1%. All slopes are no greater than 2:1 or per Soils Report.

4.600 OBSTRUCTIONS

Though local drainage facilities will be designed for a ten year storm, special consideration shall be given to obstructions such as railroads, major freeways, roads and other areas where the natural drainage flow is blocked by manmade features. These obstructions shall be noted in the master plan with all drainage structures through them designed to convey the 100 year storm.

4.700 HYDRAULIC GRADE LINE

All storm drains shall be designed for the maximum storm water entering the drain at the point of concentration and shall have a minimum of 1 foot of freeboard between the top of curb and the Hydraulic Grade Line. However, exceptions to the above standards as they relate to “bubble ups” shall be approved by City Engineer.

4.800 VERTICAL ALIGNMENT

The minimum cover on main line storm drains shall be 2-1/2 feet from finished grade.

Catch basin laterals that have less than 24 inches of cover from finished grade shall be encased in concrete.

A minimum vertical clearance of 3 inches shall be maintained between a sanitary sewer, water main, or other underground utility.

At points of convergence of pipes of various sizes, the tops of the pipe elevations shall match unless specifically approved by the City Engineer. This does not apply to catch basin laterals.

4.900 HORIZONTAL ALIGNMENT

Storm drains shall be placed within street rights-of-way unless placement in an easement is specifically approved by the City Engineer.

Alignment shall be parallel to the street centerline wherever possible.

Curved storm drains are allowed in curved streets when curvature does not exceed the pipe manufacturer's recommendations.

4.1000 SLOPE

Storm drains shall have minimum slopes equal to that necessary to give a velocity of 2.0 feet per second when flowing half full regardless of the slope of the Hydraulic Grade Line. Pipes with lower velocities shall use available fall and have the specific approval of the City Engineer.

Storm drains shall have a minimum slope of .002.

Catch basin laterals shall have a minimum fall of 0.10 feet between the catch basin and manhole. Desirable fall is 0.30 feet or more.

4.1100 PIPE

The minimum size for storm drains shall be 15-inch diameter.

All catch basin laterals shall have a minimum diameter of 15 inches.

All pipe shall conform to the following ASTM specifications:

CONCRETE PIPE

Reinforced pipe with rubber gasket joint	C 76
Rubber Gasketed Joints	C 361 Joint & C 443 Gasket

Cast-in-place concrete pipe, 24 inches and larger, may be used when specifically approved by the City Engineer. Cast-in-place pipe will not normally be permitted in existing streets.

4.1200 MANHOLES

Manholes shall be placed at the intersections of all storm drains, at all locations where there is a change in size, change in horizontal or vertical alignment and at the ends of all permanent lines.

Manhole spacing shall conform to the following limits:

<u>Diameter</u>	<u>Maximum Spacing</u>
15" to 30"	400 feet
33" to 54"	600 feet
60" and over	1000 feet

Manholes will not be required where a single catch basin meets the following criteria:

1. Size of catch basin lateral is 15 inches.
2. Storm drain has a diameter of 48 inches or larger.
3. No other existing or future catch basins are within 100 feet along storm drain centerline.

All storm drain manholes shall be constructed in conformance with Standard Detail SD-1 and SD-2 unless otherwise approved by the City Engineer.

4.1300 CATCH BASINS

Side inlet catch basins shall be located at all low points and shall be spaced in such a manner that design flows will not encroach into the travel lanes.

The total gutter run contributing to any catch basin shall not exceed 1,000 feet. It is desirable to locate catch basins on the BCR or ECR which will intercept the most runoff and also keep the main pedestrian crossing as dry as possible.

Drop inlet catch basins shall be constructed only in alleys or as temporary installations on unimproved streets where curb and gutter has not yet been installed.

4.1400 SIPHONS

Inverted siphons are not permitted.

4.1500 ON-SITE DRAINAGE

All developed areas larger than one acre shall tie on-site drainage into the City of Morgan Hill storm drain system.

4.1600 PONDING BASINS

Ponding basin on private or public property shall be designed using the following criteria:

1. A 24-hour, 25-year storm, total rainfall of 4.79 inches shall be used if a reasonable outlet is provided (detention). If no disposal other than evaporation, percolation or irrigation is provided (retention), a 24-hour, 100-year storm, total rainfall of 5.59 inches, shall be used. 25% of the total basin volume shall be considered as freeboard.
2. The maximum water surface of the basin shall be 1 foot below the elevation of the top of curb at the lowest catch basin inlet within the tributary area and a maximum of one foot above the design hydraulic grade line at the basin.
3. Fencing shall be provided around all basins greater than 3 feet in depth.
4. Adequate “all weather” access shall be provided.
5. The tributary drainage system shall be designed to connect to the City’s future storm drainage system.
6. The maximum slope ratio for turfed or landscaped side slopes shall be 4:1.



HILLSIDE DEVELOPMENT STANDARDS

SECTION 5

5.100 GENERAL

All hillside development shall conform to these Design Standards.

5.200 ENVIRONMENTAL CONSTRAINTS

No building, private street or driveway shall be constructed in an area identified by the General Plan Environmental Constraints Map as having any of the following characteristics, unless an on-site soils and geologic investigation proves otherwise:

1. Severe soil instability.
2. High erosion potential.

No building, private street or driveway shall be constructed on land determined to be a landslide area or on land in the path of a landslide, as identified by an on-site soils and geologic investigation or by the United States Geologic Survey.

No building, private street or driveway shall be constructed on land having slopes in excess of 20 percent; provided however, that minor encroachments of the facility onto slopes in excess of 20 percent may be permitted where the Community Development Department finds that the proposed encroachment will not conflict with the purposes and intent of Ordinance No. 568 N.S. This provision shall not apply to lots existing prior to adoption of the ordinance. Development of such lots shall be regulated by Section 4.22.6 (d) or Ordinance No. 568 N.S.

5.300 LAND MODIFICATION RESTRICTIONS

5.301 Lots with Greater Than 20% Ground Slopes That portion of a lot having a ground slope in excess of 20 percent shall not be altered in any way by grading, removal or alteration of natural features such as streams, rock outcrops, ridge lines and drainage swales. The removal of natural vegetation as part of a fire protection program must be approved by Central Fire District. Correction or stabilization of a geologic or seismic hazard for public safety purposes must be approved by the Planning Commission.

If the entire lot contains slopes in excess of 20 percent and the lot is a lot of record legally created in accordance with applicable regulations of the City at the time of its creation, one dwelling unit and those accessory uses permitted may be constructed on such site provided that the proposed method of building and site preparation conforms with recommendations acceptable to the Community Development Department and recommendations contained in a geologic report by a qualified and licensed engineering geologist.

A transfer of Development Rights or Residential Planned Development (RPD), shall be attempted prior to application for Community Development Department approval.

5.302 Cut and Fill Slopes Cut and fill slopes shall not be steeper than 2:1 unless stabilized by a retaining wall or cribbing approved by the City Engineer. Cut and fill slopes shall return to the natural slope as soon as possible.



IMPROVEMENT PLAN REQUIRED GENERAL NOTES

APPENDIX A

The following General Notes are required on all improvement plans submitted for approval to the City of Morgan Hill Public Works Department and shall not be modified. Additional notes may be added under the title of “Project Notes”. However, conflicts between the City’s required General Notes and the Project Notes shall be resolved by the City Engineer.

1. Temporary Bench Mark – Based on a City approved benchmark as shown on these plans.
2. All existing elevations shall be field verified by contractor unless otherwise noted.
3. All survey monuments shall be installed at locations shown on the corresponding final map before acceptance of the subdivision.
4. Contractor shall not destroy existing permanent survey monuments.
5. All work shall conform to the latest edition of the City of Morgan Hill Standard Details for Construction which are hereby made a part of these plans. Deviations from the Standard Details must be approved by the City Engineer.
6. Developer shall arrange for a pre-construction meeting with the City Engineer (Municipal Code 17.32.250b) prior to commencing any construction. An encroachment permit shall be obtained from the Public Works Department upon completion of said meeting and prior to construction of any improvements within an existing or offered for dedication right-of-way, public utility easement or public service easement.
7. A grading permit shall be obtained from the city of Morgan Hill Building Division prior to any grading of building pads. Applicant for the grading permit shall provide a plan review letter from the Soils Engineer. A grading permit does not give contractor permission to commence off-site (street) grading. Only upon City approval of the improvement plans and completion of a pre-construction meeting, shall contractor commence off-site grading.
8. Contractor shall notify the Public Works Department 48 hours prior to commencement of any work phase. At that time, an “Inspection Request Form” shall be completed to ensure proper scheduling of an inspection with the City Engineer’s Representative.
9. Contractor shall preserve all surrounding property by confining operations to within the “Limits of Work”. Contractor shall be responsible for maintaining access for all adjoining residents, places of business, and properties at all times and in a safe manner. Contractor shall make proper notification at least 24 hours in advance of any interruption in access or service to the above property owners as well as to the City Engineer’s Representative.

10. Contractor shall only use equipment provided with a spark arrestor device to reduce a potential fire hazard.

11. Right of Modification:

Approval of this plan does not release Subdivider of the responsibility for correction of mistakes, errors, or omission, contained therein. If during the course of construction, public interest requires a modification of or a departure from these improvement plans or the City Standard Details for Construction, the City Engineer shall have the authority to require such modifications and departures and to specify the manner in which the same is to be made.

12. Off-Site Water & Dust Control:

Contractor shall provide a water truck onsite at all times. Contractor will be allowed to draw water from the City of Morgan Hill Water Distribution System only after obtaining a hydrant meter from the Public Works Department and an inspection of the water truck for a proper backflow device or “air-gap” filling pipe. Developer has paid for “off-site” construction water which shall not be used for building construction. Contractor shall keep down dust from construction activity to the maximum extent possible. Contractor shall clean all existing streets, curbs, gutters, and sidewalks affected by the project at the end of each working day.

13. Material Storage:

No material shall be stored near the edge of pavement, traveled way, sidewalk, driveway, or shoulder line which may create a hazard for vehicular and pedestrian traffic.

14. Traffic Control:

Contractor shall submit a traffic control plan for approval to the Public Works Department a minimum of 5 days prior to any work within an existing public street. The plan shall be signed by a licensed Traffic Engineer when it involves an arterial street. Contractor shall provide all necessary traffic control in accordance with the latest edition of CALTRANS “Manual of Warning Signs, Lights, and Devices for Use in Performance of Work Upon Highways”, while working within the public right-of-way. Two traffic lanes (10' min.) shall be open to vehicular traffic during all hours, weekends, and holidays. One lane one way traffic, may be permitted under the control of not less than 2 (two) competent flagmen during construction operations. Street closures and detours shall only take place upon City Engineer approval and Police Department coordination.

15. Trench Excavation:

Contractor shall exercise diligence in reviewing the approved Soils Report and other available resources to familiarize himself/herself with the soil conditions to be encountered in the course of work identified in these plans. Contractor shall not cause damage to adjacent trees or existing structures above or below grade during trench excavation. All rocks, boulders, and large stones encountered shall be removed to provide a clearance of 6 inches around the pipe. The trench bottom shall be refilled to grade with sand, pea gravel, or other approved granular material. Clean 1/4" or 1/2" pea gravel shall be used in areas of moist condition, or where the soil has a history of sub-surface water. If the bottom of the trench is found to consist of wet or unstable material incapable of properly supporting the pipe, the material shall be removed to a minimum depth of 12 inches below the unstable layer for the full width of the trench and replaced with approved granular material. Trench excavation material deposited adjacent to the trench shall be placed and located to prevent spillage into the open trench.

16. Trench Safety:

It shall be Contractor's responsibility to provide all necessary trench safety measures for excavations. All trench safety measures shall be in accordance with the latest CAL-OSHA guidelines. Contractor shall provide evidence of a CAL-OSHA trenching permit at the pre-construction meeting.

17. Excavations within the public right-of-way shall be backfilled, compacted, and temporarily paved with cold mix "cut back" type A.C. to allow for vehicular and pedestrian traffic prior to 4:00 P.M. The use of trench plates is allowed, provided the Contractor covers all edges of the plates with cold mix material. It shall be the Contractor's responsibility to maintain on a daily basis, including weekends, the amount of material necessary to maintain the trench surface flush with the existing street or sidewalk. In addition, the Contractor shall respond to and correct shifting trench plates regardless of the time of day. If Contractor fails to correct sinking backfill material or shifting trench plates in a timely manner, City shall reserve the right to correct the problem and back charge the contractor.

18. Joining Existing Pavement:

Existing pavement which is to be joined by new pavement shall be saw cut vertical to provide straight, true and neat joints. Overlapping of existing pavement without saw cutting or grinding shall not be permitted. The vertical edges shall be tacked prior to paving. Terminals of all surfacing indicated on the plans shall join any existing surface in a smooth butt joint. Conform paving by method of abrasive grinding will be allowed upon approval of the City Engineer.

19. Sanitary Sewers:

All manholes, sewer mains, and laterals must pass a leakage test as described in the City of Morgan Hill Standard Details for Construction. After all backfill, testing, and pavement restoration has been completed, the contractor shall flush and clean all sewer lines 24 inches or less in diameter by the “Wayne Ball Method”. After the leakage test, but prior to paving, a television inspection shall be performed at all locations of newly installed sewer mains at contractor’s expense. The underground contractor must keep an accurate record of manholes and the distance between them and each wye branch lateral, and their direction.

20. Before any upstream sewers are constructed, the contractor shall verify the elevation and location of existing sewer lines to be connected.
21. The end of each new lateral shall be marked as shown in Detail S-2. The concrete contractor shall stamp an “S” on the face of curb directly above the lateral.

22. Water Lines:

Contractor shall not turn off or on any valves belonging to the City’s water system. Only Department of Public Works personnel shall open the necessary valves to connect new lines. Failure to follow this requirement shall be considered an “unlawful connection” and may result in issuing of a citation and fines as specified in Section 13.04 of the Morgan Hill Municipal Code.

23. Connections requiring shut down of the system shall be done between the hours of 12:00 Midnight and 6:00 AM, and only upon coordination with the Department of Public Works.
24. All water lines shall be tested after completion of the trench backfill and compaction of the final base material, but prior to placement of the final roadway surface.
25. Contractor shall place marker posts adjacent to all air relief valves and blow off assemblies along water mains located in unimproved areas or fields. The posts shall be pressure treated redwood 4”x4”x6”, painted white, buried 2’-6”, and inscribed with “W/A.V.” (for air relief valves) or “B.O.” (for blow off assemblies), in 3 inch high carved letters painted blue.
26. The concrete contractor shall stamp a letter “W” on the face of curb directly above the water service.

27. Backfill & Compaction:

Backfill material shall be hand placed and compacted up to at least 6” above the pipe. When using native soil as trench backfill, the minimum sand cover shall be 12”.

28. Jetting and/or flooding of trench backfill material will be permitted only if approved by the Soils Engineer and City Engineer.

29. Any excess excavation material may be deposited onsite in areas and at depths designated by the Owner, and with approval of the City Engineer.
30. The minimum relative compaction for trench backfill, subgrade and base material shall be 95% throughout the project unless recommended otherwise in the soils Report and approved by the City Engineer.
31. If trench backfill material is 100% sand, the City shall conduct compaction tests of the lifts specified. If the trench backfill material is native soil, contractor shall provide compaction test results of the lifts specified in the Soils Report to the City Engineer from a certified testing laboratory at contractor's expense.
32. Any aggregate base that becomes contaminated during construction shall be removed and replaced with uncontaminated base.

33. Erosion and Sediment Control:

An erosion and sediment control plan shall be required prior to any physical development of a property. Erosion control shall be planned between October 15th and May 1st, and sediment control shall be planned year round for the life of the project. Said plans shall meet the minimum standards and specifications of the California Stormwater Quality Association (CASQA) for Stormwater Best Management Practices (BMPs). Contractor shall be responsible for initiating the required control measures. CASQA BMP information can be viewed and downloaded at <http://cabmphandbooks.com/Construction/asp>.

34. Curb Inlet Stenciling:

All curb inlets shall have thermoplastic stenciling: "No Dumping, Flows to Creek/River".

35. Electroliers:

All electroliers shall be installed by the Developer (rate schedule LS-2C, 120V, high pressure sodium, at the locations shown on these plans). See Electrical Section of the Standard Details.



CHECK LIST FOR IMPROVEMENT PLANS

APPENDIX B

Planning Division Name: _____ Planning No: _____

Subdivision Name: _____ Tract No: _____

Public Works Project Number: _____ Assessor's Parcel No: _____

Tentative Map Approval Date: _____

Engineering Firm: _____ Job Number: _____

Project Engineer: _____ Telephone Number: _____

Note: Digital file submittals shall be AutoCad Release 12 (minimum) on standard 3½" diskette.

(Appropriate sections to be checked off by the Engineering firm and provided along with 1st submittal)

	<u>Checked By/ Date/Comments</u>
(<input type="checkbox"/>) 1 st Check	_____
(<input type="checkbox"/>) 2 nd Check	_____
(<input type="checkbox"/>) 3 rd Check	_____
7 Sets of Improvement Plans with Landscape Irrigation Plan.	_____
Sets of Hydrology Map and Calculations.	_____
Retention Pond Design Criteria on Plans.	_____
Copy of Engineer's Estimate.	_____
Copy of Soils Report and Pavement Design Calculations (Arterials).	_____
Set of Sewer Map and Calculations.	_____
Copy of Final Conditions of Approval (Resolutions).	_____
Copies of Fireflow Calculations (Commercial).	_____
<u>REVIEWED BY:</u>	
1. Utilities Systems Manager.	_____
2. Engineering Division Inspection Section.	_____
3. Central Fire District.	_____
4. Sent to P.G. & E., Telephone & Cable T.V.	_____
5. Other Agency Review:	_____
a. Santa Clara Valley Water District.	_____
b. Other (Specify).	_____

Checked By/
Date/Comments

GENERAL (Applicable to every sheet)

1. Sheet size is 24" x 36" with 2" space on left side of border and 1" space on right side.
2. Title Block/Border of each sheet (contains as a minimum):
 - a. City of Morgan Hill Public Works Department logo.
 - b. City Engineer's signature block.
 - c. Design Engineer's signature block.
 - d. Design Engineer's seal, R.C.E. number and original signature (stamped signatures are not acceptable on final submittal).
 - e. Horizontal scale (1"=40' max) & Vertical scale (1"=4' max).
 - f. Name of Subdivision or Project and Sheet Name.
3. Stationing referenced to nearest intersection.
4. All offset distances measured from center line.
5. City Standard Details referenced correctly & unchanged (with border).
6. Details other than standard, properly detailed.

TITLE SHEET

1. Required City General Notes on left side (compare to App.A).
2. Project Area Diagram:
 - a. Project limits shown as well as any City-County boundaries.
 - b. Phase boundaries (if applicable).
 - c. Lots and lot numbers.
 - d. New/existing abutting right of ways, easements and street names.
 - e. New electroliers.
 - f. TBM shown with reference to an approved City benchmark.
 - g. Plan Sheet references.
3. Sheet Index.
4. Symbol/Abbreviations Legend.
5. Location Map with North Arrow.
6. Construction Quantities/Scope of Work shown and itemized.

STREETS

A. PLAN VIEWS

1. Promised items in Project Narrative Questionnaire are shown on plans. _____
2. Handicap ramps are designed per Standard Details. _____
3. Property corner cutoffs used where handicap ramps installed (see Standard Detail A-1) otherwise concentric with curb. _____
4. Curb curve data given – central angle, length, and radius. _____
5. Phase boundary shown (if applicable). _____
6. R/W and street width dimensions shown. _____
7. Centerline stationing at 100' and at BC & EC of horizontal curves. _____
8. Lot/parcel lines and numbers/letters shown. _____
9. Cul-de-sac cross slopes from high point to gutter lip-.02 min/.05 max. _____
10. Rim and invert elevation and station given at all drainage structures. _____
11. TC elevation and station at property line extensions. _____
12. TC elevation and station at grade breaks and at curb returns. _____
13. 0.0025 minimum slope observed on all streets at curb line with minimum 0.2 foot fall around returns. _____
14. Location of underground pipes and utilities shown. _____
15. Fire hydrant and electrolier meanders per Standard Detail W-9 & E-2. _____
16. Street monuments shown. _____
17. Street names shown. _____
18. All notes and standard symbols conform to legend. _____
19. All ex. Utility poles, manholes, valves, signs, mail, boxes, trees, etc. shown. Indicates those to be removed, relocated or adjusted to grade. _____
20. Continuations and cross streets properly referenced i.e. (See sheet #.....). _____
21. Street knuckles are per Standard Detail A-22 or approved deviation. _____
22. Street signs, traffic signs and barricades shown in proper locations. _____
23. Driveway locations & stationing shown. Width 16'-24' (residential). _____
24. Show existing manholes, water valves and other facilities to be adjusted to grade. _____
25. North arrow shown for each plan view area. _____

STREETS

B. PROFILES

1. Vert curves designed for proper speeds per Highway Design Manual. _____
2. Minimum vertical curve lengths observed. (100'). _____
3. Vertical scale 1" = 2' of 1" = 4'. _____
4. Vertical curves used for grade-breaks where algebraic difference >1%. _____
5. Cul-de-sacs, show profiles @ centerline through radius point to TC at end of cul-de-sac (dashed line). _____
6. 2% maximum grade observed across intersections. _____
7. All underground pipes and utilities shown to include storm drain, water and sewer. _____
8. Existing ground on centerline shown. _____
9. Finished grade profile for top of curb shown. _____
10. Centerline profiles of intersecting streets shown to their point of intersection. _____
11. New road profile conforms to off-site existing road profile. _____
12. Centerline stations and elevations shown @ all BVC, EVC, PIVC, grade breaks, low points and high points. _____
13. All slopes in profile shown. _____
14. Shows all utility crossings with clearances indicated. _____
15. Manhole and drop inlet invert and flowline elevations shown. _____
16. Elevation at high and low points of water mains shown. _____

GRADING PLANS

1. Erosion control plan included when project is planned for construction between October 15th and May 1st. _____
2. Existing elevations or contours shown. _____
3. Existing and proposed storm drain lines and structures shown. _____
4. Proposed pad grades and lot numbers shown. Minimum grade of lots 1%. _____
5. "Lowest Floor" shall be minimum 1' above calculated high water point or FIRM base flood elevation, whichever is greater. See Section 4.500 of the Design Standards for further details. _____
6. Retaining walls and sound walls shown. _____
7. Section of typical lot shows property lines and slopes/grades. _____
8. Elevations at rear of lots shown. _____
9. Elevation of surrounding lots shown. _____
10. Shows grading required for off-site drainage. _____

	Checked By/ Date/Comments
11. Profile shows back-of-curb/sidewalk and original ground.	_____
12. Grading conforms to adjacent properties and does not create possible adverse effects on future development.	_____
13. Drainage does not occur across lot lines. Lots shall drain to streets where practicable.	_____
14. All slopes are maximum 2:1 or per Soils Report.	_____
<u>SANITARY SEWERS</u>	
1. System in agreement with approved tentative map and master plan.	_____
2. Design conforms to City Design Standards and Details.	_____
3. Adequate cover. 3' min to finished grade – 2' min for ductile iron.	_____
4. Minimum horizontal and vertical clearances from water main.	_____
5. Pipe size, type, slope, and length between structures shown.	_____
6. Connection to existing facilities shown. Manhole installed when tying to existing lines.	_____
7. Where sewer line extension is possible, do proposed lines extend to at least the subdivision boundary?	_____
8. Are curved sewer deflections less than 80% of pipe manufacturer's recommended maximum? Shows curve data or offsets if concentric with centerline. Short pipe lengths are indicated clearly on plans.	_____
9. Station and invert & top of manhole elevations shown.	_____
10. Sizes of existing lines shown.	_____
11. 400' maximum distance from manhole to manhole and 250' from manhole to clean out (at end of line).	_____
12. Minimum 2 fps velocity, 10 fps maximum.	_____
13. 0.1' drop around corner through manhole, or matches soffit elevation.	_____
14. Bolted manhole covers for any off street manholes.	_____
15. In unimproved areas, manholes extended 1' above ground.	_____
16. Elevations, slopes and distances all mathematically correct.	_____
17. Minimum vertical and horizontal distances to water lines maintained.	_____
<u>DRAINAGE</u>	
<u>A. HYDROLOGY – HYDRAULICS</u>	
1. Calculations conform to City Design Standards. Underground system designed to handle a 10-year storm, streets designed to carry a 100 year storm.	_____
2. Tributary drainage system designed to connect to City's future storm drainage system and conforms to Storm Drainage Master Plan.	_____

	Checked By/ Date/Comments
3. Calculations shall include: HGL, FL, E1, Q, A, S, V, freeboard at structures, structure losses, & tailwater assumptions.	_____
4. Adequacy of in-tract and off-tract drainage system verified.	_____
5. All starting water surface calculations adequately verified.	_____
6. Drainage map showing street system, existing and proposed drainage system, slope arrows, tributary sub-areas in acres, peak flow in all pipes (1" = 100' preferred).	_____
7. All pipe in tributary areas labeled to correspond with calculations.	_____
8. Base Flood Elevation verified for the project area.	_____
<u>B. EASEMENTS</u>	
1. Off-tract drainage improvements (plan and profile) and accompanying easements shown. Off-tract offers of dedication for drainage easement submitted for review.	_____
2. Off-tract work to be done but no easement required; right-of-entry submitted for review.	_____
3. Easement widths indicated.	_____
<u>C. STRUCTURES</u>	
1. 1.00' minimum HGL to TC.	_____
2. Special structure calculations profided.	_____
<u>D. PIPE</u>	
1. Minimum slope of 0.002 observed (min. 2 fps). Size (15" min.), class, slope, length, and type of pipe (RCP shown in profiles).	_____
2. Indicates clearly on plans where non-standard pipes are used.	_____
3. Are curved storm line deflections less than 80% of pipe manufacturer's recommended maximum? Shows curve data or offsets if concentric with centerline.	_____
4. Elevations, slopes and distances all mathematically correct.	_____
5. Matches hydraulic/hydrology calculations.	_____
6. Manhole inverts and rim elevations shown along with catch basin invert elevations.	_____
<u>E. CHANNELS</u>	
1. Maximum velocity in earth channel verified by soils report.	_____
2. Channel side slopes as specified by soils report.	_____
3. Channel design per City Specific Plan (if applicable).	_____
<u>F. TEMPORARY STORM DRAIN RETENTION BASINS</u>	
1. Runoff and volume calculations per City Design Guidelines.	_____
2. High water level shown on basin section.	_____

	Checked By/ Date/Comments
3. Basin bottom 5' above water table unless statement from soils engineer indicates range of depths, then 2' minimum allowed.	_____
4. Outfall protection using rip-rap required.	_____
5. Chain link fence with slats required around basins >3 feet in depth.	_____
6. Pedestrian access ramps (if any) meet ADA requirements.	_____
7. Off-tract basins have an access road around the basin.	_____
8. Easement boundary shown.	_____
9. Maximum sloped ratios for turfed or landscaped side slopes = 4:1.	_____
G. GENERAL	
1. Show winterization procedures and erosion control measures.	_____
2. Copy of permit provided (if applicable) necessary for outfall.	_____
WATER	
1. Design conforms to City of Morgan Hill Design Standards and Standard Details for Construction.	_____
2. Design conforms to Water Master plan.	_____
3. Minimum distances to sanitary sewer and storm lines maintained.	_____
4. Length shown as distance between crosses or tees.	_____
5. Air relief valves at high points.	_____
6. Invert elevations shown at all grade breaks and air relief valves.	_____
7. Sizes of all existing lines shown.	_____
8. Fire services shown (if applicable).	_____
9. Size and type of pipe shown in profile.	_____
10. Blowoffs at dead-end lines.	_____
11. Valves on all legs of a "cross" or "tee".	_____
12. Minimum cover 36 inches.	_____
13. Minimum water service size 1 inch.	_____
14. Size and location of water services laterals and meter boxes shown.	_____
15. Fire Hydrant spacing per Design Standards section 2.600.	_____
16. Valves spaced per Design Standards section 2.700.	_____